

**South Carolina Department of
Transportation**

REQUEST FOR PROPOSALS
(Final with Addendum 1)

Port Access Road

Project ID 0037345

A Design-Build Project

Charleston County

South Carolina

December 3, 2015

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I. PURPOSE OF REQUEST FOR PROPOSALS

The purpose of this Request for Proposals (“RFP”) is to select a Proposer to perform the Project services described in this RFP. SCDOT desires that this Project be constructed in a very efficient and timely manner. The proposed Project services are hereinafter referred to as the “Project”. “Proposer,” as used here, includes a firm or firms, consortia, partnerships, joint ventures, and other legal entities, which have been requested by SCDOT to submit a Proposal in response to this RFP. The Proposer shall become the Contractor if awarded the Contract.

It is not the intention of the SCDOT to receive complete detailed Project analysis and design prior to the selection of a Proposer and the later execution of an agreement. Rather, the response to this RFP shall provide sufficient information to be evaluated by SCDOT to determine if the proposal is in accordance with the specified process and criteria. The Proposal shall be specific enough on assumptions used in its preparation so as to provide the basis for determining a final agreement.

The information obtained under this RFP will become the property of SCDOT without restriction or limitation on its use. With the exception of Alternative Technical Concepts (ATCs), SCDOT shall have unrestricted authority to publish, disclose, distribute, or otherwise use in whole or in part any reports, data, or other materials prepared under this RFP. SCDOT shall retain ownership of all plans, specifications, and related documents.

The Project will be contracted and administered by the SCDOT on behalf of the South Carolina Ports Authority (SCPA).

II. OVERVIEW

A. Project Description

The Port Access Road is a new roadway and structure Project to provide direct access between the proposed marine container terminal location on the former Navy Base and I-26 while maintaining adequate service for local, commuter, and commercial traffic. Included in the Project’s purpose is the intent to safely integrate container terminal traffic with existing traffic; support local and regional planning policies and strategies; and minimizing adverse impacts on communities and the environment. The Project consists of the construction of a new fully directional interchange on I-26, a Bainbridge Connector Road, the extension of Stromboli Avenue and associated roadway improvements to surface streets to serve the proposed Naval Base Terminal (NBT) in Charleston County, South Carolina.

SCDOT intends to enter into a contract for services as detailed in **the Agreement and Agreement Exhibits**. The Proposer shall be responsible for meeting all Project requirements, specifications, and other applicable criteria as set forth in “Attachments A, B, C”.

B. Project Information Package

Project Information, containing electronic files applicable to the Project, will be posted on the SCDOT Design Build website in Attachments C. The Project Information Package will include information describing the work, which has been performed by SCDOT prior to entering into the contract for the Project. The Project Information Package is attached to this RFP as “Attachment C”. “Attachment C” may contain additional information not provided at the RFQ stage. Data, reports, plans, electronic files, and any other items supplied in Attachment C which is posted on the SCDOT Design Build website are for information only. SCDOT shall not be liable for the reliability or accuracy of the information contained therein. **It is the PROPOSER’S responsibility to check the website regularly for updates, modifications and additional documentation pertaining to this procurement.**

Proposers are encouraged to visit the Project site and to make any additional subsurface explorations, soil tests, or environmental testing that Proposer may desire for purposes of preparing the Proposal. The Proposer shall obtain any permits or permissions required prior to any additional subsurface exploration.

C. SCDOT Point of Contact

Mr. Jae Mattox is SCDOT’s Program Manager and sole point of contact (POC) and addressee for receiving all communications about the Project. No contact is allowed with any SCDOT or SCSA personnel concerning this Project except for questions of an administrative or contractual nature that shall be submitted in writing to the attention of the POC (email is acceptable). This restriction is in effect until the contract has been awarded. Any Proposer engaging in prohibited communications may be disqualified at the sole discretion of SCDOT. Written inquiries from the PROPOSER’s POC (as identified in the Proposer’s SOQ) should be sent to:

Mail Delivery:	Jae H. Mattox, III, PE Design-Build Program Manager South Carolina Department of Transportation 955 Park Street, Room 418 Columbia, South Carolina 29201
E-mail:	mattoxjh@scdot.org
Phone:	803-737-1805

D. RFP Committal

The submittal of a Proposal in response to this RFP shall constitute the PROPOSER’S agreement to enter into a contract with SCDOT for the completion of the Project under the terms set forth in the Agreement and Agreement Exhibits attached hereto as “Attachment A”.

III. GENERAL INSTRUCTIONS

A. Design Build Procurement Method

For this Design Build Project, SCDOT chose the two-phased procurement method. Phase 1, which identified a short-list of qualified PROPOSERS, is complete.

In Phase 2, SCDOT will invite each of the short-listed PROPOSERS to submit their Proposals for completion of the Project. After evaluation of the Proposals, SCDOT plans to award and execute a contract with a single Proposer. Phase 2 includes the following steps:

1. SCDOT releases RFP for Industry Review
2. SCDOT accepts Questions, Clarifications, and holds First Confidential One-On-One Meeting
3. SCDOT releases Final RFP
4. PROPOSERS submit Preliminary Alternative Technical Concepts (ATCs)
5. SCDOT conducts Second Confidential One-on-One Meetings with PROPOSERS to discuss Preliminary ATCs
6. Proposers submit Formal ATCs
7. SCDOT approves/disapproves ATCs
8. Proposers submit Proposals
9. SCDOT evaluates Proposals
10. SCDOT selects a Contractor

These steps will be carried out following the Milestones in Article VIII. The following paragraphs provide information detailing various steps of the process.

B. RFP for Industry Review

The intent of the RFP for Industry Review is to identify those areas of the RFP that may be in conflict with each other and to point out and clarify mistakes or ambiguities in the RFP. The First Confidential One-on-One Meetings may be scheduled with the Proposers to facilitate this purpose.

C. Questions, Clarifications, and First Confidential One-On-One Meeting

Once the RFP for Industry Review is issued, the Proposers POC may submit questions, may seek clarification relating to the RFP, and/or request a confidential meeting with SCDOT in accordance with the Milestone Schedule. SCDOT may hold the First Confidential One-on-One Meetings (the “First Meeting”) following the review of submitted comments or questions prior to Final RFP release. SCDOT will reserve two (2) hours of meeting time for each Proposer that requests a meeting and SCDOT will give time of day preference in the order that requests are received. **The purpose of the First Meeting will be limited to editing the RFP for Industry Review.** If time allows, other questions regarding the RFP process or the content of individual proposals may be discussed. Proposers shall submit their questions or comments using the Confidential Questions Submittal Form which can be downloaded from the SCDOT Design

Build Website under the SCDOT Design Build Documents and Standard Forms Section at http://www.scdot.org/doing/constructionLetting_DesignBuild.aspx.

SCDOT reserves the right to accept or not accept questions received after the milestone deadlines. SCDOT will review all questions and/or requests for clarification received and, if it deems appropriate, in its sole discretion, may incorporate them in the Final RFP. SCDOT's answers to Proposers' questions, are for general information only, do not constitute legal or other advice and do not amend, or form part of the Final RFP. Nothing discussed at the First Meeting shall change the requirements of the RFP.

D. Final RFP

After completion of the Questions, Clarifications, and First Confidential One-on-One Meetings stage, SCDOT may incorporate the Proposers' comments into the RFP, and a Final RFP will be issued. Items that are revised, inserted, or deleted will be highlighted and in the Final RFP. After issuance of the Final RFP, the ATC stage will begin. PROPOSERS shall submit their responses to the Final RFP in accordance with the Milestone Schedule.

E. Non-confidential Requests for Information

Once the Final RFP is issued, SCDOT will allow Non-confidential Requests for Information to allow Proposers to ask questions, request clarification, and point out mistakes or ambiguities in the RFP. SCDOT will review all questions and/or requests for clarification received and, if it deems appropriate, in its sole discretion, may incorporate them in the RFP through an Addendum. Non-confidential requests for Information will be accepted until the milestone date for the submittal of the First Round of Formal ATCs. Proposers should use the Non-Confidential Questions Submittal Form that is provided on the SCDOT website at the following address:

<http://www.scdot.org/doing/doingPDFs/NonConfidentialQuestionsSubmittalForm.pdf>

F. Preliminary Alternative Technical Concepts (ATCs)

An Alternative Technical Concept (ATC) is a confidential request by a Proposer to modify a contract requirement, specifically for that Proposer, prior to the Proposal due date. The ATC process provides an opportunity for design-build proposals to promote innovation, find the best solutions, and to maintain flexibility in the procurement process. ATC's are evaluated for approval or denial by SCDOT within the deadline set forth in the Milestone Schedule. In order to be approved, an ATC must be deemed, in SCDOT's sole discretion, to provide a Project that is "equal or better" on an overall basis than the Project would be without the proposed ATC. Concepts that simply delete scope, lower performance requirements, lower standards, conflict with environmental commitments, or reduce contract requirements are not acceptable as ATC's. SCDOT reserves the right in its sole discretion to reject any ATC. No ATC shall be included in the proposal unless approved by SCDOT in writing prior to the proposal submission deadline.

All ATCs shall be submitted in writing (email is acceptable) using the ATC's Summary Form and the Preliminary ATC Submittal Form to the SCDOT POC with a cover letter clearly identifying the submittal as a request for review of an ATC under this RFP. If the Proposer does

not clearly designate its submittal as an ATC, the submission will not be treated as an ATC by SCDOT. The Proposers shall use the ATC’s Summary Form and the Preliminary ATC Submittal Form which can be downloaded from the SCDOT Design Build Website under the SCDOT Design Build Documents and Standard Forms Section at http://www.scdot.org/doing/constructionLetting_DesignBuild.aspx.

1. Submittal of Preliminary ATCs:

Preliminary Concepts: Preliminary concepts are intended to be an informal inquiry by the Proposer to explore a concept and a quick method by SCDOT to review and comment on potential development of ATC(s) prior to investment of time and resources by the Proposer. Preliminary concepts shall present a description adequate for SCDOT to assess the benefits of the concept. Preliminary concepts shall be submitted in accordance with the Milestone Schedule in Section VIII. Submission of preliminary concepts does not change or extend the submission deadline of Formal ATCs. SCDOT reserves the right to ask Proposer to clarify its preliminary concepts. **Proposer shall be limited to two packages of preliminary concepts and the total number of preliminary concepts shall not exceed twenty (20).** A package is a submittal of one (1) or more ATC’s. If more than one preliminary concept on the same topic has been received from multiple Proposers, SCDOT has the right to revise the RFP to include that concept as an addendum to the RFP.

Submittal of Preliminary ATCs shall be in accordance with the information and milestone schedule provided below. **All Preliminary ATC information being exchanged between Proposers and SCDOT shall occur only on the specific dates shown.**

Preliminary ATC Milestone	Date
Proposers submit Preliminary ATC Package #1	Wednesday, November 11, 2015 prior to 2:00 PM EDT
Proposers submit Preliminary ATC Package #2	Wednesday, November 25, 2015 prior to 2:00 PM EDT

2. Review of Preliminary ATCs:

SCDOT will provide a “Favorable”, “Not Favorable”, or “Need Clarification” response to the Proposer no later than 2 business days prior to the Second Confidential One-on-One Meeting. The intent of this advanced response is to assist the Proposer in preparation for the Second Confidential One-on-One Meeting. A favorable response by SCDOT in no way guarantees that the concept will become an approved ATC. The favorable response may be subject to conditions.

G. Second Confidential One-On-One Meeting

Once the Final/Revised RFP is issued, SCDOT will offer the Second Confidential One-on-One Meetings (the “Second Meeting”) at the request of the Proposers. By the date specified in the Project Milestones, Proposer shall submit written questions and topics for discussion and request a meeting in writing (email is acceptable) addressed to the SCDOT POC. SCDOT will reserve

two (2) hours of meeting time for each Proposer that requests a meeting, and SCDOT will give time of day preference in the order that requests are received. The purpose of the Second Meeting is to provide the Proposer with the opportunity to confidentially discuss the contents of his proposal with SCDOT personnel. Preliminary ATCs may be discussed during the Second Confidential One-on-One Meetings. SCDOT will determine if questions submitted to or asked at the one-on-one meetings are considered confidential. Questions determined to be non-confidential may result in revisions to the RFP which will be provided in an addendum. SCDOT may answer the questions at the meeting verbally if possible. Verbal responses are for information only and are not binding. Nothing discussed at the Second Meeting shall change the requirements in the RFP.

H. Formal Alternative Technical Concepts (ATCs)

1. Contents of ATC Submittal:

- a. **ATC Identification:** ATC will be submitted by the Proposer and evaluated by SCDOT as set forth in the RFP Milestone Schedule. The Proposers shall use the ATC's Summary Form and the Formal ATC Submittal Form which can be downloaded from the SCDOT Design Build Website under the SCDOT Design Build Documents and Standard Forms Section at http://www.scdot.org/doing/constructionLetting_DesignBuild.aspx.

A maximum number of ten (10) Formal ATCs may be submitted to SCDOT by the Proposer for consideration. The Proposer shall submit its Formal ATCs according to the ATC Milestone schedule shown below. The Proposer shall submit Formal ATCs for initial review only on the two dates shown. Proposer shall be limited to two packages of Formal ATCs and the total number of Formal ATCs shall not exceed ten (10). A package is a submittal of one (1) or more ATC's.

Each ATC submittal shall include the following:

- a. **Description:** A detailed description and schematic drawings of the configuration of the ATC or other appropriate descriptive information (including, if appropriate, specifications, construction tolerances, special provisions, proposed bridge types, product details, and a traffic operational analysis);
- b. **Usage:** Locations where and an explanation of how the ATC would be used on the Project;
- c. **Deviations:** List in table format, all references to any requirements of the RFP or to any requirements of the Contract Documents that are inconsistent with the proposed ATC. Include an explanation of the nature of the proposed deviation and a request for approval of such deviations or a determination that the ATC is consistent with the requirements of the RFP;

- d. **Justification:** Justify use of the ATC and why the deviations from the requirements of the RFP should be allowed;
- e. **Schedule:** Proposed changes to the Project schedule if applicable;
- f. **Impacts:** Identify potential impacts on vehicular traffic, safety, community, utilities, right of way, and the environment;
- g. **History:** A detailed description of other projects where the ATC has been used under comparable circumstances, the success of such usage, and names and telephone numbers of project owners that can confirm such statements;
- h. **Risks:** A description of added risks to SCDOT and other persons associated with implementing the ATC;
- i. **Costs:** An estimate of the impact of the ATC on the Proposal Price and the ATC implementation costs to SCDOT, FHWA, CONTRACTOR, or other person during construction, maintenance and operations;
- j. **Quality:** A description of how the ATC is equal or better in quality and performance than the requirements of the RFP;
- k. **Operations & Maintenance:** Any changes in operation or maintenance requirements associated with the ATC,

2. Review of ATCs:

Review and submittal of Formal ATCs shall be in accordance with the information and milestone schedule provided below. **All Formal ATC information being exchanged between Proposers and SCDOT shall occur only on the specific dates provided in the ATC Milestone Schedule.**

- a. Initial Review: Formal ATCs will only be accepted on the **two specific** dates as outlined in the ATC milestone schedule below. SCDOT will review each ATC submitted in accordance with the ATC Milestone Schedule.
- b. More Information Needed: SCDOT may submit written questions to the Proposer and/or request a one-on-one meeting in order to better understand the details of the formal ATC.
 - i. Questions: In accordance with the ATC Milestone Schedule, SCDOT may submit written questions to the Proposer and Proposers shall resubmit their ATC with revisions that answer the questions.
 - ii. One-on-One Meetings: Confidential One-on-one ATC meeting(s) may be scheduled to fully understand the details of any formal ATCs. These meetings will be restricted to those persons involved in the review of the ATC and limited to discussions of the Proposer's ATC approach. The purpose of this meeting is to discuss the proposed changes, answer

questions, and other relevant issues. Verbal responses are for information only and are not binding. Nothing stated at any ATC meeting(s) will modify the RFP or Contract documents. SCDOT reserves the right to disclose to all Proposers any issues raised during the ATC meeting(s) in an addendum. However, SCDOT will not disclose any information pertaining to an individual PROPOSER'S ATCs or other technical concepts to other Proposers. SCDOT will issue a written response to Proposer regarding its ATC.

- c. No Response from SCDOT: If the Proposer does not receive correspondence from SCDOT in accordance with the ATC Milestone Schedule, the ATC is deemed rejected by SCDOT, unless written notification to extend this period is given by SCDOT.
- d. Conditional Response by SCDOT: If SCDOT issues a conditional answer; an additional ten business days are added to the ten business day review period: five business days for Proposer to respond to the condition, and five business days for SCDOT to submit its final response to the ATC.

ATC Milestone		Date*
First Round of ATCs	Proposer submits Formal ATCs for Initial Review (Package 1)	Wednesday, January 6, 2016
	SCDOT responds with final/conditional response or asks questions/requests information from Proposers	Wednesday, January 13, 2016
	Proposers re-submits ATCs with revisions	Wednesday, January 20, 2016
	SCDOT provides a final determination of ATC or issues a conditional response.	Wednesday, January 27, 2016
	Proposer re-submits ATC in its final form (no revisions allowed after this submittal)	Friday, January 29, 2016
	SCDOT provides final determination for First Round ATCs	Wednesday, February 3, 2016
Second Round of ATCs	Proposer submits Formal ATCs for Initial Review (Package 2)	Wednesday, January 20, 2016
	SCDOT responds with final/conditional response or asks questions/requests information from Proposers	Wednesday, January 27, 2016
	Proposers re-submit ATCs with revisions	Wednesday, February 3, 2016
	SCDOT provides a final determination of ATC or issues a conditional response.	Wednesday, February 10, 2016
	Proposer re-submits ATC in its final form (no revisions allowed after this submittal)	Friday, February 12, 2016
	SCDOT provides final determination for Second Round ATCs	Wednesday, February 17, 2016

*All Proposer submittals shall be emailed to SCDOT POC prior to 2:00pm EDT on the date specified.

3. Determination of SCDOT

- a. SCDOT will make one of the following written determinations with respect to each properly submitted ATC:
 - i. The ATC is approved, in its entirety.
 - ii. The ATC is not approved.
 - iii. The ATC is not approved in its present form, but may be reconsidered for approval upon satisfaction, in SCDOT's sole discretion, of certain identified conditions that must be met or certain clarifications or modifications that must be made by Proposer. The Proposer shall not have the right to incorporate this ATC into the Proposal unless and until the ATC has been resubmitted within the time limits in the RFP, with the conditions, clarification and modifications satisfied, and SCDOT has unconditionally approved the revised ATC.
 - iv. The submittal does not qualify as an ATC but appears eligible to be included in the Proposal without an ATC (i.e., the concept appears to conform to the RFP and to be consistent with other contract requirements).
 - v. The ATC is deemed to take advantage of an error or omission in the RFP, or other documents incorporated into the contract by reference, the ATC will not be considered, and the RFP will be revised to correct the error or omission.
 - vi. More than one formal ATC has been received on the same topic and SCDOT has elected to exercise its right to issue an addendum to the RFP to include that topic.
- b. Once an ATC has been approved, only the entire ATC is eligible for inclusion into the Proposal. The inclusion of partial ATCs into a Proposal is not allowed, unless the individual ATC's have received separate approval by SCDOT.
- c. Each Proposer, by submittal of its Proposal, acknowledges that the opportunity to submit ATCs was offered to all Proposers, and waives any right to object to SCDOT's determinations regarding acceptability of ATCs.

4. Incorporation into Proposal

- a. A Proposer has the option to include any or all approved ATC's in its Proposal. If SCDOT responded to an ATC by identifying conditions for approval, Proposer may not incorporate such ATC into the Proposal unless all conditions have been met. Copies of SCDOT's ATC approval letters for each incorporated ATC shall be included in the Technical Proposal appendices. Proposals with or without ATCs will be evaluated against the same technical evaluation factors set forth in the Evaluation of Proposals section, and the inclusion of an ATC, including an ATC that provides

technical enhancements, may or may not receive a higher technical rating. SCDOT approval of an ATC shall not be considered a guaranty that the proposal incorporating the ATC will be selected. SCDOT's rejection of an ATC will not entitle the Proposer to an extension of the Proposal submission deadline on the Milestone Schedule or claim for additional costs or delays, including development costs, loss of anticipated profits, or increased material or labor costs.

- b. The Total Cost to Complete shown in the Cost Proposal should reflect any incorporated approved ATCs.
- c. Except for incorporating approved ATCs, the Proposal may not otherwise contain exceptions to or deviations from the requirements of the RFP.

5. Value Engineering

An approved ATC that is not incorporated into the proposal will not be considered a pre-approved value engineering change.

6. Abandonment of ATC by Proposer

If the approved ATC is abandoned by the Proposer, is unable to obtain required approvals, is otherwise proved to be infeasible, or fails to be constructed for any reason, the successful Proposer is obligated and required to complete the Project utilizing the original RFP requirements at the awarded cost, and shall be responsible for any redesign costs.

7. SCDOT's use of Concepts Contained in an ATC

SCDOT expressly reserves the right to adopt and use any ATC, approved or disapproved, by the successful Proposer on this contract or other contracts administered by SCDOT. By submitting a Proposal, all unsuccessful Proposers acknowledge that upon acceptance of the designated stipend, all approved or disapproved ATC's may be included in this contract or other contracts administered by SCDOT and shall become the property of SCDOT without restriction on use. Prior to contract execution, limited negotiations may be conducted as necessary to incorporate the ideas and concepts from unsuccessful Proposers, provided a stipend is accepted by the unsuccessful offerer.

8. Proposer Obligations

The successful Proposer, in addition to performing all other requirements of the Contract Documents, shall:

- a. Obtain and pay the cost of obtaining all required approvals including approvals required to implement any approved ATC(s) incorporated into the Contract Documents;
- b. Obtain and pay the cost of obtaining any third party approvals required to implement any approved ATC(s) incorporated into the Contract Documents; and

- c. Unless otherwise noted in the Contract, be responsible for all costs and/or delays of any nature associated with the implementation of any approved ATC incorporated into the Contract Documents.
- d. Be solely responsible for reviewing the RFP and determining if the ATC deviates from the revised requirements if SCDOT revises the RFP after a formal ATC has been approved. The Proposer must submit a request for approval of all additional variances required within five (5) business days of receipt of the revised RFP.

I. Stipends

By submitting a Proposal in response to the RFP, the Proposer acknowledges the following:

1. It is the intent of SCDOT to award a stipend of **\$200,000.00** to each responsible and responsive Proposer subject to the terms of the Stipend Agreement set forth in Article XIII of the RFP.
2. If Proposer elects to receive a stipend, the Stipend Acknowledgement form and Stipend Agreement shall be signed by Proposer and submitted as part of the unsealed Technical proposal. These documents will not count against the specified page limit.

IV. PROPOSAL DEVELOPMENT AND SUBMITTAL

Proposals must be submitted separately in two parts, a Technical Proposal and a Cost Proposal. Required forms and approved ATC's used in preparing the PROPOSER's Cost Proposal shall also be incorporated in the Technical Proposal as Appendices. If a Proposer does not, at a minimum, submit responses to these items, the submittal may be considered non-responsive and returned without further review/evaluation. Conceptual plans that conflict with RFP requirements, and are not submitted under the ATC process, may result in the proposal being deemed non-responsive. Any concepts that conflict with the RFP specifications discovered after award of the Project, and which are not approved as an ATC, shall not prevail over RFP specifications.

A. Technical Proposal

The Technical Proposal shall contain no more than ten (10) pages, excluding any plans signed forms, and appendices. Any Conceptual Plans developed by the Proposer to accompany the PROPOSER's responses and commitments, that are not included in the ten (10) page narrative, shall be incorporated in the Technical Proposal as Appendices.

The Technical Proposal shall be single sided, with minimum twelve-point (12) Times New Roman font and double line spacing for text.

At a minimum, the Technical Proposal shall include a narrative describing the Project Delivery and Approach. The Technical Proposal Appendices shall include Conceptual Plans, required forms, and approved ATCs being incorporated into the PROPOSER's Cost Proposal. The

Technical Proposal narrative and the Conceptual Plans, included in the Technical Proposal Appendix, will be utilized to evaluate the responses below to determine responsiveness.

In the technical proposal narrative, PROPOSERS shall respond to the following items and shall develop the narrative in the following sequence:

1. Describe the Project Delivery & Approach by discussing/providing the following:

- a. Identify the proposed schedule for implementing the Project within the required time. Include the sequence of construction and material and equipment staging plan.
- b. Describe the Proposers plan to deal with the handling, disposal, exposure transport, etc of hazardous material if encountered during construction.
- c. Describe the Proposers approach to utility coordination that will minimize impacts and maintain the schedule.
- d. Describe the Proposers assurance to stay within the permitted limits.

In order for the evaluation to be accomplished efficiently, at a minimum, the Conceptual Plans, included in the Technical Proposal Appendix, shall be prepared as described below.

2. Conceptual Roadway Plans which shall consist of:

- a. 1"=400' scale Interchange Layout superimposed over aerial imagery showing:
 - i. Horizontal Geometry
 - ii. Existing Right of Way
 - iii. Proposed Right of Way
 - iv. Proposed Concrete Barrier
 - v. Proposed Retaining Walls
 - vi. Construction Limits
 - vii. Environmentally Sensitive Areas including wetlands, streams, etc.
- b. Half-sized plan and profile sheets at a 1"=100' scale
- c. Half-sized typical sections including pavement material selected
- d. Half-sized cross sections showing control of access limits. The plan should provide enough detail to illustrate the proposed typical limits as well as the proposed limits in areas constrained by obstacles, environmental issues, or right-of-way.

3. Conceptual Half-sized Structure Plans which shall consist of:

- a. Plan and profile of each bridge showing horizontal and vertical clearances and expansion joint locations and types of joint material.
- b. Superstructure cross sections and substructure elevations showing pertinent structural elements, dimensions, and the types of bearings.
- c. Bridge construction access plan showing areas used to access the bridge work and showing proposed equipment and material handling locations and staging.
- d. Retaining wall envelopes showing top of wall, ground lines, and bottom of wall.

4. Conceptual Half-sized Maintenance of Traffic Plans depicting the number of construction stages and a staging narrative within those plans to include duration of each stage. The plan scale and detail should be appropriate for demonstrating transitions, directional flow, and all items below.
 - a. The Team’s plan for access to the median work zone (ingress and egress) including access spacing.
 - b. The Team’s plan for maintaining ramp traffic.
 - c. The Team’s plan for notifying the traveling public of upcoming stages and detours.
 - d. The Team’s plan for maintaining Exit 217 traffic.

Note: Drawings and plans requested as part of the Technical Proposal or included by the Proposer to help explain commitments shall not count against the specified page limit and can be included in the Appendix.

B. Cost Proposal

The Cost Proposal shall be clearly marked as “Confidential Proprietary Information” by the Proposer and shall include the completed Cost Proposal Bid Form provided at the end of this document. The Cost Proposal Bid Form shall be sealed in a separate envelope and delivered as part of the Cost Proposal per the Milestone Schedule.

C. Proposal Submittal

Proposals must be submitted separately in two parts, a Technical Proposal and a Cost Proposal. Proposers are required to upload Technical Proposal, signed forms, and appendices, online through ProjectWise in PDF format. Only one completed submittal per team will be accepted and shall be uploaded by either the lead contracting entity or lead design firm. Please be advised of the time required to set up new account. All requests for new accounts must be received 72 hours prior to the proposal deadline indicated in the milestone schedule. More information is available at http://www.scdot.org/doing/constructionletting_projectwise.aspx.

Proposers are to physically deliver and submit three (3) printed and bound hard copies of the Technical Proposal, signed forms, and appendices. Proposers are to physically deliver one (1) sealed, printed copy of the Cost Proposal. Please deliver to:

Carmen Wright
Office of Project Delivery
South Carolina Department of Transportation
955 Park Street, Room 101
Columbia, South Carolina 29202-0191

Proposers are responsible for affecting delivery by the date in the milestone schedule. Late submissions will be rejected without opening. SCDOT accepts no responsibility for misdirected or lost proposals.

D. Confidentiality of Proposals

Proposer shall specifically mark as “CONFIDENTIAL” any elements of their submission that they consider to contain confidential or proprietary information and the release of which would constitute an unreasonable invasion of privacy. 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 the entire proposal as confidential or proprietary. **In the Technical Proposal appendix, Proposer shall include a list of page numbers that contain confidential and/or proprietary information. Failure to include this list in the Technical Proposal appendix waives the confidentiality protection and subjects the information to disclosure in accordance with the law.** In determining whether to release documents, the SCDOT will rely on PROPOSER’s list of page numbers and PROPOSER’s marking of each page or portions of pages of documents, as required by these instructions, as being either “Confidential” or “Trade Secret”. Proposer shall be prepared upon request to provide justification of why such materials shall not be disclosed under the South Carolina Freedom of Information Act, Section 30-4-10, et seq., South Carolina Code of Laws (1976) as amended. Proposals will be kept confidential and will not be disclosed, except as may be required by law.

E. Noncollusion and Equal Employment Opportunity, and Debarment Certification

Proposers shall certify that they have not participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with the submission of this proposal on this Project. Proposal submitted without the non-collusion certification may be deemed non-responsive. The non-collusion certification form provided as part of this document shall be submitted as part of the Technical proposal and will not count against the specified page limit.

Proposers shall complete the Equal Employment Opportunity (EEO) Performance Certification form and Debarment and Suspension Certification provided as part of this document. Proposal submitted without the EEO certification may be deemed non-responsive. The EEO certification form shall be submitted as part of the Technical proposal and will not count against the specified page limit.

V. EVALUATION OF PROPOSALS

A. Proposal Review Committee

A Proposal Review Committee (“Committee”) will be appointed by SCDOT to review the Proposals. The committee members will be comprised of SCDOT and SCPA employees. In addition, SCDOT will assemble a group of resource members having expertise in the various disciplines required by the Project including the Federal Highway Administration.

B. Proposal Review

The Committee will review the Proposals and determine whether each Proposal is responsive based on the Proposal Development criteria in Article IV.A. Responsive Proposals will be accepted by the Committee for advancement to the Bid Opening. Proposers that submit a non-responsive proposal will be sent a letter with a detailed explanation as to the reasons for determining non-responsiveness. Any nonresponsive unopened Cost Proposal(s) will be retained by SCDOT until either contract execution or RFP cancelation and then returned to the nonresponsive PROPOSER(s). All original copies of the nonresponsive Technical Proposal(s) will be retained by SCDOT. Reasons for determining a proposal to be non-responsive may result from, but are not limited to, the following: failure to provide all information requested in the proposal, failure to conform to the material requirements of the RFP, conflict of interests, conditional proposals, failure to provide complete and honest information, failure to complete the Cost Proposal Bid Form correctly, or failure to submit the EEO certification. Proposals which impose conditions that modify material requirements of the RFP may be rejected as non-responsive. Proposers will not be given an opportunity to correct any material nonconformity. Any deficiency resulting from a minor informality may be clarified or waived at the sole discretion of the SCDOT.

C. Presentations

Proposers who have submitted responsive Technical Proposals may be invited by the Committee to make a presentation. The presentation, if required, will allow the Proposers an opportunity to further explain any aspect of their Technical Proposals. The Committee may address questions to the Proposer after the presentation.

D. Clarifications

SCDOT, at its sole discretion, shall have the right to seek clarifications from any Proposer to fully understand information contained in their responses to the RFP. Clarifications mean a written or oral exchange of information which takes place after the receipt of proposals when award without discussions is contemplated. The purpose of clarifications is to address minor or clerical revisions in a proposal.

E. Opening of Cost Proposals/Bid Opening Meeting

All Technical Proposals will be evaluated for responsiveness based on those items requested in this RFP. Those Technical Proposals deemed non-responsive will be handled according to Article V., Paragraph B. As detailed above, those Technical Proposals deemed responsive will be evaluated according to the information provided in this RFP. At the time and date specified in the milestone schedule, SCDOT will open and publicly read the cost Proposals at the bid opening meeting.

The Cost Proposal(s) will be evaluated in accordance with SCDOT's Bid Review Policies and Procedures. Each Cost Proposal will be compared against the confidential SCDOT Engineer's Estimate.

If upon analysis, all of the bids exceed an acceptable range of the Engineer's Estimate, SCDOT personnel may assess if either award outside the prescribed range is justified or if the SCDOT will hold discussions and may request a Best and Final Offer (BAFO) from all responsive PROPOSERS.

SCDOT intends to award the contract to the Proposer with the lowest bid. However, the RFP may be cancelled after opening, but prior to the issuance of an award, when such action is determined in writing to clearly be in the best interest of the State. If the RFP is cancelled, Cost Proposals may be returned to the Proposers and a new solicitation may be conducted for the Project.

VI. SELECTION OF CONTRACTOR

The Committee will present a report regarding their review of the proposals to SCDOT Deputy Secretary for Engineering and recommend selection of the Proposer with the lowest Total Cost to Complete. Upon approval, SCDOT will offer a contract to the selected Proposer. *However, if the parties are unable to execute a contract, SCDOT may offer a contract to the Proposer with the next lowest Total Cost to Complete.*

The Design-Build Agreement will be executed for the Total Cost to Complete as shown in the Cost Proposal Bid Form and the Project shall reach Substantial Work Completion by September 30, 2019. The Notice to Proceed Shall be no later than 45 days from the effective date of the Agreement.

VII. GENERAL INFORMATION

- I. SCDOT reserves the right to terminate the evaluation of one or more of the proposals if it is determined to be in the best interest of the state to do so.
- II. SCDOT reserves the right, at its sole discretion, to either cancel this solicitation or to re-advertise in another public solicitation when it is in the best interest of the state to do so.

- III. SCDOT reserves the right to reject any and all proposals, or parts thereof, and/or to discontinue contract execution with any party at any time prior to final contract execution.
- IV. SCDOT assumes no liability and will not reimburse costs incurred by firms, whether selected or not, in developing proposals or in contract execution.
- V. SCDOT reserves the right to request or obtain additional information about any and all proposals. SCDOT may also issue addenda to the RFP, which will be posted on the website and emailed to all Proposers' Points of Contacts.
- VI. SCDOT reserves the right to revise or amend the RFP, specifications and/or drawings, including changes to the date the proposal is due. Such changes, if any, will be announced by an addendum or addenda to this Request for Proposal. All information relating to this RFP, including pertinent changes/addendums and other applicable information will be posted on SCDOT's design build website www.SCDOT.org a minimum of ten (10) business days prior to the date set for receipt of proposals as set forth in the Milestone Schedule. If changes are made to the RFP within ten (10) days of the due date, Milestones may be adjusted accordingly. **Proposers are strongly cautioned to check this site frequently to ensure they have the latest information.**
- VII. Receipt of an addendum by the Proposer must be acknowledged in the space provided on the Addendum Notice to Proposer Transmittal Form posted on the SCDOT Design Build website for this Project. Proposers shall submit the signed Notice with its Technical Proposal response to this RFP. Failure to acknowledge an addendum may result in rejection of the proposal. Explanations or instructions given in a form other than an addendum or ATC response letter shall not be binding.
- VIII. After award, if an unsuccessful Proposer would like to schedule a debriefing, Proposer shall submit a request within three (3) business days from the date the award notification is posted on the SCDOT Design Build website for this Project. Only written requests (emails are acceptable) for a debriefing will be scheduled. Failure to request a debriefing within the three (3) business day period waives the opportunity for a debriefing.
- IX. Proposer shall be held responsible for the validity of all information supplied in its proposal, including that provided by potential subcontractors. Should subsequent investigation disclose that the facts and conditions were not as stated, the proposal may be rejected or contract terminated for default if after award, in addition to any other remedy available under the contract or by law.
- X. Proposer, by submitting a proposal, represents that it has read and understands the RFP, its exhibits, attachments and addendums, and that its proposal is made in compliance with the criteria of the RFP. Proposers are expected to examine the RFP, its exhibits, attachments and addendums thoroughly and should request an explanation of any ambiguities, discrepancies, errors, omissions, or conflicting

statements therein. Failure to do so will be at the PROPOSER's risk. Proposer assumes responsibility for any patent ambiguity in the RFP, its exhibits, attachments and addendums that Proposer does not bring to SCDOT's attention.

- XI. No proposal guaranty in the form of a Bid Bond is required for this procurement.
- XII. Proposal Acceptance Period - By submitting a proposal, Proposer agrees to hold the proposal offer available for acceptance a minimum of ninety (90) calendar days after the Bid Opening date.
- XIII. A **business day** is hereby defined as a day in which SCDOT Headquarters is open for business.
- XIV. Proposals (Technical and Cost) may be withdrawn by written notice received any time before the exact time set for the bid opening as set forth in the Milestone Schedule. The Proposer withdrawing shall forfeit the stipend. Technical Proposals and unopened Cost envelopes will be returned after awarded of the contract. Upon withdrawal, there shall be no further participation by Proposer in the procurement process and Proposer waives any right to protest.

VIII. MILESTONES

Milestone	Date
Advertise Request for Qualifications (RFQ)	Thursday, May 28, 2015
Deadline for Submittal of Qualifications	Thursday, June 25, 2015 @ 12 pm EDT
Selection of Shortlisted Teams	Thursday, August 6, 2015
Issue RFP for Industry Review	Thursday, August 27, 2015
Debriefs for non-short-listed Proposers	September 1, 2015 & September 3, 2015
Deadline for Proposers to submit Comments/Questions & Deadline to Request a Confidential One-on-One Meeting.	Friday, September 18, 2015
First Confidential One-on-One Meeting	Thursday, October 8, 2015
Issue Final RFP	Thursday, November 5, 2015
Preliminary ATC Submittals (Start Date)	Wednesday, November 11, 2015
Deadline for Proposers to submit Confidential Questions and Preliminary ATCs	Wednesday, November 25, 2015
Second Confidential One-on-One Meeting	Thursday, December 17, 2015
Begin Formal ATC Process	Wednesday, January 6, 2016
Deadline to submit ATC's	Wednesday, January 20, 2016
Submittal of Technical/Cost Proposals	Thursday, March 10, 2016 @ 12pm EDT
Bid Opening	Thursday, April 14, 2016
Award/Contract Execution	May 2016

IX. COST PROPOSAL BID FORM

Port Access Road Charleston County

CONTRACTOR: _____

ADDRESS: _____

Provide full Project scope as described in Attachment A.

TOTAL COST TO COMPLETE= _____

No conditional Bids will be accepted. SCDOT reserves the right to delete any or all conditions placed on the Total Cost to Complete, and/or reserves the right to reject any Bid that is conditional or contains additions not called for in the plans and specifications.

Signature

Date

Printed Name

X. NON-COLLUSION CERTIFICATION

NON-COLLUSION CERTIFICATION

Project ID: P027002

IN ACCORDANCE WITH THE PROVISIONS OF S.C. CODE ANN. §§ 39-3-10 ET. SEQ., 39-5-10 ET. SEQ., 15 U.S.C. §45; 23 C.F.R. §635.112(F); AND 28 U.S.C. §1746, I HEREBY ACKNOWLEDGE THAT I AM AN OFFICER OF THE PROPOSER FIRM AND, UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE UNITED STATES AND SOUTH CAROLINA, DECLARE, BY MY CERTIFICATION BELOW, THAT THE FOLLOWING IS TRUE AND CORRECT, AND FURTHER, THAT THIS FIRM, ASSOCIATION OR CORPORATION HAS NOT, EITHER DIRECTLY OR INDIRECTLY, ENTERED INTO ANY AGREEMENT, PARTICIPATED IN ANY COLLUSION, OR OTHERWISE TAKEN ANY ACTION IN RESTRAINT OF FREE COMPETITIVE BIDDING IN CONNECTION WITH THE SUBMISSION OF A BID PROPOSAL ON THE ABOVE REFERENCED PROJECT.

BY CHECKING THIS BOX , I CERTIFY THAT I HAVE READ, UNDERSTAND, ACCEPT, AND ACKNOWLEDGE ALL OF THE ABOVE STATEMENTS.

Executed on _____
(Date)

Signed: _____
(Officer/Proposer)

(Title)

(Address)

XI. EQUAL EMPLOYMENT OPPORTUNITY CERTIFICATION

EQUAL EMPLOYMENT OPPORTUNITY PERFORMANCE

Select the Certification that applies to the PROPOSER:

Certification (1) or Certification (2)

Select the appropriate responses in the applicable Certification:

Certification (1): Pursuant to 41 C.F.R. §60-1.7(b)(1), Previous Equal Employment Opportunity Performance Certification, as the Prospective Prime Contractor, I HEREBY CERTIFY THAT I:

(a) **(HAVE / HAVE NOT)** developed and filed an Affirmative Action Program pursuant to 41C.F.R. §60-2 and/or 60-4;

(b) **(HAVE / HAVE NOT)** participated in a previous contract or subcontract subject to the equal opportunity clause;

(c) **(HAVE / HAVE NOT)** filed with the Joint Reporting Committee, the Director of Office of Federal Contract Compliance, or the Equal Employment Opportunity Commission, all reports due under the applicable filing requirements,

OR

Certification (2): I, HEREBY CERTIFY that as the Prospective Prime Contractor submitting this Proposal, **(CLAIM / DO NOT CLAIM)** exemption from the submission of the Standard Form 100 (EEO-1) due to the fact that it employs a total of less than fifty (50) employees under C.F.R. §60-1.7, or qualifies for an exempted status under 41 C.F.R. §60-1.5.

I FURTHER CERTIFY that the above Certification will be made part of any Subcontract Agreement involved with this project.

Executed on _____, 20 ____ .

Signed: _____
(Officer/PROPOSER)

Title: _____

Company: _____

Address: _____

Note: The above certification is required by the Equal Employment Opportunity Regulations of the Secretary of Labor (41 CFR 60-1.7(b)(1)), and must be submitted by PROPOSERS only in connection with contracts which are subject to the equal opportunity clause. Contracts that are exempt from the equal opportunity clause are set forth in 41 CFR 60-1.5. (Generally, only contracts of \$10,000 or under are exempt.)

Currently, Standard Form 100 (EEO-1) is the only report required by Executive Orders or their implementing regulations.

Proposers, Primary Members, or proposed Contractors and Consultants who have participated in a previous contract subject to the Executive Orders and have not filed the required reports shall note that 41 CFR 60-1.7(b)(1) prevents the award of contracts and subcontracts unless such contractor submits a report covering the delinquent period or such other period specified by the Federal Highway Administration or by the Director, Office of Federal Contract Compliance, U.S. Department of Labor.

XII. STIPEND ACKNOWLEDGEMENT FORM

Stipend Acknowledgement Form

Port Access Road Charleston County

PROPOSER: _____

ADDRESS: _____

The undersigned PROPOSER, hereby:

Waives the stipend for this Project.

Accepts the stipend for this Project.

By accepting the stipend for this Project, Proposer agrees:

- 1) to execute and include the Stipend Agreement in Article XIII of the RFP with their RFP response;
- 2) SCDOT will pay the stipend to each eligible unsuccessful Proposer, who has signed a Stipend Agreement, within ninety (90) days after execution of the contract or the decision not to award a contract;
- 3) to transfer all rights to its Work Product used to develop the proposal as of the date of this acknowledgement. "Work Product" means all submittals, including ATCs, ideas, innovations, solutions, methods, processes, design concepts, materials, electronic files, marked up drawings, cross sections, quantity lists and intellectual property, made by Proposer during the RFP process, including the proposal, exchange of information during the pre-proposal and post-proposal period.

Date

Proposer

Print Name

XIII. STIPEND AGREEMENT

STIPEND AGREEMENT
Project ID: 0037345
Port Access Road
Charleston County

THIS STIPEND AGREEMENT (the "Agreement") is made and entered into as of the ___ day of _____, 20__, by and between the SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION (hereinafter "SCDOT"), and _____ ("Proposer"), with reference to the following facts:

SCDOT issued a Request for Proposal ("RFP") for design and construction of the above-referenced Design-Build Project ("Project"), pursuant to procurement authority granted in Section 57-5-1625 of the S.C. Code of Laws, 1976, as amended. The RFP provided for payment of stipends as provided herein.

NOW, THEREFORE, Proposer hereby agrees as follows:

1. Work Product.

1.1 Proposer shall prepare and submit a responsible and responsive technical and cost proposal that conforms in all material respects to the requirements and provisions of the RFP, as determined by SCDOT, and are timely received by SCDOT in accordance with the RFP Milestone Schedule.

1.2 By signing this Stipend Agreement, Proposer agrees to transfer ownership to SCDOT of the electronic copy and hard copy of all Work Product used to develop the proposal. The Work Product (as defined below) shall become the property of SCDOT without restriction or limitation on its use, without further compensation or consideration, and can be used in connection with this Project or any future projects by SCDOT. Neither Proposer nor any of its team members shall copyright any of the material developed under this Agreement.

1.3 The term "Work Product" shall mean all material, electronic files, marked up drawings, cross sections, quantity lists, submittals, alternative technical concepts (ATC), ideas, innovations, solutions, methods, processes, design concepts, and intellectual property, made by or produced for Proposer in the development and submission of the technical and price proposals, including exchanges of information during the pre-proposal and post-proposal period.

2. Compensation and Payment.

2.1 A stipend to Proposer for the Work Product described herein shall be **\$200,000.00** and is payable on condition that Proposer (1) submitted a responsible and responsive technical and cost proposal to the RFP which is not selected for award of this Project, or (2) was awarded the Contract but the Contract was terminated by SCDOT at SCDOT's convenience after the Submittal of Proposal Date (See Final RFP Milestone schedule) but prior to the Notice to Proceed. Responsibility and responsiveness of the proposal will be determined by SCDOT as a condition of payment.

2.2 SCDOT will pay the stipend to Proposer under the following conditions:

(a) Within ninety (90) days after execution of the contract or the decision not to award a contract, SCDOT will pay the stipend to the unsuccessful Proposer meeting the criteria of Section 2.1, provided that the Proposer submitted a signed a Stipend Agreement with its response to the RFP.

(b) If the procurement is suspended or cancelled prior to the Proposal Due Date (see FINAL RFP Milestone schedule), no stipend will be paid to Proposer.

(c) After the submittal of proposals, but prior to award, if the procurement is cancelled, all Proposers that provide a responsive technical and cost proposal to the final RFP and submitted a signed Stipend Agreement with their RFP shall receive the stipend

(d) In the event of a Best and Final Offer, only one stipend will be paid.

(e) No stipends will be paid for submitting RFQ responses.

2.3 Acceptance by the Proposer of payment of the stipend amount from SCDOT shall constitute a waiver by Proposer of any and all right, equitable or otherwise, to bring any claim in connection with this procurement, procurement process, award of the Contract, or cancellation of this procurement.

2.4 The Proposer awarded the contract shall be not eligible to receive a stipend.

2.5 If Proposer elects to waive payment of the stipend, SCDOT will not use the ideas or information contained in that Proposer's proposal for this Project. However, the Proposer's proposal will be subject to the South Carolina Freedom of Information Act.

3. Indemnities.

3.1 Subject to the limitations contained in Section 3.2, Proposer shall indemnify, protect and hold harmless SCDOT and its directors, officers, employees and contractors from, and Proposer shall defend at its own expense, all claims, costs, expenses, liabilities, demands, or suits at law or equity arising in whole or in part from the negligence or willful misconduct of Proposer or any of its agents, officers, employees, representatives or subcontractors or breach of any of Proposer’s obligations under this Agreement.

3.2 This indemnity shall not apply with respect to any claims, demands or suits arising from use of the Work Product by SCDOT.

4. Compliance With Laws.

4.1 Proposer shall comply with all federal, state, and local laws, ordinances, rules, and regulations applicable to the work performed or paid for under this Agreement and covenants and agrees that it and its employees shall be bound by the standards of conduct provided in applicable laws, ordinances, rules, and regulations as they relate to work performed under this Agreement. Proposer agrees to incorporate the provisions of this paragraph in any subcontract into which it might enter with reference to the work performed pursuant to this Agreement.

4.2 The Proposer agrees (a) not to discriminate in any manner against an employee or applicant for employment because of race, color, religion, creed, age, sex, marital status, national origin, ancestry or disability of a qualified individual with a disability; (b) to include a provision similar to that contained in subsection (a) in any subcontract; and (c) to post and to cause subcontractors to post in conspicuous places available to employees and applicants for employment, notices setting forth the substance of this clause.

5. Assignment.

Proposer shall not assign this Agreement without SCDOT’s prior written consent. Any assignment of this Agreement without such consent shall be null and void.

6. Miscellaneous.

6.1 Proposer and SCDOT agree that Proposer, its team members, and their respective employees are not agents of SCDOT as a result of this Agreement.

6.2 This Agreement, together with the RFP, as amended from time to time, the provisions of which are incorporated herein by reference, embodies the entire agreement of the parties. There are no promises, terms, conditions, or obligations other than those contained herein or in the RFP, and this Agreement shall supersede all previous communications, representation, or agreements, either verbal or written, between the parties hereto.

6.3 It is understood and agreed by the parties hereto that if any part, term, or provision of this Agreement is by the courts held to be illegal or in conflict with any law of the State of South Carolina, the validity of the remaining portions or provisions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the Agreement did not contain the particular part, term, or provisions to be invalid.

6.4 This Agreement shall be governed by and construed in accordance with the laws of the State of South Carolina.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

Witness:

SOUTH CAROLINA DEPARTMENT
OF TRANSPORTATION

By: _____
Chris J. Gaskins, P.E.
Acting Design Build Engineer

Recommended:

James H. Mattox, III, P.E.
Program Manager

Proposer

Name of Proposer

Witness:

By: _____
Its: _____

XIV. Debarment and Suspension Certification

SC Project ID _____

The undersigned PROPOSER certifies on behalf of itself, and all contractors, consultants subcontractors and subconsultants identified by such PROPOSER as of the date hereof, as follows:

The undersigned certifies to the best of its knowledge and belief, that it and its principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or agency;
- b. Have not within a 3-year period preceding this proposal 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) transaction or contract under a public transaction; violation of federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and
- d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (federal, State or local) terminated for cause or default.

Where the PROPOSER is unable to certify to any of the statements in this certification, it shall attach a certification to its proposal or bid stating that it is unable to provide the certification and explaining the reasons for such inability.

Date: _____

Proposer: _____

Signature: _____

Title: _____

**AGREEMENT
FOR THE DESIGN & CONSTRUCTION
Of**

Port Access Road

Charleston County, South Carolina

A DESIGN-BUILD PROJECT

**BETWEEN
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
AND**

_____ day of _____, 2016

Project ID 0037345

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WHEREAS, on July 16 2009, the South Carolina State Ports Authority (SCSPA) and South Carolina Department of Transportation entered into an intergovernmental agreement in which the SCSPA requested the assistance of SCDOT to accomplish the design, right of way and construction of the Port Access Road and Interchange Project in the Charleston Region of the State of South Carolina, (hereinafter “the Project”); and

WHEREAS, the South Carolina Department of Transportation, as an agency of the State of South Carolina, wishes to enter into a design build construction agreement and administer the Project on behalf of the SCSPA in accordance with the terms of the intergovernmental agreement; and

WHEREAS, limitations imposed by traditional methods of designing, and constructing highways would mean that the Project could be completed only after an unacceptable delay; and

WHEREAS, the South Carolina Department of Transportation, working with the Federal Highway Administration (FHWA) and SCSPA, has devised an innovative plan to allow the commencement and completion of the Project in a timely and cost-effective manner; and

WHEREAS, pursuant to Section 57-5-1625 SC Code of Law, the South Carolina Department of Transportation desires to award a highway construction contract on behalf of the SCSPA using a Design / Build procedure; and

WHEREAS, after a competitive process, CONTRACTOR has been selected to participate in this venture by designing and building the Project; and

WHEREAS, the South Carolina Department of Transportation wishes to avail itself of and rely on CONTRACTOR’s expertise and proven track record in designing and constructing such projects, on time and within budget; and

WHEREAS, CONTRACTOR wishes to provide that expertise and to participate in this venture for the good of the people of the State of South Carolina;

NOW THEREFORE, this Agreement is executed and made, effective as of the Effective Date as defined herein, between the SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION (“SCDOT”) and _____ (“CONTRACTOR”). In consideration of the covenants hereinafter set forth, the parties hereto mutually agree as follows:

I. CONTRACT DOCUMENTS

The Contract shall be composed of this Agreement and all exhibits, SCDOT's Request for Proposals and all attachments, Request for Qualifications and all attachments, CONTRACTOR's Proposal and all attachments, and CONTRACTOR'S Qualifications and all attachments. In case of conflict, the order of precedence of the Contract documents shall be: (1) this Agreement; (2) Agreement Exhibits; (3) SCDOT Request for Proposals (RFP) document and Project Information; (4) CONTRACTOR's Proposal and attachments; and (5) SCDOT Request for Qualifications (RFQ) and CONTRACTOR's response. In the event of a conflict between the Project Criteria and Special Provisions identified in the Agreement Exhibits, the order of precedence shall be (1) the Project Criteria and (2) Special Provisions.

II. PROJECT SCOPE

A. Scope of Work

CONTRACTOR shall furnish all services, labor, materials, equipment, supplies, tools, transportation, and coordination required to perform all design, preliminary engineering, surveying, geotechnical services, scheduling, permitting, right of way services, procurement, construction, utility coordination, demolition, material disposal and any other services necessary to perform the Project as defined in the Project Scope of Work made a part hereof as **EXHIBIT 3**.

B. Design and Construction Responsibilities

1. CONTRACTOR, consistent with applicable state licensing laws, shall provide, through qualified South Carolina licensed design professionals employed by CONTRACTOR or procured from qualified, independent South Carolina licensed design consultants, the necessary design work, including, but not limited to, surveys, right of way services, roadway design, maintenance of traffic, geotechnical exploration and design, hydraulic analyses, storm water management, erosion control, superstructure design, and foundation and substructure design including seismic analyses for the preparation of the required drawings, specifications and other design submittals to permit CONTRACTOR to complete the work in accordance with the Contract.

2. CONTRACTOR shall provide through itself or subcontractors the necessary supervision, labor, inspection, testing, material, equipment, machinery, temporary utilities and other temporary facilities to permit performance of all demolition, earthwork, drainage, foundation work, maintenance of traffic, roadway work, structural work, excavation, erosion and sediment control work, field layout work, construction management and inspection, utility coordination and relocation, railroad coordination, CONTRACTOR quality control, and all other work necessary to complete construction of the Project in accordance with the Contract. CONTRACTOR shall perform all design and construction activities efficiently and with the requisite expertise, skill and competence to satisfy the requirements of the Contract. CONTRACTOR at all times shall exercise control over the means, methods, sequences and techniques of construction. CONTRACTOR's operations and construction methods shall comply

with all applicable federal, state and local regulations with regard to worker safety, protection and health and protection of the environment and applicable permit requirements.

3. CONTRACTOR shall design and construct the project in such a manner that the construction limits are contained within the approved environmental footprint to the extent possible. Where new right of way is required to construct the Project, the CONTRACTOR shall design and construct the Project so as to minimize the additional rights of way needed. The acquisition of rights of way, including both cost and services to acquire, shall be the responsibility of the CONTRACTOR and shall be done in accordance with Article VIII of this Agreement. CONTRACTOR shall furnish the SCDOT a copy of any agreements for the use of additional properties not acquired as right of way that are used in conjunction with the construction of this Project. CONTRACTOR shall abide by the provisions of all applicable environmental permits, any conditions of individual right of way agreements, and all environmental commitments. The CONTRACTOR shall sign the Contractor Certification Form and this agreement will be made part of the contract.

4. It shall be the responsibility of CONTRACTOR to determine and comply with all applicable federal, state, and local laws in connection with the services set forth in this Contract. This obligation shall include, but not be limited to, procurement of all permits and licenses not obtained by SCDOT provided, however, that with respect to any permit or licenses that must be obtained in the name of SCDOT, CONTRACTOR shall perform all functions within its power to obtain the permit, including mitigation, and SCDOT will fully cooperate in this effort and perform any functions that must be performed by SCDOT. CONTRACTOR shall be responsible for payment of all charges, fees, and taxes, and for providing all notices necessary and incident to the performance of the Project as of the Effective Date of this Agreement. The Contract Price shall include fees related to the above obligations and if any fees are waived by the regulatory or governmental entity, then the amount of the fee waived shall be deducted from the Contract Price.

C. Design Criteria

It shall be the responsibility of CONTRACTOR to design all aspects of the Project in accordance with the contract documents. For the Project, CONTRACTOR shall provide a completed set of construction plans signed and sealed by a licensed professional engineer in South Carolina. CONTRACTOR shall be fully responsible for the accuracy of the design and compliance with specifications, standards and Project Criteria.

D. Design Review

1. Within thirty (30) days prior to Notice to Proceed, CONTRACTOR, CONTRACTOR'S design consultant, subcontractors, suppliers and SCDOT shall meet to establish the sequencing procedures and schedule for submitting design plans for SCDOT's review. Within ten business (10) days after this meeting, CONTRACTOR shall provide a Design Submittal Procedures and Schedule acceptable to SCDOT. CONTRACTOR, CONTRACTOR'S design consultant, subcontractors and suppliers shall not submit any design work until the Design Submittal Procedures and Schedule is approved by SCDOT. The Design Submittal Procedures and Schedule will serve as the basis for reviewing the design and construction plans. The Design Submittal Procedures and Schedule shall be updated as requested by SCDOT.

2. CONTRACTOR shall provide plans to SCDOT fifteen (15) SCDOT business days prior to commencement of the next phase of work, in formats designated by SCDOT, so that SCDOT will have an opportunity to review the plans prior to commencement of construction activities. The fifteen (15) business day review period will begin the first SCDOT business day after the submittal. If more than one package is submitted within a five (5) business day period, an additional five (5) business days per submittal package will be allowed for the reviews. Plans shall be submitted with all other reports and documents as defined in **EXHIBIT 4**. SCDOT will have the right, but not the obligation, to review and comment upon the plans. CONTRACTOR shall respond to SCDOT review comments in written form within five (5) business days. SCDOT will then status CONTRACTOR's comments within five (5) business days. SCDOT review comments shall be resolved prior to commencement of construction, demolition or disposal activities. This review and comment is fully discretionary, however no review or comment nor any failure to review or comment shall operate to absolve CONTRACTOR of its responsibility to design and build the Project in accordance with the contract or to shift responsibility to SCDOT.

E. Maintenance of Traffic

The SCDOT work zone mobility requirements found within the documents known as *Rule on Work Zone Safety and Mobility: The Policy for South Carolina Department of Transportation* and *Rule on Work Zone Safety and Mobility: Implementation, Maintenance, and Safety Guidelines* shall apply to this project. These requirements apply to the CONTRACTOR, all subcontractors, all SCDOT staff and designated representatives acting on behalf of the SCDOT performing duties with responsibilities relative to a work zone, including but not limited to planning, project development, design, construction, and maintenance.

The CONTRACTOR shall design, develop, implement and maintain a set of coordinated strategies to manage the work zone impacts of the project designated as the Transportation Management Plan. These strategies will include a Temporary Traffic Control plan, a Transportation Operations component, and a Public Information component. The Policy and the anticipated work zone impacts of the project shall determine the level of detail, content, and scope of the TMP. The primary component, the Temporary Traffic Control plan shall address traffic control and safety throughout and adjacent to the project site. A secondary component, the Transportation Operations plan, will address management of traffic operations in

the project site and all adjacent areas impacted by the project. The final component, the Public Information plan, addresses communications with the public and entities impacted by the project. The CONTRACTOR's Transportation Management Plan and its components shall comply with the requirements of this Agreement and subsequent Exhibits, Part 6 of the Manual on Uniform Traffic Control Devices (MUTCD) latest edition, and SCDOT policies, standard specifications and all addendums to the standard specifications, the typical traffic control standard drawings for road construction, and procedures.

F. Ownership of Documents

Drawings, specifications, test data, inspection reports, QC documents, daily diaries and any other documents, including those in electronic form, prepared by CONTRACTOR or CONTRACTOR's consultants are "Project Documents". CONTRACTOR and CONTRACTOR's consultants shall be the owner of the Project Documents. Upon the Effective Date of this Agreement, CONTRACTOR grants SCDOT a nonexclusive license to reproduce the Project Documents for the purposes of, but not limited to, promoting, using, maintaining, upgrading, or adding to the Project. Upon completion of the Project or upon default by CONTRACTOR, CONTRACTOR shall provide copies of all Project Documents to SCDOT in the format designated by SCDOT.

G. Construction Criteria

CONTRACTOR shall construct the Project in accordance with all applicable Federal, State, and local statutes and regulations. All construction shall be performed in accordance with the following criteria, which are incorporated herein by reference and made a part hereof. The construction criteria are intended to be complementary and to describe and provide for a complete work. Where the following construction criteria conflict, the order of precedence shall be as listed below:

1. **EXHIBIT 4** – Project Design Criteria
2. **EXHIBIT 5** – Special Provisions
3. SCDOT Standard Drawings, effective as of the release of the Final RFP
4. SCDOT Supplemental Specifications and Supplemental Technical Specifications, effective as of the release of the Final RFP
5. SCDOT Standard Specifications for Highway Construction, effective as of the release of the Final RFP
6. SCDOT Construction Manual, effective as of the release of the Final RFP
7. SCDOT Approval Sheets, Material Acceptance Policies and New Products Evaluation Summary (available on SCDOT internet website)

H. Project Management

1. CONTRACTOR shall be responsible for ensuring that the Project is constructed in conformance with the Contract, all referenced documents and specifications, and applicable laws and regulations.

2. CONTRACTOR shall provide project management services sufficient to supervise the activities of his own personnel and subcontractors. CONTRACTOR shall provide a sufficient number of persons on site, to the satisfaction of SCDOT, to provide for the construction management of the Project.

3. SCDOT will provide representatives assigned to the Project to monitor the construction and provide necessary coordination between SCDOT and CONTRACTOR. All costs for salary and equipment to maintain SCDOT employees will be provided by SCDOT at no expense to CONTRACTOR. SCDOT representatives will have full and complete access to the Project, the work in progress, the "Daily Diaries", and to other technical documents and project records associated with design, construction, demolition, material disposal, materials, quality control, materials installation, and testing. SCDOT representatives will receive reasonable notice of and have the opportunity to participate in any meetings that may be held concerning the Project or the relationship between CONTRACTOR and their consultants and subcontractors when such meetings are associated with technical matters, progress, or quality of the Project. As used in this paragraph, "notice" shall require actual written notice to SCDOT's Agent.

I. Control of the Work

1. CONTRACTOR shall determine the appropriate means, methods and scheduling necessary to complete the work timely and in accordance with all construction requirements. SCDOT will have the right to review and inspect the work at any time.

2. If, at any time, SCDOT observes or has actual notice of any fault or defect in CONTRACTOR's performance of this Agreement, SCDOT will give CONTRACTOR prompt written notice reasonably detailing the nature of the fault or defect. SCDOT is not required to discover or to accept defective or faulty work. SCDOT's right to have defective or faulty work promptly corrected shall not be waived by any action of SCDOT.

3. SCDOT will have the authority to suspend the work, wholly or in part, for such periods, as SCDOT may deem necessary, due to CONTRACTOR's failure to meet the requirements of the Contract in the performance of the work.

4. No inspection, acceptance, payment, partial waiver, or any other action on the part of SCDOT will operate as a waiver of any portion of this Agreement or of any power reserved herein or any right to damages or other relief, including any warranty rights, except insofar as expressly waived by SCDOT in writing. SCDOT will not be precluded or estopped by anything contained herein from recovering from CONTRACTOR any overpayment as may be made to CONTRACTOR.

J. Contract Deliverables

CONTRACTOR shall submit deliverables including, but not limited to, the following as set forth in the CONTRACT.

1. Contract Deliverable Matrix
2. Schedule of Values (**EXHIBIT 2**)
3. Plans - Article II.D.2
4. Erosion Control and Spill Prevention Plan
5. Storm Water Pollutant Prevention Plan and signed Contractor Certification Form (SCDHEC 0437)
6. SCDHEC Notice of Intent (NOI) for Stormwater Discharges Covered Under SC NPDES Construction General Permit SCR160000)
7. Environmental Compliance Plan & Environmental Commitment Summary Report
8. Wetland and Stream Mitigation
9. Traffic Management Plan
10. Crane Operator Documents
11. QC Plan
12. Community and Public Relations Plan, as specified in **Article X** and **EXHIBIT 5**
13. Drainage Notebooks for the Project in accordance with SCDOT's Requirements for Hydraulic Design
14. CPM Schedule per Article IV
15. EEO, DBE, and OJT Requirements, as specified in **Article XVIII & EXHIBIT 5**
16. Right-of-Way documents per Article VIII
17. Shop Plans and working drawings
18. Preliminary & Final Geotechnical Reports
19. All final electronic design files for the Project, as specified in **EXHIBIT 4**
20. Escrow Proposal Documents
21. CONTRACTOR's Materials Certification
22. As-Built Plans
23. Railroad Coordination Documents & Insurance Certificates per **EXHIBIT 6**
24. HAZMAT surveys for structures not already surveyed, SCDHEC Notice of Demolition for RCE Signature

25. Clearing and Grubbing Plan
26. Utility Coordination Reports, including Utility Agreements, and Supporting Documentation
27. Right of Way Plats and Monuments (per Preconstruction Advisory Memorandum #8)
28. All deliverables as specified in Exhibit 4

III. CONTRACT PRICE/CONTRACT PAYMENTS

A. Contract Price

The “Contract Price” shall be \$_____. In consideration for the Contract Price, CONTRACTOR shall perform all of its responsibilities under the Contract. The Contract Price shall include all work identified in the Agreement and subsequent Exhibits and as identified in the Cost Proposal Bid Form – **EXHIBIT 1**.

B. Contract Price Adjustments

1. Allowable adjustments

a) The Contract Price may be adjusted to reflect the direct costs, plus an additional amount not to exceed 10% of the direct costs for the combined total of reasonable overhead* and profit, associated with any of the following: Amount added or deducted as the result of a “Change” or “Construction Change Directive”.

b) Differing site condition as defined in Article XIII.

c) Intentional or bad faith acts or omissions by SCDOT that unreasonably interfere with CONTRACTOR’s performance and cause delay of work on the critical path of the Project.

d) Changes in legal requirements or regulations that are effective subsequent to the date of this Agreement.

e) Discovery of surface hazardous materials not previously identified as set forth in Article XI; Price adjustment for discovery of subsurface hazardous materials shall be in accordance with Article XI.G.

f) Discovery of archeological or paleontological sites not previously identified as noted in Article X.

g) Premium right-of-way costs and second appraisals as set forth in Article VIII. Only the actual premium right-of-way and actual second appraisal cost will be reimbursed. No additional amount for overhead, profit, bonds and insurance will be considered for this item.

* Overhead: The operating expense of a business exclusive of direct cost as defined in Paragraph 4 below.

Other than as provided above, the Contract Price shall not be increased for contract time adjustments or delay damages. Contract Price adjustments shall be documented by Supplemental Agreement signed by both parties and shall be reflected immediately in the Schedule of Values. No claim by the CONTRACTOR for an adjustment hereunder shall be allowed if notice is not given prior to final payment under this Agreement.

2. Changes

a) A “Change” shall be any deviation or variation from the Project Scope or the Project Criteria. No Change shall be implemented without the express written approval of SCDOT. A “Change” may be an “Additive Change” or a “Deductive Change”.

b) SCDOT may initiate a change by advising CONTRACTOR in writing of the change. As soon thereafter as practicable, CONTRACTOR shall prepare and forward to SCDOT an estimate of cost or savings, and the impact to the schedule resulting from the change. SCDOT will advise CONTRACTOR in writing of its approval or disapproval of the change via “Issue Paper”. If SCDOT approves the change, CONTRACTOR shall perform the Services as changed.

3. Construction Change Directive

A Construction Change Directive is a written order from SCDOT directing a change prior to agreement with CONTRACTOR on adjustment, if any, to the Contract Price or Contract Time. If a price for the work cannot be agreed upon, CONTRACTOR shall perform the work under Force Account Procedures as outlined in Section 109.5 of SCDOT’s Standard Specifications.

4. Direct Costs

For the purpose of a Contract Price Adjustment, “Direct Costs” shall be defined as:

a) Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers’ compensation insurance;

b) Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

c) Actual costs of machinery and equipment owned by CONTRACTOR or any affiliated or related entity exclusive of hand tools;

- d) Actual costs paid for rental of machinery and equipment exclusive of hand tools;
- e) Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes;
- f) Additional costs of supervision and field office personnel directly attributable to the change or event; and
- g) Costs incurred or fees paid for design work related to the change or event.

C. Contract Payments

1. Schedule of Values

Prior to execution of this Agreement, CONTRACTOR shall provide a Schedule of Values acceptable to SCDOT and work may not start until the Schedule of Values is approved by SCDOT. The Schedule of Values will serve as the basis for cost loading of the CPM Schedule. The CPM schedule shall include sufficient information to provide for monetary and quantitative tracking of the work by SCDOT. Updates to the cost-loaded CPM schedule will serve as the basis for progress payments requested by and made to CONTRACTOR. If the Contract Price is adjusted, CONTRACTOR shall revise its Schedule of Values and the CPM Schedule to reflect the adjustment in the Contract Price. The revised Schedule of Values must be approved by SCDOT prior to the time for the subsequent request for a progress payment otherwise no progress payments will be made. The Schedule of Values shall be incorporated herein as **EXHIBIT 2**. The Schedule of Values should include Lump Sum items that will serve as measurement and payment for any item referred to in this Contract as a “contract unit bid price” item.

2. Mobilization

Mobilization shall not exceed 5% of the Total Contract Cost as shown in the Schedule of Values. Mobilization will be paid in two (2) equal installments. The first will be paid in the progress payment immediately following Notice to Proceed, and the second will be paid at the start of construction.

3. Periodic Progress Payment Applications

No application for payment of the Contract Price shall be submitted until SCDOT gives a notice to proceed. Applications for payment of the Contract Price may be submitted once a month. Each application for payment of the Contract Price shall set forth, in accordance with the Schedule of Values and the cost-loaded CPM schedule, the percentage of all items comprising the work completed since CONTRACTOR’s immediately prior request for payment. The application for payment of the Contract Price may also request payment for equipment and materials not yet incorporated into the Project, provided that (i) SCDOT is satisfied that the equipment and materials are

suitably stored at either the Project or another acceptable location, (ii) the equipment and materials are protected by suitable insurance and (iii) upon payment, SCDOT will receive title to the equipment and materials free and clear of all liens and encumbrances.

4. Periodic Progress Payments

SCDOT will review each application for payment. Upon approval by SCDOT of an application for payment, SCDOT will pay CONTRACTOR the undisputed percentage for the Project completed during the period covered by the application for payment. SCDOT will make each payment within twenty-one (21) days of the receipt of the corresponding Application for Payment. In the event of a dispute over the quality of work or percentage of the Project completed, SCDOT's decision is controlling and final. Payment by SCDOT will not preclude or estop SCDOT from correcting any measurement, estimate, or certificate regarding the percentage completion of the Project, and future payments may be adjusted accordingly.

5. Prompt Payment of Subcontractors

a) Subject to the provisions on retainage provided in Paragraph (b) below, when a subcontractor has satisfactorily performed a work item of the subcontract, CONTRACTOR must pay the subcontractor for the work item within seven (7) calendar days of CONTRACTOR's receipt of payment from SCDOT. A subcontractor shall be considered to have "satisfactorily performed a work item of the subcontract" when SCDOT pays CONTRACTOR for that work item.

b) CONTRACTOR may withhold as retainage up to five (5%) percent of a subcontractor's payment until satisfactory completion of all work items of the subcontract. "Satisfactory completion of all work items of the subcontract" shall mean when SCDOT pays CONTRACTOR for the last work item of the subcontract. CONTRACTOR must release to the subcontractor any retainage withheld within seven (7) calendar days from the date CONTRACTOR receives payment from SCDOT for the last work item of the subcontract. For further information regarding Retainage, see Article III, paragraph D.

c) With each progress payment application, CONTRACTOR shall certify to SCDOT that the payment application is complete and that all subcontractors have been paid for work covered by previous applications.

d) Failure to comply with any of the above provisions shall result in one or more of the following sanctions: (1) no further payments to CONTRACTOR unless and until compliance is achieved; (2) CONTRACTOR being placed in default; and/or (3) CONTRACTOR being declared delinquent, such delinquency being subject to procedures and penalties provided in 108.8 of the Standard Specifications.

6. Withholding of Payment

SCDOT may withhold all or part of any payment under the Contract for any of the reasons listed below. Any funds withheld will be released upon CONTRACTOR satisfactorily remedying the defect, fault, or failure and will be included in the next regularly schedule pay estimate. Payment will be subject to retainage if applicable.

- a) Defective work not remedied. Any such withholding, however, shall not exceed two times the reasonable cost of remedying the defective work. Defective work shall be defined as work or material not conforming to the requirements of the Contract.
- b) Reasonable evidence that the Work will not be Substantially Complete within the Contract Time as adjusted and that the unpaid balance of the Contract Price will not be adequate to cover Liquidated Damages for the actual unexcused delay;
- c) Failure to comply with the prompt payment provision of this Contract;
- d) Any fines or other charges to SCDOT due to CONTRACTOR's failure to comply with permit requirements or other regulations;
- e) Notice of cancellation of insurance;
- f) Failure to submit updated and approved CPM or Schedule of Values;
- g) Violation of QC plan requirements;
- h) Failure to follow specifications or procedures required by the Contract;
- i) Failure to comply with DBE, On-The-Job training, or Pre-Employment Training provisions;
- j) Failure to provide adequate work zone traffic control;
- k) Failure to provide adequate sediment and erosion control; or,
- l) Violation of any contract provisions.

D. Retainage

Provided the Project is proceeding satisfactorily, SCDOT will not withhold retainage. However, if at any time SCDOT determines that CONTRACTOR fails to meet contract terms or the Project is not proceeding satisfactorily, SCDOT may retain up to 10% of

the Contract Price as retainage. If the reason for SCDOT's withholding of retainage is attributable to a subcontractor's failure to perform, CONTRACTOR may withhold up to 10% of the subcontractor's payment until all work of the subcontract work is satisfactorily performed. If it decides to withhold retainage, SCDOT will not withhold more than 20% of any single payment application. SCDOT will have sole authority to determine the amount (not exceeding 10%) and necessity of retainage.

IV. CONTRACT TIME

A. Project Schedule

1. Time for Completion of Project. The Project shall be Substantially Completed by **September 30, 2019**. The Notice to Proceed shall be no later than 45 days from the effective date of the Agreement. Final Completion shall be reached as defined in paragraph 5 below.

Substantial Work Completion. The Project shall be considered substantially complete when it is serviceable to the public, all lanes and ramps are open, and all work is completed except for "Project Close-out Activities", "Project Close-out Activities" are defined as punch list items, site clean-up, demobilization, and final Project documentation, including but not limited to as-built plans.

2. Critical Path Method Schedule: CONTRACTOR shall prepare and maintain a schedule for the Project using the Critical Path Method of scheduling (hereinafter called "CPM Schedule"). Prepare a Level II CPM Schedule in accordance with this agreement and the SCDOT Supplemental Specifications with the following exceptions:

a) Submit to the SCDOT the initial baseline CPM schedule within 30 days from the Effective Date of this Agreement. No contract payment will be made to Contractor and no construction work may begin until a CPM baseline schedule is received and accepted by SCDOT. Update the baseline CPM schedule for monetary and quantitative tracking purposes as Released for Construction plans are developed.

b) Cost-load the CPM schedule using the expenses identified in the schedule of values. Use the schedule of values to establish Expense Categories and assign to the correct activities.

c) Include submittal activities. Allow duration for these activities to include SCDOT review periods.

d) Reuse of deleted activity ID's from schedule update to schedule update is not allowed.

e) Failure to include any element of work or any activity including but not limited to utility relocation, right of way acquisition, and permitting will not relieve the CONTRACTOR from completing all work within the Contract Time at no additional time or cost to the SCDOT, notwithstanding the acceptance of the schedule by SCDOT.

f) Develop project specific calendars reflecting all seasonal restrictions included in this Agreement and non-work days. Address durations for weather within activity duration, not within the calendar.

g) Use only a Work Breakdown Structure (WBS) to organize schedule activities. At a minimum, breakout the design and construction phases. These two breakouts should have the same parent within the structure.

h) Submit monthly updates no later than 15 days following the most recent estimate period end date, whether or not an estimate was generated. Set the data date the same as the most recent estimate period end date.

i) If SCDOT determines any schedule submission is deficient, it will be returned to the CONTRACTOR. A corrected schedule shall be provided within 7 calendar days from the SCDOT's transmittal date.

j) The schedule may indicate an early completion date. However, SCDOT will not be liable in any way for CONTRACTOR's failure to complete the Project prior to the specified Contract Time. Any additional costs, including extended overhead incurred between CONTRACTOR's scheduled completion date and the Contract Time, shall be the responsibility of the CONTRACTOR.

k) The schedule may include constraints to indicate the early completion of portions of the work. SCDOT will remove these constraints when determining the critical path of the schedule.

l) Include in each narrative a detailed listing of crews utilized on activities and their responsibilities. In lieu of this, the Contractor may request to submit a Resource Loaded CPM schedule.

3. Progress Review Meetings.

a) Review Meetings shall be held between CONTRACTOR and SCDOT at least every 2 weeks. Periodic construction meetings shall be held by CONTRACTOR with its consultants and subcontractors to coordinate the work, update the schedule, provide information and resolve potential conflicts.

b) SCDOT and CONTRACTOR will hold a regular CPM Progress Meeting at which all principal parties are expected to attend. These meetings will be held the week before the application for payment is due so that job progress will coincide with the payment application. At this meeting, CONTRACTOR shall provide the most recent schedule with notations showing actual start dates, actual finish dates, and activity progress. If the schedule provided indicates an actual or potential delay to the completion of the Contract, CONTRACTOR shall provide a narrative identifying the problems, causes, the activities affected and describing the means and methods available to complete the Project by the Contract Time.

5. Final Completion. When CONTRACTOR believes that all elements of its work on the Project, including all of the requirements of the Contract, have been completed, it shall notify SCDOT in writing. Final Completion shall be achieved within 180 calendar days of Substantial Work Completion as defined in this Agreement. Within thirty (30) days thereafter, SCDOT will acknowledge project completion or will advise CONTRACTOR in writing of any aspect of the Contract or the Project Scope that is incomplete or unsatisfactory. CONTRACTOR shall complete all corrective action within thirty (30) days after written notification of incomplete or unsatisfactory items. CONTRACTOR will notify SCDOT in writing upon completion of necessary corrective action. SCDOT will verify satisfactory completion of the corrective action in writing to CONTRACTOR. Upon verification, the Project shall be deemed to have achieved Final Completion.

6. Inspection/Acceptance; No Waiver. No inspection, acceptance, payment, partial waiver, or any other action on the part of SCDOT will operate as a waiver of any portion of this Agreement or of any power reserved herein or any right to damages or other relief, including any warranty rights, except insofar as expressly waived by SCDOT in writing. SCDOT will not be precluded or estopped by anything contained herein from recovering from CONTRACTOR any overpayment as may be made to CONTRACTOR.

B. Contract Time Adjustments

The Contract Time may be extended if there is a delay to the critical path of the Project caused by an event listed below. All requests for time extensions shall be made in writing to SCDOT within 20 days of the event causing the delay. All time extensions must be approved in writing by SCDOT. Time extensions may be allowed for the following events that affect the critical path:

1. Force Majeure as that term is defined in this Agreement in Article XIV;
2. Changes or construction change directives;
3. Differing site conditions as defined under Article XIII;
4. Injunctions, lawsuits, or other efforts by individuals or groups that hinder, delay, or halt the progress of the Project, provided that such efforts are not premised on alleged wrongs or violations by CONTRACTOR or its subcontractors;
5. Interference with or delay of work on the critical path of the Project by SCDOT; however, CONTRACTOR shall not be entitled to a time extension if SCDOT's actions are necessitated by CONTRACTOR's actions, omissions, failure to perform quality work, or failure to comply with contract requirements;
6. Changes in the legal requirements or regulations which are effective subsequent to the date of this Agreement;

7. Discovery of surface hazardous materials not previously identified as set forth in Article XI; no time adjustment for discovery of subsurface hazardous materials; or,
8. Discovery of archeological or paleontological remains not previously identified as set forth in Article X.
9. Adverse utility relocation impacts meeting the requirements set forth in Article VII.
10. Adverse Railroad coordination impacts as set forth in Article VII.
11. Adverse permit acquisition impacts as set forth in Article IX.

C. Owner's Right to Stop Work

SCDOT will have the authority to suspend the work, wholly or in part, for such periods, as SCDOT may deem necessary, due to CONTRACTOR's failure to meet the requirements of the Contract in the performance of the work. Such suspension of the work shall not constitute grounds for claims for damages, time extensions, or extra compensation.

D. Liquidated Damages

CONTRACTOR shall pay liquidated damages to SCDOT in the amount of **\$10,000.00** for each day for which construction is not substantially complete from September 30, 2019 to December 31, 2019

CONTRACTOR shall pay liquidated damages to SCDOT in the amount of **\$50,000.00** for each day for which construction is not substantially complete after December 31, 2019.

CONTRACTOR shall pay liquidated damages to SCDOT in the amount of **\$1,500.00** for each day that Final Completion, as defined in Article IV, is not achieved.

The parties acknowledge, recognize and agree that because of the unique nature of the Project, it is difficult or impossible to determine with precision the amount of damages that would or might be incurred by SCDOT as a result of the CONTRACTOR's failure to complete the Project as specified in the Contract. Therefore, any sums payable under this provision are in the nature of liquidated damages, and not a penalty, and are fair and reasonable and such payment represent a reasonable estimate of fair compensation for the losses that may reasonably be anticipated from such failure. Notwithstanding the above, liquidated damages are not intended to excuse the CONTRACTOR from liability for any other breach of its obligations under the Contract.

V. QUALITY ASSURANCE PROGRAM

A. CONTRACTOR's Responsibilities

CONTRACTOR shall be responsible for the QUALITY CONTROL Portion of the Program to include the items listed below. Work shall not commence until CONTRACTOR has met these requirements.

1. Quality Control Plan: CONTRACTOR shall submit a Design and Construction Quality Control (QC) Plan that outlines how CONTRACTOR shall assure that the design, materials, and work are in compliance with the contract documents. The initial plan shall be submitted to SCDOT for review and approval at least five (5) business days prior to any design or plan submittal or the beginning of any construction activity. The Design Quality Control Plan may be submitted separately from the Construction Quality Control Plan as part of the Design Submittal Procedures deliverable. The plan shall be updated as necessary prior to the start of any specific construction operation. The plan shall include a list of SCDOT certified personnel responsible for management and quality control of the Project, and define the authority of each individual. The plan shall also include how CONTRACTOR will monitor quality and deal with failing materials. The QC Plan shall include the QC testing and sampling frequencies and shall indicate the frequency at which the QC Manager will provide QC test results to SCDOT. CONTRACTOR shall include an estimated summary of quantities to SCDOT for the purposes of meeting the minimum sampling and testing requirements in accordance with the SCDOT Construction Manual.

2. Personnel: CONTRACTOR shall provide a sufficient number of SCDOT certified personnel to adequately control the work of the Project. Any personnel required to obtain samples or conduct material testing shall be SCDOT certified. CONTRACTOR shall provide SCDOT with copies of each individual's certifications for review and approval by SCDOT. Approved CONTRACTOR QC personnel shall be on the job at all times that permanent work items and materials are being incorporated into the project. CONTRACTOR's QC personnel shall not have any other project responsibilities.

1. CONTRACTOR Testing: CONTRACTOR is required to conduct asphalt sampling and testing in accordance with the SCDOT Standard Specifications and the SCDOT Supplemental Technical Specifications SC-M-400. CONTRACTOR shall conduct sampling and testing to ensure that all workmanship and materials are in compliance with the contract requirements. Although not used for acceptance, QC testing and inspection shall ensure that quality has been incorporated into all elements of work prior to requesting acceptance testing and inspection. The QC Program should be sufficient in scope to remedy repeated discoveries of non-compliant work by those performing acceptance inspection and testing. Repeated observations of QC quality shortfalls shall be considered a breakdown of the QC program and shall be cause for investigation and corrective action prior to commencement of work areas affected. Corrective action may include the addition of new QC procedures, revision to existing QC procedures, re-training of QC personnel, removal and replacement of QC personnel, or other such actions which will restore the effectiveness of the QC program. All QC

testing shall be performed in accordance with existing AASHTO, ASTM, or test methods used by SCDOT. The cost of these activities will be borne by CONTRACTOR. Additionally, CONTRACTOR is responsible for dynamic and static load testing of drilled shafts and piles in accordance with the requirements of **EXHIBITS 4 and 5**.

2. Testing Laboratories: All testing laboratories used on the Project must be AASHTO certified and approved by SCDOT thirty (30) days prior to beginning the portion of work for which the laboratory will be performing the testing. Hot Mix Asphalt testing laboratories require SCDOT certification.

3. Mix Designs: Copies of all initial hot-mix asphalt mix designs and Portland Cement Concrete mix designs, along with supporting data, shall be submitted to SCDOT for review at least five (5) business days prior to use. All hot-mix asphalt mix designs will be prepared by personnel certified in Mix Design Methods. Portland Cement Concrete mix designs will be prepared by a certified concrete technician or a Professional Engineer. The Portland Cement Concrete mix proportions given in the specifications are to be followed. CONTRACTOR shall design the mix to obtain the strength and water/cement ratios given in the specifications, and shall provide workability, air content, gradation and suitable set times as set forth in the Standard Specifications. The SCDOT will be notified of any revisions to CONTRACTOR's mix design. Copies of such revisions will be sent to SCDOT for review at least ten (10) business days prior to use.

4. Materials Certifications: CONTRACTOR's QC Manager shall submit all material certifications to SCDOT prior to the CONTRACTOR incorporating the material into the project.

B. SCDOT Responsibilities

SCDOT will be responsible for the QUALITY ACCEPTANCE portion of the program to include: conducting inspections, acceptance testing, independent assurance testing and final project material certification.

1. Acceptance Testing: SCDOT personnel assigned to the Project, or qualified personnel retained by SCDOT, will conduct sampling and testing, separate from CONTRACTOR's testing, at the frequencies set forth in SCDOT's construction manual. This testing will be used by SCDOT to determine the acceptability of the materials. All sampling and testing will be in accordance with existing AASHTO, ASTM, or SC test methods used by SCDOT. The cost of these activities will be borne by SCDOT. CONTRACTOR's QC Manager is required to coordinate all activities closely with SCDOT to allow the necessary acceptance testing to be conducted prior to proceeding to the next operation. The disposition of failing materials must be approved by SCDOT.

2. Independent Assurance Testing: SCDOT will be responsible for conducting Independent Assurance Testing. Personnel performing these tests will be SCDOT employees or qualified persons retained by SCDOT. Persons performing these tests will not be involved in Acceptance Testing. This testing will be used to ensure that proper sampling and testing procedures are being followed, and that testing equipment is

functioning properly. This testing will consist of observing sampling and testing by both SCDOT personnel performing Acceptance Testing and CONTRACTOR personnel performing Quality Control Testing, as well as taking split samples for the purposes of comparison testing. Independent Assurance Testing will be at an approximate frequency of one-tenth of the Acceptance Testing frequency. Independent Assurance test results will not be used for acceptance. The cost of these activities will be borne by SCDOT.

3. Materials Certification: SCDOT will be responsible for preparing the Materials Certification as required by the FHWA on federally funded projects.

C. CONTRACTOR's Obligation

SCDOT's testing in no way relieves CONTRACTOR of its obligation to comply with the Contract requirements. All materials incorporated into the Project must meet or exceed contract requirements and specifications. Further, any testing by SCDOT will not relieve CONTRACTOR of any of its warranty obligations.

VI. INSURANCE AND BONDING

A. Insurance

1. CONTRACTOR shall purchase and maintain insurance from a company or companies that maintain an A.M. Best rating of not less than A-VII with coverage forms acceptable to SCDOT. The insurance described below shall be maintained uninterrupted for the duration of the Project, including warranty periods, and shall protect CONTRACTOR from claims set forth below which may arise out of or result from CONTRACTOR's operations under the Contract, whether such operations be performed by CONTRACTOR or by any subcontractor or by anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable:

a) Claims under workers' or workmen's compensation, disability benefit and other similar employee benefit acts;

b) Claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;

c) Claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;

d) Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or (2) by any other person;

e) Claims for damages, other than to the work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

f) Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

g) Claims involving contractual liability insurance applicable to the Contractor's obligations under the indemnity provisions of this contract.

2. The minimum limits of liability for the following types of insurance are required, except where greater limits are required by statute:

a) Workers' Compensation, including: Worker's Compensation Insurance/Employer's Liability

State Statutory limits	Employer's Liability
	\$100,000 per accident
	\$500,000 per disease
	\$100,000 each employee

b) Commercial General Liability \$1,000,000 per occurrence
\$2,000,000 aggregate

Commercial General Liability insurance shall be written on ISO occurrence form CG 00 01 (or substitute for providing equivalent coverage) and shall cover liability arising from premises, operations, independent contractors, products-completed operations, contractual liability and personal injury and advertising injury. The policy shall contain the per project endorsement.

c) Business Automobile Liability \$1,000,000 per occurrence

This policy shall cover Any Auto, including Owned, Hired and Non-owned Automobiles. Business auto coverage shall be written on ISO form CA 00 01, CA 00 05, CA 00 12, CA 00 20, or a substitute form providing equivalent liability coverage.

d) Umbrella Liability Coverage \$10,000,000 per occurrence
\$20,000,000 aggregate

The general aggregate limit shall apply separately to the Project

3. Certificates of Insurance acceptable to SCDOT will be provided to SCDOT prior to execution of this Agreement. These certificates shall name SCDOT as an additional insured under the Commercial General Liability (CGL) arising out of both

the on-going operations and completed operations of CONTRACTOR. Such additional insured coverage shall be endorsed to Contractor's CGL policy using ISO Additional Insured Endorsement form CG 2010 (10/01) and CG 2037 (10/01) or a substitute providing equivalent coverage, and included under the commercial umbrella. CONTRACTOR shall maintain continual additional insured status for SCDOT under the products-completed operations coverage for the time period required to satisfy the statute of limitation for South Carolina. CONTRACTOR shall also name SCDOT as additional insured under Business Automobile and Umbrella policies and reference the Project to which the certificate applies. The policies must contain a provision that coverage afforded will not be canceled or reduced until at least 30 days prior written notice has been given to SCDOT and that the policies cannot be cancelled for non-payment of premiums until at least 10 days prior written notice has been provided to SCDOT. Send Notice of Cancellations to Director of Construction Room 330, PO Box 191, Columbia, SC 29202. Make certain that the policies are endorsed to reflect this requirement. Verification of additional insured status shall be furnished to SCDOT by including a copy of the endorsements with the Certificate of Insurance. This insurance, including insurance provided under the commercial umbrella shall apply as primary and noncontributory insurance with respect to any other insurance or self-insurance programs, including any deductibles, afforded to, or maintained by, SCDOT. CONTRACTOR'S deductibles shall not exceed \$250,000 without written consent of the SCDOT and that the certificates show the deductible amounts.

4. Limits shown in this provision are minimum acceptable limits and in no way limit available coverage to the additional insured. CONTRACTOR's CGL and commercial umbrella policies shall contain no provision providing that the limits available to an additional insured are less than the limits available to the CONTRACTOR. SCDOT shall be given all the same rights and insurance coverage as CONTRACTOR. In the event that any insurer issues a reservation of rights for SCDOT as an additional insured, SCDOT shall be entitled to employ independent counsel, of its choice, at CONTRACTOR's expense.

5. There shall be no endorsements or modifications of the CGL limiting the scope of coverage for liability arising from explosion, collapse, underground property damage or work performed by contractors on behalf of SCDOT.

6. Hazardous Materials

a) CONTRACTOR shall provide "Contractors Pollution Liability Insurance" acceptable to the SCDOT in the amount of \$10,000,000.00 per occurrence, \$10,000,000.00 aggregate covering bodily injury and property damage including National Resource Damage arising out of performance of the contract including construction activities, offsite storage/disposal and 3rd party transportation and 3rd party claims, and any remediation. The policy shall be submitted prior to execution of this Agreement. Completed operations coverage shall continue for three (3) years after the date of Final Completion of the Project. The policy shall name the SCDOT as an additional insured and shall reference the Project by name. The policy shall also state

that the coverage will not be cancelled or reduced without thirty (30) days prior written notice to the SCDOT. Such coverage shall apply as primary and non-contributory insurance with respect to any other insurance or self-insurance programs, including any deductibles, afforded to, or maintained by SCDOT.

b) If the CONTRACTOR is required to remove and haul any hazardous waste from the Project, or if the Project involves such similar environmental exposure, pollution liability coverage equivalent to that provided under the ISO Pollution Liability – Broadened Coverage for Covered Autos Endorsement (CA 99 48), shall be provided, and the Motor Carrier Act Endorsement (MCS 90) shall be attached. Limits of pollution liability shall be not less than \$1,000,000 per occurrence. Coverage shall apply on an “occurrence form” basis, shall cover at a minimum bodily injury, property damage, defense costs and clean-up costs and be extended to include non-owned disposal sites and transportation coverage. This insurance shall remain in effect after acceptance by Owner for the time period required to satisfy the statute of limitations in South Carolina. However, if coverage is written on a “claims made form”, then the Contractor’s Pollution Liability coverage shall include a retroactive date that precedes the commencement of work under this Agreement. Such coverage shall apply as primary and non-contributory insurance with respect to any other insurance or self-insurance programs, including any deductibles, afforded to, or maintained by SCDOT.

7. Waiver of Subrogation. CONTRACTOR shall waive its rights against SCDOT, other additional insured parties, and their respective agents, officers, directors and employees for recovery of damages, or any other claims, to the extent these damages are covered by the CGL, business auto, workers compensation and employer’s liability or commercial umbrella maintained pursuant to this section of the Agreement.

8. CONTRACTOR shall at the time of execution of this Agreement, obtain or require the lead designers to obtain, Errors and Omissions insurance for their Professional Liability, for all claims arising from the performance of professional services on the Project. The insurance coverage shall be for not less than **\$5,000,000.00** per claim and in the aggregate. The coverage shall be continued for three (3) years after the date of Final Completion of the Project. Evidence of such insurance shall be provided to SCDOT at the time of the execution of the Agreement.

9. CONTRACTOR shall provide “Builders Risk Insurance” acceptable to the SCDOT in the amount of the Contract Price protecting the respective interests of SCDOT and CONTRACTOR and covering physical loss or damage to the work during construction of the Project. The certificate of insurance shall be provided to the SCDOT at the time of execution of this Agreement. The policy shall name the SCDOT as an additional insured and shall reference the Project by name. The certificate shall also state that the coverage will not be cancelled or reduced without 30 days prior written notice to the SCDOT.

10. After completion of the work, CONTRACTOR shall maintain CGL and commercial umbrella coverage to include liability coverage for damage to insured's completed work equivalent to that provided under ISO CG 00 01 for three (3) years or for the statute of limitations period for damages, whichever is greater.

11. By execution of the contract, the CONTRACTOR accepts the responsibility to provide the liability insurance policies and endorsements as specified herein. Failure of SCDOT to identify a deficiency in the Certificate of Insurance submitted by the CONTRACTOR's insurance agent as evidence of the specified insurance or to request other evidence of full compliance with the liability insurance specified shall not be construed as a waiver of the CONTRACTOR's obligation to provide and maintain the required insurance for the duration of the contract.

B. Bonding

1. CONTRACTOR shall at the time of the execution of this Agreement, provide SCDOT the following bonds:

a) A Performance and Indemnity Bond from a surety or sureties satisfactory to SCDOT. The amount of bond shall be equal to the Contract Price.

b) A Payment Bond from a surety or sureties satisfactory to SCDOT. The amount of bond shall be equal to the Contract Price.

These bonds shall be in accordance with the requirements of S.C. Code Ann. §57-5-1660, (1976 as amended) and S.C. Code Ann. §29-6-250 (2000). Bonds shall be issued by a surety company licensed in the State of South Carolina with an "A" minimum rating of performance as stated in the most current publication of "A.M. Best Key Rating Guide, Property Liability" and signed by the surety's agency or attorney-in-fact. Surety must be listed on the current U.S. Department of the Treasury Financial Management Service list of approved bonding companies as approved for an amount equal to or greater than the amount for which it obligates itself in the Bond. If surety qualifies by virtue of its Best's listing, the amount of the Bond may not exceed ten percent of policyholders' surplus as shown in the latest A.M. Best's Key Rating Guide.

2. CONTRACTOR shall also provide a warranty bond, acceptable to SCDOT, in the amount of **\$5,000,000** to cover the warranty obligations of the contract.

VII. UTILITIES AND RAILROAD COORDINATION

A. CONTRACTOR is advised that, in an effort to advance the relocation of certain utilities ahead of the design build construction contract, SCDOT has entered into preliminary engineering agreements with Santee Cooper and SCE&G regarding the relocation of utilities shown in the agreements. Preliminary engineering agreements, preliminary relocation plans and preliminary schedules for these utilities have been provided in Attachment C. CONTRACTOR shall design the project in such a way that accommodates these relocations as shown in the

preliminary relocation plans. CONTRACTOR is not responsible for obtaining construction agreements for these specific utilities but is required to coordinate construction activities.

B. As part of the Project Scope, CONTRACTOR shall have the responsibility of coordinating the Project construction and demolition activities with all utilities that may be affected. CONTRACTOR shall be responsible for the cost of utility coordination as defined herein. If applicable, all temporary relocation costs as well as any other conflict avoidance measures shall be the responsibility of the CONTRACTOR. For those utilities that have prior rights SCDOT will be responsible for permanent relocation costs as defined by the Federal code. For those utilities where the CONTRACTOR determines that the SCDOT has prior rights, CONTRACTOR may exercise these rights and require the utility company to bear the costs of relocation. If there is a dispute over prior rights, SCDOT shall be responsible for resolving the dispute. SCDOT shall have final determination of the utility's prior rights.

C. For those utilities requiring relocation, CONTRACTOR shall conform with SCDOT's "A Policy for Accommodating Utilities on Highway Rights of Way", the applicable State laws, and the Code of Federal Regulations, Title 23, Chapter 1, Subchapter G, part 645, subparts A and B.

D. The resolution of any conflicts between utility companies and the construction of the Project shall be the responsibility of the CONTRACTOR. If said utility companies interfere or fail to relocate conflicting utilities in a timely manner, SCDOT may, on an individual basis, consider a time extension for utility company delays when CONTRACTOR can demonstrate that appropriate coordination efforts have been made to expedite the utility relocation, and that the delay has a direct impact on the approved Critical Path. CONTRACTOR shall not be entitled to additional compensation for interference or delays in utility relocations. CONTRACTOR shall meet with the Department's Utilities Office within thirty (30) days of the Notice to Proceed to gain a full understanding of what is required with each utility submittal.

E. CONTRACTOR shall design the Project to avoid conflicts with utilities where possible, and minimize impacts where conflicts cannot be avoided. If there is a dispute between the CONTRACTOR and SCDOT as to whether a utility relocation is required, SCDOT shall have the final determination. Additional utility relocations desired by the CONTRACTOR for but not limited to construction staging, access or convenience, shall be the sole responsibility of CONTRACTOR and all associated costs shall be borne by the CONTRACTOR.

F. CONTRACTOR shall initiate early coordination with all utilities and provide the utility companies with design plans for their use in developing Relocation Sketches as soon as the plans have reached a level of completeness adequate to allow the companies to fully understand the Project impacts. If a party other than the utility company prepares Relocation Sketches, there shall be a concurrence box on the plans where the utility company signs and accepts the Relocation Sketches as shown.

G. CONTRACTOR shall be responsible for collecting and submitting to SCDOT the following from each utility company that is located within the project limits:

1. **Relocation Sketches** including letter of “no cost” where the company does not have a prior right;
2. **Utility Agreements** including documentation of prior rights, cost estimate and relocation plans where the company has a prior right; and/or
3. **Letters of “no conflict”** where the company’s facilities will not be impacted by the Project. Include location sketches on SCDOT plans confirming and certifying that facilities are not in conflict.
4. **Encroachment Permits** for all relocations regardless of prior rights.

H. CONTRACTOR shall assemble the information included in the Utility Agreements and Relocation Sketches in a final and complete form and in such a manner that the Department may approve the submittals with minimal review. CONTRACTOR shall ensure that there are no conflicts with the proposed highway improvements, or between each of the utility company’s relocation plans. CONTRACTOR may not authorize the utility companies to begin their relocation work until authorized in writing by SCDOT. Any early authorization by CONTRACTOR shall be at the CONTRACTOR’s risk.

I. At the time that CONTRACTOR notifies SCDOT that CONTRACTOR deems the Project to have reached Final Completion, CONTRACTOR shall certify to SCDOT that all utilities have been identified and that those utilities with prior rights or other claims related to relocation or coordination with the Project have been relocated or their claims otherwise satisfied or will be satisfied by CONTRACTOR.

J. CONTRACTOR shall accurately show the final location of all utilities on the as-built drawings for the Project.

Railroad property is impacted by this project, provisions K through T shall apply:

K. Under the direction of and in coordination with SCDOT, the CONTRACTOR shall be responsible for all coordination with the involved Railroad Companies, including but not limited to, sending plans, meetings, correspondence, phone calls, writing/reviewing agreements, and etc. as may be necessary to secure the applicable executed railroad agreements, needed for the construction of the project, between the SCDOT and all involved railroad companies. All correspondence related to railroad agreements or conditions shall include the railroad file number and railroad milepost information. The CONTRACTOR shall be responsible for the cost of railroad coordination as defined herein.

L. SCDOT will submit for approval, all required railroad agreements necessary for the Preliminary Engineering and Construction of the project. Upon approval, the SCDOT will submit the agreement to the Railroad Company for execution. The CONTRACTOR shall be responsible for assisting SCDOT in the development of the railroad agreement by providing requested information.

M. The CONTRACTOR shall be responsible for all costs (excluding right of way) to the Railroad Company or Companies for services provided by the Railroad or the Railroad's Agent, as detailed in the executed Railroad Agreement between the SCDOT and the Railroad. This includes all expenses such as railroad flagging operations. The CONTRACTOR shall be responsible for all other costs associated with designing and constructing the project as described in the executed Railroad Agreement between the SCDOT and the Railroad Company. The CONTRACTOR shall include all costs associated with these requirements in the final bid price. Once a contract is executed, SCDOT shall administer invoicing for costs to the Railroad Company or Companies. Monies will be deducted from the CONTRACTOR's progress payments.

N. All design and construction activities in, adjacent to, over or under the railroad shall comply with all applicable Federal and State laws and standards, all terms identified in the Special Provisions for Protection of Railway Interests, and all terms of the final agreement executed with the Railroad Company.

O. The CONTRACTOR shall be required to meet the Railroad's Insurance Requirements as specified in the Special Provisions for Protection of Railway Interests.

P. The CONTRACTOR shall attend a mandatory meeting with the SCDOT's Utilities Office and Railroad Projects Office within thirty (30) days after the Notice to Proceed. The CONTRACTOR shall use the SCDOT approved agreement language and procedures, that will be provided in this meeting.

Q. SCDOT has negotiated language for the PE and Construction Agreements (see Exhibit 6). CONTRACTOR shall provide project specific information to SCDOT for inclusion into the agreements. The CONTRACTOR shall anticipate and include in the proposed schedule a minimum 90-day approval time-frame for all railroad agreements. However, SCDOT will not be held responsible for delays caused by negotiations with the railroad company. If said railroad companies interfere or fail to provide information in a timely manner, SCDOT may, on an individual basis, consider a time extension for railroad company delays when CONTRACTOR can demonstrate that appropriate coordination efforts have been made to expedite the railroad coordination, and that the delay has a direct impact on the approved Critical Path. CONTRACTOR shall not be entitled to additional compensation for interference or delays related to railroad coordination.

R. CONTRACTOR shall anticipate the need for a separate right-of-entry agreement between the CONTRACTOR and Railroad for surveys, borings, etc. The required PE Agreement, between SCDOT and Railroad, must be executed before Railroad will review or comment on any design questions or submittals from the CONTRACTOR. The Construction Agreement, between SCDOT and Railroad, must be executed before any construction activities can begin.

S. CONTRACTOR is advised the all utility relocations required within railroad right-of-way will require separate agreements between the affected utility company and the Railroad.

T. CONTRACTOR is advised that information related to railroad coordination is included in Exhibit 6.

VIII. RIGHT OF WAY ACQUISITION

A. Right of Way Services

CONTRACTOR is not responsible for acquiring right of way associated with the tracts identified in the Right of Way Status Report contained in Attachment B. The tract numbers in this report are referenced in the right of way plans provided in Attachment B and dated May 12, 2009. Right of way associated with these tracts has been acquired or is in the process of being acquired by SCDOT or SCSPA in accordance with these plans in advance of the Design Build Contract. Property Interest documents for "Closed" tracts are provided in Attachment C. Any additional right of way required from the tracts listed in the report for the necessary completion of the project shall be the CONTRACTOR's responsibility.

CONTRACTOR, acting as an agent on behalf of the State of South Carolina, shall provide right-of-way services for the Project. CONTRACTOR shall use firm(s) from the SCDOT's current "on-call" list for right of way consultants, as listed in Attachment B, to provide right of way services. Right-of-way services shall include appraisal, appraisal review, negotiation, acquisition, and relocation assistance services. CONTRACTOR shall be responsible for all costs related to these right-of-way services. CONTRACTOR will provide expert testimony and SCDOT will provide legal services necessary for any cases that are to be resolved by trial. Experts are defined as engineering and appraisal witnesses. SCDOT will retain final authority for approving just compensation, relocation benefits and settlements. SCDOT will designate a hearing officer to hear any Relocation Assistance Appeals. SCDOT agrees to assist with any out of state relocation by persons displaced within the rights of way by arranging with such other state(s) for verification of the relocation assistance claim. CONTRACTOR shall carry out the responsibilities as follows:

1. Acquire property in accordance with all Federal and State laws and regulations, including but not limited to the Uniform Relocation and Real Property Acquisition Act of 1970, as amended (the "Uniform Act") and the South Carolina Eminent Domain Procedure Act ("The Act"). The acquisition of property shall follow the guidelines as established by the Department and other State and Federal guidelines. CONTRACTOR shall not be entitled to an increase in the Contract Price for acquisition of borrow sources.

2. Submit procedures for handling right-of-way acquisitions and relocations to the SCDOT for approval prior to commencing right-of-way activities. These procedures are to show CONTRACTOR'S method including the appropriate steps and workflow required for appraisal, acquisition, and relocation. CONTRACTOR shall be granted the authority for administrative settlements by the SCDOT's Right-of-Way Office upon review and approval of the Right-of-Way Procedures. These procedures should also include an appropriate time allowance for SCDOT to establish just

compensation, approve relocation benefits, and approve administration and legal settlements. A SCDOT Representative will be available to make timely decisions concerning establishing just compensation, approving relocation benefits, and approving administrative settlements on behalf of SCDOT. The SCDOT Representative is committed to issuing decisions on approval requests within three (3) business days. The commitment is based on the procedure providing a reasonable and orderly workflow and the work being provided to the SCDOT Representative as completed.

3. Utilize SCDOT's right-of-way project tracking system and provide an electronic status update a minimum of twice per month or upon request by SCDOT's representative.

4. Submit a right-of-way quality control plan to the SCDOT for review prior to commencing right-of-way activities. SCDOT standard forms and documents will be used to the extent possible.

5. Provide a toll free telephone number for landowners and displaced persons to call.

6. Provide a current title certificate by a licensed South Carolina attorney for each parcel as of the date of closing or the date of filing of the Condemnation Notice.

7. Prepare appraisals in accordance with the Department's Appraisal Manual. Appraisals shall be prepared by appraisers who are on the SCDOT approved list of active fee appraisers.

8. Provide appraisal reviews complying with technical review guidelines of SCDOT Appraisal Manual and make a recommendation of just compensation. The reviewer shall be from the SCDOT's approved reviewer list.

9. Make direct payments of benefits to property owners for negotiated settlements, relocation benefits and payments to be deposited with the court and notify SCDOT monthly of payments made.

10. Prepare, obtain execution of, and record documents conveying such property rights to SCDOT with Register of Deeds, and deliver all executed and recorded easements to SCDOT. For all property obtained in conjunction with the Project, property rights will be acquired in **easement** (except that SCDOT may in its sole discretion direct the acquisition of a fee simple title or permission, in lieu of an easement, with respect to any portion of the Rights of Way) and shall be conveyed to "The South Carolina Department of Transportation" by Right of Way Easement.

11. Because these acquisitions are being made as agent on behalf of the State of South Carolina, SCDOT shall make the ultimate determination in each case as to whether settlement is appropriate or whether the filing of a condemnation action is necessary, taking into consideration the recommendations of the CONTRACTOR. When SCDOT authorizes the filing of a condemnation, CONTRACTOR shall prepare a Notice

of Condemnation in the name of SCDOT, and submit it to SCDOT for SCDOT to file and serve appropriate condemnation documents and pleadings, and request priority status pursuant to S.C. Code Ann. Section 28-2-310(1976, as amended).

12. SCDOT shall prosecute condemnation proceedings to final judgment pursuant to the requirements of the South Carolina Eminent Domain Procedures Act. The procedure shall be by way of trial as provided by Section 28-2-240 of "The Act". SCDOT shall be responsible for obtaining legal representation and CONTRACTOR will be responsible for providing expert witnesses necessary for condemnation actions. All settlements of condemnation cases shall be at SCDOT's sole discretion.

13. CONTRACTOR will be responsible for all contacts with landowners for rights-of-way or construction items and shall provide the following:

- a) All Notices of Condemnation, issued pursuant to the authority granted, all titles of real estate and all right of way easements, permissions, or right-of easements, recorded with the Office of the Register of Deeds or the Clerk of Court for the county or counties in which properties acquired through condemnation are located;
- b) A right-of-way agent's worksheet, or documents substantially in the format of SCDOT Form No. 809, for each tract.

14. CONTRACTOR shall provide a right-of-way certification and SCDOT shall approve that certification prior to CONTRACTOR entering the property. Only in exceptional circumstances will a certification be approved based on a right of entry. Certification may be on a tract-by-tract basis.

15. CONTRACTOR shall exercise care in its operations when working in proximity to adjacent developed properties, properties not yet acquired, and residences or businesses that are to be relocated. CONTRACTOR shall submit a plan to the SCDOT's right-of-way representative for approval to:

- a) Establish a clear zone adjacent to properties occupied by persons to be displaced in which construction equipment may not be operated or parked,
- b) Establish a clear zone for construction for properties occupied by persons to be displaced to prevent undue impacts or hardships,
- c) Establish a method of protecting equipment from vandalism or unauthorized use,
- d) Locate brush piles and mulching/grinding operations more than 500 feet from an occupied business or residence, or as required by South

Carolina Department of Health and Environmental Control burning regulations,

- e) Provide reasonable and safe access to residences or businesses that are to be displaced until such time as the property is vacant, and
- f) Observe the property rights of landowners of adjacent and/or yet to be acquired properties.

16. CONTRACTOR shall use reasonable care in determining whether there is reason to believe that property to be acquired for rights-of-way may contain concealed or hidden wastes or other materials or hazards requiring remedial action or treatment. When there is reason to believe that such materials may be present, CONTRACTOR shall take steps consistent with customary industry standards to investigate. SCDOT shall be notified of the presence of such materials before an offer is made.

17. During the acquisition process and for a period of three years after final payment is made to CONTRACTOR for any phase of the work, all project documents and records not previously delivered to SCDOT, including but not limited to design and engineering costs, construction costs, costs of acquisition of rights-of-way, and all documents and records necessary to determine compliance with the laws relating to the acquisition of rights-of-way and the costs of relocation of utilities, shall be maintained and made available to SCDOT for inspection or audit.

B. Acquisition of Right-of-Way

1. The CONTRACTOR is responsible for verification of all information necessary for acquisition of the Right-of-Way and is responsible for all costs, excluding premium cost as defined below, associated with the purchase of the Right-of-Way. The CONTRACTOR shall acquire the property as an agent on behalf of the State of South Carolina.

2. Acquisition of any additional area desired by the CONTRACTOR necessary to complete the project, shall comply with this Article of the Contract, with the exception of cost allocation.

3. All costs associated with the acquisition of any additional area are the sole responsibility of the CONTRACTOR, including premium right-of-way costs. CONTRACTOR shall abide by the provisions of all applicable environmental permits, any conditions of individual right of way agreements, and all environmental commitments. Any necessary permit modifications are the responsibility of the CONTRACTOR.

4. Acquisition of any additional area desired by the CONTRACTOR for, but not limited to, construction staging, access or borrow pits shall be the sole responsibility of CONTRACTOR, and any title or interest shall be secured in the name of the CONTRACTOR. CONTRACTOR shall provide SCDOT the location and

documentation for these additional areas. CONTRACTOR shall furnish SCDOT a copy of any agreements, whether for purchase or lease, for the use of additional properties in conjunction with the construction of the Project. CONTRACTOR shall abide by the provisions of all applicable environmental permits, any conditions of individual right of way agreements, and all environmental commitments. Any necessary permit modifications are the responsibility of the CONTRACTOR. CONTRACTOR is responsible for all costs associated with these additional areas, including premium right-of-way costs. If additional right-of-way is necessary beyond what has been evaluated in the NEPA documentation, CONTRACTOR shall be responsible for any re-evaluation of the approved Environmental Documents.

5. ROW acquisition costs shall be defined as amounts paid for: (1) direct payments for ownership or other property rights, and (2) direct payments for eligible relocation expenses as provided for under the Uniform Act less Premium ROW acquisition costs.

6. Premium ROW acquisition costs shall be the amount a jury award or a settlement that exceeds "Just compensation." "Just compensation" shall be defined as the value SCDOT approves for a parcel after the following procedure: CONTRACTOR shall submit its recommendation for just compensation based on appraisals and appraisal reviews which support the recommendation. If SCDOT approves CONTRACTOR'S recommendations, that value becomes just compensation. If SCDOT does not approve the recommendation, CONTRACTOR or SCDOT shall obtain another appraisal using an appraiser from the SCDOT's approved list and submit this appraisal to SCDOT. SCDOT shall be responsible for the cost of the second appraisal. SCDOT shall assign a value to the parcel which shall be deemed just compensation supported by the appraisals for the parcel.

7. CONTRACTOR shall be responsible for right-of-way service costs and right-of-way acquisition costs.

8. SCDOT shall be responsible for premium right-of-way costs except for those additional areas explained above.

9. Upon final completion of the project, if any right-of-way condemnation actions are still pending, CONTRACTOR shall provide reasonable and adequate security to cover its contractual obligation relating to right-of-way acquisition.

IX. PERMITS

A. The following permits have been acquired and are available in Attachment B:

- a. USACE Section 10 & Section 404 Permit (2005-1N-440)
- b. SCDHEC-OCRM Critical Area Permit & Coastal Zone Consistency Certification (2005-1N-440-P-C)

B. All additional permits necessary for completion of this project shall be procured by the CONTRACTOR. The CONTRACTOR shall comply with all local, state, and federal permitting requirements. Regarding any permit or license that must be obtained in the name of SCDOT, the CONTRACTOR shall perform all functions within its power to obtain the permit or license, and SCDOT shall fully cooperate in this effort and perform any functions that must be performed by SCDOT. If regulatory agencies interfere or fail to provide approved permits in a timely manner, SCDOT may, on an individual basis, consider a time extension for permitting delays when CONTRACTOR can demonstrate that appropriate efforts have been made to expedite the permits, and that the delay has a direct impact on the approved Critical Path. CONTRACTOR shall not be entitled to additional compensation for delays related to permitting.

X. ENVIRONMENTAL COMPLIANCE

A. Compliance with Environmental Commitments

CONTRACTOR shall comply with all Environmental commitments and requirements including, but not limited to, the following:

1. Compliance with the provisions of all environmental permits applicable to the Project. Copies of the environmental documents are included in **Attachment C**. Environmental Commitments are included in **Exhibit 4**.
2. Compliance with those stipulations and conditions under which SCDOT received approval of the Environmental Document(s) and any modifications resulting from a re-evaluation of the Document(s). If the CONTRACTOR elects to construct the Project in a manner that is not consistent with the assumptions in the SCDOT prepared environmental documents, the CONTRACTOR will be responsible for revising the environmental documents and provide any additional studies that may be required. All revisions will require SCDOT and FHWA approval prior to any right of way acquisition or construction activity;
3. Compliance with applicable laws and regulations relating to potential or actual hazardous materials that may be encountered in the course of carrying out this Agreement;
4. Carrying out all necessary social, economic, and environmental studies required by regulatory authorities in the course of construction;
5. Preparation, revision, acquisition, compliance, and adherence to conditions of any permits required by federal, state, or local laws or regulations; and
6. The resolution of any deviations from the contract documents, drawings or other information included in the environmental permits that would violate the intent or spirit of the permits. Any proposed changes within the permitted areas would need to be coordinated with SCDOT's Environmental Services Office.

B. Preconstruction / Partnering Conference(s)

CONTRACTOR shall conduct one (or more, if appropriate) pre-construction / partnering conference(s) prior to any construction activity to discuss environmental and permitting issues, which conference shall include all subcontractors, and, to the extent feasible, representatives from the U.S. Army Corps of Engineers, the S.C. Department of Health and Environmental Control Water Quality Division, the Federal Highway Administration, CONTRACTOR, and SCDOT. Nothing in this Section X.B. shall limit or otherwise alter CONTRACTOR's responsibilities and obligations under Section XI.

C. Protection of Archeological and Paleontological Remains and Materials

1. When archeological or paleontological remains are uncovered, CONTRACTOR shall immediately halt operations in the area of the discovery and notify SCDOT.

2. Archeological remains consist of any materials made or altered by man which remains from past historic or prehistoric times (i.e. older than 50 years) Examples include old pottery fragments, metal, wood, arrowheads, stone implements or tools, human burials, historic docks, structures or not recent (i.e. older than 100 years) vessel ruins. Paleontological remains consist of old animal remains, original or fossilized, such as teeth, tusks, bone, or entire skeletons.

3. SCDOT will have the authority to suspend the work for the purpose of preserving, documenting, and recovering the remains and materials of archeological and paleontological importance for the State. CONTRACTOR shall carry out all instructions of SCDOT for the protection of archeological or paleontological remains, including steps to protect the site from vandalism and unauthorized investigations, from accidental damage and from dangers such as heavy rainfall or runoff.

4. CONTRACTOR's Contract Time and or Contract Price shall be adjusted to the extent CONTRACTOR's cost and /or time of performance have been adversely impacted by the presence of archeological or paleontological remains.

D. Community and Public Relations Plan

The CONTRACTOR shall provide to SCDOT for review and written approval a Community Relations Plan as part of the Project in accordance with Exhibit 5. The Community Relations Plan shall be submitted within 45 calendar days after NTP.

XI. HAZARDOUS MATERIALS

This entire section from the RFP for Industry Review has been replaced. The original text has been deleted from this document.

A. General

1. Definition: “Hazardous Materials” shall include all contaminants, underground storage tanks, waste, lead based paint, lead as waste, lead in air, lead in water, lead in soil, asbestos, hazardous substances, environmental pollutants, petroleum, solvents or chemical, that may be disturbed or released into the air, soil, groundwater, or surface waters and that are deemed to be hazardous under applicable state or federal law.

2. Hazardous Material Generator: For purposes of this Project, the South Carolina Department of Transportation (SCDOT) shall be listed as “*SCDOT as the generator on behalf of the South Carolina Ports Authority (SCSPA)*” of any and all hazardous materials and/or hazardous wastes associated with work on the Project, with the exception that Contractor shall be the generator for all hazardous materials it, its consultants, subconsultants, subcontractors or suppliers, brings on to the Project or that is brought to the Project by them and subsequently is caused to be released on the Project by the Contractor, Contractor’s design consultants, subcontractors and suppliers. The foregoing shall not preclude or limit any rights or remedies that SCDOT may have against third parties and/or prior owners, lessees, licensees and occupants of the Project’s right of way.

3. Contractor’s Liability: Contractor acknowledges and understands that portions of the Project on which Contractor will be working contain Hazardous Materials. Contractor acknowledges and understands that certain activities that it may undertake on or about the potentially contaminated portions of the Project could cause generation of Hazardous Materials.

4. Public Records: Contractor acknowledges and understands that Attachment C contains all the information that has been made available to SCDOT. Additional information is available for it to review as a matter of public record by contacting the Freedom of Information offices of EPA Region 4 in Atlanta, Georgia and SCDHEC in Columbia, South Carolina.

5. Indemnification: SCDOT is not responsible for Hazardous Materials actually brought to the Project by Contractor, Contractor’s design consultants, subcontractors, subconsultants and suppliers or anyone for whose acts they may be or are liable. SCDOT is not responsible for negligent or willful acts by Contractor, Contractor’s design consultants, subcontractor, subconsultants and suppliers or anyone for whose acts they may be or are liable relating to Hazardous Materials found at the site. Contractor shall indemnify, defend and hold harmless the State of South Carolina, SCSPA, SCDOT and the SCDOT's officers, directors, employees and agents from and against all claims, losses, damages, liabilities and expenses, including attorney's fees and expenses arising out of or resulting solely from those Hazardous Materials actually brought to the Project or negligent or willful acts relating to Hazardous Materials found on the Project, or both, by Contractor, Contractor 's design consultants, subcontractor, subconsultants and suppliers or anyone for whose acts they may be or are liable.

6. The Contractor is responsible for all necessary containment, removal,

transportation and disposal of the subsurface and surface Hazardous Materials in compliance with all applicable Federal (EPA, OSHA & DOT) and State and local (SCDHEC, SCDOT, Charleston County, City of Charleston, and Charleston Water) requirements for Hazardous Materials. The Contractor is responsible for obtaining all required permits to proceed with the work.

7. For all tracts impacted by the Project, if Contractor's method includes dewatering for shallow excavation or installation of wick drains, Contractor shall test the groundwater for organics via photoionization detector and for pH and metals. If tested parameters are considered within natural ranges, then groundwater can be discharged to the surface, using stormwater best management practices. If the groundwater is determined to contain contaminants above natural ranges, then it is to be discharged to the sanitary sewer under a permit or other authorization obtained by Contractor. If the pH of the groundwater is such that it would be a characteristic hazardous waste, the Contractor shall use elementary neutralization procedures to ensure the pH of the water is appropriately adjusted to allow discharge to the sanitary sewer as a non-hazardous waste.

8. Contractor shall comply with Navy dig permit requirements, and any DHEC Voluntary Cleanup Contracts (VCC) requirements which are impacted in the course of this Project.

B. Solvay tracts

Tracts 4, 4A, 4B, 4C, & 4D

1. The Solvay property contains a Phosphogypsum (PG) stack that is regulated under the Clean Air Act, 42 U.S.C. Sections 7401, *et seq.*, (the "Act"), the Resource Conservation and Recovery Act, 42 U.S.C., Section 6991, *et seq.*, ("RCRA") and federal and state regulations promulgated pursuant to the Act and RCRA. Contractor shall comply with the appropriate regulatory authorities, including but not limited to the South Carolina Department of Health and Environmental Control ("SCDHEC") and the United States Environmental Protection Agency ("EPA") in selecting its means and methods that it will use to install foundations on this property and any worker protection monitoring it will use during construction. A work plan including a worker health and safety plan is specifically required by the EPA and shall be submitted.

2. Excavation of Phosphogypsum (PG) - Contractor shall excavate the PG material from the Solvay tracts as follows:

a. Contractor shall employ a licensed Professional Geologist, registered in the State of South Carolina, who shall be responsible for determining that material that is clearly PG, as determined by visual observation that is excavated from the PG stack, shall be placed back onto the stack within the SCDOT Right of Way. No testing is required of this material except as the contractor may deem appropriate to meet the OSHA worker general protection standard.

b. Contractor shall ensure that the excavated PG material is placed back within the existing footprint of the PG stack located on the SCDOT easement and is relocated so that the contour of this relocated PG material conforms with the general topography of that area of the stack prior to construction activities, i.e., no valleys shall be created in the relocated PG stack and that smooth transitions occur from the relocated PG material to existing PG stack contours.

3. Excavation of Mixed material - defined as soil or other subsurface components, excluding Cooper Marl, mixed with PG:

a. Where mixed material is excavated, Contractor shall relocate this material back onto the PG stack footprint within the SCDOT easement as cover material such that the contour of this relocated mixed material conforms with the general topography of that area of the stack prior to construction activities, i.e., no valleys shall be created in the PG stack and that smooth transitions occur from the relocated PG material to existing PG stack contours.

b. Contractor shall employ a licensed Professional Geologist to determine that the excavated material consists of mixed material

4. Excavation of below PG soil - Soil from below PG to Cooper Marl, defined as soil below the PG stack and below any mixed material but above Cooper Marl. This material shall not contain PG. Contractor may use this material within the Project boundary. Contractor will employ a licensed Professional Geologist to determine that the material consists of soil and does not contain PG. No testing is required for this excavated material.

5. Excavation of Cooper Marl – No testing is required for this excavated material. Contractor will employ a licensed Professional Geologist to determine that the material consists of Cooper Marl. Contractor may use this material within the Project boundary or may use it off-site.

6. Handling of Wet Excavated Material or Slurry Prior to Disposition

Excavated wet material (dry material that is wet when excavated due to entrained groundwater) and pumped slurry (in-ground material augmented with bentonite clay for stability) shall be placed in unlined bermed impoundments constructed within the SCDOT right of way areas to be stored and to dry prior to disposition. Once the material is dry, the licensed Professional Geologist shall determine the type of material stored and shall dispose of each type in accordance with above requirements.

7. Notwithstanding the above prescribed handling and disposition instructions, if during intrusive (e.g., digging, boring, excavating, trenching, probing, dewatering, etc.) or other construction activities, soils and/or groundwater exhibiting an unexpected odor, visible discoloration or other evidence of possible hazardous waste or petroleum contamination is discovered, this material shall be segregated from other

excavated material, placed on heavy plastic and covered with plastic, or otherwise appropriately contained, for storage and then disposed of in the manner required by regulatory agencies. The Contractor shall have this material sampled and characterized by a licensed Professional Geologist. This material shall be considered a solid waste and shall be characterized as necessary for proper disposal either in a municipal landfill or for hazardous waste disposal, with the generator on the manifest identified as "*SCDOT as the generator on behalf of the SCSPA*" of this waste.

C. Macalloy

Tracts 29, 30, 31, 32, 33, 59, 69; and for Former Navy Base - Tracts 34, 35, 70; and for Tracts 36, 64

1. Excavation of Soil from Surface to Cooper Marl – For all Project excavation activities, including but not limited, excavation for each foundation locations needed for any elevated structure, including drilled shafts, Contractor is required to use a geoprobe to collect soil samples from the ground surface to the Cooper Marl. One soil sample shall be collected at 0-2 feet below ground surface and then an additional sample shall be collected each additional 5 feet increment until Cooper Marl is reached. Each sample shall consist of 100 grams or more. These collected samples for each location shall be consolidated in a clean stainless steel container and mixed well into one composite sample for that location. This composite shall be tested for a full TCLP (VOCs, SVOCs, Metals, Herbicides & Pesticides; including leachate) EPA Method 1311. If the composite sample is found to be non-hazardous, then this material, if excavated, may be used by the Contractor within the Project boundary. If the composite sample is determined to be hazardous waste, then this waste must be properly disposed of with the generator on the manifest identified as "*SCDOT as the generator on behalf of the SCSPA*" of this waste.

2. Excavation of Cooper Marl – No testing is required for this excavated material. Contractor shall employ a licensed Professional Geologist to determine that the material excavated consists of Cooper Marl. Contractor may use this material within the Project boundary or may use it off-site.

3. Handling of Wet Excavated Material or Slurry Prior to Disposition – Excavated wet material (dry material that is wet when excavated due to entrained groundwater) and pumped slurry (in-ground material augmented with bentonite clay for stability) shall be placed in unlined bermed impoundments constructed within the SCDOT right of way areas to be stored and to dry prior to disposition. Disposition will be determined as prescribed above. Once the material is dry, the licensed Professional Geologist shall determine the type of material stored and shall dispose of each type in accordance with above requirements.

4. Notwithstanding the above prescribed handling and disposition instructions, if during intrusive (e.g., digging, boring, excavating, trenching, probing, dewatering, etc.) or other construction activities, soils and/or groundwater exhibiting an unexpected odor, visible discoloration or other evidence of possible hazardous waste or

petroleum contamination is discovered, this material shall be segregated from other excavated material, placed on heavy plastic and covered with plastic, or otherwise appropriately contained, for storage and then disposed of in the manner required by regulatory agencies. The Contractor shall have this material sampled and characterized by a licensed Professional Geologist. This material shall be considered a solid waste and shall be characterized as necessary for proper disposal either in a municipal landfill or for hazardous waste disposal, with the generator on the manifest identified as "SCDOT as the generator on behalf of the SCSPA" of this waste.

5. Contractor's design shall not require the relocation of or impacts to the storm water pipe system, flow of surface water runoff or alteration of the pond on the Macalloy tract; however, if Contractor determines that its design can only be implemented by impacting or changing the Macalloy tract stormwater system, Contractor shall ensure that an equal or better system, flow and pond structure is constructed and shall obtain EPA's and DHEC OCRM's approval for such design prior to Contractor's issuance of construction drawings.

D. Other Potentially Contaminated

Tracts – 1, 5, 6, 22, 23, 24, 25, 26, 28, 37, 38, 40, 41, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 55, 57, 60, 61, 62, 63, 66, 67, 68

1. Soil from Surface to Cooper Marl – For all Project excavation activities, including but not limited to excavation for the foundation locations needed for any elevated structure, Contractor is required to use a geoprobe to collect soil samples from the ground surface to the Cooper Marl. One soil sample shall be collected at 0-2 feet below ground surface and then an additional sample shall be collected each additional 5 feet increment until Cooper Marl is reached. Each sample shall consist of 100 grams or more. These collected samples for each pile location shall be consolidated in a clean stainless steel container and mixed well into one composite sample for that pile location. This composite shall be tested for any TCLP constituents per EPA Method 1311 as listed as Known/Suspected Contaminants in the August 5, 2015 S&ME report titled, *Summary of Environmental and Geotechnical Considerations Port Access Road*. If the composite sample is found to be non-hazardous, then this material, if excavated, the Contractor may use this material within the Project boundary. A licensed Professional Geologist shall test this material to determine it meets the above requirements.

2. Excavation of Cooper Marl – No testing is required for this excavated material. Contractor shall employ a licensed Professional Geologist to determine that the material consists of Cooper Marl. Contractor may use this material within the Project boundary or may use it off-site.

3. Handling of Wet Excavated Material or Slurry Prior to Disposition. Excavated wet material (dry material that is wet when excavated due to entrained groundwater) and pumped slurry (in-ground material augmented with bentonite clay for stability) shall be placed in unlined bermed impoundments constructed within the SCDOT right of way areas to be stored and to dry prior to disposition. Disposition will be

determined as prescribed above. Once the material is dry, the licensed Professional Geologist shall determine the type of material stored and shall dispose of each type in accordance with above requirements.

4. Notwithstanding the above prescribed handling and disposition instructions, if during intrusive (e.g., digging, boring, excavating, trenching, probing, dewatering, etc.) or other construction activities, soils and/or groundwater exhibiting an unexpected odor, visible discoloration or other evidence of possible hazardous material or petroleum contamination is discovered, this material shall be segregated from other excavated material, placed on heavy plastic and covered with plastic, or otherwise appropriately contained, for storage and then disposed of in the manner required by regulatory agencies. The Contractor shall have this material sampled and characterized by a licensed Professional Geologist. This material shall be considered a solid waste and shall be characterized as necessary for proper disposal either in a municipal landfill or for hazardous waste disposal, with the generator on the manifest identified as "*SCDOT as the generator on behalf of the SCSPA*" of this waste.

E. For All Other Tracts

1. Excavation of Soil from Surface to Cooper Marl – No testing is required for this excavated soil material from the ground surface to the Cooper Marl. Contractor shall employ a licensed Professional Geologist to determine that the material is above the Cooper Marl. The Contractor may use this material within the Project boundary.

2. Excavation of Cooper Marl – No testing is required for this excavated material. Contractor shall employ a licensed Professional Geologist to determine that the material consists of Cooper Marl. Contractor may use this material within the Project boundary or may use it off-site.

3. Handling of Wet Excavated Material or Slurry Prior to Disposition
Excavated wet material (dry material that is wet when excavated due to entrained groundwater) and pumped slurry (in-ground material augmented with bentonite clay for stability) shall be placed in unlined bermed impoundments constructed within the SCDOT right of way areas to be stored and to dry prior to disposition. Disposition will be determined as prescribed above. Once the material is dry, the licensed Professional Geologist shall determine the type of material and dispose of it in accordance with the above requirement.

4. Notwithstanding the above prescribed handling and disposition instructions, if during intrusive (e.g., digging, boring, excavating, trenching, probing, dewatering, etc.) or other construction activities, soils and/or groundwater exhibiting an unexpected odor, visible discoloration or other evidence of possible hazardous material or petroleum contamination is discovered, this material shall be segregated from other excavated material, placed on heavy plastic and covered with plastic, or otherwise appropriately contained, for storage and then disposed of in the manner required by regulatory agencies. The Contractor shall have this material sampled and characterized by

a licensed Professional Geologist. This material shall be considered a solid waste and shall be characterized as necessary for proper disposal either in a municipal landfill or for hazardous waste disposal, with the generator on the manifest identified as "*SCDOT as the generator on behalf of the SCSPA*" of this waste.

F. Existing SURFACE (Above Ground) Structures

1. Lead-based paint and asbestos surveys were completed for on and off-ramp structures at Exits 217 and 218 of Interstate 26 and are included in Attachment C. For these structures, Contractor shall remove, contain and dispose of the structural components containing lead-based paints and asbestos in compliance with all applicable Federal (EPA, OSHA & DOT) and State requirements for lead as waste, lead in air, lead in water, lead in soil, asbestos containing materials, and worker health and safety. The cost of removal, containment, transportation, and disposal of components containing asbestos and lead-based paints shall be included in the Contract Price.

2. If the Contractor's plan includes demolition, removal, or disposal of existing above-ground structures not previously surveyed by the SCDOT, the Contractor is required to perform asbestos and lead paint surveys on the existing structures prior to performing those activities. A copy of the lead paint and asbestos report and a notification of demolition or renovation forms must be submitted to SCDOT and SCDHEC at least ten (10) working days prior to demolition of an existing structure. The Contractor is responsible for obtaining all required permits to proceed with the work. The cost of surveys of existing above-ground structures shall be included in the Contract Price.

3. Except as noted in paragraph F.1. above, Contractor is not responsible for handling, storage, remediation, or disposal of any Hazardous Materials on existing above-ground structures encountered at the Site which were not previously identified or introduced to the site by Contractor or any of its agents. Upon encountering such Hazardous Materials, Contractor shall do as follows:

a) Contractor shall stop Work immediately in the affected area and duly notify the SCDOT and, if required by state or federal law, all government entities with jurisdiction over the Project or site.

b) Upon receiving notice of the presence of Hazardous Materials, the SCDOT will take necessary measures required to ensure that the Hazardous Materials are remediated or rendered harmless. Such necessary measures will include the SCDOT either (i) retaining qualified independent firm or (ii) negotiating a construction change directive with Contractor.

c) Contractor shall resume Work at the affected area of the Project only after written notice from the SCDOT that the (i) Hazardous Materials have been removed or rendered harmless and (ii) all necessary

approvals have been obtained from all government entities having jurisdiction over the Project.

d) Contractor's Contract Price shall be adjusted to the extent Contractor's cost has been adversely impacted by the presence of such SURFACE (ABOVE GROUND) Hazardous Materials. SCDOT may, on an individual basis, consider a time extension for SURFACE Hazardous Material delays when Contractor can demonstrate that appropriate efforts have been made to expedite the remediation or removal of the SURFACE hazardous material and that the delay has a direct impact on the approved Critical Path.

G. Compensation for SUBSURFACE Hazardous Material

1. As outlined in Sections A. through E. above, most material excavated during intrusive or other construction activities shall be stockpiled then re-deposited within the area of excavation to the extent practicable. Excess excavated material not evidencing signs of a hazardous waste may be redistributed and used within the Project boundaries, but any potential adverse impacts to off-site surface water(s) must be prevented. In addition to proper disposal of any excavated hazardous waste, Contractor shall appropriately handle, transport, and dispose of and hazardous materials determined to be a "waste" in accordance with the "Notwithstanding paragraphs" contained in Sections A. through E. above. Any excess Cooper Marl not used on the Project may be transported off-site and used by the Contractor for other purposes.

2. Notice of Subsurface Hazardous Material – "Hazardous Material Costs" shall be the difference in Contractor's reasonable, out-of-pocket costs and expenses, as compared to the Contractor's normal costs to excavate, dewater, and handle useable excavated material. Such Hazardous Material Costs are those differential costs that are directly attributable to the excavation, dewatering, performing environmental sampling of, handling, waste determination of, transportation, removal and disposal of Pre-existing subsurface Hazardous Materials encountered by Contractor and classified as solid waste, hazardous waste, and/or wastewater. Contractor shall be deemed to have waived the right to additional costs in connection with any subsurface Hazardous Materials if SCDOT is not provided written documentation of the Contractor's differential costs associated with the discovery and disposition of subsurface Hazardous Materials.

3. Once Contractor has completed its design of the Project or portions of the Project, Contractor shall perform the geoprobe sampling outlined in Sections C and D above. These costs will also constitute Hazardous Materials Costs.

4. Contractor shall be responsible for the first \$2,000,000 of Hazardous Materials Costs and shall include \$2,000,000 for Hazardous Materials Cost as a part of its "Total Cost to Complete" in its Cost Proposal Bid Form.

5. SCDOT shall compensate Contractor for 100% of the total chargeable Pre-existing subsurface Hazardous Materials costs that exceed \$2,000,000.

6. Contractor shall take all reasonable steps to minimize generation of any such Hazardous Waste.

7. Time Extensions: Contractor shall not be entitled to an extension of Contract Time with regard to any work or activities connected to or associated with subsurface Hazardous Materials.

XII. DEMOLITION, REMOVAL & DISPOSAL OF STRUCTURES

CONTRACTOR shall be responsible for the demolition, removal and disposal of all structures and their appurtenances within SCDOT Right of Way necessary for the completion of the Project, to include those portions which may extend outside the right of way, but were purchased as a part of the acquisition process. Structures shall include the bridges identified in the scope of work and all buildings acquired for the Project. All necessary permitting shall comply with Articles II.B.4 and IX of the Contract. Handling and disposal of Hazardous Conditions shall be in accordance with Article XI of the Contract. Before demolition of the structures, the CONTRACTOR shall complete and submit a Notification of Demolition and Renovation form to the South Carolina Department of Health and Environmental Control.

XIII. DIFFERING SITE CONDITIONS

A. “Differing Site Conditions” are defined as concealed or latent physical conditions at the Site that (i) materially differ from the conditions reasonably assumed to exist based on the information contained in the RFP, this Agreement and its Exhibits; or (ii) are of an unusual nature, differing materially from the conditions ordinarily encountered and generally recognized as inherent in the work. For this project, subsurface and geotechnical conditions WILL NOT be considered as a Differing Site Condition.

B. Upon encountering a Differing Site Condition, CONTRACTOR shall provide prompt written notice to SCDOT of such condition, which notice shall not be later than twenty (20) days after such condition has been encountered. CONTRACTOR shall provide such notice before the Differing Site Condition has been substantially disturbed or altered and before any work is performed.

C. Upon written notification, SCDOT will investigate the conditions and if it is determined that the conditions differ materially and cause an increase or decrease in the cost or time required for performance of the work, the Contract will be adjusted. No contract adjustment that results in a benefit to CONTRACTOR will be allowed unless CONTRACTOR has provided the required written notice.

XIV. FORCE MAJEURE

Delays or failures of performance shall not constitute breach of the Agreement if and to the extent such delays or failures of performance are caused by severe and not reasonably

foreseeable occurrences beyond the control of SCDOT or CONTRACTOR, including, but not limited to: Acts of God or the public enemy; expropriation or confiscation of facilities; compliance with any order or request of any governmental authority other than SCDOT or a party in privity with it; a change in law directly and substantially affecting performance of the Project; Acts of War; rebellion or sabotage or damages resulting there from; fires, floods, explosions, or extraordinary accidents; riots or strikes or other concerted acts of workman, whether direct or indirect, or any similar causes, which are not within the control of SCDOT or CONTRACTOR respectively, and which by the exercise of reasonable diligence, SCDOT or CONTRACTOR are unable to prevent. Any expense attributable to such occurrence shall not entitle CONTRACTOR to an adjustment in the Contract Price. Any critical path delay attributable to such an occurrence shall be added to the Contract Time.

XV. WARRANTY

A. CONTRACTOR warrants that it will perform all services in accordance with the standards of care and diligence normally practiced by recognized engineering and construction firms in performing services and obligations of a similar nature. CONTRACTOR warrants that all materials and equipment furnished shall be of good quality and new unless otherwise authorized by SCDOT and that the construction shall conform to the Contract requirements. CONTRACTOR agrees to promptly correct, at its own expense, defects or deficiencies in materials and workmanship that appear prior to and during a period of three (3) years after Final Completion of the Project. This shall include all plant-produced materials (i.e. asphalt, concrete, etc.). CONTRACTOR shall not be responsible for damages caused by SCDOT's failure to provide timely notification of potentially damaged or defective work of which SCDOT had actual knowledge. CONTRACTOR shall properly perform, at the written request of SCDOT made at any time within the warranty period after Final Completion of the Project as defined in Article IV.A.5, all steps necessary to satisfy the foregoing warranty and correct any element of the Project or the services that is defective or does not reflect such standards of care and diligence. The cost of such corrective services shall be CONTRACTOR's responsibility.

B. CONTRACTOR further warrants the performance of all bridge components on all structures for three (3) years from Final Completion of the Project. If a component fails to perform properly for any reason, including but not limited to normal wear and tear, the CONTRACTOR shall replace the failed component at no cost to SCDOT.

C. The warranty periods begin at Final Completion of the Project. CONTRACTOR shall immediately abate any warranty deficiency that poses an unsafe condition to the public; otherwise deficiencies shall be corrected no later than 30 days from the determination of corrective action. In the event CONTRACTOR, after notice, fails to immediately abate the deficiency or fails to make correction within the prescribed thirty (30) days, SCDOT may have the deficiency corrected. All costs associated with such correction by SCDOT shall be the responsibility of the CONTRACTOR and his Surety. With respect to any component that is repaired or replaced pursuant to this warranty, the warranty period of that component shall be the longer of one year from repair or replacement of the component or the remainder of the original warranty period.

D. CONTRACTOR shall take all steps necessary to transfer to SCDOT any manufacturer's or other third-party's warranties of any materials or other services used in the construction of the Project.

XVI. INDEMNITY

A. CONTRACTOR shall indemnify, defend and hold SCDOT harmless from any and all claims, liabilities and causes of action for any fines or penalties imposed on SCDOT by any state or federal agency because of violation by CONTRACTOR or any of its subcontractors of any state or federal law or regulation.

B. CONTRACTOR shall indemnify, defend and hold SCDOT harmless from any and all claims, liabilities and causes of action arising out of or resulting from, in whole or in part, the negligence or recklessness of CONTRACTOR or its agents, consultants and/or subcontractors.

XVII. TERMINATION AND CANCELLATION

A. Termination for Default

1. CONTRACTOR shall be in default of the Contract if it:

- a) Fails to supply a sufficient number of properly skilled workmen, tools, materials and equipment to assure the prompt completion of the work;
- b) Fails to perform work in accordance with contract requirements and/or refuses to remove or replace rejected materials or unacceptable work;
- c) Discontinues the prosecution of the work;
- d) Fails to resume work that has been discontinued within a reasonable time after notice to do so;
- e) Becomes insolvent or is declared bankrupt or commits any act of bankruptcy or insolvency;
- f) Allows any final judgment to remain unsatisfied for a period of 15 days;
- g) Makes an assignment for the benefit of creditors;
- h) Fails to maintain the Project schedule;
- i) Commits a substantial breach of the Contract; or

- j) For any other cause whatsoever, fails to carry on the work in an acceptable manner.

2. If CONTRACTOR does not commence work to cure the default within 15 days after receipt of written notice from SCDOT and thereafter diligently prosecute work to completion within a reasonable time as determined by SCDOT, then SCDOT will have full power and authority to terminate CONTRACTOR for default and shall provide written notification of the termination to CONTRACTOR and Surety.

3. Upon termination for default, Surety will have the right to complete the contract and shall be given thirty (30) days, or longer in SCDOT's discretion, in which to resume the work. This procedure shall not in any way serve to extend the contract time. All charges incident to negotiation with the Surety and arranging for work to be resumed, including attorney's fees, shall be charged against CONTRACTOR or Surety as part of the cost of the work.

4. If Surety refuses to complete the work or fails to take over the work promptly as provided by this Agreement, then SCDOT may appropriate or use any or all materials and equipment on the job site as may be suitable and acceptable and may enter into an agreement for the completion of the Contract. All costs and charges incurred by SCDOT together with the cost of completing the work under the Contract will be deducted from any monies due or which may become due CONTRACTOR. If such expense exceeds the sum which would have been payable under the Contract, CONTRACTOR and Surety shall be liable and shall pay to SCDOT the amount of such excess.

5. Upon termination for default, all Project Documents, as defined in Article II, shall be surrendered forthwith by CONTRACTOR to SCDOT. SCDOT will be authorized to use the Project documents for the sole purpose of promoting, completing, using, maintaining, upgrading or adding to the Project. This authorization includes allowing design professionals to make changes, corrections, or additions to the Project documents for these purposes.

6. If, after termination, it is determined that the Contractor was not in default, or that the 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 State.

B. Termination for Convenience

1. SCDOT reserves the right to cancel the Work upon ten (10) days written notice to CONTRACTOR. Should the Work be so canceled by SCDOT for convenience, CONTRACTOR shall be paid for the value of the Work, based upon the Schedule of Values, performed to the date of cancellation and demobilization together with any cancellation charges by vendors and subcontractors. CONTRACTOR shall also be entitled to the cost of securing the work, provided such cost is approved by SCDOT. In no event, however, shall the total payment to CONTRACTOR pursuant to such a cancellation exceed the Contract Price.

2. Termination of all or a portion of the Contract shall not relieve CONTRACTOR of any responsibility it would otherwise have for the work completed, or for any claims arising from that work.

3. Upon such termination, all Project Documents, as defined in Article II, shall be surrendered forthwith by CONTRACTOR to SCDOT. SCDOT will be authorized to use the Project documents for the sole purpose of promoting, completing, using, maintaining, upgrading or adding to the Project. This authorization includes allowing design professionals to make changes, corrections, or additions to the Project documents for these purposes.

XVIII. DISADVANTAGED BUSINESS ENTERPRISES

A. DBE Goal - The DBE goal on this Project is six percent (6.0 %) of the Contract Price. CONTRACTOR shall comply with the requirements of the SCDOT DBE – Design Build Special Provision, attached hereto in **EXHIBIT 5**, and the SCDOT DBE Supplemental Specification. CONTRACTOR is required to submit a DBE Utilization Plan within thirty (30) calendar days of execution of the Agreement in accordance with the requirements of the DBE Special Provision, which shall include, but not be limited to, the designation of a DBE liaison officer who will be assigned the responsibility of administering and promoting an active and inclusive DBE Program as required by 49 CFR Part 26, DBE Special Provision and DBE Supplemental Specification. CONTRACTOR's DBE liaison shall provide SCDOT with updated DBE Committal Sheets, signed quotes, and executed subcontracts in accordance with the approved DBE Utilization Plan. The Final Committal Sheet, signed quotes and executed subcontracts shall be submitted to the SCDOT prior to beginning of construction activities.

B. Copies of DBE Contracts - CONTRACTOR shall provide SCDOT with copies of executed DBE contracts, including the name of the DBE firm, the name of the subcontractor, if any, for whom the DBE will work, the amount of the contract, the type of work to be performed, and an estimated schedule of DBE performance.

C. Monthly Subcontractor Expenditure Records - CONTRACTOR shall provide SCDOT a monthly report showing amounts paid to subcontractors on the Project. The report shall provide a running total of amounts paid to subcontractors on the Project, including the name of each subcontractor paid, the amount paid to each in that month, and the cumulative amount paid to each as of the date of the report. The report shall also indicate whether the subcontractor is a DBE or non-DBE firm.

D. SCDOT'S Right to Audit - SCDOT will have the right to audit all documentation regarding DBE participation in the Project.

E. Nondiscrimination - CONTRACTOR, or subcontractor, shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. CONTRACTOR shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of SCDOT assisted contracts. Failure by CONTRACTOR to carry out these

requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as SCDOT deems appropriate.

XIX. ON-THE-JOB TRAINING REQUIREMENTS

There is an On-The-Job Training Requirement for this Project. The CONTRACTOR shall comply with the requirements of the Specific Equal Employment Opportunity Responsibilities Training Special Provisions within the Federal Aid Supplemental Specifications. The number of persons to be trained under the On-the-Job Training Program during this Project is twelve (12) for Bridge and eight (8) for Road. The CONTRACTOR shall comply with the requirements of **EXHIBIT 5**. The CONTRACTOR shall submit its plan for On-the-Job Training to SCDOT for written approval prior to commencing construction activities. The Contractor is encouraged to use trainees that are involved with the Educational and Employment Initiatives that are required for community mitigation.

XX. RECORD RETENTION

A. CONTRACTOR shall maintain the following documents for a period of three (3) years or a period equal to the warranty period, whichever is longer, after Final Completion of the Project:

1. All CONTRACTOR samples and test reports;
2. Daily Diaries and any other documents required to be retained in accordance with the Quality Control Plan.

B. During the retention period, SCDOT will be granted access to those documents upon reasonable notice. At any time during the retention period, SCDOT will have the option of taking custody of the documents. CONTRACTOR shall obtain a written release from SCDOT prior to destroying the records after the retention period.

XXI. AS-BUILTS

A. In addition to those documents set forth elsewhere in this Agreement, CONTRACTOR shall provide to SCDOT prior to Final Completion, complete sets of as-built drawings (See Article XXI.D for details). As-built plans consist of the final version of the design plan CADD drawings that incorporate all changes, including any adjustments, relocations, additions and deletions that occurred during construction. CONTRACTOR shall certify that the as-built plans are a true and correct representation of the work as constructed. If any design changes occur during construction, the plan sheets (or any other “job site record document” with a seal) revised after award of contract shall include a complete accounting and detail of the revisions and design changes. The P.E. responsible for the revisions shall seal each altered plan sheet (or any other “job site record document” with a seal). This documented information is to be part of the As-Built Plan requirements. The CONTRACTOR shall develop as-built plans in

accordance with the SCDOT Manual of Instructions for the Preparation of As-Built Plans, latest edition.

B. Information regarding major revisions to the plans shall be noted in a revision box on the plans. The information listed in the revision box shall include: the initiator of the revision, a brief explanation of the nature of the revision, and acceptance and approval from CONTRACTOR, along with associated dates.

C. In addition to the revisions that incorporated changes during construction, the as-built plans shall include the following information gathered during construction:

1. The location and elevation of foundations remaining below grade.
2. The final profile of each bridge constructed. The profile shall include the elevation along the centerline (or as specified by SCDOT) and a line three feet inboard of each gutter line. Points on the profile shall be taken at no greater than 25-foot intervals and shall include the beginning and end of each span.
3. If any structure has pile foundations, information concerning the pile driving operation shall be listed to include pile and driving equipment data, final pile bearing, elevation of pile tip when plan bearing was obtained, final pile tip elevation, penetration into the ground, and PDA or WEAP analysis data. This information shall be entered on each footing or bent sheet, or be included as a new sheet inserted immediately following the pertinent footing or bent sheet.
4. If any structure has drilled shaft foundations, information concerning the installation of the shaft shall be listed to include the drilled shaft report. This information shall be entered on each footing or bent sheet, or be included as a new sheet inserted immediately following the pertinent footing or bent sheet.
5. The final horizontal location of all existing and relocated utility lines and structures that are within the right-of-way. Include approved Utility Agreements, No Cost/No Conflict Letters, and Encroachment Permits.
6. The final location and elevations of all pipes, culverts, and drainage structures.
7. To include all right-of-way revisions, permissions, and an updated right-of-way data sheet to show the date and manner of acquisition of each tract

D. As-built plans shall be submitted as two (2) full size (36 inch x 22 inch) copies and one (1) copy on compact disc in a format acceptable to SCDOT. The levels and symbology of the as-built CADD drawings shall conform to SCDOT standard levels and symbology used to develop the design drawings for the Project.

XXII. ESCROW PROPOSAL DOCUMENTS

The Contractor shall submit bid documentation used to prepare the technical and cost proposals for this contract to the Department in accordance with the Supplemental Specification entitled Escrow Bid Documentation dated October 1, 2014.

XXIII. DISPUTE RESOLUTION

A. Each party hereby waives a trial by jury regarding any dispute between them arising out of this Contract and any such trial will be a non-jury trial before the South Carolina Circuit Court in Richland County.

B. In the event of a dispute between the parties, it shall be a condition precedent to litigation that the parties submit the dispute to the Standing Dispute Review Board pursuant to the Claims Procedure set forth in the Project Supplemental Specifications.

C. CONTRACTOR consents that any papers, notices, or process necessary or proper for the initiation or continuation of any disputes, claims, or controversies relating to the Agreement; 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 in Article XXVI. Notice by certified mail is deemed duly given upon deposit in the United States mail.

XXIV. SCDOT'S AGENT

SCDOT will appoint an individual who will be authorized to act on behalf of SCDOT, with whom CONTRACTOR may consult at all reasonable times, and whose instructions and decisions will be binding upon SCDOT as to all matters pertaining to this Agreement and the performance of the parties hereunder.

XXV. ASSIGNABILITY

The Contract shall not be assignable by CONTRACTOR without the prior written consent of SCDOT. SCDOT may assign the Contract without the consent of CONTRACTOR.

XXVI. GENERAL PROVISIONS

A. This Agreement shall be governed by and interpreted in accordance with the substantive laws of the State of South Carolina.

B. Headings and titles of the various parts of this Agreement are for convenience of reference only and shall not be considered in interpreting the text of this Agreement. Modifications or amendments to this Agreement must be in writing and executed by duly authorized representatives of each party.

C. In the event that any portion or all of this Agreement is held to be void or unenforceable, the parties agree to negotiate in good faith to reach an equitable agreement which shall affect the intent of the parties as set forth in this Agreement.

D. All notices pertaining to this Agreement shall be in writing and, if to SCDOT, will be sufficient when sent registered or certified mail to SCDOT addressed as follows:

Deputy Secretary for Engineering
South Carolina Department of Transportation
Post Office Box 191
Columbia, South Carolina 29202-0191

All notices to CONTRACTOR shall be sufficient when sent registered or certified mail to CONTRACTOR addressed as follows:

(Insert CONTRACTOR'S address here)

E. The Contract Documents set forth the full and complete understanding of the parties as of the Effective Date defined herein, and supersedes any and all agreements and representations made or dated prior thereto.

F. The parties make no representations, covenants, warranties or guarantees, express or implied, other than those expressly set forth herein. The parties' rights, liabilities, responsibilities and remedies within respect to the work shall be exclusively those expressly set forth in this Agreement.

G. In no event shall any failure by either party hereto to fully enforce any provision to this Agreement be construed as a waiver by such party of its right to subsequently enforce, assert or rely upon such provision.

H. Nothing in this Agreement is intended to create any contract rights for any party other than SCDOT and CONTRACTOR, nor are any third-party beneficiary rights intended to be created hereby.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the Effective Date defined herein. The Effective Date is defined as the date signed by the Director of Construction on behalf of South Carolina Department of Transportation.

Witnesses:

Date: _____

Witnesses:

SOUTH CAROLINA DEPARTMENT
OF TRANSPORTATION

By: _____
Todd Steagall, P.E.
Director of Construction

Recommended:

Jeff Elliott, P.E.
Contract Administration Engineer

CONTRACTOR

Name of Contractor

By: _____

Its: _____

CERTIFICATION OF CONTRACTOR

I hereby certify that I am the duly authorized representative of CONTRACTOR and that neither I nor the above CONTRACTOR I here represent has:

- a) employed or retained for a commission, percentage, brokerage, contingent fee, or other consideration, any firm or person (other than a bona fide employee working solely for me or the above CONTRACTOR) to solicit or secure this contract;
- b) agreed, as an express or implied condition for obtaining this contract, to employ or retain the services of any firm or person in connection with carrying out the contract, or
- c) paid, or agreed to pay, to any firm, organization or person (other than a bona fide employee working solely for me or the above CONTRACTOR) any fee, contribution, donation, or consideration of any kind for, or in connection with, procuring or carrying out the contract except as here expressly stated (if any);
- d) either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action, in restraint of free competitive bidding in connection with the submitted proposal.

By execution of this Agreement, CONTRACTOR certifies CONTRACTOR and all CONTRACTOR's consultants, sub-consultants, contractors, employees and agents will comply with South Carolina's Ethics, Government Accountability, and Campaign Reform Act of 1991, as amended. The following statutes require special attention: (a) Offering, giving, soliciting, or receiving anything of value to influence action of public employee - §8-13-790, 8-13-705, 8-13-720; (b) Recovery of kickbacks - §8-13-790, (c) Offering, soliciting or recovering money for advice or assistance of public official - §8-13-720, (d) Use or disclosure of confidential information - §8-13-725, (e) Persons hired to assist in the preparation of specifications or evaluation of bids - §8-13-1150, (f) Solicitation of state employees - §8-13-755, 8-13-760 and §8-13-725, (g) False Claims Act -§16-13-240. The state may rescind any contract and recover all amounts expended as a result of any action taken in violation of this provision.

I acknowledge that this certificate is to be furnished to the Department, the Federal Highway Administration, and the U. S. Department of Transportation, and is subject to applicable State and Federal laws, both criminal and civil.

I acknowledge that giving false, misleading, or incomplete information on this certification may subject me to prosecution under Section 16-9-10 of the South Carolina Code of Laws.

CONTRACTOR

Name of Contractor

By: _____

Date: _____

Its: _____

CERTIFICATION OF DEPARTMENT

I hereby certify that I am the Director of Construction for the South Carolina Department of Transportation (SCDOT) of the State of South Carolina and that the above CONTRACTOR or its representative has not been required, directly or indirectly, as an express or implied condition in connection with obtaining or carrying out this agreement to:

- (a) employ or retain, or agree to employ or retain, any firm or person, or
- (b) pay, or agree to pay, to any firm, person, or organization, any fee, contributions, donations, or consideration of any kind, except as here expressly stated (if any).

I acknowledge that this certificate is to be furnished to the Federal Highway Administration, and U. S. Department of Transportation, and is subject to applicable State and Federal laws, both criminal and civil.

SOUTH CAROLINA DEPARTMENT OF
TRANSPORTATION

BY: _____

TITLE: DIRECTOR OF CONSTRUCTION

Date: _____

DRUG-FREE WORKPLACE CERTIFICATION

In accordance with Section 44-107-30, South Carolina Code of Laws (1976), as amended, and as a condition precedent to the execution of this agreement, the undersigned, who is an authorized representative of the CONTRACTOR certifies on behalf of the CONTRACTOR that the PROPOSER will provide a drug-free workplace by:

- (1) publishing a statement notifying employees that the unlawful manufacture, distribution, dispensations, possession, or use of a controlled substance is prohibited in the CONTRACTOR's workplace and specifying the actions that will be taken against employees for violations of the prohibition;
- (2) establishing a drug-free awareness program to inform employees about:
 - (a) the dangers of drug abuse in a workplace;
 - (b) the person's policy of maintaining a drug-free workplace;
 - (c) any available drug counseling, rehabilitation, and employee assistance programs; and
 - (d) the penalties that may be imposed upon employees for drug violations;
- (3) making it a requirement that each employee to be engaged in the performance of the agreement be given a copy of the statement required by item (1);
- (4) notifying the employee in the statement required by item (1) that, as a condition of employment of this agreement, the employee will:
 - (a) abide by the terms of the statement; and
 - (b) notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than five days after the conviction;
- (5) notifying the South Carolina Department of Transportation within ten days after receiving notice under item (4)(b) from an employee or otherwise receiving actual notice of the conviction;
- (6) imposing a sanction on, or requiring the satisfactory participation in a drug abuse assistance or rehabilitation program by, any employee convicted as required in Section 44-107-50; and
- (7) making a good faith effort to continue to maintain a drug-free workplace through implementation of items (1), (2), (3), (4), (5), and (6)

By execution of this Agreement CONTRACTOR certifies CONTRACTOR and all CONTRACTOR's consultants, sub-consultants, contractors, employees and agents will comply with all applicable provisions of the Drug-Free Workplace Act, Title 44, Chapter 107 of the South Carolina Code of Laws, as amended.

CONTRACTOR: _____
(Signature)

EXHIBIT 1

COST PROPOSAL BID FORM

PROPOSED COST PROPOSAL BID FORM
FOR
PORT ACCESS ROAD
CHARLESTON COUNTY

The *Cost Proposal Bid Form*, as submitted by the selected PROPOSER, will be included with the completed agreement.

EXHIBIT 2

SCHEDULE OF VALUES

SCHEDULE OF VALUES
FOR
PORT ACCESS ROAD
CHARLESTON COUNTY

A Schedule of Values, submitted by the selected PROPOSER and approved by SCDOT, will be included with the completed agreement.

EXHIBIT 3

SCOPE OF WORK

EXHIBIT 3 – SCOPE OF WORK

The Contractor shall perform, at a minimum all work necessary to complete the design and construction of a new fully directional Port Access Road Interchange on I-26, reconstruct Exit 217 (Meeting Street), construct a new Port Access Road connecting I-26 with the proposed Naval Base Terminal (NBT), construct a Bainbridge Connector Road, construct Stromboli Avenue Extension and construct associated roadway improvements to surface streets to serve the proposed Naval Base Terminal (NBT) in Charleston County, South Carolina. The project area is located primarily in the City of North Charleston with a small portion located in the City of Charleston east of I-26 between the Cosgrove Avenue and Rutledge Street exits. In carrying out this work, the Contractor is responsible for all contract services including, but not limited to, project administration, additional right of way services and acquisition of right of way, design and construction services, maintenance of traffic, utility and railroad coordination, quality control, and public/community relations.

The new Port Access Road Interchange must provide full access to and from westbound and eastbound I-26 to the Port Access Road. The Contractor shall design the fully directional interchange on I-26 to include four one-way ramps on structure between the ramp junctions along the mainline of the Port Access Road and merge/diverge points with existing I-26 eastbound and westbound travel lanes. The fully directional interchange shall be constructed within the right of way corridor detailed in Appendix H of the Access Roadway Feasibility Study Supplemental Report (ARFS) and the USACE Permit provided in Attachment B. The typical section for each ramp shall include a 16-foot travel lane and two 10-foot shoulders. The Contractor shall remove the existing Exit 218 (Spruill Avenue) interchange from its intersection with Spruill Avenue to I-26 East Bound Station 5817+75 and West Bound Station 5813+20 to accommodate the new interchange. The demolition shall include the removal of the existing embankment between I-26 and Spruill Avenue. The Contractor shall install new pavement markings on Spruill Avenue 300 feet to the north and 200 feet to the south and shall remove the existing and place new curb and gutter and sidewalk from Hugo Avenue to Joppa Avenue. The Contractor shall reconstruct the existing Exit 217 (Meeting Street) interchange in conjunction with the new I-26 interchange. The Contractor shall demolish, shift slightly, and rebuild the existing Exit 217 exit ramps. The location and configuration of Exit 217 shall generally be the same and the proposed finished grade shall tie down to the existing ground grade at or before Station 5823+85 which is the pavement joint between the concrete and asphalt at the end of the Meeting Street ramp.

Significant improvements along I-26 are required to accommodate the Port Access Road interchange and to maintain Exit 217 generally in its current location. Improvements along I-26 shall include construction of a collector-distributor road system to combine the entrance and exit movements along I-26 for ramps D and H, and ramps A and G, respectively. The Contractor shall construct the collector-distributor road system outside of existing I-26 lanes and behind a permanent concrete barrier. The collector-distributor road shall extend approximately 0.52 miles northward starting in the area within the new interchange to a point just south of the I-26 Bridge over Baker Hospital Blvd.

All alignments that connect to I-26 shall be designed to work with the current six-lane configuration of I-26 as well as accommodate a future eight-lane configuration. The future 8-Lane configuration (four lanes in each direction) consists of a 2.5-foot Median Barrier, a 10-foot

EXHIBIT 3 – SCOPE OF WORK

Inside Shoulder in each direction, four 12-foot Travel Lanes in each direction, and a 12-foot Outside Shoulder in each direction.

The Port Access Road is a new location roadway that connects I-26 with the proposed NBT at the terminal main entrance within the right of way corridor detailed in Appendix H of the Access Roadway Feasibility Study Supplemental Report (ARFS) and the USACE Permit provided in Attachment B. The Contractor is responsible for coordinating with the South Carolina State Ports Authority (SCSPA) for the tie point of Port Access Road at the entrance to the NBT. The typical section for Port Access Road shall include two 12-foot travel lanes in each direction, 12-foot total exterior shoulders, and 14-foot (variable) paved interior shoulders with a concrete median barrier to separate opposing traffic. The width of the concrete median barrier shall be added to the total width. The Contractor shall locate the concrete median barrier in such a way as to provide adequate stopping sight distance along Port Access Road in all locations.

To accommodate the traffic movements from the removed Spruill Avenue (Exit 218) ramps, the access road design must provide a half-diamond interchange on the northern portion of the Macalloy site. This new interchange shall include two one-way ramps that connect Port Access Road, grade separated above, to a new Local Access Road (Bainbridge Connector). The typical section for these ramps shall match the typical section for the ramps along I-26. This interchange must also provide at-grade access to Tract 33 in the Right of Way Plans dated May 12, 2009 contained in Attachment B, referred to from this point forward as the Macalloy site. Furthermore, access from the southwestern portion of the Macalloy site must be provided to the northwestern storm water retention area. In the vicinity of the Macalloy site, from Station 67+00 to Station 75+50, the Port Access Road mainline shall be grade separated using a bridge.

The Bainbridge Connector Road shall connect ~~the Bainbridge Avenue Road~~ to the Port Access Road within the right of way corridor detailed in Appendix H of the Access Roadway Feasibility Study Supplemental Report (ARFS) and the USACE Permit provided in Attachment B. Southward, Bainbridge Connector Road shall connect to a two-lane roadway (Tidewater) that includes a low-level bridge crossing Shipyard Creek. A partial grade-separated (half diamond) interchange shall accommodate turning movements to and from I-26, Bainbridge Connector Road, and Tidewater Road (NP Ramp). Access between the main gate of the new NBT and any local road is not provided.

The Contractor shall construct the Bainbridge Connector Road on a low-level bridge structure along a new location northwest from the half diamond interchange to a point just behind the former county incinerator property (Tract #37) adjacent to the northern limits of Shipyard Creek. From this point, Bainbridge Connector Road shall continue at-grade to the northwest ending at Bainbridge Avenue with a new four-way, at-grade, and signalized intersection. Additionally, a signalized tee intersection shall be constructed at the intersection of Bainbridge Connector Road and the Stromboli Avenue Extension. The typical section for Bainbridge Connector Road shall include two 12-foot travel lanes in each direction, a 15-foot flush median, curb and gutter, a 5-foot sidewalk on the left outside shoulder, and a 10-foot shared use path on the right outside shoulder. The Contractor shall separate the 10-foot shared use path from the back of curb with a minimum 3-foot wide earth strip. The Contractor shall also separate the 5-foot sidewalk from the back of curb with a minimum 2-foot wide earth strip.

EXHIBIT 3 – SCOPE OF WORK

The Contractor shall reconstruct Stromboli Avenue and construct a new location roadway (Stromboli Ave Extension) from the existing intersection with Spruill Avenue to tie into the new Bainbridge Connector Road. This construction for Stromboli Avenue and Stromboli Extension shall be completed within the right of way corridor detailed in Appendix H of the Access Roadway Feasibility Study Supplemental Report (ARFS) and the USACE Permit provided in Attachment B. The Stromboli Ave Extension shall include a grade separated crossing of the existing CSX railroad track system and the proposed Palmetto Railways track system. Stromboli Avenue and the Extension shall be constructed with a raised median that includes a pipe underdrain system. The typical section for Stromboli Ave and the Extension shall include two 12-foot travel lanes in each direction, a 15-foot raised median, curb and gutter, a 5-foot sidewalk on the left outside shoulder, and a 10-foot shared use path on the right outside shoulder. The Contractor shall separate the 10-foot shared use path from the back of curb with a minimum 3-foot wide earth strip. The Contractor shall also separate the 5-foot sidewalk from the back of curb with a minimum 2-foot wide earth strip. The existing intersection of Spruill Avenue and Stromboli Avenue shall have a signal installed. The Contractor shall also construct a roadway to connect Stromboli Avenue to US-52 (Carner Avenue) and construct an intersection at Carner Avenue. The Contractor shall remove Meeting Street Road from Barnaby Road to its intersection with Carner Avenue creating a cul-de-sac on Meeting Street Road just south of Barnaby Road.

For Spruill Avenue, construct the five lane typical section within the limits of the proposed new right of way. The typical section shall include two 12-foot travel lanes in each direction, a 15-foot flush median, curb and gutter, and 5-foot sidewalk on the outside shoulders. Provide a 4-foot bike lane in both directions. The bike lanes shall be flush with the travel lanes and shall be located between the outside travel lane and the gutter. Apply the permanent pavement markings such that the travel lanes are aligned with the existing three lane typical section pavement markings along Spruill Avenue.

For the Rosemont Community, the Contractor shall construct noise barriers generally located between Hagood Street and athletic field on the north side of the Rosemont Community as detailed in the Final Noise Barrier Analysis prepared by Michael Baker International (Revised October 2015) contained in Attachment B.

The Contractor shall re-align Austin Avenue and remove existing Summerville Avenue from Austin Avenue to just south of the existing Southern Lumber access drive. The limits of re-alignment and removal are shown on the "Remove Summerville Avenue sketch" included in Attachment B. Construct a new access drive for Southern Lumber from the existing Summerville Avenue to the new right of way line as shown on the Site Plan for Southern Lumber & Millworks included in Attachment B.

The Contractor shall maintain existing access for Tracts 39 and 58 (as shown in the Right-of-Way Plans dated May 12, 2009 contained in Attachment B) via Shipyard Creek Road. Remaining portions of Shipyard Creek Road within the proposed right of way of Stromboli Extension should be removed beginning at approximate Station 13+50. A cul-de-sac in this location is not required therefore no right-of-way is needed. Portions of Shipyard Creek Road that remain shall not be resurfaced.

EXHIBIT 3 – SCOPE OF WORK

For a full understanding of the scope of the Project and the criteria of the construction items needed for this Project, please review Exhibit 4, Exhibit 5, and Attachment B.

EXHIBIT 4

PROJECT DESIGN CRITERIA

EXHIBIT 4 – PROJECT DESIGN CRITERIA

This exhibit details the criteria by which the project shall be designed and constructed. These criteria are divided into subsections as listed below:

Exhibit 4a – Roadway Design Criteria

Exhibit 4b – Structures Design Criteria

Exhibit 4c – Pavement Design Criteria

Exhibit 4d – Traffic Design Criteria

Part 1 – Signing and Pavement Markings

Part 2 – Work Zone Traffic Control

Part 3 – Traffic Signals

Part 4 – Intelligent Transportation System

Exhibit 4e – Hydraulic Design Criteria

Exhibit 4f – Geotechnical Design Criteria

Exhibit 4g – Environmental Design Criteria

Attachment B – Supplemental Project Design Criteria

DESIGN REFERENCES

This exhibit describes the general design considerations and criteria for the proposed roadway approaches, hydraulics, structures, geotechnical, and surveys.

Design standards shall be in accordance with the following design references as supplemented or amended by Sections 4a, 4b, 4c, 4d, 4e, 4f, 4g, and 4h of this Exhibit. Any variation in design from the included information shall require written approval from SCDOT.

- SCDOT Pre-Construction Survey Manual, effective as of the Final RFP release date
- 2003 SCDOT Highway Design Manual with updates effective as of the Final RFP release date and supplemented with AASHTO A Policy on Geometric Design of Highways and Streets, 2001
- AASHTO A Policy on Design Standards Interstate System, 2005
- AASHTO Roadside Design Guide, with 2006 Chapter 6 update, 3rd Edition
- AASHTO Standard Specifications for Highway Bridges, 17th Edition
- SCDOT Standard Drawings, effective as of the Final RFP release date
- SCDOT Engineering Directives, effective as of the Final RFP release date
- SCDOT Preconstruction Design Memorandum, effective as of the Final RFP release date
- SCDOT Instructional Bulletins, effective as of the Final RFP release date
- AASHTO Guide for the Development of Bicycle Facilities, 1999
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, 2004
- SCDOT Americans with Disabilities Act Transition Plan, December 2014
- United States Access Board’s Revised Draft Guidelines for Accessible Public Rights-of-Way (PROWAG), November 23, 2005
- SCDOT Roadside Plants to Avoid/Trees with Limitations on R/W, October 2014
- SCDOT Access and Roadside Management Standards, August 2008 with updates
- SCDOT Plan Preparation Guide, 2000
- SCDOT Standard Specifications for Highway Construction, 2007
- SCDOT Supplemental Specifications (2007), effective as of the Final RFP release date
- SCDOT Supplemental Technical Specifications, effective as of the Final RFP release date
- SCDOT Qualified Product Lists, effective as of the Final RFP release date
- SCDOT Road Design Reference Material for Consultant Prepared Plans, June 2010
- FHWA Manual on Uniform Traffic Control Devices, 2009
- SCDOT Supplement to the MUTCD
- The Rule on Work Zone Safety and Mobility
- SCDOT Procedures and Guidelines for Work Zone Traffic Control Design
- SCDOT Traffic Signal Design Guidelines, 2009 with updates
- Traffic Signal Material Specifications, effective as of the Final RFP release date
- Traffic Signal Supplemental Specifications, effective as of the Final RFP release date
- Highway Capacity Manual, 2010
- AASHTO “Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals”, Sixth Edition.

EXHIBIT 4 – PROJECT DESIGN CRITERIA

- SCDOT Preconstruction Advisory Memorandums, effective as of the Final RFP release date
- SCDOT Bridge Design Manual, 2006
- SCDOT Bridge Design Memoranda, effective between July 1, 2006 and the Final RFP release date
- 2012 AASHTO LRFD Bridge Design Specifications, Sixth Edition (with 2013 Interim Revisions)
- SCDOT Geotechnical Design Manual, 2010 Edition (Version 1.1)
- SCDOT Seismic Design Specifications for Highway Bridges, 2008 (Version 2.0)
- SCDOT Bridge Drawings and Details, effective as of the Final RFP release date
- AASHTO/AWS D1.5M/D1.5:2010 Bridge Welding Code, with 2011 interims
- SCDOT Pavement Design Guidelines, July 2008 Edition
- SCDOT Requirements for Hydraulic Design Studies, May 2009
- SCDOT Stormwater Quality Design Manual, effective as of the Final RFP release date;
- AASHTO “Highway Drainage Guidelines”, 2007
- AASHTO “Drainage Manual”, 2014 first edition
- FEMA Regulations, 44CFR Chapter 1
- The State Stormwater and Sediment and Erosion Control Regulations administered by DHEC, 26 S.C. Code Ann. Regs. 72-405 (Supp. 1995) et seq.
- South Carolina State Water Law
- SCDHEC NPDES MS4 Permit # SCS040001
- SCDHEC NPDES Construction Permit # SCR160000
- SCDOT Traffic Engineering Guidelines, effective as of the Final RFP release date
- AASHTO “Standard Specifications for Transportation Materials and Methods of Sampling and Testing” 2013 Thirty-Third Edition
- International Building Code, effective as of the Final RFP release date

EXHIBIT 4a

ROADWAY DESIGN CRITERIA

1.0 GENERAL

Prepare the roadway geometric design for the project using the design standards and criteria that are most appropriate based on design speed, functional classification, design traffic volumes, right-of-way, and aesthetics. The design elements shall include, but not be limited to, the horizontal and vertical alignments, lane widths, shoulder widths, median widths, sight distance, clear zone, cross slopes, and side slopes.

2.0 CRITERIA

Classify the terrain as level on all routes within the scope of work. Use the WB-62 design vehicle for all geometric design except where otherwise noted.

2.1 Functional Classification

The functional classification for each roadway is as follows:

- | | |
|--------------------------------|---------------------------|
| • Interstate 26 | Urban Arterial – Freeways |
| • Interchange Ramps | Urban Arterial – Freeways |
| • Collector/Distributor Roads | Urban Arterial |
| • Port Access Road | Urban Arterial |
| • Bainbridge Avenue | Urban Local |
| • Bainbridge Connector | Urban Arterial |
| • Stromboli Avenue/Extension | Urban Local |
| • Spruill Avenue | Urban Arterial |
| • Meeting Street Road | Urban Arterial |
| • Carner Avenue | Urban Arterial |
| • Other Side Roads and Streets | Urban Local |

2.2 Design Speed

- | | |
|-----------------------------|----------------|
| Interstate 26 | 65 mph |
| Interchange Ramps: | |
| • Loops | 30 mph minimum |
| • Ramps G & H | 40 mph minimum |
| • All other Ramps | 45 mph minimum |
| Collector/Distributor Roads | 55 mph minimum |
| Port Access Road | 50 mph |
| Bainbridge Avenue/Connector | 40 mph |

Stromboli Avenue/Extension	30 mph
Spruill Avenue	45 mph
Meeting Street Road	45 mph
Carner Avenue	45 mph
Other Side Roads and Streets	35 mph

2.3 Pavement, Shoulder & Median Width

Develop pavement, shoulder, and median widths in compliance with SCDOT Highway Design Manual Chapters 9, 13, 16, and 19 through 22.

Add 3.5 ft. to shoulder width when guardrail is required. Pave entire shoulder width when adjacent to guardrail/concrete barrier.

Interstate 26

- Through Lanes 12 ft.
- Shoulder (outside) 10 ft. paved/12 ft. total width
- Shoulder (inside) 4.75 ft. paved total width

Interchange Ramps

- Through Lanes 16 ft. single lane / 12 ft. double lanes
- Shoulder (outside) 10 ft. (6 ft. paved, 4 ft. earth)
- Shoulder (inside) 10 ft. (4 ft. paved, 6 ft. earth)

Collector/Distributor Roads

- Through Lanes 16 ft. single lane / 12 ft. double lanes
- Shoulder (outside) 10 ft. (6 ft. paved, 4 ft. earth)
- Shoulder (inside) 10 ft. (4 ft. paved, 6 ft. earth)

Port Access Road

- Through Lanes 12 ft.
- Shoulder (outside) 10 ft. paved/12 ft. total width
- Median (flush) 28 ft. minimum (not including concrete median barrier width)

Bainbridge Connector

- Through Lanes 12 ft.
- Shoulder (outside) 2 ft. Curb & Gutter
- Median (flush) 15 ft. minimum

Bainbridge Avenue

- Through Lanes 12 ft.
- Shoulder (outside) 6 ft. (2 ft. paved, 4 ft. earth)
- Median (flush) 15 ft. minimum

Stromboli Avenue/Extension

- Through Lanes 12 ft.
- Shoulder (outside) 2 ft. Curb & Gutter
- Median (raised) 15 ft. minimum

Spruill Avenue

- Through Lanes 12 ft.
- Shoulder (outside) 2 ft. Curb & Gutter
- Median (flush) 15 ft. minimum
- Bicycle Lanes 4 ft.

Carner Avenue

- Through Lanes 12 ft.
- Shoulder (outside) 2 ft. Curb & Gutter
- Median (flush) 15 ft. minimum

Macalloy Site Stormwater Detention Area Road

- Through Lane 16 ft. single lane
- Shoulder 4 ft. earth

2.4 Horizontal Curves

Develop horizontal curves and superelevation in compliance with SCDOT Highway Design Manual Chapter 11 and the SCDOT Standard Drawing No. 150-205-00.

Interstate 26

Minimum Radius (65 mph) 1485 ft.
 Superelevation “e=Retain Existing”

Ramps

Minimum Radius (30 mph)	250 ft.
Minimum Radius (40 mph)	465 ft.
Minimum Radius (45 mph)	600 ft.
Superelevation Maximum	0.08 ft./ft.

Collector/Distributor Roads

Minimum Radius (55 mph)	965 ft.
Superelevation Maximum	0.08 ft./ft.

Port Access Road

Minimum Radius (50 mph)	760 ft.
Superelevation Maximum	0.08 ft./ft.

Bainbridge Avenue/Connector

Minimum Radius (40 mph)	565 ft.
Superelevation	0.04 ft./ft.

Stromboli Avenue/Extension

Minimum Radius (30 mph)	305 ft.
Superelevation	0.04 ft./ft.

Spruill Avenue

Minimum Radius (45 mph)	660 ft.
Superelevation	0.06 ft./ft.

Meeting Street

Minimum Radius (45 mph)	660 ft.
Superelevation	0.06 ft./ft.

Carner Avenue

Minimum Radius (45 mph)	660 ft.
Superelevation	0.06 ft./ft.

Other Side Roads and Streets

	35 mph
Minimum Radius (35 mph)	425 ft.
Superelevation Minimum	0.04 ft./ft.

2.5 Vertical Curves, Grades, and Clearances

Develop vertical curves, grades, and clearances in compliance with SCDOT Highway Design Manual Chapters 12, 16, and 19 through 22 except where otherwise noted. Use grade adjusted K values where the grades are 3 percent or greater.

Do not use spline grades.

Port Access Road

Maximum Gradient 3% from approx. Sta. 56+18 to approx. Sta. 100+00

Minimum Gradient (without Curbs) 0.5%

Minimum Gradient (with Curbs & Gutters) 0.3%

Port Access Road finished grade at Sta. 100+00 is 14 feet.

Bainbridge Connector

The minimum vertical clearance is 17 ft. from proposed Drayage Road Overpass to the proposed finished grades detailed on the Navy Base Intermodal Facility 60% plan sheet 7 dated 10/12/2015 and provided in the Attachment B – Roadway. Drayage Road is crossing over Bainbridge Connector at approx. Sta. 11+85.

Macalloy Site Stormwater Detention Area Road

Minimum Vertical Clearance 16 ft.

Access Location Between Sta. 72+00 to Sta. 78+00

2.6 Side Slopes

Develop side slopes in compliance with SCDOT Highway Design Manual Chapters 13, 14, 16, and 19 through 22.

2.7 Cross Slopes

Develop cross slopes in compliance with SCDOT Highway Design Manual Chapters 11, 13, 16, and 19 through 22.

- Shoulder (paved) 4 ft. or less Match travelway pavement slope
- Shoulder (paved) greater than 4 ft. 24:1
- Shoulder (unpaved) 12:1

On the high side of superelevation, slope the shoulder at the superelevation rate.

On the low side of superelevation, maintain a 24:1 slope on the paved shoulder until the superelevation slope exceeds a 24:1 slope. After the superelevation slope exceeds a 24:1 slope, slope the shoulder at the superelevation rate.

Match existing lanes cross slope on I-26.

2.8 Clear Zones

Mainline Interstate, Collector/Distributor Roads, and Ramps

Use the SCDOT HDM (2003 with updates) Chapter 14 and the *Roadside Design Guide* (AASHTO) edition 2006 with Chapter 6 Update, 3rd Edition based on traffic volumes, design speed, and slopes. Do not limit the clear zones provided in Figure 14.3A in the SCDOT HDM (2003 with updates) to 30 feet as indicated as a possibility in the footnote for this figure. When a range of values is shown, select higher value. Also, SCDOT does not typically use a 3H:1V fill slope. See the *Roadside Design Guide* (AASHTO) edition 2006 with Chapter 6 Update, 3rd Edition for clear zone calculations where a 3H:1V fill slope is used. Use 3H:1V fill slopes only where fill heights are required to match existing conditions and clear zone can be obtained within the Project limits.

For those areas where no guardrail currently exists, design fill and cut slopes to obtain clear zones and to avoid the need for protection. In areas where new right-of-way, wetland impacts, or impacts to frontage roads or immovable obstructions would be a result of achieving the clear zone requirement, protect substandard areas.

Where existing fill and cut slopes are presently protected by guardrail, replace damaged and/or substandard guardrail and extend/install new guardrail at locations that do not meet current standard. Also, clear and grind in accordance with ED 29.

Any Other Roads

Use the SCDOT HDM (2003 with updates) Chapter 14 and the *Roadside Design Guide* (AASHTO) edition 2006 with Chapter 6 Update, 3rd Edition based on traffic volumes, design speed, and slopes.

Provide clear zone for any facilities using curbs on this project in compliance with SCDOT HDM (2003 with updates) Chapter 14.

2.9 Sight Distance

Develop sight distance in compliance with SCDOT Highway Design Manual Chapter 10.

If necessary, shift the concrete median barrier along the new Port Access Road within the paved interior shoulders to provide adequate stopping sight distance through the entire length of the horizontal curves. In areas where the concrete median barrier is shifted to provide adequate stopping sight distance, provide a minimum interior paved shoulder width of 10 feet.

2.10 Ramps

Develop ramps in compliance with SCDOT Highway Design Manual Chapter 16.

Analyze and correct ramps if there are deficiencies in acceleration and deceleration lane lengths.

2.11 Intersections

Use intersection sight distance and design speed in Intersection Design. Design all intersection turning radii in accordance with the HDM functional class requirements.

Use the SCDOT Design Manual, Figure 15.2D “Selection of Design Vehicle at Intersections” [pg 15.2(8)] to determine design vehicle.

Table 1 below shows a summary of intersection geometry requirements. Use 2025 PM Peak Hour Traffic Volumes in Attachment B as guidance to design the intersections.

Table 1 – Intersection Geometry Requirements

Intersection	Signal	Required Lanes and Storage Lengths *
Spruill Av at Stromboli Av	Yes	EB: Lt(200'), Th, Th/Rt WB: Lt(200'), Th, Th/Rt NB: Lt(200'), Th/Rt SB: Lt(200'), Th/Rt
Local Access Rd (Bainbridge Connector) at Stromboli Rd Ext	Yes	EB: Lt, Rt WB: none NB: Lt(300'), 2 Th SB: Th, Th/Rt
Local Access Rd (Bainbridge Connector) at Bainbridge Av	Yes	EB: Lt(150'), 2 Th, Rt(250') WB: 2 Lt(300'), Th/Rt NB: Lt(300'), Th, Rt SB: Lt(150'), Th, Th/Rt
Local Access Rd (Bainbridge Connector) at CNC Half-Diamond On- Ramp	Yes	EB: none WB: none NB: Lt(100'), 2 Th SB: 2 Th, Rt(250')
Local Access Rd at CNC Half-Diamond Off- Ramp	Yes	EB: Lt/Th WB: Rt NB: none SB: Lt, Th
Spruill Av at Meeting St Rd	Yes	EB: 2 Rt WB: none NB: 2 Lt(400'), Th SB: Lt(150'), Th/Rt
Carner Av at Stromboli Av Ext	No	EB: none WB: Lt, Rt NB: Th, Th/Rt SB: Lt(200'), 2 Th

* Note that the recommended lanes are presented by approach (*EB* for eastbound, *WB* for westbound, *NB* for northbound, and *SB* for southbound) and by turning movement type (*Lt* for Left, *Th* for Through, *Rt* for Right, and *All* for shared movements).

2.12 Roadside Barriers

Develop roadside barriers in compliance with SCDOT Highway Design Manual Chapter 14. Include the following items in the work:

Guardrail: Determine the existing guardrail or end treatments that do not meet current design standards. Replace existing guardrail and end treatments within the project limits that are damaged. Replace or reset existing guardrail and end treatments within the project limits that do not meet current design standards. Ensure that all new or reset guardrail and end treatments are listed on the Qualified Products Policies & Listings. Add new guardrail where necessary in order to meet current design standards. Provide pavement under guardrail adjacent to paved shoulders utilizing HMA Surface Type B at a rate of 300 psy. Provide paving under guardrail in accordance with the guidance found in the Exhibit 5, Special Provisions, Section 403.

Use additional length guardrail posts with compressed guardrail shoulder break only where right of way or environmental impacts dictate that standard guardrail shoulder break cannot be built.

Do not use three-beam guardrail with critical offset posts at the bridge piers.

Concrete Median Barrier: Provide concrete median barrier along Port Access Road where traffic will travel in opposing directions. When concrete median barrier is constructed, paved the inside shoulder to the barrier. ~~Paint all new concrete median barriers in accordance to SCDOT Standard Specifications. Final surface finish is not required on this project.~~ Use single slope shaped concrete median barriers.

2.13 Bicycle and Pedestrian Accommodations

Unless otherwise noted, provide and design pedestrian and bicycle accommodations in accordance with the SCDOT Highway Design Manual, latest edition; and supplemented with SCDOT Engineering Directive Memorandum 22 “Considerations for Bicycles;” AASHTO’s “Guide for the Development of Bicycle Facilities”, 1999 edition; AASHTO’s Guide for the Planning, Design, and Operation of Pedestrian Facilities,” 2004 edition; and the SCDOT Americans with Disabilities Act Transition Plan, December 2014.

Provide sidewalks and shared use paths on Bainbridge Connector Road and Stromboli Avenue/Extension. Provide sidewalks on Spruill Avenue and Carner Avenue. Also, provide bike lanes on Spruill Avenue. In areas where the sidewalks, bike lanes, and shared use paths are adjacent to a mainline highway bridge, design and construct the bridge to accommodate the addition of the sidewalks, bike lanes, and shared use paths.

2.14 Right-of-Way and Control of Access

Right-of-way (ROW) shall be acquired in accordance with the Agreement provided in Attachment A and the ROW plans dated May 12, 2009 provided in Attachment B. However, the project shall be constructed within the ROW corridor detailed in Appendix H of the Access Roadway Feasibility Study Supplemental Report (ARFS) and the USACE Permit provided in Attachment B.

At bridge locations, provide a ROW width on each side of the structure that allows access to maintain and inspect the structure. This may exceed ROW limits defined in the ROW plans dated May 12, 2009. At a minimum, maintain at least 45 feet from the edge of structure to edge of ROW at the mainline and ramp bridges, at the Bainbridge Connector bridge, and at the Stromboli Ave. Extension bridge.

Maintain fully controlled access along interstate, all interchanges, and ramp intersections. Follow SCDOT and FHWA guidelines for Control of Access at interstate interchanges.

2.15 Survey

The existing top of rail elevations for the two partially covered tracks crossing Shipyard Creek Road are provided in Attachment C.

Project Survey Control

The methods for establishing all new project survey control for this project will be in accordance with the SCDOT Preconstruction Survey Manual (October 2012) with the exception that all new survey control for this project will be related to the original (year 2008) project mapping control. The requirement for using the original (year 2008) project mapping control as the coordinate bases for current design is critical to maintaining the correct coordinate relationship to the completed right-of-way acquisitions for this project.

All existing project mapping control was established on the Horizontal Datum NAD83(2007), Vertical Datum NAVD88, and a combined scale factor of 0.99989681.

The original aerial mapping (year 2008) for this project was collected using (2) different tiers of accuracy.

Tier 1

Low altitude (approximately 300' AGL, negative scale 1"=50') aerial photography was used for the mapping of approximately 5.5 miles of the Interstate 26 corridor. (290) aerial panels were set at the edge of pavement along the interstate emergency lanes to support the Tier 1 mapping. Softcopy aerial triangulation was performed to develop the Digital Terrain Model (DTM) of the entire paved surface of Interstate 26 to include the median and shoulder of the interstate.

Vertical accuracy for Tier 1:

Mapping Scale: 1"=10'

Paved surfaces: 0.05' – 0.07'

Grass median and shoulder: ≤ 0.3'

Aircraft: Helicopter

Tier 2

Higher altitude (approximately 1,800' AGL, negative scale 1"=300') aerial photography was used for mapping outside the Tier 1 mapping area. (24) aerial panels were set to support the Tier 2 mapping. Tier 2 mapping included existing surface streets, the existing interchange as well as a proposed access road corridor to the port.

Vertical accuracy for Tier 2:

Orthophotography pixel resolution: 0.5'

Mapping Scale: 1"=50'

DTM: 1' contour

Aircraft: Fixed Wing

3.0 DELIVERABLES

Subject all submittals to SCDOT to a thorough QC review prior to submittal. Ensure RFC plan submittals to SCDOT are signed and sealed by the State of South Carolina licensed Professional Engineer of Record.

3.1 Preliminary Plans

Submit to the SCDOT:

- Four (4) half-size sets of preliminary plans that include, at a minimum: title sheet, roadway typical section, roadway plan and profile, cross sections, clearing limits on plan view and cross sections, drainage features, proposed right-of-way, and preliminary geotechnical reports.
- An electronic submittal to contain an Adobe PDF file of the plans with sheet size 22"x36" in landscape format along with an Adobe PDF file of the reports.
- Any design calculations requested in writing by SCDOT.

3.2 **Right-of-Way Plans**

Submit to the SCDOT:

- Four (4) half-size sets of Right-of-Way plans that include, at a minimum: right-of-way data, roadway typical section, roadway plan and profile, cross sections, drainage features, conceptual work zone traffic control plans, existing right-of-way, and proposed new right-of-way requirements.
- An electronic submittal to contain an Adobe PDF file of the plans with sheet size 22”x36” in landscape format along with an Adobe PDF file of the reports.

3.3 **Final Plans**

Submit to the SCDOT:

- Four (4) half-size sets of final plans that include, at a minimum: title sheet, roadway typical section, roadway plan and profile, cross sections, drainage design, sediment and erosion control design, existing right-of-way, proposed right-of-way, proposed barrier locations, final geotechnical and hydraulic reports, work zone traffic control plans (including temporary signal plans), signing plans, and pavement markings plans.
- An electronic submittal to contain an Adobe PDF file of the plans with sheet size 22”x36” in landscape format along with an Adobe PDF file of the reports.
- Any design calculations requested in writing by SCDOT.

3.4 **Release for Construction (RFC) Plans**

For roadway plans, provide two full size sets, four half size sets, and one electronic copy of RFC Plans to SCDOT. Insert RFC Plans into plan folders as detailed in the SCDOT plan and preparation guide.

EXHIBIT 4b

STRUCTURES DESIGN CRITERIA

1.0 GENERAL

Exhibit 4b contains requirements for:

- bridges,
- retaining walls,
- box culverts and box culvert extensions,
- sound barrier walls, and
- concrete median barriers.

2.0 CRITERIA

2.1 Bridges

2.1.1 Bridge Design

Design all new bridges in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications. Use the HL-93 design live loading.

2.1.2 Seismic Design

In accordance with the SCDOT Seismic Design Specifications for Highway Bridges, the Bridge Operational Classification (OC) is “II.” Use a live load factor of 0.5 in the seismic analysis.

2.1.3 Dimensions

Construct the bridges with minimum roadway and outside deck widths as shown on the drawings entitled “Minimum Bridge Deck Widths”. These drawings are included in Attachment B. Establish bridge lengths based on hydraulic requirements, railroad requirements, geometric considerations, and the lengths shown in the USACE permit.

2.1.4 Span Arrangements over I-26

Design the bridge spans over I-26 to accommodate the future eight lane section (four lanes in each direction) as shown on the drawing titled “Typical Sections of I-26 Showing Future Eight Lane Section”. This drawing is included in Attachment B. Assume that the existing grades and superelevation rates on I-26 will be maintained for the future widening to eight lanes and provide a minimum of 17.5 feet of vertical clearance over the future lanes and shoulders.

2.1.5 Span Arrangements over Solvay Access Road

Provide vertical and horizontal clearances at the Ramps A and D overpasses over Solvay Access Road that meet or exceed the clearances provided at the adjacent I-26 overpass.

2.1.6 Railroad Clearance Requirements

Provide vertical and horizontal clearances at the new CSX Transportation and Norfolk Southern railroad overpasses and for the proposed Palmetto Railways tracks as required by Exhibit 6.

Provide vertical and horizontal clearances at the Ramps A and D overpasses over the railroad spur tracks that meet or exceed the requirements of Chapter 22 of the SCDOT Bridge Design Manual and that meet or exceed the clearances provided at the adjacent I-26 overpass.

2.1.7 Removal and Disposal of Existing Bridges

Remove and dispose of existing bridges and appurtenances in accordance with the Standard Specifications for Highway Construction, Exhibit 4g, Exhibit 6, and all applicable laws and regulations. For existing bridges to be removed which have bents in the median of I-26, remove the columns to an elevation that is three inches lower than the top of the concrete median barrier and place three inches of grout or concrete (3000 psi min.) over the top of the remaining portions of the columns. For existing bridges to be removed which have bents in the ~~median or~~ shoulders of I-26, columns and footings shall be removed in their entirety to prevent conflicts with future construction. Ensure all piles are removed to a minimum of three feet below finished grade. If a portion of an existing structure is to be removed while traffic is maintained on the bridge, verify the structural capacity will be adequate to accommodate the traffic loading for which the bridge was originally designed.

2.1.8 Superstructure Types

For this project, Section 12.3.3 of the SCDOT Bridge Design Manual does not apply. Allowable superstructure types are outlined in Sections 12.3.2.1, 12.3.2.2, 12.3.2.3, and 12.3.2.4 of the SCDOT Bridge Design Manual.

For prestressed concrete girder superstructures, use prestressed concrete girders that are either I-beams or modified bulb-tee beams. Design prestressed concrete girders so that the algebraic sum of the beam camber at prestress transfer due to prestress force, the beam dead load deflections due to non-composite dead load, and superimposed dead load deflections due to applied superimposed dead loads results in a positive (upward) camber. Include the dead load from the future wearing surface in the determination of camber.

For steel welded plate girder superstructures, use structural steel girders that are “I” shaped. Use structural steel that conforms to the requirements

of AASHTO M 270 and paint the steel in accordance with Section 710 of the Standard Specifications.

At each support of prestressed concrete girder, steel welded plate girder, and steel rolled beam superstructures, connect all beams and girders to the substructure using anchor bolts.

Detail all construction stages for girder bridges to consist of a minimum of two lines of girders.

2.1.9 Concrete Strengths

In prestressed concrete piles and beams, concrete design strengths are not allowed to exceed 8,000 and 10,000 psi maximum, respectively. Construct all cast-in-place concrete bridge components with Class 4000 concrete. Construct all precast concrete bridge components with concrete having a minimum compressive strength of 5000 psi.

2.1.10 Cement

Use ASTM C 150 Type II(MH) cement for cast-in-place elements that are exposed to earth or water.

2.1.11 Final Finish of Exposed Concrete Surfaces

Final surface finish is not required on this project.

Apply an Anti-Graffiti Coating to exposed concrete surfaces of bridge abutments walls, including precast panels and coping of MSE Walls.

2.1.12 Lightweight Concrete

Lightweight Concrete is not permitted for this project.

2.1.13 Concrete Cover

Provide concrete cover as required by the Bridge Design Manual and Bridge Design Memorandums with the following modifications:

Element or Condition	Minimum Concrete Cover
Substructure Concrete within the Splash Zone, Water Column and/or Scour Zone	4 ½"
Concrete Cast Against and Permanently Exposed to Earth	4 ½"
Substructure Concrete Exposed to Earth or Weather	4"
Prestressed Concrete Piles	3"
Drilled Shafts in Soil (applies to hoops)	6"

The splash zone is the vertical distance from 4 feet below Mean Low Tide Water elevation to 12 feet above Mean High Tide Water elevation. The scour zone is the vertical distance between the natural ground elevation and the calculated scour elevation.

2.1.14 Post-Tensioning

External post-tensioning is not permitted. Post-tensioning is considered external when the tensioning tendon is located outside the concrete member.

2.1.15 Bridge Decks

For girder and beam spans, construct bridge decks with reinforced cast-in-place concrete.

Apply a transverse Grooved Surface Finish to bridge decks in accordance with Subsection 702.4.16 of the Standard Specifications for Highway Construction.

Make the connection of the reinforcing of decks between stages by lap-splice or mechanical splice.

Asphalt overlays are not permitted on bridge decks.

2.1.16 Stay-in-Place Bridge Deck Forms

The Contractor may use permanent stay-in-place bridge deck forms for concrete deck slabs between new beams and girders. Fabricate permanent stay-in-place bridge deck forms and supports from steel conforming to ASTM A 446/A 653, Grades 40 or 50, and having a coating class of G165 in accordance with ASTM A 525. Do not use fillers in the flutes of the stay-in-place forms. Fill form flutes with concrete as the deck slab is placed. Do not use permanent stay-in-place steel bridge deck forms in bays in which longitudinal deck construction joints are located and in bays between stages.

2.1.17 Approach Slabs

When roadway pavement approaching the bridge is concrete, make the end of the approach slab perpendicular to the roadway centerline. In addition, provide a minimum length of 20 feet along the shortest longitudinal edge of the slab.

2.1.18 Barriers

For bridges without sidewalks and multi-use paths, use the SCDOT 32-inch Concrete Bridge Barrier Parapet in accordance with Section 17.6.1.2 of the SCDOT Bridge Design Manual and as detailed on SCDOT Bridge Drawings and Details, Drawing No. 700-Misc. At ends where thrie beam is required, detail the barrier transition details shown on the Bridge Drawings and Details.

On the right (west) side of the Ramp A Bridge, use a 64-inch high reinforced concrete bridge barrier parapet extension from Sta. 5796+00 to Sta. 5802+00. Beyond the limits where this barrier extension is required, transition the height at a 10:1 maximum rate down to the top of the concrete bridge barrier parapet. Construct the extension using the dimensions shown on the detail entitled “Barrier Parapet Extension”. This detail is included in Attachment B. Design the barrier and extension for Test Level 4 and in accordance with the requirements of Sections 13 and 15 of the AASHTO LRFD Bridge Design Specifications.

On the right (west) side of the Ramp B Bridge, use a 16-inch high reinforced concrete bridge barrier parapet extension from Sta. 5814+00 to Sta. 5820+50. Beyond the limits where this barrier extension is required, transition the height at a 10:1 maximum rate down to the top of the concrete bridge barrier parapet. Construct the extension using the dimensions shown on the detail entitled “Barrier Parapet Extension”. This detail is included in Attachment B. Design the barrier and extension for Test Level 4 and in accordance with the requirements of Section 13 of the AASHTO LRFD Bridge Design Specifications.

For rails adjacent to sidewalks, use the SCDOT 42-inch Concrete Wall (with indentations) in accordance with Section 17.6.1.2 of the SCDOT Bridge Design Manual and as detailed on SCDOT Bridge Drawings and Details, Drawing No. 700-Misc.

For rails adjacent to multi-use paths, use a 42-inch high concrete wall and extend its height to 54 inches with a metal rail that meets AASHTO bicycle rail requirements. Detail indentations in the concrete portion of the rail as shown on SCDOT Bridge Drawings and Details, Drawing No. 700-Misc.

Where median barrier is required on bridges, use a reinforced concrete median barrier having single slope traffic faces. Slope the traffic faces at a constant 10.78 degrees (1H:5.25V) away from traffic. Provide an 8-inch minimum top barrier width and a minimum height, measured from top of deck to top of barrier, of 54 inches.

2.1.19 Bridge Drainage

Design and construct the bridge deck drainage and bridge end drainage to ensure that the minimum requirements of the SCDOT Bridge Design Manual are met and that erosion of the end fill slopes is prevented due to excessive run off at the bridge ends. In addition, comply with the SCDHEC-OCRM Critical Area Permit and CZC Certification provisions in Exhibit 4g.

2.1.20 Pile Sizes and Types

Minimum pile sizes and acceptable pile types are listed below. No other pile types are permitted.

PILE TYPE	MINIMUM SIZE
Steel H-Piles	HP12x53
Steel Pipe Piles	12" Diam. (min. wall thickness equal to 1/2")
Solid Prestressed Concrete Piles	18" Square
Prestressed Concrete Pile Points	W8x58

2.1.21 Steel Piles

Do not use steel piles in the splash zone or water column. The water column includes the scour zone. Design steel piles for a 75 year service life based on the results of the Corrosion Series Testing required by the SCDOT Geotechnical Design Manual. At a minimum, apply a corrosion rate of 0.001 inch per year to each surface of steel piles that is exposed to soil.

2.1.22 Steel Pipe Pile Connection Details

The pile connection detail described in Item 2 of Section 19.2.6.3 of the SCDOT Bridge Design Manual does not apply for this project. Terminate steel pipe piles at the bottom of the end bent cap and footing. Connect the piles to the cap and footing using a reinforced concrete infill, with the reinforcing extending into the cap or footing.

2.1.23 Drilled Shaft Diameters

SCDOT Bridge Design Memorandum DM0111 contains a requirement to detail the portion of shaft below the construction casing with a diameter that is six inches smaller than the diameter of the casing. This six-inch reduction requirement does not apply to this project. For this project, detail the portion of the shaft below the bottom of the construction casing, whether in soil or rock, with a diameter that is at least two inches smaller than the diameter of the casing.

2.1.24 Crosshole Sonic Logging (CSL) Testing

Install Crosshole Sonic Logging (CSL) access tubes in all drilled shafts in accordance with the SCDOT Standard Specifications for Highway Construction, 2007 Edition. SCDOT will conduct CSL testing on all of the shafts.

2.1.25 Substructures

Construct Interior Single and Multi-Column Bents using cast-in-place reinforced concrete bent caps and columns supported on cast-in-place reinforced concrete drilled shafts or pile footings. Deep foundations are required to extend below any compacted fill. ~~Set the tops of footings in accordance with Section 19.5.5 of the SCDOT Bridge Design Manual. In cases where there is pavement immediately above the footing, locate the top of footing a minimum of two feet below the pavement structure.~~

The first sentence of Item 1 in Section 19.5.5 of the SCDOT Bridge Design Manual does not apply to this project. For this project, there is not a minimum backfill requirement above the top of the footing unless there is pavement immediately above the footing. The bottom of the footing may be constructed at any elevation that is equal to or lower than the lower of the existing ground line or the finished ground line. If any portion of a footing extends above grade, maintain a minimum of 30 feet between the edge of the footing and the edge of travel lanes of adjacent roadways and a minimum of 50 feet between the edge of the footing and the centerline of existing and proposed railroad tracks. In cases where there is pavement immediately above a footing, locate the top of footing a minimum of two feet below the pavement structure. If the top of a footing is above grade, detail the top of the footing with a minimum of a 48:1 slope down towards the edges of the footing.

If a drilled shaft is extended above ground, above the scour line, or through liquefiable soil, structurally design the shaft as a column and detail the longitudinal reinforcing steel with a maximum spacing of 8 inches center-to-center.

Construct Interior Pile Bents using cast-in-place reinforced concrete bent caps and a single row of vertical prestressed concrete piles (with or without prestressed concrete pile points). Do not use Interior Pile Bents to support a span having a length that exceeds 70 feet. Do not locate Interior Pile Bents within a distance of 30 feet from the edge of a roadway. Do not locate Interior Pile Bents within a distance of 50 feet from the centerline of an existing or proposed (future) railroad track.

The following applies to bent cap cantilevers for end bents and interior pile bents:

- For a cap supported by prestressed concrete piles, provide a minimum of the equivalent of 2 pile widths of distance from the centerline of the exterior pile to the end of the cap.
- Do not detail the intersection of the centerlines of bent and exterior beam/girder on the bent cap cantilever.
- Provide a distance from the centerline of exterior pile to the edge of a slab superstructure, measured along the bent cap centerline, that is less than or equal to 30 percent of the average pile spacing of the bent.

Construct end abutments as either vertical abutments or spill through type abutments (2:1 maximum slope). Construct vertical abutments using cast-in-place reinforced concrete or MSE walls. At MSE walls, use bridge ends consisting of cast-in-place reinforced concrete caps supported with piles or cast-in-place reinforced concrete drilled shafts that are set back behind the MSE wall faces as shown in SCDOT Bridge Drawings and Details.

Locate all new bridge substructures and walls at abutments to provide the horizontal clearance required by Figure 13.5B in the SCDOT Highway Design Manual (HDM) except as shown otherwise on the drawing titled “Typical Sections of I-26 Showing Future Eight Lane Section”. This drawing is included in Attachment B. In instances where this clearance does not satisfy the Clear Zone requirements in Figure 14.3A in the SCDOT HDM, protect the structure in accordance with SCDOT requirements.

As indicated in Exhibit 4g, do not locate Ramp A substructures within the salt-marsh wetlands located between Austin Ave and I-26, north of Peace Street.

2.1.26 Integral Interior Bent Caps

If integral interior bent caps are used on this Project, construct the caps using cast-in-place concrete.

2.1.27 Slope Protection

For bridges located over water or streams, protect the bridge end fills with rip rap in accordance with Standard Drawing 804-105-00. At all other bridge end fills, provide concrete slope protection. Construct concrete slope protection with a minimum thickness of 4 inches. Use details and notes as applicable that are located on Drawing No. 804-1 of the SCDOT Bridge Drawings and Details and that conform to the requirements of Section 804 of the Standard Specifications for Highway Construction.

2.1.28 Barriers Supported by Moment Slabs

When required, provide barriers supported by moment slabs that are designed in accordance with the AASHTO LRFD Bridge Design Specifications. Detail the moment slabs independently of MSE walls as shown on Drawing No. 713-01d of the SCDOT Bridge Drawings and Details.

2.1.29 Bridge Plans

As required by the SCDOT Bridge Design Manual, include in the bridge plans Reinforcing Steel Schedules and Quantities Tables for each bridge component (end bents, interior bents, spans, etc.). When these components are required to be constructed in stages, break the Reinforcing Steel Schedules and Quantities Tables down by stage.

2.1.30 Span Arrangements over Shipyard Creek

Design and construct bridges crossing Shipyard Creek to provide a horizontal clearance of no less than 30 feet centered about the navigational channel.

2.1.31 Ramp A, B, C, and D Bridges

Design and construct the Ramp A, B, and C Bridges in a manner that does not require the relocation of the 16-inch gas line that is located on the eastern side of I-26. In addition, design and construct Ramp A and D Bridges to allow for the existing I-26 Overpass over Solvay Access Road/RR/Austin Ave. to be widened or replaced to accommodate the future eight lane section of I-26 (a 2.5-foot Median Barrier, a 10-foot Inside Shoulder in each direction, four 12-foot Travel Lanes in each direction, a 12-foot Outside Shoulder in each direction, and two 18-inch Barrier Parapets).

2.1.32 Mainline Bridge

Between Station 73+00 and Station 76+00 of the Mainline, provide a bridge span that has a minimum length of 200 feet and a low chord of Elevation 35.0 or higher. Support this span with bridge bents that are perpendicular (no skew) to the roadway alignment and provide a minimum horizontal clearance of 190 feet between all above grade elements of the supporting bents. ~~From Station 67+50 to Station 75+50 of the Mainline, provide bridge spans that have a minimum length of 200 feet, bridge spans that have a low chord of Elevation 35.0 or higher, and bridge bents that are perpendicular (no skew) to the roadway alignment.~~

In addition, design and construct the Mainline Bridge in accordance with the requirements of Article XI.C.5 of the Agreement.

2.2 Retaining Walls

2.2.1 Mechanically Stabilized Earth (MSE) Walls

Design and construct MSE walls in conformance with Supplemental Technical Specification SC-M-713 and SCDOT Bridge Drawings and Details, Drawing No. 713-01.

Construct MSE wall facing using precast concrete panels with a deep fractured fin finish in accordance with Standard Drawing 701-950-01.

Provide a minimum of 3 feet of clear distance between the fill face of the MSE wall panels and the piles or drilled shafts. For two staged walls, provide a minimum of 3 feet of clear distance between the fill face of stage 1 and the piles or drilled shafts.

Design wall heights and lengths to provide adequate cover for roadway and bridge drainage inlets and pipes in the roadway approaches. In addition, design wall heights and lengths to provide adequate slope transitions to maintain stable shoulders and slopes and design clearances and templates in accordance with the design criteria.

Do not use MSE wall structures that have wall heights exceeding 40 feet.

Provide a concrete paved drainage ditch along the top of the wall as shown on the SCDOT Bridge Drawings and Details.

2.2.2 Reinforced Concrete Walls

Base selection criteria for reinforced concrete walls on FHWA Publication FHWA NHI-07-071 entitled Earth Retaining Structures, 2008.

Design these walls in accordance with the AASHTO LRFD Bridge Design Specifications and FHWA Publication FHWA NHI-07-071 entitled Earth Retaining Structures, 2008.

Provide a concrete paved drainage ditch along the top of the wall if the retained soil slopes towards the back of the wall.

Design steel piles in accordance with Section 2.1.21. Spread footings are permitted for concrete retaining walls that are not directly supporting bridges.

2.2.3 Other Wall Types

Other acceptable wall types include Precast Counterfort walls (which are permitted in conjunction with traditional MSE walls in partial rock cuts), Tangent Pile/Secant Pile walls, Anchored walls, Sheet Pile walls having

reinforced concrete coping, Soldier Pile and Lagging walls, and Soil-Nailed walls. Design steel piles in accordance with Section 2.1.21.

Prior to commencing any designs of other wall types as specified herein, submit to SCDOT the wall type selected, design methodology, design criteria, and material and construction specifications for review. In the design criteria, include wall geometry and location, resistance factors, soil properties, and material properties of the wall. If the walls support bridge embankments, also submit conceptual bridge plans in accordance with Section 3.2 of the SCDOT Bridge Design Manual. Submit shop plans and any calculations for other wall types in accordance with Section 725 of the SCDOT 2007 Standard Specifications for Highway Construction.

Provide a concrete paved drainage ditch along the top of the wall if the retained soil slopes towards the back of the wall.

2.2.4 Plans Preparation

Retaining wall plans are typically included within the set of roadway plans and the sheets are numbered using an “S” prefix. Include the following information in the wall construction plans:

2.2.4.1 Design Information

Indicate the design parameters.

2.2.4.2 Plan View

Provide a plan view that includes the following information and details:

- proposed wall location,
- centerline of roadway,
- stationing,
- stations and offsets of beginning and end of wall,
- length of wall,
- guard rail (if required),
- drainage basins/flumes,
- construction staging (if required),
- north arrow,
- existing structures, features, and utilities in vicinity of the wall if they impact construction,
- temporary shoring (if required), and
- boring locations.

2.2.4.3 Elevation View

Provide an elevation view that shows the top of the wall elevations, footing elevations (when applicable), and the existing ground line. In the elevation view, also show the final ground line along each face of the wall.

2.2.4.4 Details

Include details of each wall component and requirements of the architectural or finish treatment.

2.2.4.5 Cross Sections

Provide section views of the wall.

2.2.4.6 Reinforcing Steel Schedule and Quantities

If the construction of the wall includes reinforcing steel, include a reinforcing steel schedule that lists the reinforcing steel required for the wall. In this schedule, include the mark, number of bars required, and dimensions for each reinforcing bar. Also, provide a table of estimated quantities for each wall. For projects requiring stage construction, break the reinforcing steel schedule and quantities down by stage.

2.2.4.7 Special Details

Include details for construction of walls around buried foundations, drainage facilities, pipe penetrations, and utilities.

2.2.4.8 Boring Logs

Include copies of the boring logs.

2.3 **Box Culverts**

2.3.1 Design Specifications

Design all new culverts in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications. Use the HL-93 live loading.

The Contractor may design extensions of existing culverts in accordance with the Seventeenth Edition of the AASHTO Standard Specifications for Highway Bridges if the existing culvert was designed using the AASHTO Standard Specifications for Highway Bridges. If this option is selected, design for HS 20-44 Loading or an Alternate Military Loading of two

axles four feet apart with each axle weighing 24,000 pounds, whichever produces the greater stress.

Hydraulically design culverts that convey water in accordance with the requirements of the SCDOT Requirements for Hydraulic Design Studies.

Perform subsurface investigations for culverts in accordance with the requirements of the SCDOT Geotechnical Design Manual.

Consider seismic effects for new culverts as required by the SCDOT Seismic Design Specifications for Highway Bridges.

2.3.2 Materials

Use Class 4000 concrete for cast-in-place elements of culverts and use Class 5000 concrete for precast elements of culverts.

Use reinforcing bars conforming to the requirements of ASTM A 706, Grade 60. Use Welded Wire Fabric that meets the requirements of AASHTO M 55 or AASHTO M 221.

2.3.3 Design and Detailing Requirements

2.3.3.1 General

Culverts will not be allowed as a substitute for bridges specified in this project. Construct culverts with four sides and using reinforced concrete.

Establish the length of the culvert so that, at the end of the culvert, the theoretical fill slope is 1 foot below the top of the top slab. Locate the culvert headwalls outside of the adjusted clear zone (see SCDOT Standard Drawing No. 805-010-00) where practical or shield the exposed portions of the structure appropriately.

Detail weep holes and French drains in accordance with Section 702 of the SCDOT Standard Specifications for Highway Construction. Locate the weep holes 12 inches above the normal water line.

For culverts that convey water, detail rip rap and geotextile fabric at both ends of the culvert in accordance with SCDOT Standard Drawing No. 804-205-00.

From the beginning of construction until the end of the 75-year design life of the culvert, limit the settlement to 8 inches. Limit the maximum allowable differential settlement along the length of a culvert to 1 inch per 50 feet of culvert length. If deep

foundations are used to limit the settlement of a culvert, limit the longitudinal differential settlement between the culvert and the adjacent paved embankment to a maximum of 1 inch in 20 years.

Detail additional reinforcing steel at openings in the top slab or side walls to meet or exceed the reinforcement shown on SCDOT Standard Drawing No. 722-105-02.

Detail all box culverts, whether cast-in-place or precast, with cast-in-place wing walls, head walls, aprons, and cut-off walls on both the inlet and outlet ends. Do not use precast wing walls, head walls, aprons, cut-off walls, and footings.

In situations where guardrail is required and installation of the posts conflicts with the top slab of the culvert, detail a 12'-6" long span of nested guardrail to bypass the culvert if site and culvert geometry permit. For details of this nested guardrail, see SCDOT Standard Drawing No. 805-565-00. As shown on this drawing, detail a 10:1 or flatter slope for the shoulder area and maintain a minimum 5'-6" offset between the face of the guardrail and the back of the head wall. When nested guardrail is required, include on the plans a note specifying that the guardrail installation must comply with SCDOT Standard Drawing No. 805-565-00.

If guardrail is required and site and culvert geometry do not permit the nested guardrail installation, provide a moment slab to anchor the guardrail. Design and detail the moment slab to eliminate transfer of moment to the culvert barrel. If the moment slab is attached to the culvert barrel for resistance to sliding forces, design and detail the connection to resist horizontal sliding forces only.

2.3.3.2 Wing Walls

Wing walls are typically flared out approximately 30 degrees in relation to the centerline of the culvert, but the angle may vary based on site conditions. Detail the wing walls so that the top of the wing wall is at least 12 inches above the finished ground line. Design and detail the wing wall height so that, at the junction of the wing wall and culvert barrel, the top of the wing wall is the same elevation as the top of the top slab of the culvert barrel. Extend the wing wall at least to a point where the soil can wrap around the exposed face of the wing wall, using a slope of 2H:1V or flatter, without encroaching on the projected barrel opening.

Support wing walls by footings or aprons, but assume no support from the culvert barrel(s).

Detail the thickness of wing walls equal to or greater than the exterior wall thickness of the culvert. If the maximum wing wall height is greater than 5 feet and the wing wall has a layer of reinforcing in each face, provide a minimum of 5 inches of clearance between the mats of reinforcing steel.

2.3.3.3 Aprons

For box culverts, detail aprons as continuously cast-in-place concrete placed from end to end of the wing walls. Aprons may cover the entire area between the wing walls and the ends of the culvert barrel(s) or may follow the edges of the wing wall/culvert barrel(s). Detail the thickness of the aprons equal to or greater than the thickness of the bottom slab unless the bottom slab thickness exceeds 12 inches. If the bottom slab thickness exceeds 12 inches, detail the apron thickness as 12 inches unless a thicker apron is required by design.

2.3.3.4 Cut-off Walls

Detail cut-off walls with a minimum thickness of 10 inches. Detail cut-off walls to extend a minimum of 2 feet below the bottom of the bottom slab or apron. Detail cut-off walls to extend to a depth 2 feet below the scour depth or into unweathered rock. If cut-off walls are used as structural elements, design and detail appropriate reinforcement.

2.3.3.5 Head Walls

Detail head walls with a minimum height of 12 inches above the finished ground line and a minimum thickness of 12 inches. Detail head walls to extend the full width of the culvert barrel(s).

Anchor the head walls to the top slabs of culverts with reinforcing steel that has been designed and detailed to resist overturning and sliding. Detail each face of the head wall with a minimum of 0.2 square inches of reinforcing steel per foot in each direction.

2.3.3.6 Concrete Cover

For cast-in-place box culverts, provide concrete cover to reinforcing in accordance with the AASHTO LRFD Bridge Design Specifications. For W/C ratios that are less than or equal to 0.4, use a concrete cover modification factor of 1.0.

For precast box culverts in counties other than Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper, detail the clear cover as shown in ASTM C 1433 and ASTM C

1577. For precast box culverts that convey intermittent flow in Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper counties, detail the clear cover as shown in ASTM C 1433 and ASTM C 1577. For precast box culverts that convey permanent flow in Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper counties, detail a minimum of 3 inches of clear cover for reinforcing.

2.3.3.7 Extensions

Construct all box culvert extensions of existing cast-in-place culverts using cast-in-place concrete. Construct extensions of existing precast culverts using either precast sections or cast-in-place concrete. If precast sections are used, design and detail the extensions with a cast-in-place concrete transition between the end of the existing barrel and the first new section of precast barrel.

For extensions of existing culverts, detail adhesive anchors, #6 (#19) or greater in size, at a maximum spacing of 18 inches in the exposed ends of the existing barrel. Match the interior barrel shape of the new culvert to that of the existing culvert (i.e. chamfers, ledges, etc.) except as noted in Section 2.3.4.3.

2.3.4 Cast-in-Place Concrete Box Culverts

2.3.4.1 General

For culverts with skews greater than 25 degrees, design and detail the transverse reinforcing steel perpendicular to the longitudinal reinforcing steel. For lesser skew angles, design and detail the transverse reinforcing steel either perpendicular or parallel to the skew.

At the discontinuous edges of culvert barrel sections, design edge beams for the top and bottom slabs.

2.3.4.2 Slabs

Use a minimum thickness of 10 inches for cast-in-place box culvert top and bottom slabs.

2.3.4.3 Walls

Detail cast-in-place box culvert walls vertical and detail a minimum thickness of 8 inches. If the vertical opening dimension of the culvert is greater than 5 feet, provide a minimum of 5 inches of clearance between mats of reinforcing in the walls.

For extensions of existing multi-barrel culverts having interior wall thicknesses less than the new wall thicknesses, detail a minimum 6:1 transition at the junction of the new and existing interior walls.

2.3.4.4 Construction Joints

Limit the maximum pouring length of cast-in-place culvert barrel sections to 70 feet. Detail keyed transverse construction joints in the barrel(s) as required to meet this limit. Detail the longitudinal reinforcing steel continuous across the joints.

If the volume of cast-in-place concrete exceeds 225 CY in any pour, provide a pouring sequence on the plans. Complete all concrete pours in less than 5 hours. If a pouring rate greater than 45 CY/hr is needed, indicate on the plans the required pouring rate.

Detail a keyed construction joint in the walls, 4 inches above the top of the bottom slab. When the height of the wall, measured from the top of the bottom slab, is 8 feet or greater, also detail a keyed construction joint between the walls and top slab.

For construction joints located between elevations of extreme low tide and extreme high tide, include requirements on the plans for the joint to be sealed. Detail each exterior side of the joint with a ½ inch chamfer on the upper side of the joint. Specify on the plans that the Contractor seal this ½ inch chamfer with a bonding epoxy conforming to ASTM C 881, Type IV, Grade 3, and that the Contractor apply the epoxy in accordance with the manufacturer's written instructions.

2.3.5 Precast Concrete Box Culverts

2.3.5.1 General

Do not use precast box culvert sections if any of the following conditions exist:

- the design earth cover exceeds 20 feet,
- the design earth cover is less than 2 feet,
- the culvert is an extension of an existing cast-in-place culvert, or
- the culvert will be used for pedestrian traffic.

Use monolithically cast box culvert sections. Do not use precast concrete split box culvert sections.

2.3.5.2 Design Requirements

Design precast box culvert sections for new culverts in accordance with ASTM C 1577 except when clear cover for reinforcing is required to be 3 inches. Design precast box culvert sections for culvert extensions of existing precast culverts in accordance with either ASTM C 1577 or ASTM C 1433 except when clear cover for reinforcing is required to be 3 inches. For precast culverts having design fill heights greater than 5 feet, round the design fill height to the next higher 5 foot increment when using the tabulated design information from ASTM C 1577 or ASTM C 1433.

2.3.5.3 Detailing Requirements

Detail precast box culverts in accordance with SCDOT Standard Drawing No. 722-305-00 and Section 722 of the SCDOT Standard Specifications for Highway Construction. Require on the plans that the Contractor place all precast box culverts on a prepared bed of aggregate (Coarse Aggregate No. 5, No. 56, or No. 57) having a minimum thickness of 6 inches. Extend the aggregate bed the entire width and length of the culvert plus 3 inches beyond the outer walls of the barrel(s).

On the plans for precast box culverts, include details for cast-in-place wing walls, head walls, aprons, cut-off walls, and footings. Detail these cast-in-place elements in accordance with the requirements of Section 2.3.3. Attach these elements to the precast culvert barrel(s) using #6 (#19) adhesive anchors detailed at a maximum spacing of 18 inches in the exposed ends of the barrel(s). Design these elements as self-supporting. Use the adhesive anchors only to control differential settlement.

Where multiple precast box culvert barrels are placed side by side, the plans shall require a 3½ inch minimum and 6 inch maximum space between adjacent barrel sections. The plans shall require this space to be filled with flowable fill or cast-in-place concrete. If the space is filled with flowable fill, the plans shall require that, at both the upstream and downstream ends, the last 6 inches of space between the barrels (measured along the longitudinal direction of the barrels) be filled with a cast-in-place concrete cap for the full height of the barrels.

2.3.6 Plans Preparation

Culvert plans are typically included within the set of roadway plans and the sheets are numbered using an “S” prefix. Include the following information in the culvert plans:

2.3.6.1 Title Blocks.

In the title blocks of the culvert sheets, include the fill height used to design the culvert, the culvert opening size (span x rise), the station at centerline of culvert, and the slope of fills.

2.3.6.2 Location Sketch.

Provide a location sketch that includes the following information and details:

- proposed culvert outline,
- existing culvert outline as a light, dashed line,
- centerline of roadway,
- direction of stationing,
- station of intersection of roadway centerline and culvert centerline,
- dimensions of culvert barrels,
- length of each end of culvert measured from the roadway centerline,
- skew angle,
- construction staging (if required),
- temporary shoring locations (if required for construction),
- permissible types of temporary shoring (if restricted),
- stream name,
- direction of flow,
- limits of riprap or note that riprap in accordance with SCDOT Standard Drawing No. 804-205-00 (if required),
- north arrow,
- existing structures, features, utilities in vicinity of culvert if they impact culvert construction,
- invert elevations at each end of new culvert or both ends of each side being extended,
- boring locations, and
- hydraulic data.

2.3.6.3 Design Information.

Indicate the design specification and live load in the plans.

2.3.6.4 Plan View.

Provide a plan view that details the culvert, apron, cut-off wall, wing wall, and footing dimensions; the reinforcing bars, bar callouts, and bar spacing; and the location of any required transverse construction joints.

2.3.6.5 Cross Section

Provide section views of the barrel(s), wing walls, head walls, aprons, cut-off walls, and footings detailing the dimensions; the reinforcing bars, bar callouts, and bar spacing; the weep holes and french drains; and the location of construction joints.

2.3.6.6 Reinforcing Steel Schedule and Quantities

For each culvert, include a reinforcing steel schedule that lists the reinforcing steel required for the culvert. In this schedule, include the mark, number of bars required, and dimensions for each reinforcing bar. Immediately below the reinforcing steel schedule, include a list of estimated quantities for the culvert. Include all quantities required for construction of the culvert (e.g., reinforcing steel, concrete, piling, excavation, riprap, geotextile, etc.). For projects requiring stage construction, break the reinforcing steel schedule and quantities down by stage.

2.3.6.7 Boring Logs

Include copies of the boring logs in the plans.

2.4 Sound Barrier Walls

2.4.1 Design Specifications

Except as noted otherwise in these requirements, design sound barriers in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications.

Modify Section 15 of the AASHTO LRFD Bridge Design Specifications by replacing the third and fourth paragraphs of Article 15.8.2 with the following:

“For sound barriers, base the wind velocity at 30.0 feet above low ground or above design water level, V30, on the county in which the barrier is located. For Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper Counties, use 110 mph for V30. For Aiken, Allendale, Bamberg, Barnwell, Calhoun, Clarendon, Dillon, Florence, Hampton, Marion, Orangeburg, and Williamsburg Counties, use 100 mph for V30. For all other counties, use 90 mph for V30. For a project that crosses a county line, design all sound barriers in the project for the higher wind velocity of the two counties if the velocities are different.

For sound barriers, use the factors V_o and Z_o only from the Coastal, Open Country, and Sparse Suburban columns of Table 15.8.2-1.”

2.4.2 Materials

Construct ground-mounted sound barrier walls using cast-in-place concrete, precast concrete panels and/or precast concrete posts. Support the barriers by spread footings, driven or drilled piles, or drilled shafts.

Use Class 4000 concrete for cast-in-place concrete, Class 4000P concrete for non-prestressed precast concrete, Class 5000 concrete for precast, prestressed concrete, and Class 4000DS concrete for drilled shafts and drilled piles.

Use reinforcing bars conforming with the requirements of ASTM A 706, Grade 60. Use Welded Wire Fabric meeting the requirements of AASHTO M 55 or AASHTO M 221. Use prestressing strands that are low-relaxation, 7-wire strands and that conform to AASHTO M 203, Grade 270.

Use elastomeric bearing pads conforming with the requirements of Section 724 of the SCDOT Standard Specifications for Highway Construction.

Use steel H-piles, steel pipe piles, prestressed concrete piles, or combination piles (prestressed concrete piles with steel pile extensions). If steel piles are extended and used as posts, detail the post portions of the piles with a precast concrete encasement that extends to at least 2 feet below the finished ground line.

2.4.3 Design and Detailing Requirements

2.4.3.1 General

The maximum permissible wall height is 25 feet. Detail the top of wall not to exceed a 2 feet vertical step between adjacent panels. Detail the wall panels to extend a minimum of 6 inches below the finished ground line. If a leveling pad is used, construct the pad of reinforced concrete that is a minimum of 6 inches thick and that extends a minimum of 3 inches beyond each face of the panel.

Design and detail the wall to accommodate obstructions (drainage, light or sign foundations, utilities, etc.) in the foundation zone.

Do not use precast panels that are longer than 20 feet. Use a consistent panel length for the entire length of the wall. Detail panels located in a horizontal curve to follow the roadway alignment. To minimize the chording effect of panels in a horizontal curve, consider the need to use shorter length panels.

2.4.3.2 Foundation Design

Perform subsurface investigations for sound barriers in accordance with the requirements of Section 4.3.6 of the SCDOT Geotechnical Design Manual.

Evaluate overall static and seismic stability of the ground supporting the sound barrier foundation system using the requirements of the SCDOT Geotechnical Design Manual. If it is determined that ground improvements are required, use a design methodology and construction specifications that comply with the requirements of the SCDOT Geotechnical Design Manual.

Calculate pile embedment design methodology for lateral stability using P-y curves developed for the soils at the site, as used in LPILE.

Over the 75-year design life of the wall, limit the vertical settlement at any point of the wall to a maximum of 3 inches and limit the vertical differential settlement along the wall to a maximum of 1.25 inches in 50 feet. Limit the lateral displacement of the foundation at the base of the wall to a maximum of 1 inch.

2.4.3.3 Seismic Design

For the Acceleration Coefficient (A), use the Peak Ground Acceleration (PGA) for the Functional Evaluation Earthquake as modified by the appropriate Site Class.

2.4.3.4 Wind Design

Limit the maximum deflection at the top of the wall due to service wind load to the lesser of 1/50 of the wall height or 5 inches (deflection measured relative to the point of fixity in the soil).

2.4.3.5 Concrete Cover

Provide concrete cover that meets or exceeds the requirements of Section 15.3.1.2 of the SCDOT Bridge Design Manual.

2.4.3.6 Traffic Railing

If the sound barrier wall or any portion of it functions as a traffic rail and aesthetic treatments are used, detail the aesthetic treatments of the railing portion to comply with the guidelines of NCHRP Report 554, Aesthetic Concrete Barrier Design.

2.4.3.7 Anti-Graffiti Coating

Apply an anti-graffiti coating to both sides of the concrete panels and to all exposed faces of the concrete posts.

2.4.4 Plans Preparation

Sound barrier wall plans are typically included within the set of roadway plans and the sheets are numbered using an “S” prefix. Include the following information on the sound barrier wall construction plan sheets:

2.4.4.1 Design Information

Indicate the design parameters in the plans.

2.4.4.2 Plan View

Provide a plan view that includes the following information and details:

- proposed sound barrier wall location,
- centerline of roadway,
- horizontal clearance to edge of adjacent travel lane,
- stationing,
- stations of beginning and end of wall,
- length of sound barrier wall,
- post spacing,
- guard rail,
- drainage basins/flumes,
- locations and types of openings,
- construction staging,
- north arrow,
- existing structures, features, and utilities in vicinity of the sound barrier wall if they impact construction,
- boring locations, and
- benchmark data.

2.4.4.3 Elevation View

Provide an elevation view that shows the top of the wall elevations and the existing ground line. In the elevation view, also show the final ground line along each face of the wall.

2.4.4.4 Details

Include details of each wall component (concrete panels, panel connections, posts, and foundation elements) and details of the architectural or finish treatment.

2.4.4.5 Cross Sections

Provide section views of the wall, posts, and foundations.

2.4.4.6 Reinforcing Steel Schedule

For each wall, provide a reinforcing steel schedule that lists the reinforcing steel required for the wall. Include in this schedule the mark, number of bars required, and dimensions for each reinforcing bar. For projects requiring stage construction, break the reinforcing steel schedule down by stage.

2.4.4.7 Special Details

Include details in the plans for construction of walls around buried foundations, drainage facilities, pipe penetrations, and utilities. Also, include details for special features such as access doors and wall bends.

2.4.4.8 Boring Logs

Include copies of the boring logs.

2.5 Concrete Median Barriers

Slope the traffic faces of concrete median barrier at a constant 10.78 degrees (1H:5.25V) away from traffic. Provide an 8-inch minimum top barrier width and a minimum height, measured from top of pavement to top of barrier, of 54 inches. Apply the following requirements when designing concrete median barriers:

Condition A – Concrete Median Barrier with grade separations of less than 6 inches: Use details from the SCDOT Standard Drawings.

Condition B – Concrete Median Barrier with grade separations of 6 inches to 20 inches: Reinforce the barrier wall in accordance with Chapter 7 of Midwest States' Regional Pooled Fund Research Program: Development of a TL-5 Vertical Faced Concrete Median Barrier Incorporating Head Ejection Criteria (<http://nlcs1.nlc.state.ne.us/epubs/R6000/B016.0124-2007.pdf>). Calculate and detail the minimum expansion joint spacing required for stability analysis to resist the overturning of the Test Level 4 impact force at the increased moment arm generated by the grade separation.

Condition C – Concrete Median Barrier with grade separations between 20 inches and 36 inches: In addition to the design requirements of Condition B, design the barrier in accordance with AASHTO LRFD Bridge Design Specifications for a Test Level 4 impact, omitting Extreme Event I requirements.

Condition D – Concrete Median Barrier with grade separations 36 inches and greater: In addition to the design requirements of Condition B, design a cantilever wall barrier in accordance with AASHTO LRFD Bridge Design Specifications for a Test Level 4 impact and in accordance with SCDOT seismic design requirements.

For Conditions B, C, and D, use a transverse impact force of 54 kips for the strength design of the barrier as required by AASHTO. However, when evaluating the stability of the barrier, use a transverse force of 10 kips instead of the 54-kip load.

3.0 DELIVERABLES

Prior to submittal, subject all submittals to SCDOT to a thorough QC review.

3.1 Preliminary Structural Plans

For each bridge, submit two half size sets and an electronic copy (in PDF format) of Preliminary Structural Plans for SCDOT's review. Include in the Preliminary Structural Plans, at a minimum, all items described in Chapter 3 of the SCDOT Bridge Design Manual. Partial submittal of the required contents of the preliminary set of plans will not be allowed. Submit the Preliminary Geotechnical Report with the preliminary plans.

3.2 Preliminary Seismic Design Summary Report

Along with the preliminary bridge plans submittal, submit one hard copy and one electronic copy (in PDF format) of the Preliminary Seismic Design Summary Report documenting the strategy that is planned to achieve the required seismic performance criteria for the bridge. Describe in the report the seismic design approach for the bridge and include, at a minimum, the following information:

- a discussion of the expected performance of the bridge in regard to elastic and inelastic behavior (locations where plastic hinging is expected),
- maximum ductility demands,
- a description of design features required to meet the critical performance requirements of the SCDOT Seismic Design Specifications for Highway Bridges,
- the name(s) of computer software that will be used for modeling,
- any unique structural and geotechnical issues affecting the seismic design, and
- the design response spectrum (when a site-specific study is required).

If any changes to the seismic design strategy are made during the design process, modify the report and resubmit it to the Department for review.

3.3 Final Structural Plans

For each bridge, submit two half size sets and an electronic copy (in PDF format) of Final Structural Plans for SCDOT's review. Include in the Final Structural Plans, at a minimum, all items described in Chapter 3 of the SCDOT Bridge Design Manual. Partial submittal of the required contents of the final set of plans will not be allowed. Submit the Final Geotechnical Report with the final plans.

3.4 Final Seismic Design Summary Report

Along with the final bridge plans submittal, submit two hard copies and one electronic copy (in PDF format) of the Final Seismic Design Summary Report. Ensure the Final Seismic Design Summary Report is signed and sealed by a State of South Carolina licensed Professional Engineer. As a minimum, include the following in the Final Seismic Design Summary Report:

- the required Seismic Design Specifications,
- a project description,
- discussion of changes from the Preliminary Seismic Design Summary (if applicable),
- seismic design criteria and objectives, including Operational Classification, design earthquake(s), ADRS, and SDC,
- expected service performance and damage levels,
- ductility and displacement criteria,
- seismic design approach and strategy criteria to achieve the required seismic performance; including seismic load path, potential plastic hinges, and any unique aspects of the project,
- liquefaction assessment and any geotechnical recommendations,
- seismic analysis/design software used in the project (include discussions regarding the structural and geotechnical modeling aspects for the bridge),
- seismic detailing, and
- tabulated results for the design earthquake(s) tension and compression models as applicable for variations of liquefaction and scour, including:
 - longitudinal and transverse fundamental periods,
 - mass participation,
 - displacement demand,
 - yield displacement,
 - displacement capacity,
 - displacement performance limits,
 - displacement capacity check,
 - ductility demand check, and
 - ductility capacity check.

3.5 Design Calculations

Provide an electronic copy (in PDF format) of all structural design calculations to SCDOT.

3.6 Release for Construction (RFC) Plans

Provide one full size set of RFC Plans to SCDOT. Ensure RFC plan submittals to SCDOT are signed and sealed by the State of South Carolina licensed Professional Engineer of Record. Insert RFC Plans into plan covers as detailed in the SCDOT Bridge Design Manual.

3.7 Shop Plans

Submit shop plans, as defined by the Standard Specifications for Highway Construction, to the Contractor's designer for review and approval. Route all approved shop plans to SCDOT for review and distribution. Provide shop plan submittals that meet the criteria of Subsection 725.1.1 of the Standard Specifications for Highway Construction. After reviewing the plans, SCDOT will either distribute the plans or provide comments. If comments are provided, the Contractor's designer shall review the comments prior to resubmitting to the SCDOT for further review. The Contractor's designer shall stamp the shop plans "approved" prior to submittal to SCDOT. SCDOT will stamp and distribute the plans. Do not commence fabrication and construction/erection until after SCDOT distributes the plans. The responsible engineer, registered as a Professional Engineer in the State of South Carolina, shall seal, sign, and date all design calculations and shop plans.

3.8 Working Drawings

Submit working drawings and design calculations, as defined by the Standard Specifications for Highway Construction, to the Contractor's designer for review and approval. Route all approved working drawings and design calculations to the SCDOT for review and distribution. Provide working drawings and design calculation submittals that meet the criteria of Subsection 725.1.2 of the Standard Specifications for Highway Construction. SCDOT will review the drawings and calculations and either provide acceptance of the drawings as prepared or provide comments. If comments are provided, the Contractor's designer shall review the comments prior to resubmittal to SCDOT for further review. The Contractor's designer shall stamp the working drawings and design calculations "approved" prior to submittal to SCDOT. SCDOT will stamp and distribute the drawings and calculations. Do not commence construction/erection until after SCDOT distributes the drawings and calculations. The responsible engineer, registered as a Professional Engineer in the State of South Carolina, shall seal, sign, and date all design calculations and working drawings. SCDOT will review the working drawings and design calculations only to verify that the specifications have been addressed.

EXHIBIT 4c

PAVEMENT DESIGN CRITERIA

1.0 GENERAL

The pavement shown in the Typical Section included in the SCDOT Conceptual Plans provided in Attachment C is for information only. The design for pavement shall conform to the criteria listed in Section 2.0.

Milled-in rumble strips shall be used on all mainline I-26 shoulders, both inside and outside, in accordance with SCDOT Standard Drawings and specifications for the entire project.

2.0 CRITERIA

2.1 Mainline Connector Pavement and Ramps

Construct a plain jointed Portland Cement Concrete (PCC) pavement.

2.1.1 PCC Pavement

Thickness:	12”
Transverse Joint Spacing:	15’
Transverse Load Transfer:	1.5” dowels, 18” long, spaced 12” c-c, mainline only
Longitudinal Reinforcement:	#4 deformed bar, 30” long, 30” c-c
Surface Texture:	Diamond Grind
Joint Sealant:	Silicone, 3/8” wide longitudinal and transverse
Nominal Compressive Strength:	4500 psi
Width:	Widened 14 feet

Base options for the pavement structure are as follows and may be alternated throughout the project as desired, although the same structure must be used transversely at any location unless the differing options are separated by an earth median or otherwise approved by the RCE.

- Option 1:** 175 psy Asphalt Surface Type C, 8 inches Graded Aggregate Base
- Option 2:** 450 psy Asphalt Base Type A
- Option 3:** Fabric Interlayer, 6 inches Cement Stabilized Aggregate Base

2.2 Bainbridge Connector

Construct a plain jointed PCC pavement.

2.2.1 PCC Pavement

Thickness:	10”
Transverse Joint Spacing:	15’
Transverse Load Transfer:	1.5” dowels, 18” long, spaced 12” c-

	c, mainline only
Longitudinal Reinforcement:	#4 deformed bar, 30” long, 30” c-c
Surface Texture:	Diamond Grind
Joint Sealant:	Silicone, 3/8” wide longitudinal and transverse
Nominal Compressive Strength:	4500 psi
Width:	Widened 14 feet

Base options for the pavement structure are as follows and may be alternated throughout the project as desired, although the same structure must be used transversely at any location unless the differing options are separated by an earth median or otherwise approved by the RCE.

Option 1: 175 psy Asphalt Surface Type C, 6 inches Graded Aggregate Base

Option 2: 450 psy Asphalt Base Type A

Option 3: Fabric Interlayer, 6 inches Cement Stabilized Aggregate Base

2.3 **Stromboli Avenue Extension**

Construct a plain jointed PCC pavement.

2.3.1 PCC Pavement

Thickness:	10”
Transverse Joint Spacing:	15’
Transverse Load Transfer:	1.5” dowels, 18” long, spaced 12” c-c, mainline only
Longitudinal Reinforcement:	#4 deformed bar, 30” long, 30” c-c
Surface Texture:	Diamond Grind
Joint Sealant:	Silicone, 3/8” wide longitudinal and transverse
Nominal Compressive Strength:	4500 psi
Width:	12 feet

Base options for the pavement structure are as follows and may be alternated throughout the project as desired, although the same structure must be used transversely at any location unless the differing options are separated by an earth median or otherwise approved by the RCE.

Option 1: 175 psy Asphalt Surface Type C, 6 inches Graded Aggregate Base

Option 2: 450 psy Asphalt Base Type A

Option 3: Fabric Interlayer, 6 inches Cement Stabilized Aggregate Base

2.4 General Notes for New PCC Pavements

For all new PCC pavements, construct an expansion joint of a design acceptable to the Department when abutting bridges or other structures. At bridge ends and other rigid obstructions, provide three (3) expansion joints one (1) inch in width located at the obstruction and 75 feet and 150 feet away from the obstruction. Obtain approval of expansion joint assembly and detail from the RCE prior to construction.

In Section 5.6.1 of SC-M-501(0308), the compressive strength of 4000 psi is removed and replaced with 4500 psi.

Section 6.3.3.1 of SC-M-501(0308) is removed and replaced with the following:

6.3.3.1 Furnish a suitable concrete compression testing machine meeting the requirements of ASTM C39. Have the machine professionally calibrated after installation in the field laboratory and prior to commencement of work. Maintain proper calibration of the equipment for the duration of the project.

Section 7.4.2 and 7.4.3 of SC-M-501(0308) shall be adjusted for compressive strength of 4500 psi such that the same percentages are applied.

No ATC's will be considered for the above defined pavement type of new PCC pavement.

2.5 New Shoulders

2.5.1 Shoulder Design

The design of shoulders is at the discretion of the Design Build Team with the limitations included in Exhibit 4C. Submit all pavement design calculations for review. Submittal schedule for pavement design on shoulders shall follow the ATC milestones. All calculations must be in accordance with SCDOT Pavement Design Guide. AASHTO's Mechanistic Empirical Pavement Design Guide (MEPDG) designs will be considered as supplementary and will not be accepted as the sole method of design.

2.5.2 HMA Shoulders

HMA Shoulders shall not have a structural number less than 3.36. Allowable base materials include: Cement Stabilized Aggregate Base, Graded Aggregate Base, Asphalt Aggregate Base, Cement Modified Subbase, PCC pavement, Roller Compacted Concrete.

2.5.3 PCC Shoulders

PCC pavement thickness shall not be less than 8 inches. Allowable base materials include: Cement Stabilized Aggregate Base, Graded Aggregate Base, Asphalt Aggregate Base, Cement Modified Subbase, PCC pavement, Roller Compacted Concrete.

Roller Compacted Concrete (RCC) is an acceptable alternate for PCC pavement. If RCC is selected, the total thickness shall not be less than 10 inches, placed in two (2) lifts.

2.6 **New HMA Pavement Spruill Avenue Widening**

Pavement surface type will be Asphalt, having a thickness of not less than two (2), two-hundred (200) pounds per square yard (psy) lifts of Surface Type B. Options for the remaining pavement structure below the two lifts of Surface Type B are as follows.

Option 1: 1100 psy HMA Base Type A

Option 2: Substitute one (1) lift of 250 psy Intermediate A for 200 psy Surface B, 10 inches Cement Stabilized Aggregate Base

Option 3: 600 psy HMA Base Type A, 9 inches Graded Aggregate Base

Option 4: 9 inches Roller Compacted Concrete

2.7 **Existing PCC Pavement**

PCC pavement not requiring reconstruction shall be diamond ground full width for the pavement prior to placement of the final pavement markings. This shall be required from the end of the Baker Hospital Boulevard bridge to the beginning of the Hagood Street bridge on Interstate 26.

2.8 **Existing HMA Pavement**

Asphalt pavement transition areas not requiring pavement reconstruction or rehabilitation but requiring revised pavement markings shall be milled 2-inches full width and resurfaced utilizing 200 lbs/sy Hot Mix Asphalt (HMA) Surface Type B.

Include 200 SY of full depth asphalt patching in accordance with the Special Provision in Exhibit 5.

Mill Existing Spruill Avenue 2 inches in areas of widening and overlay with 200 psy Surface Type B.

2.9 **Temporary Pavement**

Design of temporary pavement, including using the existing shoulder to carry the mainline traffic, is at the discretion of the Contractor. However, temporary

pavement must provide a satisfactory rideability to the public prior to opening to traffic and during construction. Satisfactory rideability is defined as any 0.1 mile segment having roughness not to exceed 170 inches per mile when tested in accordance with SC-T-125. In addition to rideability, rutting shall not exceed ¼” when the wheel paths are measured with a 4’ straightedge.

Should potholes appear in the temporary pavement the Contractor shall take action within one calendar day to temporarily fill the pothole for safety. Once per week all temporarily filled pot holes shall be full depth patched varying in depth as necessary but shall be no less than 4 inches.

If temporary pavement is to be incorporated in the final pavement structure, it must minimally meet the structural requirements given in Section 2.2 of this Exhibit. Additionally, the pavement must be free of cracks and distortion prior to overlay. If the pavement has visible wear or deterioration, then take remedial action to improve or repair the pavement to the Department’s satisfaction prior to overlaying.

2.10 Macalloy Site Stormwater Detention Area Road

Design shall insure positive drainage and provide 6 inches of maintenance stone as the finish surface. Contractor shall strip organics and prepare subgrade appropriately prior to placement of stone.

2.11 Meeting Street Road Cul-De-Sac

Pavement surface type will be Asphalt, having a thickness of not less than two (2), 200 psy lifts of Surface Type B and one (1) 450 psy lift of Base Type A.

3.0 DELIVERABLES

3.1 Pavement Design Calculations

Provide an electronic copy (in PDF format) of all calculations.

3.2 PCCP Jointing Plan

Provide an electronic copy of this plan (in PDF format) with the concrete mix design submittal. This plan must be approved prior to the placement of concrete.

EXHIBIT 4d

TRAFFIC DESIGN CRITERIA

Part 1 – Signing and Pavement Marking

1.0 GENERAL

2.0 CRITERIA

2.1 Permanent Pavement Markings

Pavement marking work on this project consists of preparing detailed pavement marking plans and applying appropriate markings for the entire length of the project including tie points to the interstate mainline, all new ramps and all new non interstate routes. All mainline and ramp edge lines and lane lines shall be to interstate standards as detailed in the Standard Drawings. The markings on all crossing routes and surface roads shall be as detailed in the Standard Drawings. For interstate ramps and the port access road, lane lines and edge lines shall be 6 inches in width. Exit and entrance gore markings shall be 12 inches in width. For all other roads, markings shall be 4 inches in width with any channelization markings being 8 inches in width. The final roadway surface material will determine which type of permanent marking material is to be applied. The CONTRACTOR shall use either polyurea or preformed tape (T-1) markings on concrete surfaces for the applications noted below. Thermoplastic markings shall be used on all asphalt surfaces. The CONTRACTOR shall install surface mounted raised pavement markers in accordance with the Standard Drawings.

Pavement marking materials used shall meet the following requirements:

1.) THERMOPLASTIC PAVEMENT MARKINGS (ASPHALT SURFACES):

All thermoplastic markings installed on the interstate mainline or any crossing routes shall meet the requirement of Section 627 of the Standard Specifications.

2.) POLYUREA PAVEMENT MARKINGS (CONCRETE SURFACES):

All polyurea markings installed on the interstate mainline, crossing routes or any bridge decks on this project shall be a liquid, multi-component system that includes highly reflective elements.

The polyurea pavement marking lines shall have a minimum dry thickness of 20 mils when placed on concrete and asphalt pavements. The pavement marking material and highly reflective elements shall be applied in a simultaneous operation.

The CONTRACTOR shall apply the polyurea resin, mixed at the proper ratio according to the manufacturer's recommendations, to the pavement surfaces within the proper application temperatures as determined by the material manufacturer. Highly reflective elements shall be injected into the molten (liquid) polyurea pavement markings in accordance with the manufacturer's recommendations using a dispenser approved by the manufacturers of both the polyurea materials and the highly reflective elements.

Upon curing, the markings shall be uniformly reflectorized and have the ability to resist deformation caused by traffic throughout the entire length of the line.

If requested by the Engineer, the manufacturer of the selected polyurea material shall provide a technical representative, or a manufacturer's certified representative, to assure proper application technique by the contractor during the initial installation of the product.

All materials will be accepted based on manufacturer's certifications.

3.) PREFORMED PATTERNED TAPE (T-1) PAVEMENT MARKINGS (OPTION FOR CONCRETE BRIDGE DECKS):

The CONTRACTOR may choose to apply performed patterned tape markings to concrete bridge decks on this project. If this option is selected the markings shall be preformed patterned tape with a raised diamond pattern covered with ceramic elements having a refractive index of 1.9 or greater. All preformed tape markings installed on the bridge decks on this project shall be installed with a truck mounted application system or other motorized applicator approved by the manufacturer.

The CONTRACTOR shall provide to the Department the manufacturer's normal warranty which shall guarantee the tape materials for a period of 72 months from the date of installation from failure to retain the minimum reflectance values provided by the manufacturer and from failure due to loss of material adhesion or complete wear through. If failure occurs, the manufacturer will provide the replacement materials to restore the markings to their original effectiveness.

2.2 **Permanent Signing**

Signing work on this project consists of preparing a detailed, comprehensive signing plan for the I-26 mainline, the new ramps and roadway for the new port facility and any surface roads. In addition, work also includes fabricating, furnishing, and erecting new ground mounted and overhead mounted signs, breakaway posts, u-channel supports, overhead sign structures and delineators. Also included is the removal and relocation of the signs, delineators, overhead structures and supports to be replaced. The location of the signing work is on I-26 from Exit 216 to Just East of Exit 218 in Charleston County.

1.) MAINTENANCE OF MAINLINE AND RAMP DIRECTIONAL AND INFORMATION (LOGO) SIGNING MOUNTED ON I-BEAM BREAKAWAY POSTS:

The existing mainline and ramp directional and information signs mounted on I-beam breakaway posts may have to be relocated due to the construction. Where relocation is necessary, the mainline signs should be mounted temporarily on 4"x6" wood posts using the method detailed on Standard Drawing 625-120-00. Ramp information signs (logo) should be mounted temporarily on 4"x4" wood posts. No

separate payment will be made for these relocations. All signs are to be maintained throughout construction.

In addition, the CONTRACTOR will be responsible for replacing signs damaged during construction which are to be retained (i.e. logo signs) and erected as part of the permanent signing. A Department representative should conduct an inspection/evaluation prior to and at the conclusion of construction to determine in any damage occurred during execution of the contract.

2.) BRIDGE CLEARANCE AND CROSSING ROUTE INFORMATION SIGNING:

The CONTRACTOR will be required to erect bridge vertical clearance and crossing route number flat sheet signs on the new bridge in both directions of travel. The signs shall be fabricated in accordance with the SCDOT sign numbers shown in the table below. The CONTRACTOR shall determine the actual minimum vertical clearance in each direction after all interstate mainline or crossing route surfacing is completed.

SCDOT Sign Number	Sign Description	Crossing Route Type
W12-2P-78	Vertical Clearance	All
OHB M1-1-48	Crossing Route Information	Interstate – 2 or 3 digit
OHB M1-4-48	Crossing Route Information	US Route – 2 digit
OHB M1-4-60	Crossing Route Information	US Route – 3 digit
OHB M1-5-48	Crossing Route Information	SC Route – 2 digit
OHB M1-5-60	Crossing Route Information	SC Route – 3 digit
OHB M1-6-78	Crossing Route Information	Secondary Route – 2 digit
OHB M1-6-84	Crossing Route Information	Secondary Route – 3 digit

Detailed layouts for the signs in table are available from SCDOT – Director of Traffic Engineering, (803) 737-1462.

The vertical clearance sign shall be centered over the centerline of the interstate or crossing route travel way. The crossing route number sign shall be placed to the left of the vertical clearance sign with a minimum spacing of 8 feet between the right of the route number sign and the left of the clearance sign.

The flat sheet panels may be mounted on the outside beam on each side of the bridge using 3-M Very High Bond Tape in accordance with the tape manufacturer’s recommendations, or other method, such as direct bolting, approved by the Engineer.

2.3 Special Instructions to the Contractor

A conceptual signing plan is included in Attachment B of the RFP which shows the proposed sign locations and sign layouts for all overhead signs as well as all signs mounted on I-beam breakaway posts. Notes are provided on the plan for each sign location that details the sign size, sign identification numbers and a brief description of work to be accomplished. The conceptual plan does not show the location of flat sheet signs mounted on u-section posts (mile markers, warning signs, regulatory signs, etc.) along the I-26 mainline, ramps and roadway to the new port facility or surface roads. These signs should be included in the comprehensive signing plan and fabricated and erected as part of this contract and should be in compliance with the 2009 MUTCD.

The CONTRACTOR shall contact the Director of Traffic Engineering within 30 days of the issuance of the Notice to Proceed to review the conceptual signing plan and the overall signing requirements of the contract. A complete as built set of signing plans should be submitted to the Director of Traffic Engineering at the conclusion of the project. The Director of Traffic Engineering will provide an example set of interstate signing plans to the Contractor at this meeting to use as a guide in preparation of the as built signing plans.

The CONTRACTOR is advised that SignCAD files for the all of the signs shown on the conceptual signing plan are available from the Director of Traffic Engineering. The signs are designed using SignCAD software and Clearview Fonts.

As of the issue of this document, the official names of the new port terminal and other new roads were not available. The legend shown in the conceptual signing plan serves as a place holder for the official designation of the new facilities. The CONTRACTOR is advised that the size of the signs which display the name of the new port terminal or newly constructed roads (OH-1A, OH-2, OH-3A, OH-6, OH-8, OH-10A and OH-10-B) may vary from the sizes shown in the conceptual plan.

Guardrail should be included for all overhead uprights located within the clear zone on either side of the travel way. For guardrail installations that protect sign uprights, typically the face of the guardrail is located approximately 1 foot behind the edge of shoulder. The center of the upright should be located approximately 9 feet behind the face of guardrail.

The CONTRACTOR will be responsible for obtaining soil borings to be used for foundation designs for all new overhead sign structures.

Overhead sign lighting will also be included on this project. The environmental commitment in Section 4G 2.1-7 does not apply to the overhead interstate signs. The CONTRACTOR will be responsible for:

- Designing and installing the complete electrical and sign lighting systems.

- Coordinating power supply with local utilities to provide connection from the nearest power supply lines to the lighting system which shall include all necessary conduit, power poles, conductors, etc., for connection to the meter base and from the meter base to the lighting system service panel.
- Submitting as-built electrical plans that show locations of power supply and conduit location. A schematic of the lighting control equipment and cabinet shall also be provided.

All work involving overhead sign lighting will be in accordance with the Department's Supplemental Specification entitled *Sign Lighting Systems* dated September 25, 1998 of which Section 4. Materials- Sign Lighting Luminaires, is revised as follows:

LED sign lighting luminaires will be used and will be either two or three array fixtures with internal refractors. The CONTRACTOR will be required to consult with fixture manufacturer to determine the number and appropriate wattage of fixtures that are necessary to properly illuminate the overhead signs. Sign luminaires shall be Holophane SVLED25K7XXSSVSGXX (XX = voltage) or SVLED35K1XXSSVSGXX (XX=voltage), or approved equal. Any fixtures other than those specified should be approved by the Director of Traffic Engineering prior to submitting project proposals.

Walkways should be included in the design of all new overhead structures as noted in the Standard Specifications. Unistrut channels should be installed on the walkway supports to support the new LED sign lights. Placement of the unistrut will be verified by the Contractor by contacting the lighting fixture manufacturer.

The CONTRACTOR is advised that Logo signs may have to be relocated and I-beam supports replaced if exit ramps are significantly lengthened. Likewise, if entrance ramps are significantly lengthened, Speed Limit and Post Interchange Mileage signs that are noted as "Replace Sign – Refurbish Posts" will have to be relocated and I-beam supports replaced. Correct location for Speed Limit signs is 1500 feet beyond the end of the entrance taper. Correct location for Post Interchange Mileage Signs is 2500 beyond the end of the entrance taper.

The CONTRACTOR is advised that all signs have a unique barcode sticker attached to the back of each sign and each sign assembly has a unique barcode sticker attached to one post of the assembly. The CONTRACTOR will be required to record the barcode number for each sign and the associated assembly that is removed, replaced or relocated. These numbers and the date that the sign and assembly were removed, replaced or relocated shall be recorded on a form and the form shall be and turned into the Resident Construction Engineer.

The CONTRACTOR is advised that the conceptual roadway plan indicates that the overhead structure located at approximate station 5830+00 will have to be replaced to accommodate the new roadway width. However, the ramp configuration shown

was designed to accommodate a future additional lane on I-26. If the roadway and ramp design submitted by the CONTRACTOR permits, the existing sign and structure may be retained at its current location. If design does not permit, the structure and sign should be replaced as shown on the conceptual signing plan.

3.0 DELIVERABLES

3.1 Permanent Pavement Marking Plans

The Contractor shall submit Permanent Pavement Marking Plans with the Final Plans for SCDOT's review. Permanent Pavement Marking Plans shall include, at a minimum, all items described in this section of the RFP and all other applicable design references listed in Exhibit 4.

3.2 Permanent Signing Plans

The Contractor shall submit Permanent Signing Plans with the Final Plans for SCDOT's review. Permanent Signing Plans shall include, at a minimum, all items described in this section of the RFP and all other applicable design references listed in Exhibit 4.

3.3 As-Built Signing Plans

A complete as-built set of signing plans, including SignCAD copies of all layouts, shall be submitted to the SCDOT as directed by the Director of Traffic Engineering at the conclusion of the project.

EXHIBIT 4d

TRAFFIC DESIGN CRITERIA

Part 2 – Work Zone Traffic Control

1.0 GENERAL

The Contractor shall execute the item of Traffic Control as required by the Standard Specifications, the Standard Drawings For Road Construction, the Special Provisions, all Supplemental Specifications, the SCDOT Procedures and Guidelines for Work Zone Traffic Control Design, the MUTCD, the Plans, and the Engineer. This is an amendment to the Standard Specifications to require the following:

2.0 CRITERIA

2.1 GENERAL REGULATIONS

These special provisions shall have priority to the plans and comply with the requirements of the MUTCD and the standard specifications. Revisions to the traffic control plan through modifications of the special provisions and the plans shall require approval by the Department. Final acceptance of any revisions to the traffic control plan shall be pending upon review by the member of the Design-Build team representing the Director of Traffic Engineering through the Design-Review Process.

In accordance with the document, *Rule on Work Zone Safety and Mobility: Implementation, Maintenance, and Safety Guidelines*, this project has been classified as “SIGNIFICANT” and all components of the Transportation Management Plan prepared by the CONTRACTOR are required and shall be implemented.

Install and utilize changeable message signs in all lane closures installed on high volume high-speed multilane roadways. Use of changeable message signs in lane closures installed on low volume low speed multilane roadways is optional unless otherwise directed by the plans and the Engineer. Install and use a changeable message sign within a lane closure set-up as directed by the *Standard Drawings For Road Construction*. When a lane closure is not present for any time to exceed 24 hours, remove the changeable message sign from the roadway. Place the sign in a predetermined area on the project site, as approved by the Engineer, where the sign is not visible to passing motorists. Utilize preprogrammed messages in accordance with the *Standard Drawings For Road Construction* when using the changeable message sign as part of the traffic control set-up for lane closures. Only those messages pertinent to the requirements of the traffic control situation and the traffic conditions are permitted for display on a changeable message sign at all times. At no time will the messages displayed on a changeable message sign duplicate the legends on the permanent construction signs.

During operation of changeable message signs, place the changeable message sign on the shoulder of the roadway no closer than 6 feet between the sign and the near edge of the adjacent travel lane. When the sign location is within 30’ of the

near edge of a travel lane open to traffic, supplement the sign location with no less than 5 portable plastic drums placed between the sign and the adjacent travel lane for delineation of the sign location. Install and maintain the drums no closer than 3 feet from the near edge of the adjacent travel lane. This requirement for delineation of the sign location shall apply during all times the sign location is within 30' of the near edge of a travel lane open to traffic, including times of operation and non-operation. Oversized cones are prohibited as a substitute for the portable plastic drums during this application.

All signs mounted on portable sign supports shall have a minimum mounting height of 5' from the bottom of the sign to the ground. All signs mounted on ground mounted u-channel posts or square steel tube posts shall have a minimum mounting height of 7' from the bottom of the sign to the grade elevation of the near edge of the adjacent travel lane or sidewalk when a sidewalk is present.

On multilane primary routes, avoid placement of signs on portable signs supports within paved median areas utilized for two-way left turns unless otherwise directed by the RCE.

Temporary "Exit" signs (M1025-00) shall be located within each temporary gore during lane closures on multilane roadways. Mount these signs a minimum of 7' from the pavement surface to the bottom of the sign in accordance with the requirements of the MUTCD.

When mounting signs on ground mounted u-section or square steel tube posts, utilize either a sign support / ground support post combination with an approved breakaway assembly or a single direct driven post for each individual sign support of a sign assembly installation. Do not combine a sign support / ground support post combination and a direct driven post on the same sign assembly installation that contains two or more sign supports. Regarding sign support / ground support post combination installations, ensure that post lengths, stub heights and breakaway assemblies comply with the manufacturer's requirements and specifications. Use approved breakaway assemblies found on the *Approved Products List For Traffic Control Devices in Work Zones*.

When covering signs with opaque materials, the Department prohibits attaching a covering material to the face of the sign with tape or a similar product or any method that will leave a residue on the retroreflective sheeting. Residue from tape or similar products, as well as many methods utilized to remove such residue, damages the effective reflectivity of the sign. Therefore, contact of tape or a similar product with the retroreflective sheeting will require replacement of the sign. Cost for replacement of a sign damaged by improper covering methods will be considered incidental to providing and maintaining the sign; no additional payment will be made.

Overlays are prohibited on all rigid construction signs. The legends and borders on all rigid construction signs shall be either reversed screened or direct applied.

Signs not illustrated on the typical traffic control standard drawings designated for permanent construction signs shall be considered temporary and shall be included in the lump sum price bid item for “Traffic Control” unless otherwise specified.

Install “Grooved Pavement” signs (W8-15-48) supplemented with the “Motorcycle” plaque (W8-15P-30) in advance of milled or surface planed pavement surfaces. On primary routes, install these signs no further than 500 feet in advance of the beginning of the pavement condition. On interstate routes, install these signs no less than 500 feet in advance of the beginning of the pavement condition. Install two sign assemblies at each sign location, one on each side of the roadway, on multilane roadways when the pavement condition is present. Install these signs immediately upon creation of this pavement condition and maintain these signs until this pavement condition is eliminated.

Install “Steel Plate Ahead” signs (W8-24-48) in advance of an area of roadway where temporary steel plates are present. Install these signs no further than 300 feet in advance of locations where steel plates are present. On multilane roadways, comply with the same guidelines as applied to all other advance warning signs and install two sign assemblies at each sign location, one on each side of the roadway, when roadway conditions warrant. Install these signs immediately upon installation of a temporary steel plate and maintain the signs until the temporary steel plates are removed.

Install and maintain any necessary detour signing as specified by the typical traffic control standard drawings designated for detour signing, Part VI of the MUTCD, these Special Provisions, and the Engineer. The lump sum price bid item for “Traffic Control” includes payment for installation and maintenance of the detour signing.

The Contractor shall maintain the travel patterns as directed by the traffic control plans and shall execute construction schedules expeditiously. The Contractor shall provide the Resident Engineer with no less than a two-week prior notification of changes in traffic patterns.

During nighttime flagging operations, flaggers shall wear a safety vest and safety pants that comply with the requirements of ANSI / ISEA 107 standard performance for Class 3 risk exposure, latest revision, and a fluorescent hard hat. The safety vest and the safety pants shall be retroreflectorized and the color of the background material of the safety vest and safety pants shall be fluorescent orange-red or fluorescent yellow-green.

During nighttime flagging operations, the contractor shall illuminate each flagger station with any combination of portable lights, standard electric lights, existing

street lights, etc., that will provide a minimum illumination level of 108 Lx or 10 fc.

During nighttime flagging operations, supplement the array of advance warning signs with a changeable message sign for each approach. These changeable message signs are not required during daytime flagging operations. Install the changeable message signs 500' in advance of the advance warning sign arrays. Messages should be "Flagger Ahead" and "Prepare To Stop".

During surface planing and milling operations, grade elevation differences greater than 1 inch in areas with pavements composed of hot mixed asphalt (HMA) base courses, intermediate courses or surface courses and Portland cement concrete are PROHIBITED unless otherwise directed by the Department. However, during surface planing and milling operations for removal of Open-Graded Friction courses ONLY, a grade elevation difference of 1½ inches between adjacent travel lanes opened to traffic may exist unless otherwise directed by the Department.

During the paving operations, the length of roadway with an acceptable grade elevation difference less than or equal to 2" shall be restricted to 4 miles.

During the milling and surface planing operations, the length of roadway with an acceptable grade elevation difference less than or equal to 1" shall be restricted to 4 miles.

During construction on the ramps, the contractor shall conduct flagging operations. The flagging operations shall either stop traffic or direct the traffic around the work area. Installation and operation of these flagging operations shall be according to these special provisions and the MUTCD.

Supplement and delineate the shoulder edges of travel lanes through work zones with traffic control devices to provide motorists with a clear and positive travel path. Utilize portable plastic drums unless otherwise directed by the Department. Vertical panels may be used where specified by the plans and directed by the RCE. The installation of traffic control devices are required in all areas where those areas immediately adjacent to a travel lane open to traffic have been altered in any manner by work activities, including but not limited to activities such as grading, milling, etc. Install the traffic control devices immediately upon initiating any alterations to the areas immediately adjacent to or within 15 feet of the near edge line of the adjacent travel lane. When sufficient space is available, place the traffic control devices no closer than 3 feet from the near edge of the traffic control device to the near edge line on the adjacent travel lane. When sufficient space is unavailable, place the traffic control device at the maximum distance from the near edge of the adjacent travel lane available.

2.2 LANE CLOSURE RESTRICTIONS

The lane closure restrictions stated below are project specific, for all other restrictions, see supplemental specification, “Restrictions”, dated September 1, 2015.

Primary and Secondary Routes

On primary and secondary routes, the Department prohibits lane closures during any time of the day that traffic volumes exceed 800 vehicles per hour per direction. The Department reserves the right to suspend a lane closure if any resulting traffic backups are deemed excessive by the Engineer. Maintain all lane closure restrictions as directed by the plans, these special provisions, and the Engineer.

Interstate Routes

Single Lane Closures

On Interstate 26, the Department prohibits lane closures on eastbound I-26 Monday through Thursday from 6:00 am to 7:00 pm, on Fridays from 6:00 am to 7:00 pm, and on Saturdays from 11:00 am to 7:00 pm. The Department prohibits lane closures on westbound I-26 Monday through Thursday from 7:00 am to 7:00 pm, on Fridays from 7:00 am to 7:00 pm, on Saturdays from 12:00 am (noon) to 7:00 pm and on Sundays from 12:00 am (noon) to 6:00 pm.

Hourly Lane Closure Prohibitions (Single)	
Eastbound	Westbound
MON-THU: 6A-7P	MON-THU: 7A-7P
FRI: 6A-7P	FRI: 7A-7P
SAT: 11A-7P	SAT: 12P(noon)-7P
SUN: -----	SUN: 12P(noon)-6P

On Interstate 26, the Department prohibits dual lane closures on eastbound I-26 Monday through Wednesday from 5:00 am to 9:00 pm, on Thursdays from 5:00 am to 10:00 pm, on Fridays from 5:00 am to 11:00 pm, on Saturdays from 6:00 am to 11:00 pm, and on Sundays from 8:00 am to 9:00 pm. The Department prohibits dual lane closures on westbound I-26 Monday through Tuesday from 6:00 am to 10:00 pm, on Wednesdays through Thursdays from 6:00 am to 11:00 pm, on Fridays from 6:00 am to 12:00 am midnight, on Saturdays from 7:00 am to 1:00 am, and on Sundays from 8:00 am to 10:00 pm.

Dual Lane Closures

Hourly Lane Closure Prohibitions (Dual)	
Eastbound	Westbound
MON-WED: 5A-9P	MON-TUE: 6A-10P
THU: 5A-10P	WED-THU: 6A-11P
FRI: 5A-11P	FRI: 6A-12A (Midnight)
SAT: 6A-11P	SAT: 7A-1A(Sun)
SUN: 8A-9P	SUN: 8A-10P

All other routes with lane closure prohibitions for this project are listed on the SCDOT website under Doing Business with SCDOT in the Publications and Manuals section for Traffic Engineering.

These restrictions also apply to all road closures and pacing operations. The Department reserves the right to suspend a lane closure if any resulting traffic backups are deemed excessive by the Engineer. Maintain all lane closure restrictions as directed by the plans, these special provisions, and the Engineer.

Installation and maintenance of a lane closure is PROHIBITED when the Contractor is not actively engaged in work activities specific to the location of the lane closure unless otherwise specified and approved by the Engineer. The length of the lane closure shall not exceed the length of roadway anticipated to be subjected to the proposed work activities within the work shift time frame or the maximum lane closure length specified unless otherwise approved by the Engineer. Also, the maximum lane closure length specified does not warrant installation of the specified lane closure length when the length of the lane closure necessary for conducting the work activity is less. The length and duration of

each lane closure, within the specified parameters, shall require approval by the Engineer prior to installation. The length and duration of each lane closure may be reduced by the Engineer if the work zone impacts generated by a lane closure are deemed excessive or unnecessary.

On multilane primary and secondary routes, a reduced regulatory speed limit of 35 MPH shall be in effect during lane closures. Erect temporary regulatory “Speed Limit” signs (R2-1-48-35) and “Speed Reduction 35 MPH” signs (W3-5-48-35) on temporary supports according to the typical traffic control standard drawings. Cover the existing regulatory speed limit signs when reduced speed limits are in place. Immediately remove or cover the “Speed Limit” signs (R2-1-48-35) and the “Speed Reduction 35 MPH” signs (W3-5-48-35) upon the removal of the lane closures.

On interstate routes, a reduced regulatory speed limit of 45 MPH shall be in effect during lane closures. Erect temporary regulatory “Speed Limit” signs (R2-1-48-45) and “Speed Reduction 45 MPH” signs (W3-5-48-45) on temporary supports according to the typical traffic control standard drawings. Cover the existing regulatory speed limit signs when reduced speed limits are in place. Immediately remove or cover the “Speed Limit” signs (R2-1-48-45) and the “Speed Reduction 45 MPH” signs (W3-5-48-45) upon the removal of the lane closures.

On interstate routes, the presence of temporary signs, portable sign supports, traffic control devices, trailer mounted equipment, truck mounted equipment, vehicles and vehicles with trailers relative to the installation or removal of a closure and personnel are prohibited within 30 foot clear zone during the prohibitive hours for lane closures specified by these special provisions.

Truck mounted changeable message signs shall be required during all interstate lane closures. The Contractor shall provide, install, and maintain these signs in accordance with all requirements of the Standard Specifications for Highway Construction (latest edition) and the typical traffic control standard drawings designated for interstate lane closures.

The truck mounted changeable message signs are in addition to the requirements for trailer mounted changeable message signs. Truck mounted changeable message signs and trailer mounted changeable message signs are not interchangeable.

The Contractor shall discontinue and remove a lane closure when the work activities requiring the presence of the lane closure are completed or are discontinued or disrupted for any period of time to exceed 60 minutes unless the presence of unacceptable grade elevation differences greater than 1” in milled areas or greater than 2” in all other areas are present unless otherwise directed by the Engineer.

2.3 SHOULDER CLOSURE RESTRICTIONS:

Primary and Secondary Routes

On primary and secondary routes, the Department prohibits the Contractor from conducting work within 15' of the near edge of the adjacent travel lane on an outside shoulder or a median area under a shoulder closure during any time of the day that traffic volumes exceed 800 vehicles per hour per direction. The hourly restrictions for lane closures shall also apply to work activities conducted under a shoulder closure within 15' of the near edge of an adjacent travel lane or a median area. The Department reserves the right to suspend work conducted under a shoulder closure if any traffic backups develop and are deemed excessive by the Engineer. Maintain all shoulder closure restrictions as directed by the plans, these special provisions, and the Engineer.

On primary and secondary roadways, the Department prohibits the Contractor from conducting work within 1' or less of the near edge of an adjacent travel lane under a shoulder closure. All work that may require the presence of personnel, tools, equipment, materials, vehicles, etc., within 1' of the near edge of an adjacent travel lane shall be conducted under a lane closure.

Interstate Routes

On Interstate 26, the Department prohibits the Contractor from conducting work within 15' of the near edge of the adjacent travel lane on the outside shoulders or the median areas of eastbound I-26 Monday through Thursday from 6:00 am to 7:00 pm, on Fridays from 6:00 am to 7:00 pm, and on Saturdays from 11:00 am to 7:00 pm. The Department prohibits the Contractor from conducting work within 15' of the near edge of the adjacent travel lane on the outside shoulders or the median areas of westbound I-26 Monday through Thursday from 7:00 am to 7:00 pm, on Fridays from 7:00 am to 7:00 pm, on Saturdays from 12:00 am (noon) to 7:00 pm and on Sundays from 12:00 am (noon) to 6:00 pm.

The hourly restrictions for lane closures shall also apply to work activities conducted under a shoulder closure within 15' of the near edge of an adjacent travel lane or a median area. The Department reserves the right to suspend work conducted under a shoulder closure if any traffic backups develop and are deemed excessive by the Engineer. Maintain all shoulder closure restrictions as directed by the plans, these special provisions, and the Engineer.

On interstate highways, the Department prohibits the Contractor from conducting work within the limits of a paved shoulder or within 10' of the near edge of an adjacent travel lane under a shoulder closure. All work that may require the presence of personnel, tools, equipment, materials, vehicles, etc., within the limits of a paved shoulder or within 10' of the near edge of an adjacent travel lane shall be conducted under a lane closure.

The Contractor shall install all shoulder closures as directed by the typical traffic control standard drawings designated for shoulder closures, and the Engineer. Substitution of the portable plastic drums with oversized cones during nighttime shoulder closures is PROHIBITED.

2.4 MOBILE OPERATIONS

A mobile operation moves continuously at all times at speeds of 3 mph or greater without any stops. The minimal traffic flow impacts generated by these operations involve brief traffic flow speed reductions and travel path diversions. Conduct work operations that cannot be performed at speeds of 3 mph or greater under standard stationary lane closures.

The distance intervals between the vehicles, as indicated in the *Standard Drawings For Road Construction*, may require adjustments to compensate for sight distance obstructions created by hills and curves and any other conditions that may obstruct the sight distance between the vehicles. However, adjustments to the distance intervals between the vehicles should be maintained within the range of variable distance intervals indicated in the standard drawings unless otherwise directed by the Engineer.

Maintain two-way radio communication between all vehicles in the vehicle train operating in a mobile operation.

Supplement the work vehicles and the shadow vehicles with amber colored flashing dome lights. The vehicles may also be supplemented with advance warning arrow panels and truck mounted attenuators as directed in the *Standard Drawings For Road Construction* and the Standard Specifications.

The Contractor shall install, operate and maintain all advance warning arrow panels, truck mounted attenuators and truck mounted changeable message signs as required by these special provisions, the manufacturer's specifications, the *Standard Drawings For Road Construction*, the Standard Specifications, the plans and the Engineer.

2.5 TYPICAL TRAFFIC CONTROL STANDARD DRAWINGS:

The typical traffic control standard drawings of the "Standard Drawings For Road Construction", although compliant with the MUTCD, shall take precedence over the MUTCD. The typical traffic control standard drawings of the "Standard Drawings For Road Construction" shall apply to all projects let to contract.

Install the permanent construction signs as shown on the typical traffic control standard drawings designated for permanent construction signing.

2.6 ADDENDUMS

(Addendums to the “2007 Standard Specifications for Highway Construction”)

2.6.1 Construction (Sub-section 601.4)

Sub-section 601.4.2 Construction Vehicles (paragraph 2)

When working within the rights-of-way of access-controlled roadways such as Interstate highways, the Contractor’s vehicles may only change direction of travel at interchanges. These vehicles are prohibited from crossing the roadway from right side to the median or vice versa. Use a flagger to control the Contractor’s vehicles when these vehicles attempt to enter the roadway from a closed lane or the median area. Ensure the flagger does not stop roadway traffic, cause roadway traffic to change lanes, or affect roadway traffic in any manner. The Contractor’s vehicles may not disrupt the normal flow of roadway traffic or enter the travel lane of the roadway until a sufficient gap is present.

The Contractor shall have flaggers available to control all construction vehicles entering or crossing the travel lanes of secondary and primary routes. The RCE shall determine the necessity of these flaggers for control of these construction vehicles. The RCE shall consider sight distance, vertical and horizontal curves of the roadway, prevailing speeds of roadway traffic, frequency of construction vehicles entering or crossing the roadway and other site conditions that may impact the safety of the workers and motorists when determining the necessity of these flaggers. Ensure these flaggers do not stop roadway traffic, cause roadway traffic to change lanes or affect roadway traffic in any manner. The Contractor’s vehicles may not disrupt the normal flow of roadway traffic or enter the travel lane of the roadway until a sufficient gap is present.

When working within the rights-of-way of access-controlled roadways with posted regulatory speed limits of 55 MPH or greater and average daily traffic volumes {ADT} of 10,000 vehicles per day or greater, i.e. Interstate highways, all construction and work vehicles possessing any one or more of the vehicular characteristics listed below are only permitted to enter and exit a right or left shoulder work area during the presence of active lane closures unless otherwise directed by the RCE. These vehicles are not permitted to enter or exit these work areas without the presence of active lane closures unless otherwise directed by the RCE. Shoulder closures are unacceptable and insufficient methods for control of traffic at ingress / egress areas for these vehicles. The restrictive vehicular characteristics include the following:

- Over six (6) tires

- Tandem rear axles
- A base curb weight greater than 8000 lbs.
- A gross vehicular weight greater than 12000 lbs. unless performing duties as a shadow vehicle while supporting a truck mounted attenuator
- A trailer in tow except under the following conditions:
 - Trailers transporting traffic control devices (including but not limited to standard and 42” oversized traffic cones, portable plastic drums, signs, portable sign supports, u-channel and square steel tube sign posts) relative to the installation of lane closures, shoulder closures or other traffic control operations approved by the RCE
 - Trailer mounted traffic control devices (including but not limited to advance warning arrow panels, changeable message signs, temporary traffic signals, highway advisory radios, work zone intelligent transportation systems and trailer towed truck mounted attenuators)

2.6.2 **Construction** (Sub-section 601.4)

Sub-section 601.4.2 Construction Vehicles

Auxiliary Warning Lights for Vehicles and Equipment

Supplement all construction and/or construction-related vehicles and equipment that operate in a stationary or mobile work zone within or adjacent to a roadway within the highway rights-of-way with AMBER or YELLOW colored high intensity rotating or strobe type flashing auxiliary warning light devices. Utilize, install, operate and maintain a single or multiple lighting devices as necessary to provide visibility to approaching motorists.

All auxiliary warning light models shall meet *Society of Automotive Engineers* (SAE) Class I standards and SAE Standard J575 relative to *Tests for Motor Vehicle Lighting Devices and Components* and these specifications.

The amber/yellow color of the dome/lens of an auxiliary warning light device shall meet SAE Standard J578 for amber/yellow color specifications.

Auxiliary warning lights with parabolic reflectors that rotate shall rotate around a halogen lamp at a rate to produce approximately 175 flashes per minute. The parabolic reflector shall produce a minimum 80,000 candle

power and a minimum 54,000 candela through an SAE Standard J846 approved amber dome.

Equip strobe type flashing auxiliary warning light devices with photosensitive circuit controls to adjust the lighting intensity in response to changes in ambient light conditions such as from day to night. These lights shall have a double-flash capability rated at approximately 80 double flashes per minute and produce a minimum 24 joules of flash energy at the highest power level setting.

Acceptable auxiliary warning light models shall provide sufficient light output to be clearly recognizable at a minimum distance of 1750 feet.

Mount all auxiliary warning light devices intended to function as the auxiliary warning light system or as an element thereof on vehicles and equipment at locations no less than 3 feet above the ground and in conspicuous locations to provide visibility to approaching motorists.

Auxiliary warning light devices and/or models that mount in the locations of the standard vehicle lighting system are unacceptable as the specified auxiliary warning light system due to restrictive simultaneous visibility capabilities from multiple sight angles. However, auxiliary warning light devices that mount in the standard vehicle lighting system locations are acceptable as supplements to the specified lighting devices mounted in locations that do meet the minimum height requirements and provide simultaneous visibility capabilities from multiple sight angles.

Standard vehicle hazard warning lights are only permitted as supplements to the specified auxiliary warning light devices.

2.6.3 Category I Traffic Control Devices (Section 603)

Sub-section 603.2.2 Oversized Traffic Cones (paragraph 6)

Reflectorize each oversized traffic cone with 4 retroreflective bands: 2 orange and 2 white retroreflective bands. Alternate the orange and white retroreflective bands, with the top band always being orange. Make each retroreflective band not less than 6 inches wide. Utilize Type III – Microprismatic retroreflective sheeting for retroreflectorization on all projects let to contract after May 1, 2010 unless otherwise specified. Separate each retroreflective band with not more than a 2-inch non-reflectorized area. Do not splice the retroreflective sheeting to create the 6-inch retroreflective bands. Apply the retroreflective sheeting directly to the cone surface. Do not apply the retroreflective sheeting over a pre-existing layer of retroreflective sheeting.

Sub-section 603.2.3 Portable Plastic Drums (paragraph 3) -

Reflectorize each drum with Type III – Microprismatic retroreflective sheeting: 2 orange and 2 white retroreflective bands, 6 inches wide on all projects let to contract after May 1, 2010 unless otherwise specified. Alternate the orange and white retroreflective bands with the top band always being orange. Ensure that any non-reflectorized area between the orange and white retroreflective bands does not exceed 2 inches. Do not splice the retroreflective sheeting to create the 6-inch retroreflective bands. Apply the retroreflective sheeting directly to the drum surface. Do not apply the retroreflective sheeting over a pre-existing layer of retroreflective sheeting.

2.6.4 Category II Traffic Control Devices (Section 604)Sub-section 604.2.1 Type I and Type II Barricades (paragraph 3)

Reflectorize these barricades with Type VIII or IX Prismatic retroreflective sheeting on all projects let to contract after May 1, 2012 unless otherwise specified. Ensure that the retroreflective sheeting has alternate orange and white stripes sloping downward at a 45-degree angle in the direction of passing traffic. The stripes shall be 6 inches wide.

Sub-section 604.2.2 Type III Barricades (paragraph 3)

Reflectorize these barricades with Type VIII or IX Prismatic retroreflective sheeting on all projects let to contract after May 1, 2012 unless otherwise specified. Ensure that the retroreflective sheeting has alternate orange and white stripes sloping downward at a 45-degree angle. Apply the sloping orange and white stripes in accordance with the requirements of the Plans, SCDOT Standard Drawings and the MUTCD. The stripes shall be 6 inches wide.

2.6.5 Temporary Concrete Barrier (Sub-section 605.2.3.2)Sub-section 605.2.3.2 Temporary Concrete Barrier (paragraph 6)

Previously used temporary concrete barrier walls are subject to inspection and approval by the RCE before use. Ensure that previously used temporary concrete barrier walls are in good condition. Defects to a temporary concrete barrier wall that may disqualify a section of wall for use include gouges, cracks, chipped, or spalled areas. A defect that exposes reinforcing steel warrants immediate disqualification. A disqualification grade type defect shall consist of measurements in excess of 1 inch, entirely or partially within the boundaries of the end connection areas and the drainage slot areas as illustrated in the “Standard Drawings

for Road Construction”, and/or in excess of 4 inches for all areas beyond the end connection areas. To warrant disqualification, these measurements shall exceed the specified dimensions in all three directions, width, height, and depth. A defect that exceeds the specified dimensions in only one or two of the three directions does not warrant disqualification.

Temporary concrete barrier walls with defects less than 6 inches in all three directions, width, height, and depth that do not expose reinforcing steel may be repaired in accordance with the following requirements. Repair is prohibited on temporary concrete barrier walls with defects 6 inches or greater in all three directions, width, height, and depth.

For repair of temporary concrete barrier walls with defects less than 6 inches in all three directions, width, height, and depth that do not expose reinforcing steel, repair the defect with a premanufactured patching material specifically fabricated for patching structural concrete. The strength of the patch must meet or exceed the design strength of the class 3000 concrete of the temporary concrete barrier wall. Perform the repair procedures in accordance with all requirements and instructions from the manufacturer of the patch material. Use a bonding compound between the patch material and the concrete unless specifically stated by the manufacturer that a bonding compound is not required. If the manufacturer states that application of a bonding compound is optional, SCDOT requires application of a bonding compound compatible with the patch material. If cracking occurs within the patched area, remove the patch material completely and repeat the repair process. The contractor shall submit documentation stating all repairs have been conducted in accordance with these requirements prior to installing any temporary concrete barrier walls with repairs. Utilization of temporary concrete barrier walls with repairs shall require approval by the RCE prior to installation.

The Contractor shall submit certification documents for the patch material utilized for repairs to the Engineer prior to placing temporary concrete barrier walls that have been repaired on the project site.

*** *(Effective on all projects let to contract after January 1, 2017)* ***

Sub-section 605.2.3.2 Temporary Concrete Barrier (paragraph 5) -

In regard to projects let to contract after January 1, 2017, ALL *NCHRP Report 350* compliant temporary concrete barrier walls placed on a project site SHALL comply with the requirements for the recessed approval stamp as directed by the *SCDOT Standard Drawings*. Those *NCHRP Report 350* compliant temporary concrete barrier walls with the original recessed approval stamp that reads "SCDOT 350" will continue to be acceptable on

projects let to contract after January 1, 2017. However, those temporary concrete barriers with the “SCDOT 350” identification plate attached to the side of the barrier walls with mechanical anchors previously grandfathered will no longer be acceptable on projects let to contract after January 1, 2017.

2.6.6 Construction Signs (Sub-section 605.4.1.1)

*** (Effective on all projects let to contract after January 1, 2016) ***

On all projects relative to **interstate highways** let to contract after January 1, 2016, all signs attached to portable sign supports on and/or adjacent to **interstate highways** shall be rigid. Fabricate each of these rigid signs from an approved aluminum laminate composite rigid sign substrate approved by the Department. Utilization of signs fabricated from roll-up fabric substrates attached to portable sign supports installed on and/or adjacent to **interstate highways** will no longer be acceptable on projects let to contract after January 1, 2016.

ONLY those portable sign supports specified and approved for support of rigid signs fabricated from approved aluminum laminated composite rigid sign substrates and included on the *Approved Products List for Traffic Control Devices in Work Zones*, latest edition, are acceptable. To facilitate location of acceptable portable sign supports, the listing of portable sign supports is now separated into two (2) sections; “Portable Sign Supports for Use with Roll-Up Signs ONLY” and “Portable Sign Supports for Use with Roll-Up Sign Substrates and Rigid Sign Substrates”.

The trade names of the approved aluminum laminate composite rigid sign substrates are “Acopan”, “Alpolic”, “Dibond” and “Reynolite”. These rigid sign substrates are restricted to thicknesses no greater than 2 millimeters.

Rigid signs fabricated from standard aluminum sign blanks or any other rigid material other than Acopan, Alpolic, Dibond or Reynolite are PROHIBITED for attachment to portable sign supports. However, rigid signs fabricated from standard 0.080 and 0.100 inches thick aluminum sign blanks will continue to be acceptable for mounting on ground mounted sign supports.

Signs fabricated from roll-up fabric substrates approved by the Department will continue to be acceptable for use on and/or adjacent to secondary and primary roadways unless otherwise directed by the Department.

The minimum mounting height of signs mounted on these portable sign supports shall continue to be 5 feet from the ground to the bottom edge of the sign except where a minimum 7 foot mounting height is required in accordance with the standard specifications, the standard drawings, these special provisions and the MUTCD, latest edition.

2.6.7 Truck-Mounted Attenuator (Sub-section 605.4.2.2)

Sub-section 605.2.2.2.3.3 Color (paragraph 1)

Use industrial grade enamel paint for cover of the metal aspects of the unit. Provide and attach supplemental striping to the rear face of the unit with a minimum Type III high intensity retroreflective sheeting unless otherwise directed by the Department. Utilize an alternating 4 to 8 inch black and 4 to 8 inch yellow 45-degree striping pattern that forms an inverted “V” at the center of the unit that slopes down and to the sides of the unit in both directions from the center.

2.6.8 Truck-Mounted Attenuator (Sub-section 605.4.2.2)

Sub-section 605.4.2.2 Truck-Mounted Attenuators (paragraph 6)

A direct truck mounted truck mounted attenuator is mounted and attached to brackets or similar devices connected to the frame of a truck with a minimum gross vehicular weight (GVW) of 15,000 pounds (actual weight) unless otherwise directed. A trailer towed truck mounted attenuator is towed from behind and attached via a standard pintle hook / hitch to the frame of a truck with a minimum gross vehicular weight (GVW) of 10,000 pounds (actual weight) unless otherwise directed.

Each truck utilized with a truck mounted attenuator shall comply with the manufacturer’s requirements to ensure proper operation of the attenuator. The minimum gross vehicular weight (GVW) (actual weight) for each truck shall comply with these specifications unless otherwise directed within the “Remarks” column of the *Approved Products List For Traffic Control Devices in Work Zones* in regard to specific requirements for the device in question.

If the addition of supplemental weight to the vehicle as ballast is necessary, contain the material within a structure constructed of steel. Construct this steel structure to have a minimum of four sides and a bottom to contain the ballast material in its entirety. A top is optional. Bolt this structure to the frame of the truck. Utilize a sufficient number of fasteners for attachment of the steel structure to the frame of the truck to ensure the structure will not part from the frame of the truck during an impact upon the attached truck mounted attenuator. Utilize either dry

loose sand or steel reinforced concrete for ballast material within the steel structure to achieve the necessary weight. The ballast material shall remain contained within the confines of the steel structure in its entirety and shall not protrude from the steel structure in any manner.

2.6.9 Trailer-Mounted Changeable Message Signs (Sub-section 606.3.2)

Sub-section 606.3.2.7 Controller (paragraphs 1-4)

The controller shall be an electronic unit housed in a weatherproof, rust resistant box with a keyed lock and a light for night operation. Provide the unit with a jack that allows direct communications between the on-board controller and a compatible personal computer. The unit shall have a LCD display screen that allows the operator to review messages prior to displaying the message on the sign.

The controller shall have the capability to store 199 factory preprogrammed messages and up to 199 additional messages created by the user in a manner that does not require a battery to recall the messages. Also, the controller shall allow the operator the capability to program the system to display multiple messages in sequence.

Provide the controller with a selector switch to allow the operator to control the brightness or intensity level of the light source of the sign panel. The selector switch shall include "bright," "dim" and "automatic" modes; inclusion of additional modes is permissible. When the selector switch is in the "automatic" mode, a photosensitive circuit shall control the brightness or intensity level of the light source in response to changes in ambient light such as from day to night and other various sources of ambient light.

Equip each sign with remote communications capabilities, such as utilization of cellular telephone or internet browser technology, to allow the operator to revise or modify the message selection from the office or other remote location. Also, provide protection to prohibit unauthorized access to the controller, (i.e. password protection).

Sub-section 606.5 Measurement (paragraph 2)

Trailer-mounted changeable message signs are included in the lump sum item for Traffic Control in accordance with **Subsections 107.12** and **601.5** of the “2007 Standard Specifications for Highway Construction”. No separate measurement will be made for trailer-mounted changeable message signs unless the contract includes a specific pay item for trailer-mounted changeable message signs.

The Contractor shall provide, install, operate, and maintain the trailer-mounted changeable message sign per traffic control set-up as directed by the Plans, the “Standard Drawings for Road Construction”, these Special Provisions, the Specifications, and the Engineer.

Sub-section 606.6 Payment (paragraph 2)

In addition to **Subsections 107.12** and **601.6**, the payment for Traffic Control is full compensation for providing, installing, removing, relocating, operating, and maintaining trailer-mounted advance warning arrow panels and trailer-mounted changeable message signs as specified or directed and includes providing the units’ primary power source; repairing or replacing damaged or malfunctioning units within the specified time; providing traffic control necessary for installing, operating, and maintaining the units; and all other materials, labor, hardware, equipment, tools, supplies, transportation, incidentals, and any miscellaneous items necessary to fulfill the requirements of the pay item in accordance with the Plans, the Specifications, and other items of the Contract.

Sub-section 606.6 Payment (paragraph 3)

Disregard this paragraph unless the Contract includes a specific pay item for trailer-mounted changeable message signs.

2.6.10 Temporary Pavement Markings (Sub-section 609.4.1)

Sub-section 609.4.1.1.1 Application Requirements General (in addition to paragraph 3)

On two-lane two-way roadways, apply and place temporary or permanent pavement markings, as specified hereupon, prior to the end of each day’s work or shift or reopening a closed travel lane to traffic. These pavement markings shall include 4-inch wide solid lines on edge lines and solid center lines and 4-inch wide by 10 feet long broken lines with a 30-foot gap for broken center lines and lane lines unless otherwise specified. The center line pavement markings shall be either double yellow solid lines, yellow broken lines or an appropriate combination of a yellow solid line and yellow broken lines for passing / no passing zones. Placement of a singular yellow solid line for a center line pavement marking is unacceptable. The edge line pavement markings shall be a white solid line.

On multilane primary and secondary roadways, apply and place temporary or permanent pavement markings, as specified hereupon, to the travel lanes prior to reopening a closed travel lane to traffic. These pavement

markings shall include 4-inch wide solid lines, utilized for edge lines and solid center lines, and 4-inch wide by 10 feet long broken lines with a 30-foot gap, utilized for lane lines and turn lanes, unless otherwise specified. The center line pavement markings shall be either double yellow solid lines or an appropriate combination of a yellow solid line and 4-inch wide by 10 feet long yellow broken lines for two-way left turn median areas. The right edge line pavement markings shall be a white solid line and the left edge line shall be a yellow solid line except in areas where the travel lanes separate to create a gore type situation and then the color schemes shall comply with SCDOT application practices for gore areas. The lane lines between travel lanes and turn lanes shall be 4-inch wide by 10 feet long white broken lines with a 30-foot gap.

However, on two-lane two-way and multilane primary and secondary roadways, application of a 4-inch wide solid line utilized for an edge line adjacent to an earth shoulder, white or yellow, may be delayed up to 72 hours after eradication of the original line when the length of eradicated line at a single location is no longer than 250 feet. In the event of multiple locations along the same line, each location must be separated from the adjacent location by no less than 250 feet with a cumulative total distance of eradicated line of no more than 1300 feet within any continuous 1 (one) mile length of roadway measured from a selected location. If the length of eradicated line exceeds 250 feet at any single location, the distance interval between multiple adjacent locations is less than 250 feet or a cumulative total distance of multiple locations of eradicated line exceeds 1300 feet within any continuous 1 (one) mile length of roadway measured from a selected location, replace the eradicated line(s) prior to reopening the adjacent travel lane to traffic.

On interstate roadways, apply and place temporary or permanent pavement markings, as specified hereupon, to the travel lanes prior to reopening a closed travel lane to traffic. These pavement markings shall include 6-inch wide solid lines, utilized for edge lines, and 6-inch wide by 10 feet long white broken lines with a 30-foot gap, utilized for lane lines between travel lanes and auxiliary lanes, unless otherwise specified. The right edge line pavement markings shall be a white solid line and the left edge line shall be a yellow solid line except in areas where the travel lanes separate to create a gore type situation and then the color schemes shall comply with SCDOT application practices for gore areas.

On all roadways, apply and place white stop bars and white triangle yield bars in all locations where previous stop bars and triangle yield bars have been eradicated by the work. Apply and place white stop bars and white triangle yield bars at intersections controlled by stop and yield signs within 72 hours of the eradication of the original pavement marking. Apply and place white stop bars at signalized intersections controlled by

traffic control signals and at railroad crossings prior to reopening a closed travel lane to traffic.

Within the limits of existing turn lanes on all roadways, apply and place white arrows in all locations where previous arrows have been eradicated by the work unless otherwise directed by the RCE. Apply and place white arrows within 72 hours of the eradication of the original pavement markings. However, in regard to newly constructed turn lanes, apply and place white arrows the within turn lanes as directed by the RCE.

Within the limits of existing lane-drop sites on all roadways, apply and place white arrows in all locations where previous arrows have been eradicated by the work prior to the end of each day's work or shift or reopening the closed travel lane to traffic. In regard to newly constructed lane-drop sites, apply and place white arrows within the travel lane to be terminated prior to opening the travel lane to traffic and as directed by the RCE.

Sub-section 609.4.1.1.1 Application Requirements General (Revision to paragraph 8)

On two-lane, two-way roadways, passing zones may be eliminated within the work zone through application of 4-inch double yellow centerline pavement markings if determined feasible and directed to do so by the Plans and/or the RCE. Apply no passing zone markings as specified by the Plans, the Specifications, the *MUTCD* and the RCE.

2.6.11 Flagging Operations (Sub-section 610.4.1)

Sub-section 610.4.1.1 Flagging Operations (paragraph 1)

Use a flagging operation to control the flow of traffic when two opposing directions of traffic must share a common travel lane. A flagging operation may be necessary during a lane closure on a two-lane two-way roadway, an intermittent ramp closure or an intermittent encroachment of equipment onto a portion of the roadway. Utilize flagging operations to direct traffic around work activities and maintain continuous traffic flow at reduced speeds when determined to be appropriate by the RCE. As stated above, flagging operations shall direct traffic around the work activities and maintain continuous traffic flow; therefore, stopped traffic shall not be required to stop for time durations greater than those listed below unless otherwise directed by the RCE. Begin measurement of the time interval immediately upon the moment the Flagger rotates the Stop/Slow paddle to display the "Stop" condition to the approaching motorists.

LENGTH OF CLOSURE	MAXIMUM TIME DURATION FOR STOPPED TRAFFIC
1 MILE or LESS	5 Minutes
1 to 2 MILES	7 ½ Minutes

If the work activities require traffic to be stopped for periods greater than 5 to 7 ½ minutes as stated above, consider alternate work methods, conducting work activities during times of lowest traffic volumes such as during the hours of darkness or complete road closure with detour installation.

2.6.12 Paving and Resurfacing (Sub-section 611.4.1)

Sub-section 611.4.1.2 Requirements (paragraph 8)

Whenever travel lanes with acceptable grade elevation differences are open to traffic, provide “Uneven Lanes” signs (W8-11-48) or “Uneven Pavement” signs (W8-11A-48). Reflectorize these signs with a fluorescent orange colored prismatic retroreflective sheeting unless otherwise specified. Install these signs adjacent to roadways with uneven pavement surfaces between travel lanes or between travel lanes and the adjacent paved shoulders. Install these signs at intervals no greater than 2600 feet.

2.7 STAGING

2.7.1 Traffic Control Restrictions (Project Specific)

Maintain the existing number of I-26 mainline lanes of traffic in each direction during the times of the lane closure restrictions. Maintain the existing number of travel lanes for all on-ramps and off-ramps during the times of the lane closure restrictions unless otherwise approved by the Department. All ramps must maintain free-flow operation (no yield control) unless otherwise approved by the Department.

SCDOT will allow a detour of the I-26 Interchange ramp traffic (Exits 217 and 218) provided the TMP and associated detour plan are reviewed and approved by SCDOT and meet acceptable requirements for the safe and efficient flow of traffic. This detour plan shall be submitted for review on the submittal date for the First Round of Formal ATCs and will follow the ATC milestone schedule. The Detour Plan submittal shall include the

requirements in this section as well as items A, B, C, F, H, I, J, and K that are required in the Formal ATC submittals.

Conduct, maintain and install all roadway detours and the detour signing in accordance with SCDOT requirements, the *SCDOT Standard Drawings* and the *MUTCD*, latest edition.

Select roads for a detour route that have a structure and geometry to safely sustain the type and amount of detoured traffic. Ensure the detour route has adequate sight distances at intersections, no bridges with posted weight limitations, travel lanes with adequate lane widths to accommodate the detoured traffic, adequate pavement markings and a good pavement surface. Also, during the detour route selection process consider factors such as school locations, emergency services access, areas of reduced speed limits, intersection geometry and traffic control at intersections impacted by the detour.

Monitor the detour during the operation so that any deficiencies that may arise can be addressed and corrected.

The Contractor shall have no more than 72 hours to begin elimination of any grade elevation differences between or adjacent to the travel lanes of I-26. The 72 hour time period shall begin upon creation of the grade elevation difference. This restriction shall apply to all acceptable grade elevation differences less than or equal to 1" in milled areas or less than or equal to 2" in paved areas.

During surface planing and milling operations, the length of roadway with a milled surface open to traffic is restricted to 4 miles. This restriction does not apply to concrete diamond grinding operations.

During surface planing and milling operations, the length of roadway with an acceptable grade elevation difference less than or equal to 1" adjacent to a single travel lane or between multiple travel lanes open to traffic is restricted to a maximum distance of 4 miles.

During asphalt paving operations, the length of roadway with an acceptable grade elevation difference less than or equal to 2" adjacent to a single travel lane or between multiple travel lanes open to traffic is restricted to a maximum distance of 4 miles.

The Contractor may conduct various work activities in the same direction at various locations concurrently if approved by the Department. Various work activities in the same direction requiring simultaneous closures in the same travel lane or shoulder shall be separated by no less than 2 miles

from the end of the first closure that a motorist will encounter to the beginning of the taper of the second closure. Also, various work activities in the same direction requiring simultaneous right and left lane closures or shoulder closures shall be separated by no less than 4 miles from the end of the first closure that a motorist will encounter to the beginning of the taper of the second closure.

2.7.2 Traffic Control Restrictions (Project Specific by Location)

Solvay Entrance Road – The Contractor must maintain existing travel lanes in each direction unless otherwise approved by the Department.

3.0 DELIVERABLES

3.1 Traffic Management Plan

The Contractor shall submit a Traffic Management Plan in accordance with the document, *Rule on Work Zone Safety and Mobility: Implementation, Maintenance, and Safety Guidelines*. All components of the Transportation Management Plan prepared by the CONTRACTOR are required and shall be submitted for review by the Department and must be approved before any construction activities can begin.

3.2 Conceptual Work Zone Traffic Control Plans

The Contractor shall submit Conceptual Work Zone Traffic Control Plans in the Right-of-Way Plans. The plans shall include, but not be limited to, the following:

- Staging Narrative
- Concept Staging Plans
 - Widening/Rehabilitation Typical Sections for each Stage of Construction and any critical points
 - Show areas where additional Right-of-Way is warranted for the purposes of Staging
 - Show the Separation of Adjacent Travel Lanes / Traffic Splits as described in the SCDOT Procedures and Guidelines for Work Zone Traffic Control Design
 - Show areas where the travel lane leaves the existing roadway bed or direction on new alignment (transition area) and returns (termination area)

3.3 Work Zone Traffic Control Plans

The Contractor shall submit Work Zone Traffic Control Plans (including Temporary Signal Plans) in the Final Plans Submittal. The plans shall be in accordance with the SCDOT Procedures and Guidelines for Work Zone Traffic Control Design and all other applicable design references listed in Exhibit 4.

EXHIBIT 4d

TRAFFIC DESIGN CRITERIA

Part 3 – Traffic Signals

1.0 GENERAL

Design and Rebuild/Construct seven traffic signals utilizing steel poles, including new cabinet/controller, signal heads, signal cable, and overhead signs conforming to the Special Provisions; install pedestrian treatments in accordance with SCDOT policy. One intersection will only require a new cabinet/controller. Signal design should include running fiber optic cable to connect all 8 traffic signals. Signal designs (temporary and permanent) shall logically follow various construction phases of the “Traffic Control Plans” for this project.

The Contractor shall repair and maintain all signal related equipment during the construction of this project. Any work at the intersections that impact the traffic signal, such as damage to detection, fiber interconnect or any other signal appurtenances, shall be immediately repaired/replaced to SCDOT standards. The project should include any temporary detection measures (such as video detection cameras) that would be required if damage to the existing inductive loops occurs during this project. **Maintain detection at ALL times.**

2.0 CRITERIA

All criteria listed in Exhibit 5 and all other applicable design references in Exhibit 4 shall be incorporated into the signal design, maintenance, and construction.

2.1 LIST OF TRAFFIC SIGNALS WITHIN PROJECT

Intersection Name	Description of Signal
I-26 Ramps at Spruill Avenue	Maintain Detection while Signal is Active
Meeting Street at Spruill Avenue	Maintain Detection at all times Design and Rebuild Signal
Viaduct Road at Spruill Avenue	Maintain Detection at all times Design and Partially Rebuild Signal
Stromboli Avenue at Spruill Avenue	Design and Construct Signal
Stromboli Avenue Extension at Bainbridge Connector Road	Design and Construct Signal
Bainbridge Avenue at Bainbridge Connector Road	Design and Construct Signal
Bainbridge Connector at New On-Ramp to Port Access Road	Design and Construct Signal
New Off-Ramp from Port Access Road at Bainbridge Connector Road	Design and Construct Signal

2.2 PROJECT DESCRIPTION

Design and Rebuild/Construct seven traffic signals utilizing steel poles, including new cabinet/controller, signal heads, signal cable, and overhead signs conforming to the Special Provisions; Install pedestrian treatments in accordance with SCDOT policy. The Spruill Avenue at Viaduct Road signal rebuild will only include necessary work required to upgrade the cabinet and controller to accept the fiber optic cable. This shall include a larger cabinet and controller meeting current standards. Signal design should include running fiber optic cable to connect all 8 traffic signals. As part of the signal designs, signal phasing should be coordinated with the district traffic engineer to decide the appropriate signal phasing for the intersections based on traffic patterns, develop clearance times (yellow and all-red) for various phases and complete various charts and tables associated with the signal design like loop chart, coordination chart, phasing diagram, etc.

Signal designs (temporary and permanent) shall logically follow various construction phases of the “Traffic Control Plans” for this project. Existing signals shall be maintained during construction by modifying the signal designs to incorporate the traffic patterns during the parallel construction phase of the project. These design changes shall include installation of wood poles, realignment of signal heads, installation of new cabinet/controller, installation of new span wire, etc.

The Contractor shall repair and maintain all signal related equipment during the construction of this project. During the various stages of construction it is anticipated that there will be impacts associated to the detection at the existing traffic signals in the project limits. It is unacceptable for these traffic signals to operate in a pre-timed manner during the construction project. The project should include any temporary detection measures (such as video detection cameras) that would be required if damage to the existing inductive loops occurs during this project. In addition, once the project is completed, the damaged inductive loops should be replaced in accordance with the latest SCDOT design standards for loops. **Maintain detection at ALL times.**

In addition to maintaining the detection, any work at the intersections that impact the traffic signal, such as damage to fiber interconnect or any other signal appurtenances, shall be immediately repaired/replaced to SCDOT standards. Coordination with the District 6 Signal Staff should occur to ensure the work will avoid damaging traffic signal utilities as much as is feasible.

All traffic control devices including poles, signal heads, loops, electrical connections and others shall be removed and returned to the SCDOT.

The Contractor shall coordinate with the district traffic engineer to determine which signals will need to be interconnected. The Contractor shall perform

studies and design cable routing plans for all signal that will be interconnected. Appropriate grouping of the signals for cable routing plans, location of poles, pull-boxes, etc., shall be determined and incorporated in the design. Cable routing plans shall be developed using overhead fiber and wood poles. Any existing wood poles, if available in the close vicinity of the intersection shall be used or else new poles shall be installed. Poles used for the cable routing shall be joint-use poles, except for the poles at the intersection, which shall be exclusively used for signal purposes. Cable routing plans shall be developed using SCDOT's Traffic Signal Design Guidelines (latest revision) and using standard traffic engineering practices.

All signal work shall be inspected by the District Signal Shop. Any modifications to the signal work shall be approved by the District Traffic Engineer.

Include the District Signal Shop in all Preconstruction conferences.

Provide a redline signal plan to the District Signal Shop after the signal work is completed.

Full Continuity of Operation shall be provided; and shall include the installation of a temporary controller, if needed. Operation shall be transferred to the temporary controller, simultaneously turning off the old controller.

Below is more information concerning any changes, revisions, or clarifications to the SCDOT Traffic Signal Supplemental Specifications and/or pay items for this particular contract:

Mobilization: 103.1 Mobilization, 103.2 Mobilization of Material

No changes, revisions, or clarifications.

Wiring: 675.1 Electrical Conduit, 677.1 Electrical Cable, 680.2 Splice Box/Junction Box, 680.1 Electric Service

No changes, revisions, or clarifications.

Communications: 676.1 Fiber Optic Training, 676.2 Fiber Optic Test Equipment, 677.2 Communication Cable, 677.3 Fiber Optic Cable, 677.4 Fiber Interconnect Center, 677.5 Fiber Optic Modem, 677.6 Factory Terminated Patch Panel, 677.7 Spread Spectrum Radio Assembly

No changes, revisions, or clarifications.

Detection: 678.1 Detector Loop, 688.3 Video Detection – Loop Emulation System

Provide video detection cameras as necessary for temporary detection during rehabilitation. These cameras will become SCDOT property and may remain in place at the discretion of the District Traffic Engineer in addition to the inductive loops. Replace any damaged inductive loops and reconnect to traffic signal. The Contractor is hereby notified that All Catalog descriptions and documentation are to be submitted within (5) days after the bid openings to the Contracts Administrator. The loops shall be installed in the surface course on all projects in Engineering Districts 3, 4, 5, 6, & 7.

Signal Supports: 682.1 Wood Pole, 682.2 Back Guy, 682.3 Steel Cable, 688.5 Steel Strain Pole and Foundation, 688.6 Concrete Strain Pole, 690.1 Steel Pole with Mast-Arm

No changes, revisions, or clarifications.

Signal Heads, Pedestrian Treatments, Illuminated signs, solar flashing assemblies: 682.4 Pedestrian Pole and Base, 686.1 LED Modules and/or Polycarbonate Vehicle Signal Head and/or Backplate, 686.2 Optically Programmable Vehicle Signal Head, 686.3 Pedestrian Signal Head, 686.4 Pedestrian Push Button Station Assembly with Sign, 686.5 Symbolic LED Blankout Sign, 688.9 Solar Powered Flasher Assembly

No changes, revisions, or clarifications.

Cabinet Items: 688.7 Controller and 332/336 Cabinet, 688.8 Remote Splice/Flasher Cabinet

No changes, revisions, or clarifications.

Service Items: 688.1 Removal Salvage and Disposal of Equipment and Materials, 688.2 Temporary Adjustment of Traffic Signal Equipment and Timings, 689.2 System Integration and Testing, 689.3 Traffic Signal System Training

No changes, revisions, or clarifications.

2.3 QUANTITY LISTS

No quantities are provided in a design build project.

2.4 EQUIPMENT

2.4.1 SCDOT Supplied Equipment – The Department will not furnish signal equipment.

2.4.2 Contractor Supplied Equipment

2.4.2.1 The CONTRACTOR shall furnish all **new** equipment (submittal of invoices required), including incidental items;

used, refurbished equipment or any equipment past warranty will not be accepted.

2.4.2.2 Compatibility

2.4.2.2.1 To insure compatibility, any additional equipment required during the life of this contract, as Change Order or Extra Work, shall be purchased by the CONTRACTOR from the same Manufacturer as the original item.

2.4.2.2.2 When installing equipment such as signal heads or pedestrian equipment, where some existing equipment is being retained, the contractor shall provide the same type of equipment, as is remaining, for visual compatibility.

2.4.2.3 The CONTRACTOR shall submit for approval a list of equipment including make, model number, manufacturer serial numbers, and warranty information, in a format similar to chart on next page. The chart shows a list of potential furnished signal equipment. Documentation only has to be submitted for the furnish items required for this contract. At the time of such submission, the CONTRACTOR shall provide a copy of the Transmittal Letter, to the Engineer.

2.4.2.4 If equipment is on the SCDOT Equipment Contract or the SCDOT QPL, catalog cut sheets do not have to be provided. On all other equipment, the CONTRACTOR shall submit for approval, catalog descriptions and documentation--THREE (3) COPIES--for each class of signal equipment and materials furnished by the CONTRACTOR. They are to be submitted TWO WEEKS PRIOR TO INSTALLATION to the Construction Office FOR APPROVAL. At the time of such submission, the CONTRACTOR shall provide a copy of the Transmittal Letter, to the Engineer.

2.4.2.5 Equipment substitutions in the life of the contract are only allowed if the contractor can show a valid hardship in remaining with the originally submitted equipment. A valid hardship may include drastic price increases, non-availability of type of equipment due to unforeseen delivery or material shortages (contractor ordering equipment late does not apply), vendor going out of business, etcetera. SCDOT may allow equipment substitutions if product is of better quality than originally submitted or if contractor is replacing non-QPL items with QPL or SCDOT Equipment Contract items, or if equipment is experimental in nature and SCDOT wants to test said equipment.

2.4.2.6 SCDOT will not pay for furnish and or installation costs of any materials installed without prior approval and acceptance, in accordance with iii and iv above.

2.4.2.7 Contractor to provide letter from the manufacturer of the cabinet and from the manufacturer of the controller indicating the equipment provided is the SCDOT QPL qualified equipment; Contractor to ensure all warranties, serial numbers, documentation, and receipts are provided with cabinet assembly and controller delivery.

Item	Make	Model #	Manufacturer	Is item on current QPL or is item under current SCDOT equipment contract (y or n)	If no, is cut sheet attached (y or n)	Serial #'s attached	Warranty info attached	Purchase date	Purchase invoice attached
Traffic Signal Cabinet									
Traffic Signal Controller									
Conflict Monitor									
Electrical Cable									
Communication Cable									
Fiber Optic Cable									
Fiber Interconnect Center / Fiber Splice Trays									
Loop Wire and Sealant Splice Boxes / Junction Boxes									
Steel Cable									
Vehicle Signal Head with LED Modules									
LED Blank Out Signs									
Optically Programmable Vehicle Signal Head									
Pedestrian Signal Head									
Pedestrian Push Button Station Assembly									
Steel Strain Pole									
Mast Arm									
Concrete Strain Pole									
Controllers and 332/336 Cabinets									
Spread Spectrum Radio Assembly									
Ethernet Extender									
Video Detection Systems									

2.5 SIGNAL INTEGRATION

Signal integration is not anticipated to be needed for this project. If damage to a cabinet occurs and a new cabinet/controller is required, integration would be the responsibility of the design build team, in accordance with 689.2 System Integration and Testing.

2.6 GENERAL PROVISIONS

- 2.6.1 All work under this Contract shall be performed under: the SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION, "STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION", Latest Edition; the SCDOT SUPPLEMENTAL SPECIFICATIONS FOR TRAFFIC SIGNALS; the SCDOT STANDARD DRAWINGS; these SCDOT TRAFFIC SIGNAL SPECIAL PROVISIONS; the "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" (latest revision); the SCDOT TRAFFIC SIGNAL DESIGN GUIDELINES; and the PLANS.
- 2.6.2 Unless noted otherwise on the plans or in these Special Provisions this is a "turn-key" project, with the contractor furnishing and installing all equipment, complete and operational to the satisfaction of the Engineer.
- 2.6.3 The PLANS are schematic in nature, showing what is generally expected at each intersection. The CONTRACTOR must devise/refine the final details, working within the Supplemental Specifications, the Design Details, the Standards, and with the Engineer.
- 2.6.4 Any deviation from the Plans must be approved by the Engineer.
- 2.6.5 At Project completion all traffic signals/equipment shall be complete and operational, to the satisfaction of the Engineer.
- 2.6.6 The CONTRACTOR will install the traffic signal to provide a completely modern installation.
- 2.6.7 Notifications – Prior to beginning construction, the CONTRACTOR shall participate in a "Pre-Construction Conference" at a time and place to be scheduled by the Department's Resident Construction Engineer (RCE).
- 2.6.8 Unauthorized Work – Any work performed without notification of the proper parties in the Department, will be treated as un- authorized work (see Section 105.11 of the Standard Specifications), and could result in nonpayment to the CONTRACTOR for that work.
- 2.6.9 Power – The CONTRACTOR, prior to the beginning of any construction activity, shall coordinate as necessary with the Utility Company supplying the power for this project. A representative of the Utility Company should be present at the RCE's Pre-Construction Conference.
- 2.6.10 Maintenance during construction – The design build team shall be responsible for the maintenance and operation of all existing signals, from notice to proceed until the final acceptance of the project. Final acceptance occurs 60 days after all punch list items are completed and signal is accepted by SCDOT. This shall include all daily maintenance of signals and any emergencies which may arise. There is no separate pay item for maintenance during construction; maintenance is simply part of the construction process. Additional details on maintenance responsibility are found in these Special

Provisions, *Section 10 Maintenance of Operations* and in the *SCDOT Traffic Signal Supplemental Specifications, 688.2 Temporary Adjustment of Traffic Signal Equipment and Timings*.

2.7 PERMITS, CODES, LICENSES, & ABILITIES

- 2.7.1 All work shall be done in a workmanlike manner to meet the highest industry standards, all in accordance with the requirements of the latest editions of the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the Illuminating Engineering Society (IES), the American National Standards Institute (ANSI), the National Electrical Manufacturer's Association (NEMA), and the regulations and standards of the local power company.
- 2.7.2 The prime contractor or subcontractor responsible for the performance of the work covered by these SCDOT TRAFFIC SIGNAL SPECIAL PROVISIONS **must be licensed by the SC Licensing Board For Contractors and possess a Journeyman Card issued by the South Carolina Municipal Association or as required by the city in which work occurs at the time work is performed.**
- 2.7.3 Further, at least one 'ON-SITE' field supervisor shall have LEVEL II or higher, Traffic Signal Certification by the International Municipal Signal Association (IMSA). Photo copies of the license and certificate (for both above) shall be submitted before work commences. The CONTRACTOR shall retain employee(s) holding the above certificate for the duration of the project; and the employee(s) shall be present **DAILY** and at the **FINAL INSPECTION.**
- 2.7.4 The CONTRACTOR shall employ persons capable of programming traffic signal controllers of the type used by this project. The CONTRACTOR shall possess both a desktop and a portable (laptop) computer, and be capable of using them to upload and download signal operating parameters.
- 2.7.5 In addition to the state requirements, all permits and licenses required by a City/County are the responsibility of the CONTRACTOR. The CONTRACTOR shall arrange with the utility company for hookup connections and attachment agreements.

2.8 INSPECTION

- 2.8.1 Engineer – During construction, the INSPECTION will be the responsibility of the Department. The Department's Construction Office, shall designate those individuals responsible for inspection, and may include a number of qualified persons, including DISTRICT ELECTRICAL SUPERVISOR (DES). For signals located within a local government that SCDOT has a signal maintenance agreement,

the inspection personnel may include the local government's Electrical Supervisor to perform inspection for SCDOT.

- 2.8.2 Disputes – The CONTRACTOR is advised that in any dispute between the Contractor and the Manufacturer, concerning the operation/maintainability/reparability of any piece of equipment, THE DECISION OF THE ENGINEER SHALL BE FINAL.
- 2.8.3 Faulty Equipment – When equipment supplied by the Department is designated faulty by the Engineer, if it is under warranty, the Contractor shall return it to the Manufacturer for replacement. The Manufacturer shall furnish a replacement unit.

2.9 MAINTENANCE OF OPERATION

- 2.9.1 Fixed time operation of signals is not acceptable for this project. In accordance with 688.2 Temporary Adjustment of Traffic Signal Equipment and Timings – Continuity of Signal Operation CONTRACTOR shall provide temporary actuation devices such as video detection to maintain actuated signal control at all times. The temporary actuation devices shall be installed and operational, and operation shall be transferred to the temporary devices prior to demolition of the existing loop detector systems. It is not permissible to adopt “uncoordinated” operation of adjacent signals; and if the existing interconnection system is broken or disconnected, it shall be repaired immediately. If possible, the District Traffic ENGINEER should be requested to provide temporary controller time settings.
- 2.9.2 Existing traffic signals shall **REMAIN IN OPERATION** until the new/modified installation has been satisfactorily tested, and it has been placed in operation after approval by the Engineer. The Testing shall be accomplished without hazard to the traveling public and while the signal heads are suitably **BAGGED WITH BURLAP**. All signal heads in place, but not in use, shall be covered with **BURLAP**. **NOTE: PLASTIC BAGS ARE NOT ACCEPTABLE.**
- 2.9.3 After approval is received from the Engineer, the new signal heads shall be switched into service during that controller phase being displayed by the existing equipment; and the existing equipment shall be turned off simultaneously. Immediately after the new signal equipment has been made operational, the existing signal heads shall be turned off, and removed.
- 2.9.4 The Contractor is cautioned to **PLAN** their work to cause minimum interference with any existing signal operation. Adjustments in the existing equipment made necessary by the new installation will be made at the expense of the Contractor.
- 2.9.5 The Contractor shall retain ownership of the materials and equipment after the intersection has been made operational, until Inspection and Acceptance (either partial or final) has been made by the Engineer,

when it then becomes SCDOT property. Prior to Acceptance, if the materials or equipment is damaged by whatever cause, the Contractor shall be responsible for repair or replacement.

- 2.9.6 Operation, Maintenance and Emergency Service – The contractor shall be responsible for the maintenance and operation of all existing signals in the “LIST OF PROJECT TRAFFIC SIGNALS” from the date of the “NOTICE TO PROCEED” of the contract until the final acceptance of the project. This shall include all daily maintenance of signals and any emergencies which may arise. The CONTRACTOR is also responsible and liable for proper and safe operation of each signal. Herein, this activity will be termed "Maintenance".
- 2.9.6.1 Restriction - The CONTRACTOR shall not change the phasing or other operation of a signalized intersection without Departmental approval.
- 2.9.6.2 Procedure - At that point in the project when construction activity is about to occur which could Affect the operation of a particular signal, the CONTRACTOR shall request the Department's concurrence, and the CONTRACTOR shall assume responsibility for operations and maintenance of that traffic signal. This request shall be in writing to the ENGINEER and shall have a written response. In the absence of the request, any activity of the CONTRACTOR which affects the operation of a signal shall be deemed evidence of the CONTRACTOR's assumption of responsibility for the operation and maintenance of the signal.
- 2.9.6.3 New Signals - Signals installed by the CONTRACTOR shall be maintained by the CONTRACTOR until the Department formally accepts the work.
- 2.9.6.4 Requirements - The CONTRACTOR shall perform EMERGENCY REPAIRS AND SERVICES as required, to insure continuity of operation of listed traffic signals and associated equipment. **This shall include replacement of malfunctioning LED modules.**
- 2.9.6.5 Technician - The CONTRACTOR shall provide at least one (1) qualified LOCAL signal technician, subject to call at all times, to provide emergency services as required to assure continuous and efficient operation of signal installations and systems. This shall include non-business hours, weekends, and holidays. The Technician shall be fully qualified to trouble-shoot, service, repair and/or replace traffic controllers and components, both electro-mechanical and solid-state. At the PRE- CONSTRUCTION CONFERENCE, the CONTRACTOR shall furnish the RCE with a LIST OF THE SIGNAL TECHNICIANS who will be responsible for performing the emergency service, and the LOCAL PHONE NUMBER(S) of the CONTRACTOR's agent(s) (answering

service, etc.), who will receive emergency calls during and after the CONTRACTOR's normal business hours.

2.9.6.6 Repair Time - The CONTRACTOR shall be ON-SITE of the malfunctioning signal for emergency service within the maximum time listed in the following schedule

<u>Weekdays or Saturday</u>	<u>Maximum Time</u>
6 AM to 6 PM	1 hour
6 PM to 6 AM	4 hours

Sundays or Holidays

Day or Night	4 hours
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2.9.6.7 Restoration of Normal Service - Once the CONTRACTOR has started repair work/emergency service, the CONTRACTOR shall restore a malfunctioning signal to normal phase operations uninterrupted.

2.9.6.8 Time Changes (EST/DST) - As part of Maintenance, the CONTRACTOR shall reset all time clocks to local legal time.

2.9.6.9 Records - The CONTRACTOR shall maintain a LOG of all trouble calls received, the response time, and the corrective action taken. The records and logs shall be available to Department personnel for review during normal working hours. All records and logs shall be turned over to the Department at FINAL ACCEPTANCE.

2.9.6.10 Failure To Perform - In the event the CONTRACTOR fails to perform in accordance with requirements and schedules of this Specification, the Department reserves the right, without notice to the CONTRACTOR, to engage a Third Party to perform the maintenance and emergency service necessary to assure continuous traffic signal operation. Further, all expenses incurred by the Department in implementing this option, shall be deducted from the payment due the CONTRACTOR, plus a **FIFTEEN HUNDRED (\$1500) DOLLAR PENALTY FOR EACH OCCASION, FOR EACH DAY (UNTIL CORRECTED)**. The penalty shall be forfeited as liquidated damages.

2.10 CONTRACT SCHEDULE

The **CONTRACTOR** shall furnish the Engineer with a **WEEKLY SCHEDULE** for the **TRAFFIC SIGNAL CONSTRUCTION** work, each Friday, for the week to come, listing the location and date of each intended activity. This will permit scheduling signal inspection personnel. Deviation from this schedule may cause the Department to delay Inspection and Payments.

2.11 PAYMENT FOR MATERIALS ON HAND

The attention of the CONTRACTOR is directed to Section 109.7 of the STANDARD SPECIFICATIONS; which is amended to include the following paragraphs.

When permitted by the Engineer, partial payment will be made for major traffic signal items that are being furnished by the CONTRACTOR. Certain items such as wooden poles, and other very heavy units not readily movable or vandalized, may be stored in un-secured locations either ON- or OFF-SITE. Other items such as signal heads, detector amplifiers, controllers, cabinets, and certain other major items may be stored in a secured/protected location either ON- or OFF-SITE. The equipment shall be labeled stating SCDOT, and the Project Name. Other requirements of Paragraph 109.8 remain applicable. Payment shall be in accordance with the following criteria:

1. For MATERIALS ON HAND, the Contractor may be paid at: FIFTY (50%) PERCENT OF THE CONTRACT UNIT PRICE OF ITEM, NOT TO EXCEED THE PAID INVOICE AMOUNT.
2. ONLY ITEMS MEASURED BY --EACH-- SHALL BE ELIGIBLE.
3. ONLY ITEMS WITH A UNIT PRICE EXCEEDING \$100 SHALL BE ELIGIBLE.
4. THE TOTAL INVOICE PRICE OF THE ITEMS SHALL EXCEED \$5000.

2.12 SUBMITTING AS-BUILT PLANS

After the completion of the project, the CONTRACTOR shall furnish to the Engineer, three (3) "red-lined" sets of Plans showing the exact locations and sizes of all conduits, poles, pedestals, splice boxes, detectors, and the routing and destination of all wires leaving the control cabinets.

2.13 FINAL INSPECTION

2.13.1 Request - The CONTRACTOR shall request Final Inspection one week prior to the desired day of inspection. Confirmation to the Resident Construction Engineer shall be provided forty-eight (48) hours prior to Final Inspection, that the project is on schedule and ready for inspection.

2.13.2 System Test - Upon completion of the Final Inspection and correction of any deficiencies, the work will be subject to a **sixty (60) day operational test** for the System, and for individual intersections. If during this period a problem arises in either the System or an

individual traffic signal, it must be resolved, and a **NEW sixty (60) day test** period shall begin.

2.14 MAINTENANCE OF TRAFFIC

The Contractor shall execute the item of Traffic Control as required by the Standard Specifications, the plans, the Standard Drawings For Road Construction, these special provisions, all supplemental specifications, the MUTCD, and the Engineer.

3.0 DELIVERABLES

3.1 Temporary Work Zone Traffic Control Signal Plans

Provide Temporary Work Zone Traffic Control Signal Plans in the Final Plan Submittal. The purposes of these plans are to show the relocation of existing equipment and any changes to the phasing for temporary purposes.

3.2 Signal Plans

Provide Signal Plans in the Final Plan Submittal.

3.3 As-Built Signal Plans

Provide As-Built “red-lined” signal plans to the District Signal Shop after the signal work is completed.

EXHIBIT 4d

TRAFFIC DESIGN CRITERIA

Part 4 – Intelligent Transportation System

1.0 GENERAL

SCDOT ITS elements exist within the limits of this project. The CONTRACTOR is not responsible for the maintenance or construction of the ITS elements. The CONTRACTOR shall call PUPs for locating the existing ITS underground infrastructure. Contact the ITS Field Operations Manager at 1408 Shop Road (803) 737-1163 or the ITS Coordinator at 1412 Shop Road (803) 737-1646 for information concerning the existing ITS infrastructure within this project. CONTRACTOR shall provide 48 hours' notice to the ITS Field Operations Manager prior to impacting the ITS infrastructure.

As-Built ITS Plans will be provided to the CONTRACTOR as FOR INFORMATION ONLY.

EXHIBIT 4e

~~DRAINAGE~~ HYDRAULIC DESIGN CRITERIA

1.0 GENERAL

Perform all hydrologic and hydraulic drainage designs associated with this project in accordance with the “SCDOT’s Requirements for Hydraulic Design Studies”, May 2009, Stormwater Quality Design Manual, and Project Design Criteria, as listed in EXHIBIT 4. Designs to address:

- Open Channels
- Storm Sewer Systems
- Detention
- Underdrains
- Cross-line Pipes and Non-Bridge Sized Culverts
- Bridge-Sized Culverts and Bridges
- Scour
- Sediment and Erosion Control
- Best Management Practices
- Stormwater Quality Design

2.0 CRITERIA

2.1 Field Investigations and Data Collection

- 2.1.1 Locate plans and reports for existing hydraulic features that currently encroach upon the floodplain(s).
- 2.1.2 Delineate watershed boundaries and note land use conditions for existing and proposed conditions.
- 2.1.3 Determine Manning’s “n” values for the channels and floodplains and rationale coefficient “c” values for land-use of smaller drainage areas.
- 2.1.4 Determine soil types.
- 2.1.5 Note presence of hydraulic controls, high-water marks, and identify known flooding issues associated with the project based on historical data.
- 2.1.6 Inventory and evaluate the condition and usability of existing outfall ditches, giving additional attention to ditches and stormwater piping in the vicinity of Summerville Avenue/Southern Lumber/I26 as shown on Site Plan for Southern Lumber provided in Attachment B.
- 2.1.7 Note slope failures and washout areas.
- 2.1.8 Inventory the location of existing cross-line and median drainage structures, to include pipes, culverts, and inlets.

- 2.1.9 Perform cross-line pipe inspections in accordance with SCDOT’s Pipe and Culvert Field Inventory and Inspection Guidelines (2011), with exceptions noted herein.
- 2.1.9.1 Inspect box culverts via direct measure techniques utilizing a video camera to document condition, jointing and obstructions.
- 2.1.9.2 Inspect pipes 18-inches and greater in diameter using a pipe camera system (no laser).
- 2.1.9.3 Perform a condition assessment on the barrel, inlet and outlet of each structure. Summarize the results and note the structural deficiencies.
- 2.1.9.4 A SC Registered Professional Engineer shall prepare a report.

2.2 Roadway Drainage Design

- 2.2.1 Evaluate roadway ~~and offsite~~ drainage. Note areas of additional imperviousness, new bridges, shifting of road crown, temporary drainage affected by staging (to include underpasses), noise and median barrier wall locations, flooding (concerns at Summerville Avenue/Southern Lumber/I-26), outfall, and underdrain locations. **Include offsite drainage areas and inflows in proposed designs. Upstream systems should not be included in the designs but the upstream drainage areas shall be accounted for at system inlets. When tying into existing systems, at a minimum, include one downstream pipe link of the system in the design.**
- 2.2.2 Design new and analyze existing closed drainage systems with Geopak Drainage software. Use the design storm event for the appropriate roadway designation, with interstate ramps considered primary roads. Address grade separation differences at walls in the design.
- 2.2.3 Tie median underdrains into storm drainage systems.
- 2.2.4 Design temporary drainage systems for the 5-yr storm event. Minimize ponding and temporary spread, in particular at flood sensitive locations and the low side of barrier walls.
- 2.2.5 Perform hydraulic analyses on all cross-line and median drainage structures for the design storm event. Additionally include the 100-yr overtopping flood event for cross-lines and the 50-yr surcharging event for median inlets.
- 2.2.6 Include backwater effects from natural dams or other downstream controls in drainage designs and road profiles.

- 2.2.7 Perform open channel designs. Include ditch capacity and stability analyses on all median, sideline, and outfall ditches within the right-of-way limits.
- 2.2.8 Design structures to detain increases in post-developed discharges from pre-developed discharges to comply with permitting requirements.
- 2.2.9 Calculate pre-developed and post-developed discharges for the 2-yr and 10-yr storm events at outfall locations. Include these locations on the Erosion Control Data Sheet (ECDS).
- 2.2.10 Consult with the SCDOT’s Environmental Office for guidance when an existing pipe or culvert discharging to wetlands requires upsizing.
- 2.2.11 Scupper drains must not be placed directly over a waterbody and must be limited in numbers elsewhere.
- 2.2.12 CSX and Norfolk Southern have rails within the project limits. Conform to their requirements when impacts due to construction occur within each of their right-of-ways. Free falling discharges from bridges are not allowed on railroad right-of-way. Prepare a report summarizing the pre- and post- runoff conditions for ditches and drainage structures within the Railroad’s right-of-way. Send a copy to the Railroad and the SCDOT Right-of-Way Office – Railroad Coordinator.

2.3 Pipes, Culverts, Inlets, Junctions, and Ditches

- 2.3.1 Perform repairs and rehabilitations to cross-line and median drainage pipes and culverts that have structural deficiencies as determined from the pipe inspections in accordance with 2.1.9. For deficiencies discovered only during video inspections, SCDOT will take necessary measures required to ensure that the deficiencies are remediated, or rendered harmless. Such necessary measures will include self-performing, retaining a qualified firm, or negotiating a construction change order with the Contractor.
- 2.3.2 Verify the hydraulic capacity of pipes and culverts through hydraulic analyses performed by a SC Registered Professional Engineer to demonstrate compliance with the Requirements and Design Criteria. Analyses shall reflect the “n” value for the liner material and any reduction in diameter. When results do not comply with the Requirements and Criteria, replace the structure or make other improvements to achieve compliance.
- 2.3.3 Obtain necessary permits to perform the replacement or repairs.

- 2.3.4 Remove sedimentation from structures and video inspect prior to acceptance of the project.
- 2.3.5 Consider the need for traffic control while performing work on the structures.
- 2.3.6 Abandon pipes by filling with flowable fill. Note abandoned pipe locations on drainage sheets.
- 2.3.7 Perform repairs and rehabilitations to inlet and junction structures, median, sideline and outfall ditches as noted during field review.
- 2.3.8 Construct storm drains subject to tidal flow with O-ring reinforced concrete pipe.

2.4 Hydraulic Modeling

The below requirements of 2.4 apply to the Port Access Road (Mainline) and Tidewater Road (NP Ramp) bridge crossings over Shipyard Creek, and to the Bainbridge Connector Road bridge, spanning between Stromboli Avenue Extension and the Mainline, that parallels Shipyard Creek.

- 2.4.1 Model natural, existing, and proposed conditions for bridges constructed over Shipyard Creek using the unsteady flow model HEC-RAS. Refer to the HEC-RAS Reference Manual v4.1 or latest edition for guidance on setting up cross sections and other inputs within the model for tidal bridges. In addition to the four cross sections described within the Manual, add additional cross sections as necessary to achieve a downstream limit where a change in starting elevation will not affect the computed high-water depth at the bridge and the upstream limit extends to the limit of backwater from the bridge.
- 2.4.2 Set the bridge configurations based on the triple profile, which consists of cross sections cut 30' left and right of the proposed centerline, and one at the proposed centerline. Locate the offset cross sections to best reflect stream alignment (approximately 30 feet left and right) and excludes the existing roadway fill limits. Proposed fill cannot project into the channel. If the 2:1 slope intersects with natural ground prior to the channel, the slope must project through the ground line to an elevation below the bottom of the channel. Do not allow this projection to cross through either the offset or the centerline plot of the channel (triple profile).
- 2.4.3 The required freeboard for these tidal bridge crossings is 2.0 feet above the 10-year high-water elevation including wave height.
- 2.4.4 Submit the preliminary model setup to SCDOT for approval before finalizing it. Summarize model inputs and results, to include beginning

and end stations, the finished grade, low chord elevations and optimal span configurations.

- 2.4.5 Compare model results of the proposed conditions to the unrestricted (natural conditions) for the 100-yr storm event to limit backwater to 1.0 foot or less.
- 2.4.6 Prepare a scour study, to include the 100-yr and 500-yr storm events, for each hydraulically modeled structure. Plot the results for each event on the triple profile.

2.5 Floodplains and Floodways

- 2.5.1 Minimize impacts during construction within the Special Flood Hazard Areas (SFHA) defined by FEMA as Zones A or AE.
- 2.5.2 When impacts occur within these SFHAs, coordinate with the appropriate agencies in accordance with the “SCDOT’s Requirements for Hydraulic Design Studies”, May 2009 for obtaining models, approvals, and certifications that may be required. Continuously verify the FEMA maps are the most updated ones available.

2.6 Outfalls

- 2.6.1 Determine the classification of the receiving waters and what impairments may exist downstream of the discharges. Provide additional water quality treatment when outfalls discharge to outstanding resource waters (ORW), shellfish beds, trout streams, 303(d) listed, TMDL, and other sensitive waters.
- 2.6.2 The Contractor shall include treatment at outfalls through vegetative practices where possible and utilize structural controls when vegetative practices are not applicable. Obtain approval from the SCDOT for structural controls prior to implementation.
- 2.6.3 Evaluate temporary and post-construction water quality treatment for each outfall on a case specific basis against the Maximum Extent Practicable standard.

2.7 Sediment and Erosion Control

- 2.7.1 Develop a plan that outlines methods to minimize the amount of erosion and sedimentation during construction. Summarize the plan on the ECDS that is included within the construction plans.
- 2.7.2 Include inlet filters and outlet protection locations on the drainage sheets.

- 2.7.3 Allocate sufficient right-of-way to maintain erosion and sediment control measures during and post construction.
- 2.7.4 Perform repairs and rehabilitations to slope failures and washouts as noted during field review.

2.8 NPDES Permitting

2.8.1 Prepare the NPDES permit package.

- Notice of Intent (NOI)
- Stormwater Pollution Prevention Plan (SWPPP)
- SCDOT/OCRM checklist
- A half-sized set of signed and sealed final drainage plans

2.8.2 The SCDOT reviews, signs and submits the package to OCRM.

2.8.3 Contractor is responsible for all coordination to obtain the permit.

2.9 Additional Information

The Macalloy site has approximately 140 acres that fronts Shipyard Creek. This facility was listed on the National Priorities List (NPL) in February 2000, and subsequently the EPA published a Record of Decision (ROD) in August 2002 for the cleanup of contaminated soil, groundwater, stormwater, and sediment at the site. Part of the remedial action was the construction of a comprehensive stormwater management system as depicted on the As-Built drawing included under Attachment C. The new right-of-way limits to accommodate the construction of Port Access Road encroach on parcels 9, 31, 32, 33, 29 and 65, all of which may contain a portion of this stormwater management system. The Contractor shall comply with the Agreement Section XI.C.5.

3.0 DELIVERABLES

Perform a thorough QC review of the submittals prior to submitting them to the SCDOT. Ensure the final submittals are signed and sealed by the Engineer of Record, a licensed and registered Professional Engineer in the State of South Carolina.

3.1 Preliminary Hydraulic Design Submittal

Submit to the SCDOT:

- One (1) Set of Preliminary Roadway Drainage Plans
- One (1) Hard Copy and Electronic Copy of the Preliminary Hydraulic Design Report, to include:

- Field Investigation and Pipe Inspection Report
 - Roadway Drainage Design and Supporting Documentation including flowrates, inlet spacing calculations, Hw/D, Geopak summaries, open channel designs, and outlet protection
 - Sediment and Erosion Control Plan and Supporting Documentation
 - Preliminary Hydraulic Model Design and Supporting Documentation including Hydrology Data Sheets and Risk Assessment Forms (for each applicable location)
 - Detention Design(s) and Supporting Documentation
 - Outlet structural controls.
- Address Permitting Requirements associated with Federal, State and Local Agencies
 - One (1) Electronic Copy of the reports to CSX and Norfolk Southern

3.2 **Final Hydraulic Design Submittal**

Submit to the SCDOT:

- Two (2) Copies of the CLOMR and/or “No Impact” Certification and Supporting Documentation, when applicable
 - Three (3) Copies of the NPDES Permit Package (include 1 additional copy of the NOI)
 - One (1) Hard Copy and One (1) Electronic Copy of the Final Hydraulic Design Report and Final Drainage Plans.
- Final Hydraulic Calculations
 - Scour Study and Supporting Documentation (for each applicable location)
 - Final Plans- include the hydrology data for bridges, culverts and pipes greater than 48 inches

EXHIBIT 4f

GEOTECHNICAL DESIGN CRITERIA

1.0 GENERAL

The following items, at a minimum, shall be included in the geotechnical design for this project:

- Design foundations for the proposed bridge structures. All subsurface exploration, geotechnical design, and construction for the Project shall be carried out in accordance with the design criteria below.
- Provide pile and drilled shaft dynamic and/or static load testing as outlined in the design criteria and in accordance with the project specifications and Special Provisions. The results shall be used to determine capacities of the associated foundation system.
- Design and provide ground improvements as necessary to meet required design criteria and performance limits.
- Evaluate new pavement subgrades within the proposed alignment and any other proposed new pavements on the project.
- Contain and dispose of hazardous media spoils (soil, groundwater, sediment, and surface water) generated by geotechnical investigation and construction as required by the Agreement.

2.0 CRITERIA

The Geotechnical Base Line Report (GBLR) prepared by S&ME dated July 21, 2015, has been provided in Attachment C for geotechnical information. In addition, soil test boring log input files have been provided electronically in gINT format. Preliminary analysis provided in the GBLR was performed prior to specific design criteria were developed for this project and is provided for information only. Additionally, the analysis was performed based on certain assumptions that may not reflect what will be constructed under this contract. SCDOT has not performed a review of this analysis and makes no claims regarding the correctness, applicability, or validity of the analysis.

All geotechnical testing shall comply with the requirements of the SCDOT Geotechnical Design Manual (GDM), 2010, Version 1.1. Geotechnical design shall comply with the requirements stated below and the Special Provisions listed in Exhibit 5. Geotechnical information provided in the Appendix of the GBLR (field and lab data only) as part of this RFP is intended for use in the design of this project. The Contractor shall verify that geotechnical information provided in Attachment C meets the requirements for a geotechnical investigation for this specific project as required by the GDM. If the requirements of the GDM are not met, then the Contractor shall provide additional geotechnical investigation to meet the geotechnical requirements for this specific project.

2.1 Bridge

Design all bridge structures proposed for this project in accordance with the GDM.

Install permanent construction casing to the Marl for all drilled shaft excavations within all areas of environmental contamination where drilled shafts are proposed. This includes all areas of known or suspected contamination and all areas identified during construction to have environmental contamination. The Contractor shall install all casing prior to excavating the shafts.

The Contractor shall be responsible for the load testing of all foundations used on this project. All testing reports whether for driven piles or drilled shafts shall bear the legible seal, signature, and date of the testing firm’s engineer registered as a Professional Engineer in the State of South Carolina. The Contractor’s designer shall review and approve, in writing, all load test reports prior to submitting the reports to SCDOT for review and acceptance or comment. Comments made by SCDOT shall be reviewed and rectified by the Contractor’s designer prior to the results of the load testing being used in design.

2.1.1 Pile Dynamic Load Testing with Pile Driving Analyzer

The Contractor shall select a testing firm for PDA Testing from those firms currently approved to provide foundation testing services on SCDOT’s Foundation Testing On-Call Contract. In addition to the PDA testing, CAPWAP (Case Pile Wave Analysis Program) analysis shall also be performed. The Contractor shall provide a Pile Installation Plan (PIP) that shall include the pile index testing program. The pile index testing program shall at a minimum include the Bent and Pile number of each pile to be tested as well as the number of index piles to be tested. The number of index piles shall conform to the requirements of the GDM.

2.1.2 Shaft Load Testing

A non-production drilled shaft shall be tested prior to the construction of any production drilled shafts. The number of load tests shall conform to the requirements of the GDM. Any drilled shaft testing shall consist of either a bi-directional static load test, a rapid axial load test, or a high strain dynamic load test. The Contractor shall provide a Drilled Foundation Installation Plan (DFIP) that shall also include which load test procedure will be used (i.e. static, rapid, or high strain). The test shaft shall have a minimum diameter of 48 inches. The test shaft shall be located at least 25 feet from any existing bridge foundation and shall be positioned such that construction and testing operations do not adversely affect the existing bridges. In addition, the test shaft shall be located a minimum of 25 feet and a maximum of 50 feet from any future bridge

drilled shaft foundation location. The location shall avoid conflicts with any construction staging, necessary work trestle, and/or utilities.

2.2 **Roadway**

Design all new roadway structures required for the Project in accordance with the GDM. Geotechnical evaluation of new embankments will be required in accordance with the GDM and applicable Bridge Design Memos.

Perform a geotechnical exploration to include soil test borings at 500 foot intervals as recommended by the SCDOT Pavement Design Guidelines, July 2008, for the proposed roadway alignment, all proposed new pavement areas, and all proposed pavement overlay areas to verify pavement subgrades within the Project.

Miscellaneous overhead structure foundations such as lighting and signage shall be designed in accordance with AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, effective as of the Final RFP release date.

2.3 **Seismic**

Seismic design of the bridge structures, roadway structures, and new embankments shall be required in accordance with the SCDOT Geotechnical Design Manual and SCDOT Seismic Design Specifications for Highway Bridges.

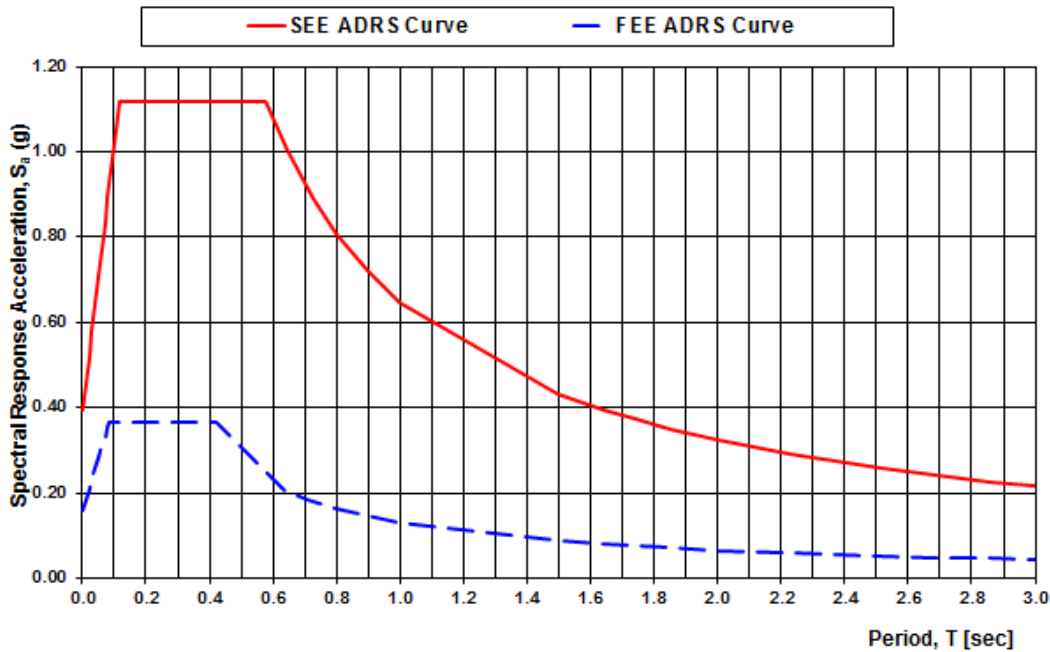
A one-dimensional non-linear site-specific response analysis (SSRA) has been performed for this project by S&ME. The SSRA report dated August 5, 2015 is attached in Appendix C for information only. Based on the SSRA report, single ADRS curves for the SEE and FEE design events have been developed for all structures bearing on deep foundations extending to or into the Marl and are supplied in this design criteria. Separate ADRS curves for the SEE and FEE design events are provided for each of four locations for embankment and roadway structure design which include Interstate 26, the Port Access Road Mainline west of Shipyard Creek to I-26, the Port Access Road east of Shipyard Creek, and the Local Access Road as shown in Figure 1 of S&ME's SSRA report. The ADRS curves are provided below and shall be used for all seismic design on the Project.

The provided curves are the final design curves for the Project. Submittal of ATC's for site-specific site response analyses will not be approved.

The Simplified Newmark method described in Section 13.17.2 and Equation 13-106 of the GDM shall be used to analyze seismic ground displacements along a shear plane.

EXHIBIT 4f – GEOTECHNICAL DESIGN CRITERIA

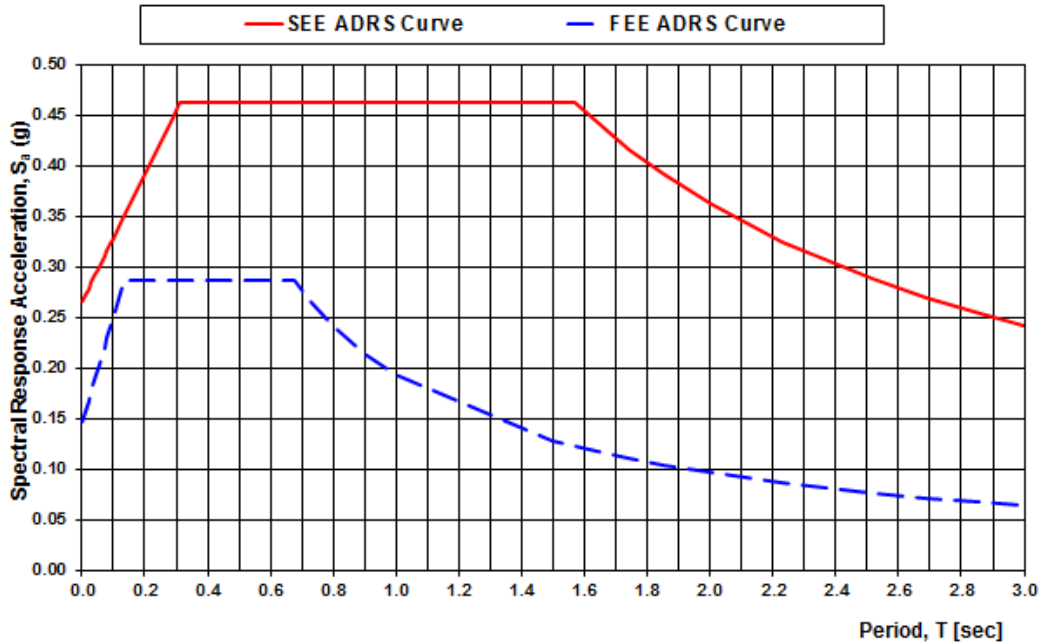
Port Access Road-Structures on Deep Foundations Bearing on Marl
Site-Specific ADRS Curves From Top of Marl



FEE ADRS Curve Site-Specific		SEE ADRS Curve Site-Specific		
T	S_a	T	S_a	
0.00	0.161	0.00	0.394	
0.01	0.185	0.01	0.457	
0.02	0.209	0.02	0.519	
0.03	0.234	0.03	0.582	
0.04	0.258	0.04	0.644	
0.05	0.282	0.05	0.707	
0.06	0.300	0.06	0.770	
0.07	0.331	0.07	0.832	
0.08	0.355	0.08	0.895	
To	0.364	0.09	0.958	
0.10	0.364	0.10	1.020	
0.13	0.364	To	0.12	1.119
0.14	0.364		0.14	1.119
0.29	0.364		0.29	1.119
Ts	0.364		0.31	1.119
0.53	0.285		0.32	1.119
0.64	0.205	Ts	0.58	1.119
0.68	0.193		0.64	1.007
0.71	0.185		0.73	0.889
0.80	0.164		0.80	0.809
0.90	0.146		0.90	0.719
1.00	0.131		1.00	0.647
1.50	0.088		1.50	0.432
1.64	0.080		1.64	0.395
1.74	0.075		1.74	0.372
1.85	0.071		1.85	0.350
2.00	0.066		2.00	0.324
2.23	0.059		2.23	0.290
2.52	0.052		2.52	0.257
2.69	0.049		2.69	0.241
2.86	0.046		2.86	0.226
3.00	0.044		3.00	0.216

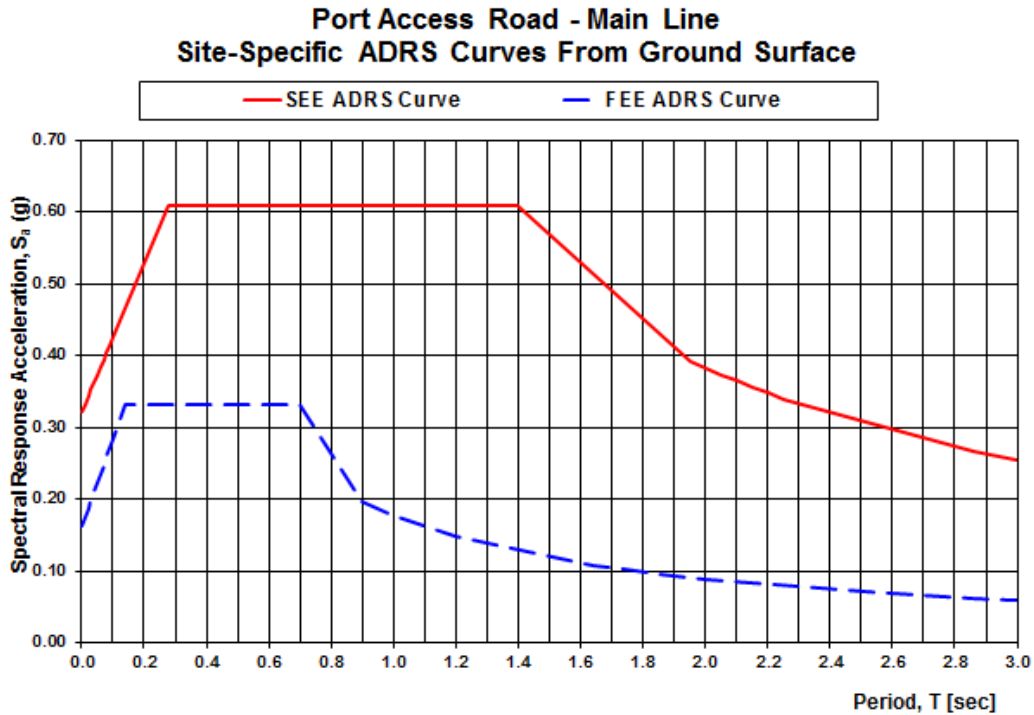
EXHIBIT 4f – GEOTECHNICAL DESIGN CRITERIA

Port Access Road - Interstate 26
Site-Specific ADRS Curves From Ground Surface



FEE ADRS Curve Site-Specific		SEE ADRS Curve Site-Specific		
T	S_a	T	S_a	
0.00	0.148	0.00	0.266	
0.01	0.158	0.01	0.273	
0.02	0.168	0.02	0.279	
0.03	0.179	0.03	0.285	
0.04	0.189	0.04	0.291	
0.05	0.199	0.05	0.298	
0.06	0.210	0.06	0.304	
0.07	0.220	0.07	0.310	
0.08	0.230	0.08	0.316	
0.09	0.240	0.09	0.323	
0.10	0.251	0.10	0.329	
To	0.13	0.13	0.347	
0.19	0.287	0.19	0.385	
0.29	0.287	0.29	0.447	
0.31	0.287	To	0.31	0.462
0.32	0.287	0.32	0.462	
0.60	0.287	0.60	0.462	
Ta	0.67	0.68	0.462	
0.73	0.266	0.73	0.462	
0.80	0.242	0.80	0.462	
0.90	0.215	0.90	0.462	
1.00	0.194	1.00	0.462	
1.50	0.129	1.50	0.462	
1.64	0.118	To	1.57	0.462
1.74	0.111	1.74	0.416	
1.85	0.105	1.85	0.392	
2.00	0.097	2.00	0.362	
2.23	0.087	2.23	0.325	
2.52	0.077	2.52	0.287	
2.69	0.072	2.69	0.269	
2.86	0.068	2.86	0.253	
3.00	0.065	3.00	0.241	

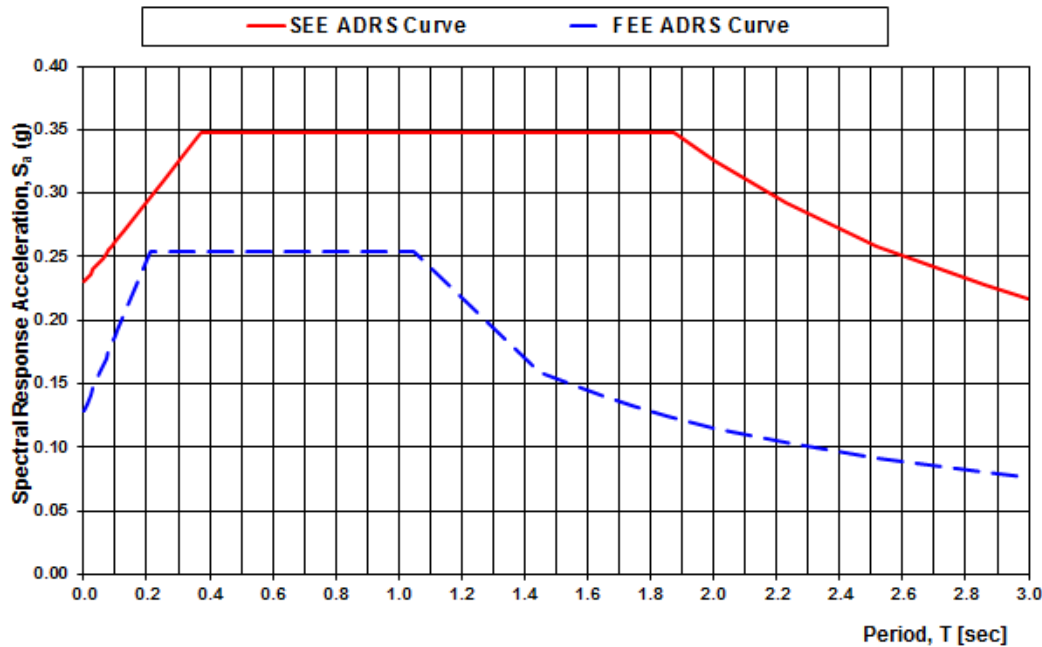
EXHIBIT 4f – GEOTECHNICAL DESIGN CRITERIA



FEE ADRS Curve Site-Specific		SEE ADRS Curve Site-Specific		
T	S_a	T	S_a	
0.00	0.162	0.00	0.322	
0.01	0.174	0.01	0.332	
0.02	0.186	0.02	0.342	
0.03	0.198	0.03	0.353	
0.04	0.210	0.04	0.363	
0.05	0.223	0.05	0.373	
0.06	0.235	0.06	0.383	
0.07	0.247	0.07	0.394	
0.08	0.259	0.08	0.404	
0.09	0.271	0.09	0.414	
0.10	0.283	0.10	0.424	
To	0.14	0.13	0.455	
0.19	0.332	0.19	0.517	
0.25	0.332	To	0.28	0.609
0.31	0.332	0.31	0.609	
0.32	0.332	0.32	0.609	
0.53	0.332	0.60	0.609	
Ts	0.70	0.68	0.609	
0.90	0.197	0.73	0.609	
0.95	0.187	0.80	0.609	
0.90	0.197	0.90	0.609	
1.00	0.178	1.00	0.609	
1.20	0.148	Ts	1.40	0.609
1.64	0.108	1.95	0.392	
1.74	0.102	2.00	0.382	
1.85	0.096	2.05	0.373	
2.00	0.089	2.10	0.364	
2.23	0.080	2.15	0.356	
2.52	0.070	2.20	0.347	
2.69	0.066	2.25	0.340	
2.86	0.062	2.86	0.267	
3.00	0.059	3.00	0.255	

EXHIBIT 4f – GEOTECHNICAL DESIGN CRITERIA

Port Access Road - East of Shipyard Creek
Site-Specific ADRS Curves From Ground Surface



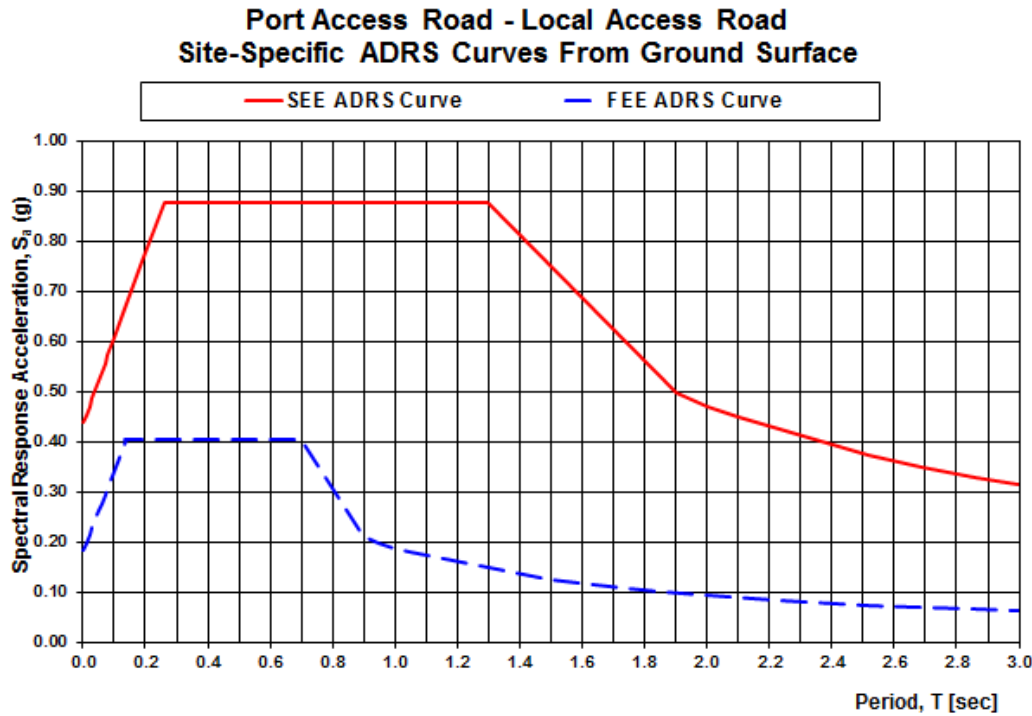
FEE ADRS Curve
Site-Specific

T	S_a
0.00	0.129
0.01	0.135
0.02	0.141
0.03	0.147
0.04	0.153
0.05	0.159
0.06	0.165
0.07	0.171
0.08	0.176
0.09	0.182
0.10	0.188
0.11	0.192
0.18	0.237
T_0 0.21	0.254
0.31	0.254
0.32	0.254
0.53	0.254
0.58	0.254
0.63	0.254
0.68	0.254
0.73	0.254
T_0 1.05	0.254
1.45	0.159
1.64	0.141
1.74	0.133
1.85	0.125
2.00	0.115
2.23	0.104
2.52	0.092
2.69	0.086
2.86	0.081
3.00	0.077

SEE ADRS Curve
Site-Specific

T	S_a
0.00	0.230
0.01	0.233
0.02	0.237
0.03	0.240
0.04	0.243
0.05	0.246
0.06	0.249
0.07	0.252
0.08	0.255
0.09	0.259
0.10	0.262
0.13	0.271
0.19	0.290
0.25	0.310
0.31	0.328
T_0 0.37	0.348
0.60	0.348
0.68	0.348
0.73	0.348
0.80	0.348
0.90	0.348
1.00	0.348
1.20	0.348
1.64	0.348
1.74	0.348
T_0 1.87	0.348
2.00	0.326
2.23	0.292
2.52	0.259
2.69	0.242
2.86	0.228
3.00	0.217

EXHIBIT 4f – GEOTECHNICAL DESIGN CRITERIA



FEE ADRS Curve Site-Specific		SEE ADRS Curve Site-Specific	
T	S _n	T	S _n
0.00	0.183	0.00	0.437
0.01	0.199	0.01	0.454
0.02	0.215	0.02	0.471
0.03	0.231	0.03	0.488
0.04	0.246	0.04	0.505
0.05	0.262	0.05	0.522
0.06	0.278	0.06	0.539
0.07	0.294	0.07	0.556
0.08	0.309	0.08	0.573
0.09	0.331	0.09	0.590
To 0.14	0.404	0.10	0.607
0.14	0.404	0.13	0.657
0.19	0.404	0.19	0.759
0.29	0.404	To 0.26	0.877
0.31	0.404	0.31	0.877
0.32	0.404	0.32	0.877
0.47	0.404	0.60	0.877
Ts 0.70	0.404	0.68	0.877
0.90	0.210	0.73	0.877
0.95	0.199	0.80	0.877
1.00	0.189	0.90	0.877
1.05	0.180	1.08	0.877
1.50	0.126	Ts 1.30	0.877
1.64	0.115	1.90	0.497
1.74	0.109	1.95	0.484
1.85	0.102	2.00	0.472
2.00	0.095	2.05	0.460
2.23	0.085	2.10	0.449
2.52	0.075	2.52	0.374
2.69	0.070	2.69	0.351
2.86	0.066	2.86	0.330
3.00	0.063	3.00	0.314

3.0 GEOTECHNICAL CONSTRUCTION REQUIREMENTS - HAZARDOUS MATERIALS

The Contractor shall dispose of all hazardous media spoils as required by the Agreement.

Geotechnical construction with regard to hazardous materials shall comply with the Agreement. The following reports prepared by S&ME are provided in Appendix C for information only:

- Phase I Environmental Site Assessment dated January 24, 2011.
- Environmental Data Summary Report dated June 26, 2015.
- Summary of Environmental and Geotechnical Considerations dated August 5, 2015.

4.0 DELIVERABLES

Geotechnical reports shall, at a minimum, contain all that is described in Chapter 21 of the SCDOT Geotechnical Design Manual and the latest design memorandums. The reports shall contain design details and plan notes along with data that are consistent with that shown in the preliminary and final bridge and road plans. In addition, the Contractor's designer shall prepare the required geotechnical bridge and roadway plan sheets that clearly detail any geotechnical requirements outlined in the reports. The reports and plans shall bear the legible seal, date, and signature of the responsible engineer registered as a Professional Engineer in the State of South Carolina. Submit each report to SCDOT along with the preliminary or final bridge or roadway plan submittal. The review of the reports and plans will be performed in accordance with the submittal plan review process.

All submittals to SCDOT shall be thoroughly QC reviewed by the Contractor prior to submittal and all final submittals shall be signed and sealed by the Engineer of Record who shall be licensed and registered as a Professional Engineer in the State of South Carolina.

4.1 Preliminary Geotechnical Design Submittals

The Contractor shall submit to SCDOT:

- Electronic Copy of the Preliminary Bridge Geotechnical Engineering Report for each bridge structure.
- Electronic Copy of the Preliminary Roadway Geotechnical Engineering Report to include roadway embankments, retaining walls, culverts, and any other roadway structures.

4.2 Final Geotechnical Design Submittals

The Contractor shall submit to SCDOT:

- Electronic Copy of the Final Bridge Geotechnical Engineering Report for each bridge structure.

- Electronic Copy of the Final Roadway Geotechnical Engineering Report to include roadway embankments, retaining walls, culverts, and any other roadway structures.

4.3 Foundation Installation Plan Submittals

Prepare Drilled Foundation Installation Plans (DFIP) and/or Pile Installation Plans (PIP) in accordance with the SCDOT Standard Specifications for Highway Construction, 2007 Edition. Submit all foundation installation plan submittals electronically. The Contractor's designer shall review and approve all DFIP and PIP (including pile driving criteria) prior to submitting the foundation installation plans to SCDOT for review and acceptance. SCDOT will review the foundation installation plans and provide either acceptance or comments. The Contractor's designer shall resolve all comments prior to re-submittal to SCDOT. SCDOT will review the DFIP and/or the PIP only to verify that the specifications have been addressed. The Contractor shall provide a supplement to the report containing the actual field conditions encountered and as-built foundation data and information after construction of the foundations is complete.

4.4 Foundation Testing Submittals

Submit to SCDOT an electronic copy of all applicable foundation testing reports for all bridge and roadway structures to include but not limited to Shaft Load Test and Pile Driving Analyzer test reports.

4.5 Hazardous Materials Testing Submittals

The Contractor shall submit to SCDOT:

- Results of any hazardous materials analytical testing of sampled or excavated subsurface materials as outlined in the Agreement.
- Manifests of all hazardous materials requiring disposal.

EXHIBIT 4g

ENVIRONMENTAL DESIGN CRITERIA

1.0 GENERAL COMMITMENTS

The Agreement, Article X, includes details related to Environmental Compliance. The NEPA documents and other environmental information are provided in Attachment B. The Contractor shall avoid impacts to the environment to the maximum extent practicable. In cases where impacts cannot be avoided, the Contractor shall minimize impacts to the environment to the most practicable extent. As a minimum the Contractor shall include the following in the Project:

- 1) The Contractor is responsible for the preparation, revision, acquisition, and adherence to conditions of any permits required by federal, state, local laws or regulations.
- 2) The Contractor is responsible for any modifications or revisions to the environmental documents and permits that result from deviations in the project design and environmental impacts as stated in the environmental documents.
- 3) The Contractor shall provide an Environmental Compliance Plan for the Project. The plan shall be submitted to SCDOT for review and approval prior to any construction activity. The plan shall identify all specific measures that the Contractor will implement to assure compliance with all federal, state and local laws & regulations including, but not limited to, environmental documents, permits, and environmental commitments. The plan shall also designate specific personnel that are charged with carrying out monitoring and compliance activities included in the Environmental Compliance Plan.
- 4) Fines assessed by any agencies to the Department as the result of the Contractor's non-compliance or violation of said permit provisions shall be paid by the Department and subsequently deducted from the Contractor's monthly pay estimate.
- 5) The Contractor shall coordinate all permitting through SCDOT's Environmental Services Office.
- 6) Contractor responsible for providing a summary report documenting how all commitments that fall within his responsibility have been satisfied.

2.0 ENVIRONMENTAL DOCUMENT COMMITMENTS

The Contractor shall comply with all Environmental Commitments related to the Project. The following list of Environmental Commitments and instructions serves as a guideline for the relationship between SCDOT and the Contractor as it pertains to fulfilling the Environmental Commitments for the Project.

2.1 Port EIS Appendix N

- 1) Commercial and residential land uses that experience direct right of way impacts will receive full compensation through the Uniform Relocation Assistance and Real Properties Act of 1970 (The Uniform Act). Properties that require displacement will receive assistance as provided by the Uniform Act.

Contractor's Responsibility (See Agreement)

- 2) Excess property associated with the proposed removal of I-26 Exit 218 in the affected area will be conveyed to the City of North Charleston under a separate agreement.

Contractor is responsible for preparing the deed of conveyance to the City of North Charleston and should coordinate with SCDOT's Property Management Office of Surplus Property.

- 3) Safety improvements such as the installation of gates, lights, and signs will be provided at four railroad crossings in the affected community. These crossings are located at Accabee, Misroon, Hackerman, and Discher.

SCDOT Responsibility

- 4) Streetscaping will occur along Stromboli Avenue, Spruill Avenue, and Meeting Street between Naval Base Road and Pittsburgh Avenue. For example, work items may include sidewalks, pedestrian signals, refurbishment of existing drainage structures, period lighting, and landscaping.

SCDOT Responsibility

- 5) SCDOT will continue to work with the City of North Charleston and LAMC by providing technical assistance related to transportation related issues that may occur as a result of the community's master plan.

SCDOT will meet the requirements of this commitment outside of the RFP/Design Build Contract

- 6) Operational improvements will be provided along Meeting Street and will terminate at Morrison Drive. For example, work will include surfacing, geometric improvements, thermoplastic highway markings, raised pavement markers, pedestrian crosswalks, high type concrete railroad crossing, and improved signalization.

SCDOT Responsibility

Stromboli will terminate into Carner Avenue. For operational and safety concerns, a cul-de-sac will be constructed on Meeting Street just north of the new intersection.

Contractor's Responsibility

- 7) Where applicable, overhead reflective sheeting will be used instead of overhead lights.

Contractor's responsibility to use standard reflective sheeting for roadway signage per the latest version of the MUTCD.

- 8) A noise wall will be constructed adjacent to the Rosemont neighborhood.

Contractor's Responsibility

- 9) Environmental (Wetland) Mitigation: If no suitable in-kind mitigation opportunities are identified, SCDOT will debit the Huspa Creek Mitigation Bank for estuarine wetland impacts and the Black River Mitigation Bank for freshwater wetland impacts.

SCDOT Responsibility

- 10) The contractor will be required to submit a vibration plan, for approval by SCDOT, prior to any construction activity. The plan shall at a minimum, provide for pre- and post-construction surveys of nearby structures, establish appropriate monitoring sites during construction, develop protection plans for susceptible structures, and identify protection measures of existing structures to prevent vibration induced damage. Periodic reviews of the construction site will be conducted by SCDOT to ensure compliance with the plan.

Contractor's responsibility (See Exhibit 5)

- 11) The contractor will be required to minimize dust resulting from construction activity by using water trucks and other acceptable means. A dust control plan will be submitted to SCDOT prior to any construction activity. Periodic reviews of the construction site will be conducted by SCDOT to ensure compliance with the plan.

Contractor's responsibility

- 12) Educational and Employment Initiatives: As part of the Port Access Road project, several programs will be established to support educational and employment opportunities for individuals within the affected communities. These programs are described in Section 2.4.2.4 of Appendix N of the Port EIS.

SCDOT is responsible for fulfilling the educational and employment initiatives described in Section 2.4.2.4 (Items 1-5) of Appendix N of the Port EIS. The Contractor is responsible for Items 6 and 7 described below:

Project Employment Office: The contractor will be required to establish a local employment office in the affected area. The office will remain operational until up to 75% of project completion.

Contractor's Responsibility

Project Job Fair: A Job Fair will be held in the project area to market career opportunities associated with the roadway project.

Contractor's Responsibility (See Exhibit 5)

- 13) **Public Relations:** The contract will include a public relations component in the construction contract provisions. Items that may be included in the public relations component include updated news briefs, press releases, website access, and project brochures throughout the construction phase of the proposed roadway to keep the affected communities fully informed.

Contractor's Responsibility

- 14) **Dissemination of Information:** In addition to disseminating information using mainstream media, SCDOT will disseminate information to the affected area. Special efforts will be made to reach out to media sources commonly used by the African American community of the affected area. Information to be disseminated may include job announcements, project updates, traffic updates, etc.

Contractor's Responsibility

- 15) **Community Liaison:** SCDOT will employ a community liaison. This person will interface with the SCDOT, FHWA, City of North Charleston and members of the affected area to keep all stakeholders apprised of the project's status, community concerns, etc.

SCDOT Responsibility - It is anticipated that the community liaison will be a part of the CE&I team that is selected for the project.

2.2 Department of Army Permit 2005-IN-440 General Conditions

- 1) The time limit for completing the work authorized ends on 30 June 2027. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

Contractor's Responsibility

- 2) You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

SCDOT/Contractor Shared Responsibility

- 3) If you discover previously unknown historic or archaeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing the National Register of Historic Places.

SCDOT/Contractor Shared Responsibility: SCDOT will be responsible for agency coordination and the evaluation/recovery of any unanticipated historic or archaeological remains. The contractor is responsible for stopping work and notifying the Resident Construction Engineer in the event of an unanticipated or late discovery. Compensation for work stoppage/delays will follow guidance described in Articles III and IV of the Agreement.

- 4) If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

SCDOT Responsibility

- 5) If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit.

Contractor Responsibility

- 6) You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

SCDOT/Contractor Shared Responsibility.

2.3 Department of Army Permit #2005-IN-440 (Special Conditions)

- 1) That the permittee agrees to provide all contractors associated with construction of the authorized activity a copy of the permit and drawings. A copy of the permit will be available at the construction site at all times.

SCDOT/Contractor Shared Responsibility

- 2) That the permittee shall submit a signed compliance certification to the Corps within 60 days following completion of the authorized work and any required mitigation. The certification will include: a. A copy of this permit; b. A statement that the authorized work was done in accordance with the Corps authorization, including any general or specific conditions; c. A statement that any required mitigation was completed in accordance with the permit conditions; d. The signature of the permittee certifying the completion of the work and mitigation.

SCDOT/Contractor Shared Responsibility: The contractor is only responsible for the closeout of items under the contractor's responsibility. SCDOT will be responsible for coordination with the Corps and final certification of the permit.

- 3) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

SCDOT Responsibility

- 4) That the permittee recognizes that its commitment to implement their portion of the CNC Marine Terminal Mitigation Plan, dated May 1, 2006, and revised August 18, 2006, was a deciding factor towards the favorable and timely decision on this permit. If the permittee is unable to execute any portion of the approved mitigation plan within three years of the date of issuance of this permit, the permittee will be required to actively work with the Corps in

coordination with NMFS and other Federal and state regulatory and resource agencies to develop a contingency plan to accomplish the necessary mitigation.

SCDOT/Contractor Shared Responsibility. Contractor’s responsibilities under the CNC Marine Terminal Mitigation Plan are defined in this document (Exhibit 4G)

- 5) Your responsibility to complete the required compensatory mitigation as set forth in Special Condition d will not be considered fulfilled until you have demonstrated mitigation success and have received written verification from the U.S. Army Corps of Engineers.

SCDOT Responsibility

- 6) That any Corps of Engineers Monument cannot be disturbed without first notifying this office 30 days in advance. After coordination with this office, a decision will be made as to the proper steps to be taken with regard to removing and relocating the monuments(s).

Contractor’s Responsibility.

2.4 SCDHEC-OCRM Critical Area Permit and CZC Certification Special Conditions

- 1) Provided a stormwater plan for the four lane limited access highway and bridge for NPDES coverage is submitted to and approved by SCDHEC staff before any work is performed under this permit.

Contractor is responsible for developing the stormwater plan and submitting the plan to SCDOT for review and approval. SCDOT will coordinate the submittal of the plan with SCDHEC-OCRM.

- 2) Provided that scupper drains must not be placed directly over the waterbody and must be limited in numbers elsewhere.

Contractor’s Responsibility

- 3) Provided the permittee implement best management practices during construction to authorize erosion and sediment run-off. All disturbed marsh areas adjacent to the construction site must be restored to original contours and conditions upon project completion. Once project construction is initiated, it must be carried to completion in an expeditious manner in order to minimize the period of disturbance to the surrounding environment.

Contractor’s Responsibility

- 4) Provided that in the event on-site in-kind mitigation opportunities are not found, SCDOT will mitigate impacts to wetlands by debiting credits from the Huspah Creek Mitigation Bank for the estuarine wetland impacts and the Black River Mitigation Bank for freshwater wetland impacts at the prescribed ratios.

SCDOT Responsibility

- 5) Provided that access to the project must be obtained from an upland location when possible. If access cannot be gained solely from an upland location, all equipment must be operated by floating barges or mats.

Contractor's Responsibility. SCDOT received guidance from SCDHEC-OCRM that temporary trestles constructed with no fill do meet the intent of this permit condition. The Contractor shall construct and remove the temporary trestle from uplands, permitted fill, floating barges, and mats so that tidal areas are not permanently impacted.

- 6) Provided that the permittee is required to keep adjacent critical areas free of construction materials, litter, debris, chemical contaminants, etc.

Contractor's Responsibility

- 7) Provided that no materials are allowed to be stored in the critical area adjacent to the construction site and that all debris, litter, concrete spillage, etc be cleaned up at least weekly.

Contractor's Responsibility

- 8) Provided material used for the road and bridge construction must consist of clean concrete, rock, etc., free of potential sources of pollution.

Contractor's Responsibility

- 9) Provided that an as built-survey or engineered drawings representing the bridge must be submitted to the Department (SCDHEC) within 90 days of the expiration date of the final construction placard. The survey must be performed by a registered land surveyor, must show all components of the bridge, and must list the starting and ending coordinates of the bridge in the SC State Plane Coordinate System, which can be obtained by survey-grade Global Positioning System equipment.

Contractor's Responsibility

- 10) Provided that in the event that archaeological or paleontological remains are found during the course of work, the applicant should notify the South

Carolina Institute of Archaeology and Anthropology pursuant to South Carolina Underwater Antiquities Act. Archaeological remains consist of any materials made or altered by man, which remain from past historic or prehistoric times (ie. older than 50 years). Examples included old pottery fragments, metal, wood, arrowheads, stone implements or tools, human burials, historic docks, structures, and non-recent vessel remains. Paleontological remains consist of old animal remains, original or fossilized, such as teeth, tusks, bone, or entire skeletons.

SCDOT/Contractor Shared Responsibility: SCDOT will be responsible for agency coordination and the evaluation/recovery of any unanticipated historic or archaeological remains. The contractor is responsible for stopping work and notifying the Resident Construction Engineer in the event of an unanticipated or late discovery. Compensation for work stoppage/delays will follow guidance described in Articles III and IV of the Agreement.

2.5 SCDHEC-OCRM Critical Area Permit and CZC Certification Water Quality Special Conditions

- 1) The applicant must implement Best Management Practices during construction to minimize erosion and migration of sediments off site, as proposed. These practices may include the use of mulches, hay bales, silt fences, or other devices capable of preventing erosion and migration of sediments. All disturbed land surfaces must be stabilized upon project completion. All disturbed land surfaces and sloped areas must be stabilized and sloped with a minimum 3/1 slope upon project completion.

Contractor's Responsibility

- 2) Scupper drains must not be placed directly over the waterbody. Other drains must be placed at the maximum distance apart as design criterial allows.

Contractor's Responsibility

- 3) All necessary measures must be taken to prevent oil, tar, trash, debris and other pollutants from entering the adjacent waters or wetlands.

Contractor's Responsibility

- 4) Construction activities must avoid to the greatest extent practicable, encroachment into any wetland/river bank areas not designated as impact areas.

Contractor's Responsibility

- 5) Upon completion of construction activities, all disturbed areas, including filled areas, which are not paved must be permanently stabilized with a vegetative cover. This may include sprigging, trees, shrubs, vines or ground cover.

Contractor's Responsibility

- 6) The applicant must develop a spill prevention and clean-up plan for this project. The plan should contain the names of appropriate officials to contact in case of a reportable spill and outline measures to be taken. Clean up materials, such as absorbent pads and booms, must be kept at the project site for small spills. This plan must be submitted to the Department of Health and Environmental Control for review and approval prior to initiation of the project.

Contractor's Responsibility: Contractor to coordinate with SCDOT regarding the submittal of the plan to SCDHEC-OCRM.

The applicant must provide a stormwater management plan for the project describing any strategies that might be employed to prevent runoff from contributing to the further impairment of Shipyard Creek. Such strategies may include but are not limited to bioretention areas, vegetated filter strips, infiltration trenches, vegetated swales and other proprietary technologies.

Contractor's responsibility: SCDOT will coordinate submittal of the plan to SCDHEC-OCRM.

- 7) The applicant must provide compensatory mitigation for wetlands impacts associated with the proposed work by locating suitable in-kind mitigation in the vicinity of the project. If no suitable compensatory mitigation can be found in the vicinity of the project then the applicant must compensate for tidal impacts by withdrawing 30.75 credits from the SCDOT Huspah Creek Mitigation Bank. Credit withdrawal documentation from the SCDOT Huspah Creek Mitigation Bank must be submitted to the Water Quality Division within 30 days issuance of the 404 Permit. Likewise, for unavoidable freshwater impacts, the applicant must locate suitable compensatory mitigation in the vicinity of the project. If none can be found, the applicant must compensate by withdrawing 1.02 credit acres from the SCDOT Black River Mitigation Bank at the prescribed ratio of 3:1, as proposed. Documentation of credit withdrawal from the Black River Mitigation Bank and Huspah Creek Mitigation Bank must be submitted to the Department within 30 days of credit withdrawal. If suitable compensation is located in the vicinity of the project area, a declaration of restrictive covenants or other preservation documentation must be submitted to the Department for review and approval prior to recording. A recorded declaration of restrictive

covenants or other preservation documentation must be submitted to the Department within 30 days after alternate mitigation plan approval.

SCDOT Responsibility

2.6 FONSI for I-26 Interchange (Commitments for I-26 Interchange area only)

- 1) Floodplains – Detailed hydrologic studies would be completed during future design phases of the project, as required by 23 CFR Part 650, Subpart A. Location Floodplains, as well as coordination with the Charleston County Flood Administrator to ensure that the project will meet state and federal requirements.

Contractor's Responsibility: Contractor is required to coordinate with the Charleston County Flood Administrator for approval and to ensure the project meets state and federal requirements for flood hazard protection.

- 2) Wetlands & Streams – A small portion of the tidally influenced ditch and a small portion of the salt marsh would be crossed by an interchange ramp associated with the proposed project, but the ramp would be elevated, would be supported by piers, and would span these jurisdictional areas without impacting them.

Contractor Responsibility

- 3) Essential Fish Habitat – EFH is limited to a small area of salt-marsh wetlands located between Austin Ave and I-26, north of Peace Street. The portion of the wetland area that is within the limits of the proposed project would be crossed by an elevated ramp that would span the jurisdictional wetland limits: therefore only minor shading would occur. Because the elevated ramp would be situated along the southeastern edge of the salt march and would range from 20 to 26 feet above the marsh, shading would occur from mid-morning to mid-day. Pilings would not be placed within the salt marsh, but would be immediately adjacent to them. To minimize the potential for noise impacts to fish species, these could be driven during low tide periods. If these areas were to be disturbed during construction, EFH impacts could occur due to disturbance of sediment that could affect the adjacent salt-marsh and unnamed tidal creek. No direct EFH impacts are anticipated as a result of the proposed project therefore coordination with NOAA-NMFS is not required. However, an on-site meeting was held on March 18, 2013, and NMFS indicated that due to the fact the wetlands are of poor quality and would be spanned, they have no EFH impact concerns. If as the project moves forward it becomes apparent that impacts to the salt marsh would result from construction of the interchange, coordination with NOAA-NMFS would be initiated at that time.

Contractor Responsibility

- 4) Section 4(f) Resources – There is one public park and recreational facility that is publicly-owned in the project area, Rosemont Field, and no wildlife/waterfowl refuges. The City of Charleston leases the property and the lease agreement states that any takings by eminent domain shall terminate the lease, and therefore Section 4(f) is not applicable.

N/A

- 5) Hazardous Material Impacts – The Phase II [ESA] progress should be continued to be tracked throughout project development and be made a part of the construction documents.

SCDOT Responsibility to provide to Contractor

- 6) Hazardous Material Impacts – Should previously unknown contamination be discovered as the project moves forward, the contamination (contaminated soil and/or groundwater within the right-of-way) would be removed and properly disposed of prior to the initiation of construction activities at that site.

Contractor Responsibility in accordance with Agreement Article XI.

- 7) Stormwater control measures, both during construction and post-construction, are required for SCDOT projects in the vicinity of 303(d), TMDL, ORW, Tidal, and other sensitive waters in accordance with SCDOT's MS4 permit

Contractor Responsibility

- 8) Construction would be performed to comply with all Federal, State, and Local Laws governing safety, health, and sanitation. Procedures would apply all safeguards, safety devices, protective equipment, and any other action reasonably necessary to protect the life and health of employees on the job, the safety of the public, and the property in connection with the performance of the work. The following items would be utilized, where necessary, to maintain public safety and the flow of traffic: 1) Construction and maintaining temporary detours, temporary structures, temporary approaches, crossings, and intersections with streets and roads, as well as using aggregates for the maintenance of traffic and water for use as a dust palliative. 2) Furnish flaggers, pilot trucks, and drivers. 3) Furnishing, erecting, and maintaining warning devices such as signs, flares, and reflective markers. If a street must be closed to traffic, traffic control devices would be illuminated during hours of darkness.

Contractor Responsibility

- 9) An erosion control plan would be developed and implemented prior to construction using BMPs that reflect policies contained in 23 CFR 650 B and SCDOT's Supplement Specifications on Seeding and Erosion Control measures (Latest Edition). The plan would incorporate measures to control non-point source impacts. These practices include but are not limited to: using berms, dikes, silt barriers, and catch basins, vegetating or covering disturbed areas as soon as possible, and conforming to proper clean-up practices.

Contractor Responsibility

- 10) Contractors will be required to comply with Occupational Safety and Health Administration (OSHA) regulations concerning noise attenuation devices on construction equipment. Construction activities could be limited during the evening, weekends, and holidays. Storage and staging areas would be located as far from noise sensitive areas as practicable.

Contractor Responsibility

- 11) Dust Control will be the responsibility of the contractor and may include the following: 1) Minimize exposed earth surface 2) Temporary and permanent seeding and mulching 3) Watering work and haul areas during dry periods 4) Covering, Shielding, or stabilizing material stockpiles 5) Using covered haul trucks

Contractor Responsibility

- 12) All construction waste material generated during clearing, grubbing, and other construction phases would be removed from the project site and burned or disposed of by the contractor in accordance with state and local regulations.

Contractor Responsibility

- 13) All relocations were and would be conducted in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Relocation resources will be available to all relocates without discrimination.

Contractor Responsibility

- 14) Should previously unknown contamination be discovered as the project moves forward, the contamination (Soil and/or groundwater within the right of way) would be removed and properly disposed of prior to initiation of construction activities at that site.

Contractor Responsibility in accordance with Agreement Article XI.

- 15) Should any Native American artifacts and/or human remains be located during ground disturbing activities, SCDOT will notify the Catawba Indian Nation.

SCDOT/Contractor Shared Responsibility

2.7 EA for I-26 Interchange

- 1) Pursuant to ROD, a noise barrier will be built for the Rosemont Neighborhood.

Contractor Responsibility

- 2) BMPs in accordance with local, state, and federal guidelines will be incorporated during the design and construction of the project to minimize impacts to water quality.

Contractor Responsibility

- 3) If roadways must be closed during periods of time during construction, a temporary detour route will be established to accommodate traffic. The detour route would be signed using state primary and secondary route, no residential streets would not be signed as detour routes.

Contractor Responsibility

- 4) If any cultural resources (artifacts/human remains) are encountered during the construction phase of the project, the SC State Historic Preservation Office (SHPO) will be immediately notified and all work in the vicinity of the discovered materials and site work shall cease until SCDOT is otherwise directed.

SCDOT/Contractor Shared Responsibility: SCDOT will be responsible for agency coordination and the evaluation/recovery of any unanticipated historic or archaeological remains. The contractor is responsible for stopping work and notifying the Resident Construction Engineer in the event of an unanticipated or late discovery. Compensation for work stoppage/delays will follow guidance described in Articles III and IV of the Agreement.

- 5) The federal Migratory Bird Treaty Act, 16 USC § 703-711, states that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. The Department will comply with the Migratory Bird Treaty Act of 1918 in regard to the avoidance of taking of

individual migratory birds and the destruction of their active nests. Prior to construction/demolition of the bridges the Resident Construction Engineer (RCE) will coordinate with SCDOT Environmental Services Office to determine if there are any active nests on the bridge. After this coordination, it will be determined whether construction/demolition can begin. After construction/demolition has begun, measures can be taken to prevent birds from nesting, such as screens, noise producers, and deterrents etc. If during construction or demolition a nest is observed on the bridge that was not discovered during the biological surveys, the contractor will cease work and immediately notify the SCDOT Environmental Services Office. SCDOT biologists will determine whether the nest is active and the species utilizing the nest. After this coordination, it will be determined whether construction/demolition can resume or whether a temporary moratorium will be put into effect. All costs for determining the need for, the placing of deterrents, and applying of all special actions including, but not limited to, removing nests and any costs associated with conducting work in compliance with the Migratory Bird Treaty Act as stated herein will not be paid for separately but will be considered to have been included with other items of work.

Contractor Responsibility: The Contractor is advised that this commitment applies to existing, temporary, and new structures.

3.0 ENVIRONMENTAL COMMITMENTS SUMMARY REPORT

Prior to Final Completion, the Contractor shall prepare and submit to SCDOT an Environmental Commitment Summary Report that summarizes the Contractor's compliance with the above listed commitments and includes all supporting documentation for that specific commitment. The Contractor shall provide two hard copies and one PDF copy of the document.

EXHIBIT 5

SPECIAL PROVISIONS AND CONTRACT REQUIREMENTS

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SPECIAL PROVISIONS

(1) **SECTION 101: STANDARD DRAWINGS:**

The Bidders are hereby advised that this project shall be constructed using the 2013 Standard Drawings with all updates effective at the time of the letting. The Standard Drawings are available for download at http://www.scdot.org/doing/sd_Disclaimer.aspx. . All drawings that are updated are labeled with their effective letting date in red.

The Standard Drawings are available to purchase through the SCDOT Engineering Publications Sales Center. The Engineering Publication Sales Center is located in Room G-19 (basement level) of the SCDOT Headquarters Building, 955 Park Street, Columbia, South Carolina.

All references in the plans, standard specifications, supplemental specifications, supplemental technical specifications or special provisions to drawings under the previous numbering system are hereby updated to the new drawing numbers. Refer to sheets 000-205-01 through 000-205-07 to find new drawing numbers when looking for references to older drawing numbers.

(2) **SECTION 102: STANDARD DRAWING ERRATA:**

The Bidders are hereby advised that the following note changes apply to the published Standard Drawings.

On sheet 000-205-05, add the following information under the columns below:

OLD DRAWING NAME	NEW DRAWING NAME
720-905-01 to 720-905-05	720-901-01 to 720-993-32

On sheet 605-005-05, replace entire text of General Note #4 with the following text:

4. The square footage of sign panels attached to 2½" x 2½" 12 gauge sign support secured to a 3" x 3" 7 gauge breakaway anchor shall not exceed 20 square feet.

On sheet 720-305-00, delete the entire note directly above main detail:

~~If sidewalk exists, the driveway opening should...~~

On sheet 720-405-00 Detail 2 replace dimension 2'-6" maximum with:
2'-6" minimum

On sheet 720-901-01 replace note 5.04 with:

5.04 When a mid-block crossing is required, consider mid-block staggered crossing (720-955-41) to encourage eye contact between the pedestrian and the oncoming traffic. Always angle the stagger so that the pedestrian travels through the refuge facing the oncoming traffic.

On sheet 722-305-00 Detail 4 replace note "French Drain see note 21" with:
French Drain see note 4.5.

On sheet 722-305-00 table 722-305A, 4th column, change the following:
Delete (SF)

Replace text "up to 36" with "up to 3'X3' "

Replace text "larger than 36" with "larger than 3'X3' "

On sheet 804-105-00 Title Block replace text "Riprap (Bridge End)" with:
Riprap (Bridge End)

On sheet 805-325-00 detail 2 replace text "rectangular washers (FWR03) See 805-005-00" with:
"rectangular washers (FWR03) See 805-090-00"

On sheet 805-325-00 change text of note 5 to the following:

5. For project specific requirements such as additional offset blocks, extra length posts, and post attachment details, see Project Plans. Include all costs of project specific requirements in the Guardrail Thrie-Beam Bridge Connector pay item.

On sheet 805-330-00 detail 2 replace text “rectangular washers (FWR03) See 805-005-00” with: “rectangular washers (FWR03) See 805-090-00”

On sheet 805-330-00 change text of note 4 to the following:

4. For project specific requirements such as additional offset blocks, extra length posts, and post attachment details, see Project Plans. Include all costs of project specific requirements in the Guardrail Thrie-Beam Bridge Connector pay item.

On sheet 805-510-00 detail 3 replace guardrail base plate note with the following:

See standard drawings 805-655-xx for guardrail base plate options.

On sheet 805-655-M1 replace note 30.4 with the following:

30.4 Install adhesive anchors to a depth sufficient to develop a minimum factored (reduced) ultimate tensile capacity of 21 kips per anchor bolt. Increase minimum embedment shown in detail 4 as required by adhesive manufacturer’s recommendations for the existing material properties, anchor bolt pattern, edge conditions, and any other design reduction.

On sheet 805-811-01 Type 11A barrier wall reinforcement add the following note:

Provide reinforcement equal to the stem reinforcement and bending details shown for the Type 11B concrete barrier (drawing 805-811-02).

On sheet 815-002-00 Type B, D1, & D2 Inlet Structure Filters, revise as follows:

Replace all references of #5 stone with #5 or #57 stone.

On sheet 815-305-00 Sediment Control Structure and Basin, revise as follows:

Replace all references of #5 stone with #5 or #57 stone.

On sheet 815-405-00 Sediment Dams, revise as follows:

Replace all references of #5 stone with #5 or #57 stone.

Payment for either #5 or #57 stone will be made under the pay item for **Aggregate No. 5 for Erosion Control (6 “ Uniform)**

(3) SECTION 103: MOBILIZATION – SUBCONTRACTOR:

Mobilization – Subcontractor consists of the preparatory operations for subcontractors including: moving personnel and equipment to the project site; paying bond and insurance premiums; establishing offices, buildings, and other facilities necessary for work on the project; and all other preparatory work or costs incurred before beginning work on the project.

Mobilization - Subcontractor is paid at the lump sum price bid, which price and payment is full compensation for organizing and moving all subcontractor forces, supplies, equipment and incidentals to the project site, regardless of the number of times such moves are made. The price and payment also includes costs for demobilization.

When the item Mobilization – Subcontractor is included in the bid items, payment will be made on the first four construction estimates. Each payment is for 25% of the lump sum price for Mobilization - Subcontractor, subject to the maximum total limit of 5.0% of the total contract amount.

If there is a remaining amount of the lump sum price for Mobilization after payments are made according to the limit above, then the remaining amount is paid after all work on the project has been completed and accepted.

Partial payment for this item in no way acts to preclude or limit any of the provisions of partial payments otherwise provided for by the Contract or these specifications.

Payment for this item includes all direct and indirect costs and expenses required to complete the work.

Pay items under this section include the following:

Item No.	Pay Item	Unit
1031100	MOBILIZATION – SUBCONTRACTOR	LS

(4) SECTION 105: AUTOMATED MACHINE GUIDANCE:

1. GENERAL

The use of Automated Machine Guidance (AMG) is required for the rough grading for this contract; however, the contractor may choose to use AMG on any operations (paving, fine grading, curb and gutter, etc). This special provision describes the process required to ensure that the end results generated by equipment using AMG are in conformance with the tolerances required for conventional stakeout. This special provision is supplemental to Subsection 105.8 of the Standard Specifications.

Those areas not covered by this special provision are subject to the requirements of Subsection 105.8.

The Contractor is responsible for all errors resulting from the use of AMG. Correct all deficiencies to the satisfaction of the RCE at no additional cost to the Department.

2. EQUIPMENT

Provide all equipment required to accomplish AMG. Use equipment that generates end results meeting the current Standard Specification for Highway Construction and all applicable supplemental specifications and special provisions.

3. CONSTRUCTION

1) The Contractor shall provide electronic engineering data (EED) files to SCDOT prior to beginning construction. The files shall be generated with the computer software applications MicroStation (CADD software) and GEOPAK (civil engineering software). The EED files shall contain the following information and be in the native formats and other software formats as described below. The contractor will perform necessary conversion of the data files for the selected grade control equipment.

a. Survey Controls:

- Control points
- Bench marks
- Project datum and scale factors

b. CADD Files:

- MicroStation design file for plans, profiles, and other 2D linear features
- MicroStation design files for cross sections
- GEOPAK GPK file

c. Data Files:

- Alignment Report
- Cross Section Report
- Horizontal Alignments in LandXML format
- Vertical Alignments in LandXML format
- Existing DTM in LandXML format
- Proposed 3D surface model DTM files in in LandXML format
- Proposed 3D break lines in DGN or DXF format

The Department assumes no risk or responsibility for any use of the EED files.

- 2) Where electing to use AMG, use the EED files to import and develop a 3D AMG model of the finish grade surface and break lines. Submit the 3D AMG surface in LandXML format and break lines in DGN or DXF format to the RCE. Submit a centerline and profile verification report that records differences between the developed 3D model and provided EED to the RCE. Provide the DOT representatives and RCE with a minimum of three hours of information exchange meeting and demonstrations about the 3D model builder software, work flow, data exchange, and quality control process. If the 3D AMG model is revised during construction, also submit the revised model to the RCE.
- 3) At least 14 days prior to use AMG, submit to the RCE a written AMG work plan which includes:
 - a. Location and scope of work to be completed using AMG.
 - b. A description of the manufacturer, model, and control software version of the AMG equipment.
 - c. A description of how the proposed additional (new) project control points will be established and a map showing their locations.
 - d. Completed SCDOT Survey Control Plan Form.
 - e. Project site calibration procedures, including equipment calibration and calibration frequency.
 - f. A description of the setup of the GPS system, laser system, sonic systems, and/or robotic total stations to be used.
 - g. Designation of a single staff person as the primary contact for GPS technology issues.
 - h. PE or PLS seal and signature.
- 4) Prior to use of AMG, construct a test section for work to be completed (in the final footprint of the roadway) with AMG to demonstrate to the RCE that the system has the capability to achieve acceptable results. Make the test section at least 500 feet in length. If acceptable results are not achieved, make necessary adjustments and rework the test section to the satisfaction of the RCE.
- 5) Provide a GPS rover, including a data collector loaded with 3D models including surfaces, break lines, and alignments, with the same capabilities as units used by the Contractor for the RCE's use for the duration of the contract. The GPS rover unit will remain property of the Contractor. Provide the RCE and/or RCE's representatives with a minimum of eight hours of formal training on the use of the GPS rover unit and Contractor's AMG systems. Formal training will be provided by a manufacturer certified trainer and will include, but not be limited to, hardware, software, GPS localization/calibration, and operation of the rover unit.
- 6) The RCE may perform spot checks of the machine control grading results, surveying calculations, records, field procedures, and actual staking as the RCE deems necessary. If the RCE determines the work is not being performed in a manner that will assure accurate results, the RCE may order such work to be redone to the requirements of the contract documents at no additional cost to the Department. At minimum, check, and if necessary, recalibrate the AMG system at the beginning of each work day and any time the results are suspected of being out of conformance with the specifications. Calibration results and out of tolerance checks will be provided to the RCE.
- 7) Establish supplemental project control as needed for AMG operations. At minimum, establish secondary control points at appropriate intervals along the length of the project at intervals not to exceed 1000 feet. Establish the horizontal position of these points using methods where the relative horizontal accuracy meets the Class A Urban Survey accuracy standard (Standards of Practice Manual for Surveying in South Carolina). Establish the elevation of these control points using differential or trigonometric leveling

from the project benchmarks with maximum allowable error of $0.05\sqrt{L}$, where L is the length of level run in miles. Provide a digital copy of all new control point information to the RCE. Department review of control point information in no way relieves the Contractor for responsibility for any and all errors resulting from their efforts. Correct all deficiencies to the satisfaction of the RCE at no additional cost to the Department.

- 8) If the Contractor elects to use AMG for fine grading and placement of base or other roadway materials, use laser systems, sonic systems or robotic total stations-based AMG systems.
- 9) Provide a clearly marked station stake at a minimum of every 500 feet on an offset from the edge of pavement as specified by the RCE.

4. METHOD OF MEASUREMENT

The Contractor bears all costs, including but not limited to the cost of actual reconstruction of work, that may be incurred due to errors in application of AMG. Correction of grade elevation errors and associated quantity adjustments resulting from the Contractor's activities will be made at no cost to the Department.

5. PAYMENT

The use of AMG is incidental to other project costs. No additional payment will be made for the use of AMG.

(5) SECTION 106: SOURCE OF SUPPLY AND QUALITY OF MATERIALS:

Delete Paragraph 3 of Subsection 106.1 of the Standard Specifications and replace it with the following:

"When materials, components, or elements that are not specifically covered in the Standard Specifications, Supplemental Specifications, Supplemental Technical Specifications, or Project Special Provisions are proposed to be incorporated into the work, submit to the RCE a specification covering the proposed material, component, or element for review and acceptance prior to incorporating it into the work. Ensure that such materials, components, or elements meet the requirements of the AASHTO specifications that were effective as of the date of the Final RFP. If the materials, components, or elements are not covered in the AASHTO specifications, ensure that they meet the requirements of the ASTM specifications that were effective as of the date of the Final RFP. Submission of a specification for a material, component, or element not covered in the Standard Specifications, Supplemental Specifications, Supplemental Technical Specifications, or Project Special Provisions does not guarantee approval for use on the Project."

(6) SECTION 106: PLANT/FABRICATOR INSPECTION:

Subsection 106.4, **Plant Inspection**, of the Standard Specifications shall be amended with the following:

Change the subsection title to **Plant/Fabricator Inspection** and add the following sentence after the first sentence:

"Provide 14 calendar days written notice to the Materials and Research Engineer prior to beginning fabrication work for Department projects."

(7) SECTION 106: QUALIFIED PRODUCT LISTINGS:

All references to "Approval Sheet" or "Approval Policy" are to be replaced with "Qualified Products Listings (QPL)" and "Qualified Products Policies (QPP)" respectively. This change includes all references in the SCDOT Standard Drawings, SCDOT Standard Specifications, SCDOT Supplemental Specifications, SCDOT Special Provisions, SCDOT Supplemental Technical Specifications, SCDOT Internet and Intranet websites, and all other documents produced by SCDOT.

(8) SECTION 106: SOUTH CAROLINA MINING ACT:

This Supplemental Specification is hereby modified as follows:

Paragraph 9 is hereby deleted and replaced with the following:

The deputy secretary for engineering, or his duly appointed representative, will make a final inspection of the reclaimed area and keep a permanent record of his approval thereof. A map or sketch providing the location and approximate acreage of each pit used on the project will be provided to the resident construction engineer for inclusion in the final plans.

The last paragraph is hereby deleted and replaced with the following:

The contractor shall comply with the provisions of the plan that are applicable to the project as determined by the engineer. Seeding or other work necessary to comply with the plan on pits furnished by the contractor shall be at the expense of the contractor. Seeding shall be in accordance with SC-M-810 (latest version) which can be found at http://www.scdot.org/doing/road_SupTechSpec.aspx.

(9) SECTION 107: PROJECT BULLETIN BOARDS:

In accordance with the Required Contact Provisions Federal-Aid Construction Contracts Section II, Item 3, Part d, add the following:

Single Location Projects – On projects in which work is performed at a single location (such as bridge replacement projects, two-lane to five-lane widening projects, etc.), mount the project bulletin board in a permanent location within the project limits so that it is visible and accessible at all times.

Multiple Location Projects – On projects in which work is being performed or has the capability of being performed at multiple locations (such as resurfacing projects, pavement marking projects, etc.), display a portable bulletin board with at least one of the prime contractor's work crews. If the prime contractor is not performing work, display the portable bulletin board with at least one of the subcontractor's work crews. Display the portable bulletin board in a location and a manner that is acceptable to the RCE. Notify the RCE and all subcontractors as to the location of the portable bulletin board. On resurfacing projects, mount an additional project bulletin board in a permanent location at the asphalt plant supplying asphalt mix to the project so that it is visible and accessible at all times.

(10) SECTION 107: FAIR LABOR STANDARDS ACT OF 1938, AS AMENDED:

Attention is directed to this Federal Legislation, which has been enacted into law. The contractor will be responsible for carrying out all of the provisions of this legislation, which may affect this contract.

(11) SECTION 107: APPLICATION OF DAVIS-BACON AND RELATED ACTS TO INDEPENDENT TRUCK DRIVERS AND MISCELLANEOUS CONSTRUCTION ACTIVITIES:

June 13, 1990

The Davis-Bacon and Related Acts apply when:

- 1) A Contractor or Subcontractor hires a trucking firm or fleet of trucks to haul materials from a plant, pit, or quarry, which has been established specifically to serve (or nearly so) a particular project or projects covered by Davis-Bacon and Related Acts.
- 2) A Contractor or Subcontractor hires a trucking firm or fleet of trucks to haul material from a non-commercial stockpile or non-commercial storage site outside the limits of the project to the project site.
- 3) A Contractor or Subcontractor hires a trucking firm or fleet of trucks to haul excavated materials away from a Davis-Bacon covered project.

- 4) A contractor or Subcontractor rents or leases equipment with an operator to perform work as called for under a Davis-Bacon construction contract.
- 5) A common carrier is used for the transportation of materials from an exclusive material supply facility to fulfill the specific need of a construction contract.

The fleet owner is not considered a Subcontractor with regard to the 70% subcontracting limitations and would not have to be approved as a Subcontractor. However, payrolls must be submitted by truck fleet owner covering the truck drivers, and all requirements such as predetermined wages, overtime, etc., are applicable. Legitimate owner-operators (truck owner driving his own truck) must appear on the payroll by name and notation "truck Owner Operator" with no hours, etc. shown.

The Davis-Bacon and Related Acts do not apply when:

- 1) A Contractor or Subcontractor hires a trucking firm or fleet of trucks to haul materials from a commercial plant, pit, or quarry which had previously been established for commercial use and regularly sell materials to the general public.
- 2) A Contractor or Subcontractor hires a trucking firm or fleet of trucks to haul materials from an established commercial plant, pit, or quarry to a stockpile outside the limits of the project.
- 3) Bona fide owner-operators of trucks, who are independent contractors, use their own equipment to haul materials to or from or on a Davis-Bacon covered project. (One man-One truck)

The fleet owner is not considered a Subcontractor with regard to the 70% subcontracting limitation and would not have to be approved as a Subcontractor.

(12) SECTION 107: REQUIREMENTS FOR FEDERAL AID CONTRACTS WHICH AFFECT SUBCONTRACTORS, DBE HAULERS, MATERIAL SUPPLIERS AND VENDORS:

March 1, 2010

- A. The contractor's attention is directed to the requirements of Section I.2 in Form FHWA 1273 that is included in your contract documents as the Supplemental Specification "Required Contract Provisions Federal-Aid Construction Contracts". Section I.2 requires that "the contractor shall insert in each subcontract all of the stipulations contained in the Required Contract Provisions". This requirement also applies to lower tier subcontractors or purchase orders. These provisions must be physically included in your subcontracts. A reference to the applicable specification will not suffice.
- B. The contractor's attention is directed to the requirements of the Supplemental Specification "Standard Federal Equal Employment Opportunity Construction Contract Specifications". Section 2 requires that the provisions of this specification must be physically included in each subcontract with a value of \$10,000 or greater.
- C. The contractor's attention is directed to the requirements of the Equal Employment Opportunity Performance certifications in the Proposal Form Certifications and Signatures section of the contract. Section 1 concerning Equal Employment Opportunity must be physically included in each subcontract.
- D. Prior to the issuance of formal approval, all DBE subcontracts must include a signed copy of the subcontract agreement between the Prime Contractor and the DBE Subcontractor.
- E. Prior to the issuance of formal approval, of any DBE haulers, the contractor must submit a signed copy of the hauling agreement.

F. The contractor's attention is further directed that sections 1, 2, 3, 8, 9, and 11 of Form FHWA 1273, or Sections 1, 3, 8 and 10 of Form 1316 (for Appalachian contracts only) must be physically included in each purchase agreement with a value of \$10,000 or greater with a vendor or supplier, and in open-end contracts where individual purchases are less than \$10,000 but where the total purchases accumulate to \$100,000 or more per year.

(13) SECTION 107: CONTRACT PROVISION TO REQUIRE CERTIFICATION AND COMPLIANCE CONCERNING ILLEGAL ALIENS:

By submission of this bid, the bidder as the prime contractor does hereby agree:

- a. to certify its compliance with the requirements of Chapter 14 of Title 8 of the S.C. Code of Laws regarding Unauthorized Aliens and Public Employment;
- b. to provide SCDOT with any documents required to establish such compliance upon request; and
- c. to register and participate and require agreement from subcontractors and sub-subcontractors to register and participate in the federal work authorization program to verify the employment authorization of all new employees, or to employ only workers who supply the documents required pursuant to S.C.Code 8-14-20(B)(2).

(14) SECTION 107: IRAN DIVESTMENT ACT:

By submission of this bid/proposal, the bidder/proposer as the prime contractor/consultant/vendor does hereby certify his compliance to the following:

- 1) CERTIFICATION: (a) The Iran Divestment Act List is a list published pursuant to Section 11-57-310 that identifies persons engaged in investment activities in Iran. Currently, the list is available at the following URL: <http://procurement.sc.gov/PS/PS-iran-divestment.phtm>. Section 11-57-310 requires the government to provide a person ninety days (90) written notice before he is included on the list. The following representation, which is required by Section 11-57-330(A), is a material inducement for the SCDOT to award a contract to you. (b) By signing your Offer, you certify that, as of the date you sign, you are not on the then-current version of the Iran Divestment Act List. (c) You must notify the SCDOT immediately if, at any time before posting of a final statement of award, you are added to the Iran Divestment Act List.
- 2) ONGOING OBLIGATIONS: (a) You must notify SCDOT immediately if, at any time during the contract term, you are added to the Iran Divestment Act List. (b) Consistent with Section 11-57-330(B), you shall not contract with any person to perform a part of the Work, if, at the time you enter into the subcontract, that person is on the then-current version of the Iran Divestment Act List.
- 3) OPTION TO RENEW RESTRICTION: Contractor acknowledges that, unless excused by Section 11-57-320, if the contractor is on the then-current Iran Divestment Act List as of the date of any contract renewal, the renewal will be void ab initio.

(15) SECTION 107: DISADVANTAGED BUSINESS ENTERPRISES (DBE) GOALS AND REQUIREMENTS:

1. GENERAL

For Design Build Projects, PROPOSER shall comply with the Disadvantaged Business Enterprises (DBE) Supplemental Specification, dated May 2, 2014, except as specifically modified pursuant to this special provision. This special provision modifies the timing and steps for which the PROPOSER is to obtain DBE committals for a design build project.

2. DBE PROGRAM RELATED CERTIFICATIONS

By submitting a proposal and by entering into any contract on the basis of that proposal, the PROPOSER certifies to each of the following DBE Program-related conditions and assurances:

- a. That the PROPOSER agrees to comply with the project construction and administration obligations of the USDOT DBE Program, 49 CFR Part 26 as amended, and the DBE Supplemental Specifications setting forth the SCDOT's DBE Program requirements.
- b. PROPOSER shall comply fully with the DBE Program requirements in the execution and performance of the Contract. PROPOSER acknowledges that failure to comply may result in any one or more of the sanctions listed in the SCDOT's DBE Supplemental Specification.
- c. To ensure that DBE firms have been given full and fair opportunity to participate in the performance of the contract, PROPOSER certifies that all reasonable steps were, and will be, taken to ensure that DBE firms had, and will have, an opportunity to compete for and perform work on the contract. The PROPOSER further certifies that the PROPOSER shall not discriminate on the basis of race, color, age, national origin, or sex in the performance of the contract or in the award of any subcontract. Any agreement between a PROPOSER and a DBE whereby the DBE promises not to provide quotations for performance of work to other PROPOSERS is prohibited.
- d. PROPOSER shall make good faith efforts to obtain DBE participation in the proposed contract at or above the goal. The PROPOSER, by submitting its proposal, certifies the DBE participation information that will be submitted within the required time as specified herein is true, correct, and complete, and that the information to be provided includes the names of all DBE firms that will participate in the contract, the specific item(s) that each listed DBE firm will perform, and the dollar amounts of the participation of each listed DBE.
- e. By submitting its proposal, the PROPOSER certifies that good faith efforts will be made on work that it proposes to subcontract; and that it will seek out and consider DBE firms as potential subcontractors and sub-consultants. The PROPOSER shall, as a continuing obligation, contact DBE firms to solicit their interest, capability, and prices in sufficient time to allow them to respond effectively, and shall retain on file proper documentation to substantiate its good faith efforts.
- f. PROPOSER shall comply fully with all contractual and legal requirements of the USDOT DBE Program and SCDOT DBE Program, and shall cause each DBE firm participating in the Contract to fully perform the designated work items with the DBE firm's own forces and equipment under the DBE firm's direct supervision, control, and management. Where a contract exists and where the PROPOSER, DBE firm, or any other firm retained by the PROPOSER has failed to comply with federal or SCDOT DBE Program requirements, SCDOT has the authority and discretion to determine the extent to which the DBE contract regulations have not been met, and will assess against the PROPOSER any remedies available at law or provided in the contract.
- g. If a bond surety assumes the completion of work, if for any reason the SCDOT has terminated the PROPOSER, the surety shall be obligated to meet the same DBE contract terms and requirements as were required of the original PROPOSER in accordance with the requirements of this contract.

3. DBE PROGRAM COMPLIANCE PROCEDURES

- a. DBE Utilization Plan
 - (1) Within thirty (30) calendar days from the effective date of the Agreement, the PROPOSER shall submit to the SCDOT a DBE Utilization Plan for review and approval. This plan shall include the following information:
 - i. The various work elements the PROPOSER anticipates subcontracting to DBE firms in order to meet the established contract goal;
 - ii. The expected dollar amount and contract percentages of each work element to be applied towards meeting the contract goal; and
 - iii. Anticipated timeframes for which PROPOSER expects DBE subcontracts to be executed for each of the work elements identified.
 - (2) The SCDOT will not accept or review any design submittals from the PROPOSER nor make any progress payments until the DBE Utilization Plan is approved by SCDOT. However, failure to promptly submit the DBE Utilization Plan will not delay the SCDOT's issuance of the Notice to Proceed thereby commencing Contract Time.
 - (3) As the Project proceeds through the design phase, the PROPOSER may submit revisions to the approved DBE Utilization Plan, if necessary, for the SCDOT's

consideration and approval. Reasons for the revisions shall be documented by the PROPOSER and included in the revision request.

- (4) In the DBE Utilization Plan submittal, CONTRACTOR shall designate and make known to the SCDOT a DBE liaison officer who is assigned the responsibility of administering and promoting an active and inclusive DBE program as required by 49 CFR Part 26, the SCDOT's DBE Supplemental Specifications, and this Special Provision.
- (5) After approval of the DBE Utilization Plan, PROPOSER may begin submitting DBE Committal Sheets for review and acceptance at the monthly Progress Meetings.

b. Establishing DBE Committals

- (1) The PROPOSER shall aggressively implement the approved DBE Utilization Plan by submitting DBE Committal Sheets listing specific DBE firms to carry out the identified work elements. **The use of DBE firms and the information to be provided on the DBE Committal Sheet shall be as instructed in Part A of the SCDOT's DBE Supplemental Specification.**
- (2) The PROPOSER shall obtain the SCDOT's approval of all subcontracts as set forth in the SCDOT DBE Supplemental Specification.
- (3) PROPOSER shall not unilaterally terminate, substitute for, or replace any DBE firm listed on the Committal Sheet in whole or in part with another DBE, any non-DBE firm, or with the PROPOSER's own forces without the prior written consent of SCDOT as set forth in the SCDOT DBE Supplemental Specification.
- (4) The PROPOSER's Final DBE Committal Sheet, signed quotes, and all DBE executed subcontracts are to be submitted to the SCDOT prior to beginning of construction activities. If the PROPOSER fails to meet the deadline, SCDOT shall withhold progress payments until the Final DBE Committal Sheet is submitted.
- (5) If the Final DBE Committal Sheet falls short of the DBE contract goal, the PROPOSER shall submit good faith efforts documentation in accordance with Part A of the DBE Supplemental Specification. This information is due within three (3) business days following the due date of the Final DBE Committal Sheet. If upon review of the Final DBE Committal Sheet, good faith efforts documentation and, if necessary, the findings of the Reconsideration Panel, the PROPOSER fails to meet the contract DBE goal or demonstrate good faith, the SCDOT will withholding monthly progress payments until compliance with DBE contract goal or PROPOSERs good faith efforts have been accepted by SCDOT.

c. Progress Review Meetings / Monthly Updates

- (1) Implementation of the PROPOSER's DBE Utilization Plan shall be a discussion point during each progress review meeting (as required in the Agreement) until such time as the SCDOT deems it a closed issue. The PROPOSER's DBE liaison officer shall attend all progress review meetings until such time the issue is closed. At each progress review meeting, the DBE liaison officer shall provide a summary of the PROPOSER's progress towards implementing the DBE Utilization Plan as well as provide an updated DBE Committal sheet.
- (2) The PROPOSER shall provide the SCDOT monthly updates of its progress in accomplishing the DBE Utilization Plan. Monthly updates must include a copy of the latest committal sheet, signed quotes and copies of executed DBE subcontracts. The SCDOT's approval date of the DBE Utilization Plan will establish the date for which monthly updates are required of the PROPOSER.
- (3) The SCDOT, at its discretion, may withhold progress payments if the PROPOSER fails to submit monthly updates or any other submittal requirement on time or if the SCDOT believes the efforts of the PROPOSER in implementing the DBE Utilization Plan are insufficient.

d. PROPOSER's Obligation Post DBE Committal

- (1) **Once a firm is listed on the DBE Committal sheet, the PROPOSER shall administer the subcontract with the firm in accordance with the instructions provided in Part B of the SCDOT DBE Supplemental Specification.**

- (2) It is the PROPOSER's responsibility to comply with all elements of the SCDOT's DBE Program and to continuously pursue DBE participation as the project progresses. If the PROPOSER's Final DBE Committal Sheet and good faith efforts fall short of meeting the project goal and/or payments to committed DBE firms were less than the committed amounts, SCDOT may impose one of the sanction set forth under Part B of the SCDOT DBE Supplemental Specifications.
- (3) PROPOSER, for itself, for its design build team, and for its subcontractors and suppliers, whether certified DBE firm or not, commits to complying fully with all federal and state DBE provisions and agrees to assume these contractual obligations and to bind the design build team contractually to the same at the PROPOSER's expense.

(16) SECTION 107: LATE DISCOVERY OF ARCHAEOLOGICAL/HISTORICAL REMAINS ON FEDERAL AID PROJECTS AND APPROVAL OF DESIGNATED BORROW PITS:

August 7, 1991

A. Late Discovery of Archaeological/Historical Remains on Federal Aid Projects.

1. Responsibilities:

The Contractor and subcontractors must notify their workers to watch for the presence of any prehistoric or historic remains, including but not limited to arrowheads, pottery, ceramics, flakes, bones, graves, gravestones, or brick concentrations. If any such cultural remains are encountered, the Resident Construction Engineer shall be immediately notified and all work in the vicinity of the discovered materials or site shall cease until the Department's Staff Archaeologist or the State Highway Engineer directs otherwise.

2. Applicability:

This provision covers all areas of ground disturbance resulting from this federal - aid contract, including but not limited to road construction, Department designated borrow pits, Contractor furnished borrow pits, and/or staging areas.

3. Cost Reimbursement and Time Delays:

Any extra work required by A(1) above within the project right of way or on Department designated borrow pits (see below) will be paid for in accordance with Subsection 104.05 of the Standard Specifications. Extra contract time may be provided under Subsection 108.06 of the Standard Specifications for archaeological work within the project right of way or on designated borrow pits.

NOTE: On Contractor furnished borrow pits the contractor is not entitled to any additional time or money for delay on impact resulting from A(1) above or for extra work required by A(1) above. Therefore, contractors may wish to retain professional archaeological services to better ensure that borrow pit areas are cleared of archaeological/historical remains prior to use on Federal aid projects.

B. Approval of Designated Borrow Pits on Federal Aid Projects (Plant Sites which qualify as commercial are not included).

In instances where the Department specifically designates the location of borrow pits on project plans or in contract specifications for use on a Federal aid project, an archaeological survey will be performed by Department archaeologists prior to award of contract.

This provision also applies to designated disposal sites, staging areas, haul roads, and job site field offices.

**(17) SECTION 107: SPECIFIC EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES
TRAINING SPECIAL PROVISIONS:**

August 20, 1975
Revised April 1, 2004

This Training Special Provision supersedes Subparagraph 7b of the Special Provision entitled "Specific Equal Employment Opportunity Responsibilities", (Attachment 1), and is in implementation of 23 U.S.C. 140(a).

As part of the contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The contractor shall provide on-the-job training aimed at developing full journeymen in the type of trade or job classification involved.

THE NUMBER OF TRAINEES TO BE TRAINED UNDER THE SPECIAL PROVISION WILL BE.
Road – 16 (at 520 hours each).
Bridge – 12 (at 1040 hours each).

In the event that a Contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this Special Provision. The Contractor shall also insure that this training Special Provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the Contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment. Prior to commencing construction, the Contractor shall submit to the State Highway Agency for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. The Contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program.

Training and upgrading of minorities and women toward journeyman status is a primary objective of this Training Special Provision. Accordingly, the Contractor shall make every effort to enroll minority trainees and women (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women (trainees)) to the extent that such persons are available within a reasonable area of recruitment. The contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The Contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the Contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the Contractor and approved by the State Highway Agency and the Federal Highway Administration. The State Highway Agency and the Federal Highway Administration shall approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the Contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore,

apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal Aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the division office. Some off-site training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the cost for the training will be included in the contract price. There will be no reimbursement given by SCDOT for the hours of training that are provided on this project. However, a "Statement of Completed Training" will be required at the end of the project. The fact that the cost of the training must be included in the contract does not prohibit the contractor from receiving training program funds from other sources, if he so desires. Training hours may be counted if training is done off-site where the contractor does one or more of the following and the trainees are concurrently employed on a Federal Aid project: contributes to the cost of the training, provides the instruction to the trainee, or pays the trainee's wages during the off-site training period.

The training requirement will not be considered completed by the Contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the Contractor and evidences a lack of good faith on the part of the Contractor in meeting the requirements of this Training Special Provision. It is normally expected that a trainee will begin his training on the project as soon as feasible after start of work the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program. It is not required that all trainees be on board for the entire length of the contract. A Contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the Departments of Labor or Transportation in connection with the existing program shall apply to all trainees being trained for the same classification who are covered by this Training Special Provision.

The Contractor shall furnish the trainee a copy of the program he will follow in providing the training. The Contractor shall provide each trainee with a certification showing the type and length of training satisfactorily completed.

The Contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision, as required under the SCDOT approved training program.

Meeting the On-the-job Training Requirements or Making Good Faith Efforts to Meet the On-the-job Training Requirements. It is the Contractor's responsibility to meet the On-the-job Training Requirements stated in this section. Failure to meet the requirement or demonstrate good faith efforts, as determined by SCDOT, to meet the requirement may result in any one or more of the following sanctions:

- (1) Withholding monthly progress payments;

- (2) Declaring the Contractor in default pursuant to Section 108.10 of the Standard Specifications and terminating the contract;
- (3) Disqualifying the Contractor from bidding pursuant to Regulation 63-306, Volume 25A, of the S. C. Code of Laws; and/or
- (4) Requiring the Contractor to obtain On-the-job Training participation on future contracts to the extent the Contractor failed to meet or use good faith efforts to meet the On-the-job training contract requirement.

(18) SECTION 107: MONITORING OF CONSTR.-RELATED EARTHBORNE VIBRATIONS:

July 8, 2015

1. DESCRIPTION:

The project construction will generate vibrations that will travel through the earth, which will subsequently be received or “sensed” by nearby structures and inhabitants. Specific procedures that will generate earthborne vibrations during bridge and roadway construction include (but are not limited to) the installation of piles, earthquake drains, shoring walls, general foundation construction, and vibratory compaction of unclassified or borrow excavation. To mitigate the risk of vibration-related damage to nearby structures, this specification outlines the Contractor’s responsibility for performing a program of pre-construction condition assessment and vibration monitoring during construction.

This specification is based, in part, on AASHTO R 8-96 (2004) *Standard Recommended Practice for Evaluation of Transportation-Related Earthborne Vibrations*. As discussed in AASHTO R 8-96 (2004), humans respond to a much broader range of vibration frequencies and intensities than structures. Intrusive vibration levels can annoy humans at much lower intensities than levels considered critical for structures. Thus, occupants of adjacent properties may perceive that the construction-induced vibrations may present risk to their structures. The recommended safe vibration limits are intended to mitigate the risk of structure damage, and more specifically, reduce the development of “threshold cracks” or cosmetic cracking. Such cracks may appear at lower vibration levels than the level at which architectural or minor structural damage would be expected to occur.

2. PRE-CONSTRUCTION CONDITION ASSESSMENT:

The Contractor shall retain a geotechnical engineering firm to perform a pre-construction condition assessment to document the conditions of nearby buildings and other sensitive nearby structures prior to the beginning of construction. The assessment shall be performed on all properties adjacent to the project site and any other properties as directed by the Engineer. The assessment shall include any structures within 300 feet of any vibration inducing construction activity. The assessment should include video and photographic documentation of all exteriors and interiors, and installation of crack monitors on cracks that might propagate due to construction vibrations. All documentation of existing building conditions and information concerning the type and location of crack monitors shall be presented to the Engineer in a report prior to construction.

3. CRACK MONITORING DURING CONSTRUCTION:

During all construction, the Contractor shall perform periodic readings of the crack monitors that were installed during the pre-construction condition assessment. All readings shall be provided to the Engineer within 48 hours of taking the reading. Provided that the crack readings confirm that vibrations are not contributing to increasing the crack width, the crack monitors may be read once per week. More frequent readings may be directed by the Engineer during activities that are expected to have greater earthborne vibrations (e.g., pile driving). If the crack readings suggest that vibrations from the project site are contributing to crack width, then the Contractor shall immediately notify the Engineer and review those activities that are generating the earthborne vibrations. The Contractor and his or her geotechnical firm shall then submit a detailed plan for repair, perform the repair at no cost to the Department and develop and submit for review a revised construction plan to address the vibration problems and minimize further damage and complaints.

4. VIBRATION MONITORING DURING CONSTRUCTION:

- A. Procedure - The Contractor shall monitor vibrations at no less than four locations at each specific site of construction activity along the perimeter of the project during all foundation and embankment construction activities. The locations shall be selected by the Contractor based on the location of the construction activities and their relative position to nearby offsite structures. Prior to construction, a plan of the monitoring locations shall be submitted to the Engineer for acceptance. The locations of the vibration monitors shall be adjusted during construction with acceptance by the Engineer. The vibration monitors shall be established at the site so that background vibrations may be determined prior to beginning foundation or embankment construction. The sensitivity range of the seismograph shall be selected so that the recording is initiated below the maximum allowable particle velocity shown in Figure 1 and extends above the highest expected intensity. Specific activities of the vibration source shall be indexed in time to allow correlation with the arrivals on the vibration
- B. Project Vibration Criteria - The maximum allowable particle velocity is shown in Figure 1. If the data from the monitors indicate that vibrations are exceeding the established criteria, then the Contractor shall immediately notify the Engineer and suspend those activities which are generating the earthborne vibrations, until the Contractor and his or her geotechnical firm have developed a revised construction plan to resolve the problem. The problem shall be resolved at no additional cost to the Department.
- C. Instrumentation – The vibration monitors shall consist of digital seismographs that display the particle velocities and associated frequencies plotted against the criteria for this project (i.e., Figure 1). Each seismograph shall contain geophones with response capability in three mutually perpendicular axes or components: one vertical and two horizontal (radial and transverse). The frequency response of the geophones shall be linear from at least 4 Hz to more than 200 Hz. The sensitivity shall range from less than 0.02 in/sec to more than 5.0 in/sec. The BlastMate III by InstanTel is one type of seismograph that is suitable for this project.
- D. Calibration and Instrument Use - The Contractor shall field calibrate the vibration monitors before the start of each recording period. The transducer shall be positioned with the longitudinal axis toward the vibration source. Transducers must be adequately coupled with the ground. Operation of all vibration monitors shall be in accordance with the instrument manufacturer’s instructions and recommendations. Vibration records shall be collected in waveform plot or strip chart plot. The peak vector sum of the particle velocity in longitudinal, transverse, and vertical planes shall be shown along with the respective dominant or principle frequencies. The highest recorded particle velocity (i.e., the vector sum of the three orthogonal directions), when indexed to a particle vibration event, shall be reported as the peak particle velocity. The recorded peak particle velocity shall be compared to criteria appropriate for the subject of concern.
- E. Complaints - In the event of a complaint, the Contractor shall immediately contact the Engineer and review those construction activities that are inducing vibrations into the earth. The Contractor shall prepare a report documenting all relevant data such as the time and date presented in the complaint, a description of the construction activities during the subject time/date, data from the monitoring instruments for the subject time/date, complaint information and a description (including photographs, if possible) of the alleged damage. The Contractor and his or her geotechnical firm shall then submit a detailed plan for repair, perform the repair at no cost to the Department and develop and submit for review a revised construction plan to address the vibration problems and minimize further damage and complaints.

5. METHOD OF MEASUREMENT:

In addition to the pre-construction condition assessment report, the Contractor shall also provide monthly reports containing the results of the crack monitors and vibration monitors during those activities that generate earthborne vibrations, including (but not limited to) ground improvement and foundation construction. The reports shall document that the Contractor is providing the work described by this specification.

6. BASIS OF PAYMENT:

Payment shall be made in proportion with the percent of the project that is complete. Final payment of the remaining lump sum balance shall be made when vibration monitoring is complete as approved by the Engineer. Payments shall be made under:

Item No.	Pay Item	Pay Unit
1075001	MONITORING OF CONSTRUCTION-RELATED EARTHBORNE VIBRATIONS	Lump Sum

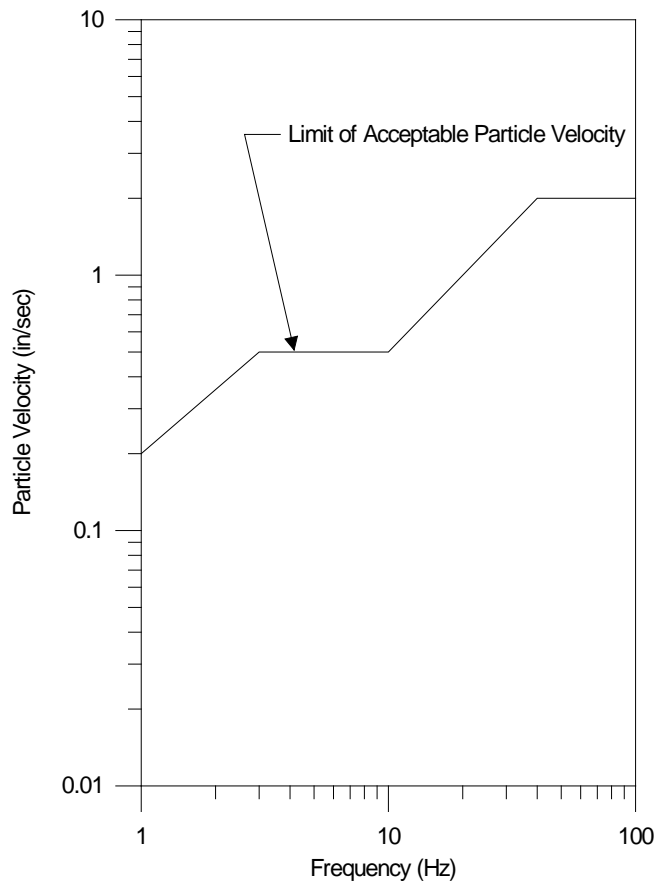


Figure 1 - Vibration Criteria (adapted from AASHTO R8-96)

(19) SECTION 107: COMMUNITY AND PUBLIC RELATIONS PLAN:

SCDOT will take the lead role on this project and be responsible for a portion of the public information efforts. Unless noted otherwise elsewhere in this RFP, the SCDOT, or its consultant's, responsibilities include:

Developing and maintaining the project website

Soliciting and administering advertisements and media announcements, as deemed necessary

The CONTRACTOR shall coordinate with the Department to promote public awareness for this project. The amount of public involvement required for this project is directly based on the CONTRACTOR's Transportation Management Plan and construction details. The Design- Build Team's responsibilities shall include:

- Providing an assigned contact person
- Providing details surrounding the impacts to the public
- Providing advance notice to the Department of upcoming project impacts
- Assisting the Department in the development of the target audience list
- Attending and/or speaking at public meetings and providing a trained outreach specialist
- Hand delivery of time sensitive informational materials
- Preparing advertisements and media announcements
- Preparing and forwarding direct mailers, flyers, and other promotional materials as necessary
- Organizing public meetings, including venue selection, reservation and fee, preparing meeting materials such as renderings and aerial maps

- Identifying major sporting and social events that will impact traffic within the project limits and scheduling lane closures and detours around these events to avoid unacceptable traffic impacts. Submit a calendar of known events to SCDOT prior to starting work.
- Develop photographic renderings, project maps and other graphical displays to clearly explain project details, complex traffic staging, proposed highway and/or bridge geometry that will be used for the design of the project website, for public meetings, and for the community liaison's local office.
- Prior to starting work and prior to any scheduled detours, develop and mail a project information notice (flyer) to include the stakeholder list and residents, property owners, and businesses within a one-mile radius of the project limits. Obtain a routing list from the local post office. Within the flyer, describe any proposed detours and provide maps with detour routes shown. Obtain SCDOT approval of the flyer prior to distribution.
- Develop computer-generated 30 videos/renderings of proposed traffic staging along I-26 for publication on the project website prior to impacts to I-26 traffic. Renderings shall depict motor vehicles in motion and in their proposed lane patterns for each stage/traffic shift required for construction.
- Provide digital time-lapse images taken from the same location throughout the duration of the project. Provide an appropriate scale for viewing the entire project in a single image. Provide web-access that can be linked to the project website for public viewing. Provide hourly updates of the images on the link and archive one image per month for public viewing over the duration of the project.

The CONTRACTOR shall hold an initial project coordination meeting with SCDOT at least one month prior to start of construction to discuss project impacts to the public. This information will be used by the CONTRACTOR to create a Public Information Plan.

The CONTRACTOR shall inform the Department at least twenty-one (21) calendar days in advance of any construction activity that will have significant impact on the public, including, but not limited to, the start of construction, major traffic shifts, road closures, ramp closures, detours, night work and project completion.

The CONTRACTOR will develop, with the assistance of SCDOT, the specific list of target audiences for this project. The following groups are identified as typical target audiences to receive informational materials:

- State Senator(s) and Representative(s)
- Chairman of the County Council
- County Administrator/Manager
- County Planner
- City Mayor (as appropriate)
- City Manager (as appropriate)
- Transportation services
- Emergency services
- Neighborhood groups and private homes
- Industry and businesses
- Chamber(s) of Commerce
- Individual schools effected by the project
- Public School District(s) and Transportation Office(s)
- Post Office
- Any other organization as deemed necessary by the Department

The minimum public information requirements solely associated with the Transportation Management Plans shall include, but not be limited to the following:

Public Meetings – Provide a trained outreach specialist to represent the Contractor at a Beginning of Construction and quarterly meetings for stakeholders, area businesses, and residents. Provide a venue as mentioned above.

Distribution of Informational Materials - For beginning of construction and for all road closures with detour routes, the CONTRACTOR shall be responsible for delivering time sensitive informational material provided by the SCDOT directly to portions of the target audience. If the CONTRACTOR informs the Department of the aforementioned activities less than twenty-one (21) calendar days in advance, the CONTRACTOR shall hand deliver the informational materials to the impacted target audiences.

Variable Message Boards – Utilize Variable Message Boards on local routes to notify motorists a minimum of one week in advance of major changes in traffic patterns and detours.

SCDOT, or its consultant, will be responsible for establishing, creating, maintaining and updating the project website for this project. However, throughout the project duration, the CONTRACTOR shall coordinate with the RCE to ensure the accuracy of the aforementioned project website. At a minimum, the CONTRACTOR shall designate a contact for public information inquiries and coordination. Throughout construction, at a minimum, this contact shall provide bi-weekly updates to the RCE, including, but not limited to, traffic control phasing, graphic illustrations, project pictures, etc.

The CONTRACTOR shall include in their Total Cost to Complete, all costs associated with their involvement in the Community and Public Relations Plan.

(20) SECTION 107: CSXT SPECIAL PROVISION

December 3, 2013

DEFINITIONS:

As used in these Special Provisions, all capitalized terms shall have the meanings ascribed to them by the Agreement, and the following terms shall have the meanings ascribed to them below:

"CSXT" shall mean CSX Transportation, Inc., its successors and assigns.

"Agreement" shall mean the Agreement between CSXT and DEPARTMENT.

"DEPARTMENT" shall mean the South Carolina Department of Transportation.

"Contractor" shall have the meaning ascribed to such term by the Agreement.

"Work" shall mean the Project as described in the Agreement.

1. WORK TO BE PERFORMED IN ACCORDANCE WITH SPECIAL PROVISIONS, DEPARTMENT/CSXT AGREEMENT AND APPROVED PLANS

Contractor shall perform all work upon or adjacent to CSXT'S property in accordance with these Special Provisions, the Agreement between DEPARTMENT and CSXT for this Project, and the approved Plans which are incorporated into the Agreement.

2. AUTHORITY OF CSXT ENGINEER

The authorized representative of CSXT ("CSXT Representative") shall have final authority in all matters affecting the safe maintenance of CSXT operations and CSXT property, and his or her approval shall be obtained by the DEPARTMENT or its Contractor for methods of construction to avoid interference with CSXT operations and CSXT property and all other matters contemplated by the Agreement and these Special Provisions.

3. INTERFERENCE WITH CSXT OPERATIONS

A. Contractor shall use reasonable care and diligence at all times and cooperate with CSXT officials in order to avoid accidents, damages, or delay to, or interference with, CSXT operations. Contractor shall not work on CSXT'S tracks or allow any of Contractor's equipment or material to encroach or to present a risk of encroachment, in the opinion of

CSXT, within the following minimum construction clearances, without first obtaining authority from CSXT'S Chief Engineer or his authorized representative: (a) Horizontal – 25.0 feet, measured at a right angle to the centerline of the nearest track, and (b) Vertical – 23.0 feet above top of the highest rail of CSXT's track.

- B. Contractor shall arrange and conduct its work so that there will be no interference with CSXT operations, including train, signal, telephone and telegraphic services, or damage to CSXT's property, or to poles, wires, and other facilities of tenants on CSXT's Property or right-of-way. Contractor shall store materials so as to prevent trespassers from causing damage to trains, or CSXT Property. Whenever Work is likely to affect the operations or safety of trains, the method of doing such Work shall first be submitted to the CSXT Representative for approval, but such approval shall not relieve Contractor from liability in connection with such Work.
- C. If conditions arising from or in connection with the Project require that immediate and unusual provisions be made to protect train operation or CSXT's property, Contractor shall make such provision. If the CSXT Representative determines that such provision is insufficient, CSXT may, at the expense of DEPARTMENT or its Contractor, require or provide such provision as may be deemed necessary, or cause the Work to cease immediately.

4. NOTICE OF STARTING WORK.

Contractor shall not commence any work on CSXT Property or rights-of-way until it has complied with the following conditions:

- A. Notify CSXT in writing of the date that it intends to commence Work on the Project. Such notice must be received by CSXT at least ten (10) business days in advance of the date Contractor proposes to begin Work on or within fifty (50) feet of CSXT property or right of way. The notice must identify the Project by reference to the CSXT OP# and Railroad Milepost and SCDOT File No. and Project No., as set forth on the first page of the Agreement. If contract flagging service is required, such notice shall be submitted at least thirty (30) business days in advance of the date scheduled to commence the Work. (See also the provisions for additional notice regarding flagging set forth in Section XI (C) of these Special Provisions.)
- B. Obtain authorization from the CSXT Representative to begin Work on CSXT property or right-of-way or within fifty (50) feet of railroad property or which affects a CSXT railroad bridge or trestle, tracks, roadbeds, tunnel, underpass or crossing, such authorization to include an outline of specific conditions with which it must comply.
- C. Obtain from CSXT the names, addresses and telephone numbers of CSXT's personnel who must receive notice under provisions in the Agreement. Where more than one individual is designated, the area of responsibility of each shall be specified.

5. WORK FOR THE BENEFIT OF THE CONTRACTOR

- A. No temporary or permanent changes to wire lines or other facilities (other than third party fiber optic cable transmission systems) on CSXT property that are considered necessary to the Work are anticipated or shown on the Plans. If any such changes are, or become, necessary in the opinion of CSXT or DEPARTMENT, such changes will be covered by appropriate revisions to the Plans and by preparation of a force account estimate. Such force account estimate may be initiated by either CSXT or DEPARTMENT, but must be approved by both CSXT and DEPARTMENT. DEPARTMENT or Contractor shall be responsible for arranging for the relocation of the third party fiber optic cable transmission systems, at no cost or expense to CSXT.
- B. Should Contractor desire any changes in addition to the above, then it shall make separate arrangements with CSXT for such changes to be accomplished at the Contractor's expense.

6. HAUL ACROSS CSXT

- A. If Contractor desires access across CSXT property or tracks other than at an existing, open public road crossing, Contractor must first obtain the permission of CSXT and shall execute a license agreement or right of entry satisfactory to CSXT, wherein Contractor agrees to bear all costs and liabilities related to such access.
- B. If at any time Contractor desires to establish and use a temporary at-grade crossing of CSXT'S tracks, Contractor shall obtain written authority from CSXT and, if required by CSXT, to execute CSXT'S standard form of private grade crossing agreement with respect to the crossing desired.
- C. Contractor shall not cross CSXT's property and tracks with vehicles or equipment of any kind or character, except at such crossing or crossings as may be permitted pursuant to this Section VI.

7. COOPERATION AND DELAYS

- A. Contractor shall arrange a schedule with CSXT for accomplishing staged construction involving work by CSXT. In arranging its schedule, Contractor shall ascertain, from CSXT, the lead time required for assembling crews and materials and shall make due allowance therefor.
- B. Contractor may not charge any costs or submit any claims against CSXT for hindrance or delay caused by CSXT traffic, work done by CSXT or other delay incident to or necessary for safe maintenance of CSXT traffic, or for any delays due to compliance with these Special Provisions.
- C. Contractor shall cooperate with others participating in the construction of the Project to the end that all work may be carried on to the best advantage.
- D. Contractor understands and agrees that CSXT does not assume any responsibility for work performed by others in connection the Project. Contractor further understands and agrees that it shall have no claim whatsoever against CSXT for any inconvenience, delay or additional cost incurred by DEPARTMENT or its Contractor on account of operations by others.

8. STORAGE OF MATERIALS AND EQUIPMENT

Contractor shall not store its materials or equipment on CSXT's property or where they may potentially interfere with CSXT's operations, unless Contractor has received CSXT Representative's prior written permission. Contractor understands and agrees that CSXT will not be liable for any damage to such materials and equipment from any cause except the negligence, recklessness or intentional wrongdoing of CSXT, or its agents or employees. CSXT may move, or require Contractor to move, such material and equipment, at Contractor's sole expense. To minimize the possibility of damage to the CSXT tracks resulting from the unauthorized use of equipment, all grading or other construction equipment that is left parked near the tracks unattended by watchmen shall be immobilized to the extent feasible so that it cannot be moved by unauthorized persons.

9. CONSTRUCTION PROCEDURES

A. General

- 1. Construction work on CSXT property shall be subject to CSXT's inspection and approval.
- 2. Construction work on CSXT property shall be in accord with these Special Provisions.

3. Contractor shall observe the terms and rules of the CSXT Safe Way manual, which DEPARTMENT and Contractor shall be required to obtain from CSXT, and in accord with any other instructions furnished by CSXT or CSXT's Representative.

B. Blasting

1. Contractor shall obtain the prior written approval of CSXT Representative's and DEPARTMENT for use of explosives on or adjacent to CSXT property. If permission for use of explosives is granted, Contractor must comply with the following:
 - a) Blasting shall be done with light charges under the direct supervision of a responsible officer or employee of the Contractor.
 - b) Electric detonating fuses shall not be used because of the possibility of premature explosions resulting from operation of two-way train radios.
 - c) No blasting shall be done without the presence of an authorized representative of CSXT. At least 72 hours' advance notice to CSXT Representative is required to arrange for the presence of an authorized CSXT representative and any flagging that CSXT may require.
 - d) Contractor must have at the Project site adequate equipment, labor and materials, and allow sufficient time, to (i) clean up (at Contractor's expense) debris resulting from the blasting without any delay to trains; and (ii) correct (at Contractor's expense) any track misalignment or other damage to CSXT's property resulting from the blasting, as directed by CSXT Representative, without delay to trains.
 - e) DEPARTMENT and its Contractor shall not store explosives on CSXT property.
2. CSXT Representative will:
 - a) Determine the approximate location of trains and advise Contractor of the approximate amount of time available for the blasting operation and clean-up.
 - b) Have the authority to order discontinuance of blasting if, in his or her opinion, blasting is too hazardous or is not in accord with these Special Provisions.

10. MAINTENANCE OF DITCHES ADJACENT TO CSXT TRACKS

Contractor shall maintain all ditches and drainage structures free of silt or other obstructions that may result from their operations. Contractor shall provide erosion control measures during construction and use methods that accord with applicable state standard specifications for road and bridge construction, including either (1) silt fence; (2) hay or straw barrier; (3) berm or temporary ditches; (4) sediment basin; (5) aggregate checks; and (6) channel lining. All such maintenance and repair of damages due to Contractor's operations shall be performed at Contractor's expense.

11. FLAGGING / INSPECTION SERVICE

- A. Contractor shall utilize CSXT flagmen, watchmen, or other protective measures that are required, in the sole opinion of CSXT, to promote safety and/or continuity of CSXT traffic. CSXT has sole authority to determine the need for flagging required to protect its operations and property. In general, flagging protection will be required whenever the Contractor or its equipment are, or are likely to be, working within fifty (50) feet of live track or other track clearances specified by CSXT, or over tracks.
- B. DEPARTMENT shall reimburse CSXT directly for all costs of flagging that is required on account of construction within CSXT property shown in the Plans, or that is covered by an approved plan revision, supplemental agreement or change order.
- C. Contractor shall give a minimum of ten (10) days advance notice to CSXT Representative of anticipated need for flagging service. No work for which flagging service is required shall be undertaken until the flag person(s) is/are at the job site. [The estimated number and classifications of flag-persons are shown in the Estimate.] If it is necessary for CSXT

to advertise a flagging job for bid, it may take up to ninety (90) days to obtain this service, and CSXT shall not be liable for the cost of delays attributable to obtaining such service.

- D. CSXT shall have the right to assign an individual to the site of the Project to perform inspection service whenever, in the opinion of CSXT Representative, such inspection may be necessary. DEPARTMENT shall reimburse CSXT for the costs incurred by CSXT for such inspection service. Inspection service shall not relieve DEPARTMENT or its Contractor from liability for its Work.
- E. CSXT shall render invoices for, and DEPARTMENT shall pay for, the actual pay rate of the flagpersons and inspectors used, plus standard additives, whether that amount is above or below the rate provided in the Estimate. If the rate of pay that is to be used for inspector or flagging service is changed before the work is started or during the progress of the Work, whether by law or agreement between CSXT and its employees, or if the tax rates on labor are changed, bills will be rendered by CSXT and paid by DEPARTMENT using the new rates. Contractor shall perform Work that requires flagging protection or inspection service in such a manner and sequence that the cost of such will be economical as possible.

12. UTILITY FACILITIES ON CSXT PROPERTY

Contractor shall arrange to have any utility facilities on or over CSXT Property changed as may be necessary to provide clearances for the proposed trackage.

13. CLEAN-UP

Contractor, upon completion of the Project, shall remove from CSXT's Property any temporary grade crossings, any temporary erosion control measures used to control drainage, all machinery, equipment, surplus materials, falsework, rubbish, or temporary buildings belonging to Contractor. Contractor, upon completion of the Project, shall leave CSXT Property in neat condition, satisfactory to CSXT Representative.

14. FAILURE TO COMPLY

If DEPARTMENT or its Contractor violate or fail to comply with any of the requirements of these Special Provisions, (a) CSXT may require DEPARTMENT and/or its Contractor to vacate CSXT Property; (b) CSXT may withhold monies due DEPARTMENT and/or Contractor; and (c) CSXT may cure such failure and the DEPARTMENT shall reimburse CSXT for the cost of curing such failure.

15. INSURANCE PROVISIONS

A. Insurance Policies:

Contractor shall procure and maintain the following insurance policies:

1. Commercial General Liability (CGL) coverage at their sole cost and expense with limits of not less than \$5,000,000 in combined single limits for bodily injury and/or property damage per occurrence, and such policies shall name CSXT as an additional insured.
2. Statutory Worker's Compensation and Employers Liability Insurance with limits of not less than \$1,000,000, which insurance must contain a waiver of subrogation against CSXT and its affiliates [if permitted by state law].
3. Commercial Automobile Liability insurance with limits of not less than \$1,000,000 combined single limit for bodily injury and/or property damage per occurrence, and such policies shall name CSXT as an additional insured.
4. Railroad Protective Liability (RPL) insurance with limits of not less than \$5,000,000 combined single limit for bodily injury and/or property damage per occurrence and an

aggregate annual limit of \$10,000,000, which insurance shall satisfy the following additional requirements:

a) The Railroad Protective Liability Insurance Policy must be on the ISO/RIMA Form of Railroad Protective Insurance - Insurance Services Office (ISO) Form CG 00 35.

b) CSX Transportation must be the named insured on the Railroad Protective Liability Insurance Policy. The named insured's address should be listed as:

CSX Transportation, Inc.
500 Water Street, C-907
Jacksonville, FL 32202

c) The Name and Address of the Contractor and of the Project Sponsor/Involved Governmental Agency must be shown on the Declarations page.

d) A description of operations and location must appear on the Declarations page and must match the Project description.

e) Terrorism Risk Insurance Act (TRIA) coverage must be included.

f) Authorized endorsements must include:

i. Pollution Exclusion Amendment - CG 28 31, unless using form CG 00 35 version 96 and later

g) Authorized endorsements may include:

- i. Broad Form Nuclear Exclusion - IL 00 21
- ii. Notice of Non-renewal or cancellation
- iii. Required State Cancellation Endorsement
- iv. Quick Reference or Index - CL/IL 240

h) Authorized endorsements may not include:

- i. A Pollution Exclusion Endorsement except CG 28 31
- ii. An Endorsement that excludes TRIA coverage
- iii. An Endorsement that limits or excludes Professional Liability coverage
- iv. A Non-Cumulation of Liability or Pyramiding of Limits Endorsement
- v. A Known Injury Endorsement
- vi. A Sole Agent Endorsement
- vii. A Punitive or Exemplary Damages Exclusion
- viii. A "Common Policy Conditions" Endorsement
- ix. Policies that contain any type of deductible
- x. Any endorsement that is not named in Section 4 (f) or (g) above that CSXT deems unacceptable

5. All insurance companies must be A. M. Best rated A- and Class VII or better.

6. Such additional or different insurance as CSXT may require.

B. Additional Terms

1. Contractor must submit the complete Railroad Protective Liability policy, Certificates of Insurance and all notices and correspondence regarding the insurance policies in an electronic format to:

insurancedocuments@csx.com with a copy to CSXT's Engineering Consultant
(Contact Information will be provided at the Project's Preconstruction Meeting)

2. Neither Agency nor Contractor may begin work on or about CSXT property until written approval of the required insurance has been received from CSXT or CSXT's Insurance Compliance vendor, Ebix.

16. CONTRACTOR'S AGREEMENT

Prior to commencement of Work on CSXT's property or right-of-way or within fifty (50) feet of railroad property or which affects a CSXT railroad bridge or trestle, tracks, roadbeds, tunnel, underpass or crossing, Contractor shall execute and deliver to CSXT the Contractor's Agreement (Schedule I to the Agreement).

INSURANCE APPROVAL REQUEST - To be sent with required evidence of insurance.

TO:

Risk Management/Insurance
CSX Transportation, Inc.
500 Water Street, C-907
Jacksonville, Florida 32202

Date _____

CSXT Agreement With: _____
(Name of Public Authority, Private Entity, Etc.) (Date)

Name of Contractor: _____

(Provide both CSXT and Contract Project Description using CSXT and Contract File Nos. when available)

Project Description: _____

Project involves either passenger rail service or rail shipment of hazardous materials:

YES NO

Anticipated Starting Date: _____ Completion Date: _____

City: _____ County: _____ State: _____

Division: _____ Sub-Division: _____ M. P.: _____

Attached are Original Railroad Protective Insurance Policy, in duplicate, required to be furnished to CSXT. Please advise if the attached evidence of insurance is satisfactory and complies with the insurance requirements of the agreement.

(Public Authority, Private Entity or Contractor must show address below and attach self-addressed, stamped envelope)

TO:

Date: _____

File: _____

- Approved - this is not authority to proceed with work, entry arrangements must be made with our Division Manager.
- Not Approved.** Reason:
 - General Liability limits inadequate (\$_____ required).
 - No evidence of Contractual Liability Insurance.
 - No unconditional 30-day notice of cancellation.
 - Other:
- Returned for your further handling.
- Insufficient information provided
Returned without approval. CSX Transportation, Inc.

cc: Division Manager -Division _____

Risk Management

SCHEDULE I

SCDOT Project No. : _____

CSXT OP No.: _____

CONTRACTOR'S AGREEMENT

This CONTRACTOR'S AGREEMENT is made as of _____, 2010, by _____ [Insert Name of Contractor] ("Contractor"), to and for the benefit of CSX Transportation, Inc. ("CSXT") and to induce CSXT to permit Contractor on or about CSXT's property, for the purposes of performing work in connection with the above referenced project for South Carolina Department of Transportation.

In consideration of CSXT's consent to permit Contractor on or about CSXT's property for such purposes, and other good and valuable consideration, the receipt and sufficiency of which are acknowledged by Contractor, Contractor hereby agrees as follows:

1. CSXT Special Provisions. Contractor agrees to abide by and observe the terms and conditions of the CSXT Special Provisions (which is incorporated by reference into this Agreement).
2. Insurance Requirements. Contractor shall acquire and maintain the insurance described by the Special Provisions, and shall submit proof of insurance to CSXT in accordance with the Special Provisions, satisfactory to CSXT, prior to commencement of work on or about CSXT's property.
3. Indemnification.

Contractor further specifically agrees as follows:

- a. Contractor shall indemnify, defend and save harmless CSXT and its affiliates from all suits or claims of any character brought because of any injuries or damage received or sustained by any person, persons, or property, in whole or in part, on account of the operations of Contractor or any subcontractor or sub-subcontractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials or workmanship in constructing the work; or because of any act or omission, neglect, or misconduct of Contractor or any subcontractor or sub-subcontractor; or because of any claims or amounts recovered from any infringements of patent, trademark or copyright; or for failing to pay, when and as due, all bills and other legitimate charges, including lawful claims for labor performed or materials, equipment and supplies furnished for use in and about the construction of the work under contract; or from any claims or amounts arising or recovered under the Worker's Compensation Act, or any other law, ordinance or decree. The foregoing indemnifications obligation shall not be limited to the insurance coverage required by this Agreement.
- b. Contractor shall comply with any federal, state or local laws, statutes, codes ordinances, rules, and regulations applicable to its construction and maintenance of the Project. Contractor shall indemnify, defend, and hold CSXT and its affiliates harmless with respect to any fines, penalties, liabilities, or other consequences arising from breaches of this Agreement.
- c. For the purpose of this Agreement, CSXT's affiliates include CSX Corporation and all entities, directly or indirectly, owned or controlled by or under common control of CSXT or CSX Corporation and their respective officers, directors, employees and agents.

- d. Contractor shall notify CSXT promptly of any loss, damage, injury or death arising out of or in connection with the Project work.
- e. The provisions of this Agreement shall survive the termination or expiration of the Agreement.

IN WITNESS WHEREOF, Contractor has executed and delivered this Agreement as of the date set forth below.

CONTRACTOR

By: _____

Print: _____

Title: _____

Date: _____

(21) **SECTION 107: NORFOLK SOUTHERN RAILWAY COMPANY SPECIAL PROVISIONS FOR PROTECTION OF RAILWAY INTERESTS:**

January 4, 2010

**SPECIAL PROVISIONS FOR
PROTECTION OF RAILWAY INTERESTS**

NORFOLK SOUTHERN RAILWAY COMPANY, hereinafter called the "Railway"; and

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION, hereinafter called the
"Department";

1. AUTHORITY OF RAILWAY ENGINEER AND DEPARTMENT ENGINEER:

The authorized representative of the Railway Company, hereinafter referred to as Railway Engineer, shall have final authority in all matters affecting the safe maintenance of railroad traffic of his Company including the adequacy of the foundations and structures supporting the railroad tracks.

The authorized representative of the Department, hereinafter referred to as the Department Engineer, shall have authority over all other matters as prescribed herein and in the Project Specifications.

2. NOTICE OF STARTING WORK:

A. The Department's Prime contractor shall not commence any work on Railway's rights-of-way until he has complied with the following conditions:

1. Given the Railway written notice, with copy to the Department Engineer who has been designated to be in charge of the work, at least ten days in advance of the date he proposes to begin work on Railway's rights-of-way.

Office of Chief Engineer
Bridges & Structures
Norfolk Southern Corporation
1200 Peachtree Street NE
Internal Box #142
Atlanta, Georgia 30309

2. Obtained written approval from the Railway of Railroad Protective Liability Insurance coverage as required by paragraph 14 herein. It should be noted that Railway Company does not accept notation of Railroad Protective insurance on a certificate of liability insurance form or Binders as Railway Company must have the full original countersigned policy. Further, please note that mere receipt of the policy is not the only issue but review for compliance. Due to the number of projects system-wide, it typically takes a minimum of 30-45 days for Railway Company to review.
3. Obtained Railway's Flagger Services as required by paragraph 7 herein.
4. Obtained written authorization from the Railway to begin work on Railway's rights-of-way, such authorization to include an outline of specific conditions with which he must comply.
5. Furnished a schedule for all work within the Railway's rights-of-way as required by paragraph 7,B,1.

B. The Railway's written authorization to proceed with the work shall include the names, addresses, and telephone numbers of the Railway Representatives who are to be notified

as hereinafter required. Where more than one representative is designated, the area of responsibility of each representative shall be specified.

3. INTERFERENCE WITH RAILWAY OPERATIONS:

- A. The Contractor shall so arrange and conduct his work that there will be no interference with Railway's operations, including train, signal, telephone and telegraphic services, or damage to the property of the Railway Company or to poles, wires, and other facilities of tenants on the rights-of-way of the Railway Company. Whenever work is liable to affect the operations or safety of trains, the method of doing such work shall first be submitted to the Railway Engineer for approval, but such approval shall not relieve the Contractor from liability. Any work to be performed by the Contractor which requires flagging service or inspection service shall be deferred by the Contractor until the flagging service or inspection service required by the Railway is available at the job site.
- B. Whenever work within Railway's rights-of-way is of such a nature that impediment to Railway operations such as use of runaround tracks or necessity for reduced speed is unavoidable, the Contractor shall schedule and conduct his operations so that such impediment is reduced to the absolute minimum.
- C. Should conditions arising from, or in connection with the work, require that immediate and unusual provisions be made to protect operations and property of the Railway, the Contractor shall make such provisions. If in the judgment of the Railway Engineer, or in his absence, the Railway's Division Engineer, such provisions are insufficient, either may require or provide such provisions as he deems necessary. In any event, such unusual provisions shall be at the Contractor's expense and without cost to the Railway or the Department.

4. TRACK CLEARANCES:

- A. The minimum track clearances to be maintained by the Contractor during construction are shown on the Project Plans. However, before undertaking any work within Railway's rights-of-way, or before placing any obstruction over any track, the Contractor shall:
 - 1. Notify the Railway Representative at least 72 hours in advance of the work.
 - 2. Receive assurance from the Railway Representative that arrangements have been made for flagging service as may be necessary.
 - 3. Receive permission from the Railway Representative to proceed with the work.
 - 4. Ascertain that the Department Engineer has received copies of notice to the Railway and of the Railway's response thereto.

5. CONSTRUCTION PROCEDURES:

A. General:

Construction work and operations by the Contractor on Railway's property shall be:

- 1. Subject to the inspection and approval of the Railway.
- 2. In accord with the Railway's written outline of specific conditions.
- 3. In accord with the Railway's general rules, regulations and requirements including those relating to safety, fall protection and personal protective equipment.
- 4. In accord with these Special Provisions.

B. Excavation:

The subgrade of an operated track shall be maintained with edge of berm at least 10'-0" from centerline of track and not more than 24- inches below top of rail. Contractor will not be required to make existing section meet this specification if substandard, in which case existing section will be maintained.

Additionally, the Railway Engineer may require installation of orange construction safety fencing for protection of the work area.

C. Excavation for Structures:

The Contractor will be required to take special precaution and care in connection with excavating and shoring pits, and in driving piles or sheeting for footings adjacent to tracks to provide adequate lateral support for the tracks and the loads which they carry, without disturbance of track alignment and surface, and to avoid obstructing track clearances with working equipment, tools or other material. All plans and calculations for shoring shall be prepared and signed by a Registered Professional Engineer. The Registered Professional Engineer will be responsible for the accuracy for all controlling dimensions as well as the selection of soil design values which will accurately reflect the actual field conditions. The procedure for doing such work, including need of and plans and calculations for shoring, shall first be approved by the Department Engineer and the Railway Engineer, but such approval shall not relieve the Contractor from liability.

Additionally, walkway with handrail protection may be required as noted in paragraph 11 herein.

D. Demolition, Erection, Hoisting

1. Railway's tracks and other Railway property must be protected from damage during the procedure.
2. The Contractor is required to submit a plan showing the location of cranes, horizontally and vertically, operating radii, with delivery or disposal locations shown. The location of all tracks and other railroad facilities as well as all obstructions such as wire lines, poles, adjacent structures, etc. must also be shown.
3. Crane rating sheets showing cranes to be adequate for 150% of the actual weight of the pick. A complete set of crane charts, including crane, counterweight, and boom nomenclature is to be submitted.
4. Plans and computations showing the weight of the pick must be submitted. Calculations shall be made from plans of the existing and/or proposed structure showing complete and sufficient details with supporting data for the demolition or erection of the structure. If plans do not exist, lifting weights must be calculated from field measurements. The field measurements are to be made under the supervision of the Registered Professional Engineer submitting the procedure and calculations.
5. A data sheet must be submitted listing the types, size, and arrangements of all rigging and connection equipment.
6. A complete procedure is to be submitted, including the order of lifts, time required for each lift, and any repositioning or re-hitching of the crane or cranes.
7. All erection or demolition plans, procedures, data sheets, etc. submitted must be prepared, signed and sealed by a Registered Professional Engineer.
8. The Railway Engineer or his designated representative must be present at the site during the entire demolition and erection procedure period.

9. All procedures, plans and calculations shall first be approved by the Department Engineer and the Railway Engineer, but such approval does not relieve the Contractor from liability.

E. Blasting:

1. The Contractor shall obtain advance approval of the Railway Engineer and the Department Engineer for use of explosives on or adjacent to Railway property. The request for permission to use explosives shall include a detailed blasting plan. If permission for use of explosives is granted, the Contractor will be required to comply with the following:
 - a) Blasting shall be done with light charges under the direct supervision of a responsible officer or employee of the Contractor and a licensed blaster.
 - b) Electric detonating fuses shall not be used because of the possibility of premature explosions resulting from operation of two-way radios.
 - c) No blasting shall be done without the presence of the Railway Engineer or his authorized representative. At least 72 hours advance notice to the person designated in the Railway's notice of authorization to proceed (see paragraph 2B) will be required to arrange for the presence of an authorized Railway representative and such flagging as the Railway may require.
 - d) Have at the job site adequate equipment, labor and materials and allow sufficient time to clean up debris resulting from the blasting without delay to trains, as well as correcting at his expense any track misalignment or other damage to Railway property resulting from the blasting as directed by the Railway's authorized representative. If his actions result in delay of trains, the Contractor shall bear the entire cost thereof.
2. The Railway representative will:
 - a) Determine approximate location of trains and advise the Contractor the appropriate amount of time available for the blasting operation and clean up.
 - b) Have the authority to order discontinuance of blasting if, in his opinion, blasting is too hazardous or is not in accord with these special provisions.

F. Maintenance of Railway Facilities:

1. The Contractor will be required to maintain all ditches and drainage structures free of silt or other obstructions which may result from his operations and provide and maintain any erosion control measures as required. The Contractor will promptly repair eroded areas within Railway's rights-of-way and repair any other damage to the property of the Railway or its tenants.
2. All such maintenance and repair of damages due to the Contractor's operations shall be done at the Contractor's expense.

G. Storage of Materials and Equipment:

Materials and equipment shall not be stored where they will interfere with railroad operations, nor on the rights-of-way of the Railway Company without first having obtained permission from the Railway Engineer, and such permission will be with the understanding that the Railway Company will not be liable for damage to such material and equipment from any cause and that the Railway Engineer may move or require the Contractor to move, at the Contractor's expense, such material and equipment.

All grading or construction machinery that is left parked near the track unattended by a watchman shall be effectively immobilized so that it cannot be moved by unauthorized persons. The Contractor shall protect, defend, indemnify and save Railway, and any associated, controlled or affiliated corporation, harmless from and against all losses, costs, expenses, claim or liability for loss or damage to property or the loss of life or personal injury, arising out of or incident to the Contractor's failure to immobilize grading or construction machinery.

H. Cleanup:

Upon completion of the work, the Contractor shall remove from within the limits of the Railway's rights-of-way, all machinery, equipment, surplus materials, falsework, rubbish or temporary buildings of the Contractor, and leave said rights-of-way in a neat condition satisfactory to the Chief Engineer of the Railway or his authorized representative.

6. DAMAGES:

- A. The Contractor shall assume all liability for any and all damages to his work, employees, servants, equipment and materials caused by Railway traffic.
- B. Any cost incurred by the Railway for repairing damages to its property or to property of its tenants, caused by or resulting from the operations of the Contractor, shall be paid directly to the Railway by the Contractor.

7. FLAGGING SERVICES:

A. Requirements:

Flagging services will not be provided until the contractor's insurance has been reviewed & approved by the Railway.

Under the terms of the agreement between the Department and the Railway, the Railway has sole authority to determine the need for flagging required to protect its operations. In general, the requirements of such services will be whenever the Contractor's personnel or equipment are or are likely to be, working on the Railway's right-of-way, or across, over, adjacent to, or under a track, or when such work has disturbed or is likely to disturb a railroad structure or the railroad roadbed or surface and alignment of any track to such extent that the movement of trains must be controlled by flagging.

Normally, the Railway will assign one flagman to a project; but in some cases, more than one may be necessary, such as yard limits where three (3) flagmen may be required. However, if the Contractor works within distances that violate instructions given by the Railway's authorized representative or performs work that has not been scheduled with the Railway's authorized representative, a flagman or flagmen may be required full time until the project has been completed.

B. Scheduling and Notification:

- 1. The Contractor's work requiring railroad flagging should be scheduled to limit the presence of a flagman at the site to a maximum of 50 hours per week. The Contractor shall receive Railway's approval of work schedules requiring a flagman's presence in excess of 40 hours per week.
- 2. Not later than the time that approval is initially requested to begin work on Railway's rights-of-way, Contractor shall furnish to the Railway and the Department a schedule for all work required to complete the portion of the project within Railway's rights-of-way and arrange for a job site meeting between the Contractor, the Department, and the Railway's authorized representative. Flagman or Flagmen may not be provided until the job site meeting has been conducted and the Contractor's work scheduled.

3. The Contractor will be required to give the Railway representative at least 10 working days of advance written notice of intent to begin work within Railway's rights-of-way in accordance with this special provision. Once begun, when such work is then suspended at any time, or for any reason, the Contractor will be required to give the Railway representative at least 3 working days of advance notice before resuming work on Railway's rights-of-way. Such notices shall include sufficient details of the proposed work to enable the Railway representative to determine if flagging will be required. If such notice is in writing, the Contractor shall furnish the Engineer a copy; if notice is given verbally, it shall be confirmed in writing with copy to the Engineer. If flagging is required, no work shall be undertaken until the flagman, or flagmen are present at the job site. It may take up to 30 days to obtain flagging initially from the Railway. When flagging begins, the flagman is usually assigned by the Railway to work at the project site on a continual basis until no longer needed and cannot be called for on a spot basis. If flagging becomes unnecessary and is suspended, it may take up to 30 days to again obtain from the Railway. Due to Railway labor agreements, it is necessary to give 5 working days' notice before flagging service may be discontinued and responsibility for payment stopped.
4. If, after the flagman is assigned to the project site, an emergency arises that requires the flagman's presence elsewhere, then the Contractor shall delay work on Railway's rights-of-way until such time as the flagman is again available. Any additional costs resulting from such delay shall be borne by the Contractor and not the Department or Railway.

C. Payment:

1. The Department will be responsible for paying the Railway directly for any and all costs of flagging which may be required to accomplish the construction.
2. The estimated cost of flagging is current rate per day based on a 10-hour work day. This cost includes the base pay for the flagman, overhead, and includes a per diem charge for travel expenses, meals and lodging. The charge to the Department by the Railway will be the actual cost based on the rate of pay for the Railway's employees who are available for flagging service at the time the service is required.
3. Work by a flagman in excess of 8 hours per day or 40 hours per week, but not more than 12 hours a day will result in overtime pay at 1 and 1/2 times the appropriate rate. Work by a flagman in excess of 12 hours per day will result in overtime at 2 times the appropriate rate. If work is performed on a holiday, the flagging rate is 2 and 1/2 times the normal rate.
4. Railway work involved in preparing and handling bills will also be charged to the Department. Charges to the Department by the Railway shall be in accordance with applicable provisions of Subchapter B, Part 140, Subpart I and Subchapter G, Part 646, Subpart B of the Federal-Aid Policy Guide issued by the Federal Highway Administration on December 9, 1991, including all current amendments. Flagging costs are subject to change.

D. Verification:

1. Railway's flagman will electronically enter flagging time via Railway's electronic billing system. Any complaints concerning flagging must be resolved in a timely manner. If need for flagging is questioned, please contact Railway's System Engineer Public Improvements (404) 529-1641. All verbal complaints will be confirmed in writing by the Contractor within 5 working days with a copy to the Highway Engineer. Address all written correspondence to:

Office of Chief Engineer
Bridges & Structures

Attn:
System Engineer

2. The Railway flagman assigned to the project will be responsible for notifying the Department Engineer upon arrival at the job site on the first day (or as soon thereafter as possible) that flagging services begin and on the last day that he performs such services for each separate period that services are provided. The Department Engineer will document such notification in the project records. When requested, the Department Engineer will also sign the flagman's diary showing daily time spent and activity at the project site.

8. HAUL ACROSS RAILROAD:

- A. Where the plans show or imply that materials of any nature must be hauled across a railroad, unless the plans clearly show that the Department has included arrangements for such haul in its agreement with the Railway, the Contractor will be required to make all necessary arrangements with the Railway regarding means of transporting such materials across the railroad. The Contractor will be required to bear all costs incidental to such crossings whether services are performed by his own forces or by Railway personnel.
- B. No crossing may be established for use of the Contractor for transporting materials or equipment across the tracks of the Railway Company unless specific authority for its installation, maintenance, necessary watching and flagging thereof and removal, until a temporary private crossing agreement has been executed between the Contractor and Railway. The approval process for an agreement normally takes 90-days.

9. WORK FOR THE BENEFIT OF THE CONTRACTOR:

- A. All temporary or permanent changes in wire lines or other facilities which are considered necessary to the project are shown on the plans; included in the force account agreement between the Department and the Railway or will be covered by appropriate revisions to same which will be initiated and approved by the Department and/or the Railway.
- B. Should the Contractor desire any changes in addition to the above, then he shall make separate arrangements with the Railway for same to be accomplished at the Contractor's expense.

10. COOPERATION AND DELAYS:

- A. It shall be the Contractor's responsibility to arrange a schedule with the Railway for accomplishing stage construction involving work by the Railway or tenants of the Railway. In arranging his schedule he shall ascertain, from the Railway, the lead time required for assembling crews and materials and shall make due allowance therefore.
- B. No charge or claim of the Contractor against either the Department or the Railway Company will be allowed for hindrance or delay on account of railway traffic; any work done by the Railway Company or other delay incident to or necessary for safe maintenance of railway traffic or for any delays due to compliance with these special provisions.

11. TRAINMAN'S WALKWAYS:

Along the outer side of each exterior track of multiple operated track, and on each side of single operated track, an unobstructed continuous space suitable for trainman's use in walking along trains, extending to a line not less than 10 feet from centerline of track, shall be maintained. Any temporary impediments to walkways and track drainage encroachments or obstructions allowed during work hours while Railway's protective service is provided shall be removed before the close of each work day. If there is any excavation near the walkway, a handrail, with 10'-0" minimum clearance from centerline of track, shall be placed and must conform to AREMA and/or FRA standards.

12. GUIDELINES FOR PERSONNEL ON RAILWAY'S RIGHTS-OF-WAY:

- A. All persons shall wear hard hats. Appropriate eye and hearing protection must be used. Working in shorts is prohibited. Shirts must cover shoulders, back and abdomen. Working in tennis or jogging shoes, sandals, boots with high heels, cowboy and other slip-on type boots is prohibited. Hard-sole, lace-up footwear, zippered boots or boots cinched up with straps which fit snugly about the ankle are adequate. Wearing of safety boots is strongly recommended. In the vicinity of at-grade crossings, it is strongly recommended that reflective vests be worn.
- B. No one is allowed within 25' of the centerline of track without specific authorization from the flagman.
- C. All persons working near track while train is passing are to lookout for dragging bands, chains and protruding or shifted cargo.
- D. No one is allowed to cross tracks without specific authorization from the flagman.
- E. All welders and cutting torches working within 25' of track must stop when train is passing.
- F. No steel tape or chain will be allowed to cross or touch rails without permission.

13. GUIDELINES EQUIPMENT ON RAILWAY'S RIGHTS-OF-WAY:

- A. No crane or boom equipment will be allowed to set up to work or park within boom distance plus 15' of centerline of track without specific permission from Railway official and flagman.
- B. No crane or boom equipment will be allowed to foul track or lift a load over the track without flag protection and track time.
- C. All employees will stay with their machines when crane or boom equipment is pointed toward track.
- D. All cranes and boom equipment under load will stop work while train is passing (including pile driving).
- E. Swinging loads must be secured to prevent movement while train is passing.
- F. No loads will be suspended above a moving train.
- G. No equipment will be allowed within 25' of centerline of track without specific authorization of the flagman.
- H. Trucks, tractors or any equipment will not touch ballast line without specific permission from Railway official and flagman.
- I. No equipment or load movement within 25' or above a standing train or railroad equipment without specific authorization of the flagman.
- J. All operating equipment within 25' of track must halt operations when a train is passing. All other operating equipment may be halted by the flagman if the flagman views the operation to be dangerous to the passing train.
- K. All equipment, loads and cables are prohibited from touching rails.
- L. While clearing and grubbing, no vegetation will be removed from railroad embankment with heavy equipment without specific permission from the Railway Engineer and flagman.

- M. No equipment or materials will be parked or stored on Railway's property unless specific authorization is granted from the Railway Engineer.
- N. All unattended equipment that is left parked on Railway property shall be effectively immobilized so that it cannot be moved by unauthorized persons.
- O. All cranes and boom equipment will be turned away from track after each work day or whenever unattended by an operator.

14. INSURANCE:

- A. In addition to any other forms of insurance or bonds required under the terms of the contract and specifications, the Prime Contractor will be required to carry insurance of the following kinds and amounts:
 - 1. Commercial General Liability Insurance having a combined single limit of not less than \$2,000,000 per occurrence for all loss, damage, cost and expense, including attorneys' fees, arising out of bodily injury liability and property damage liability during the policy period. Said policy shall include explosion, collapse, and underground hazard (XCU) coverage, shall be endorsed to name Railway specified in item A.2.c. below both as the certificate holder and as an additional insured, and shall include a severability of interests provision.
 - 2. Railroad Protective Liability Insurance having a combined single limit of not less than \$2,000,000 each occurrence and \$6,000,000 in the aggregate applying separately to each annual period. If the project involves track over which passenger trains operate, the insurance limits required are not less than a combined single limit of \$5,000,000 each occurrence and \$10,000,000 in the aggregate applying separately to each annual period. Said policy shall provide coverage for all loss, damage or expense arising from bodily injury and property damage liability, and physical damage to property attributed to acts or omissions at the job site.

The standards for the Railroad Protective Liability Insurance are as follows:

- a. The insurer must be rated A- or better by A.M. Best Company, Inc.
- b. The policy must be written using one of the following combinations of Insurance Services Office ("ISO") Railroad Protective Liability Insurance Form Numbers:
 - (1) CG 00 35 01 96 and CG 28 31 10 93; or
 - (2) CG 00 35 07 98 and CG 28 31 07 98; or
 - (3) CG 00 35 10 01; or
 - (4) CG 00 35 12 04.
- c. The named insured shall read:

Norfolk Southern Railway Company
 Three Commercial Place
 Norfolk, Virginia 23510-2191
 Attn: Risk Management
- d. The description of operations must appear on the Declarations, must match the project description in this agreement, and must include the appropriate Department project and contract identification numbers.
- e. The job location must appear on the Declarations and must include the city, state, and appropriate highway name/number. NOTE: Do not include any references to milepost on the insurance policy.

- f. The name and address of the prime contractor must appear on the Declarations.
- g. The name and address of the Department must be identified on the Declarations as the "Involved Governmental Authority or Other Contracting Party."
- h. Other endorsements/forms that will be accepted are:

Broad Form Nuclear Exclusion – Form IL 00 21

- (1) 30-day Advance Notice of Non-renewal or cancellation
- (2) Required State Cancellation Endorsement
- (3) Quick Reference or Index Form CL/IL 240

- i. Endorsements/forms that are NOT acceptable are:

- (1) Any Pollution Exclusion Endorsement except CG 28 31
- (2) Any Punitive or Exemplary Damages Exclusion
- (3) Known injury or Damage Exclusion form CG 00 59
- (4) Any Common Policy Conditions form
- (5) Any other endorsement/form not specifically authorized in item no. 2.h above.

- B. If any part of the work is sublet, similar insurance, and evidence thereof as specified in A.1 above, shall be provided by or on behalf of the subcontractor to cover its operations on Railway's right of way.
- C. Prior to entry on Railway's rights-of-way, the original Railroad Protective Liability Insurance Policy shall be submitted by the Prime Contractor to the Railway and a copy shall be provided to the Department's Resident Construction Engineer, for information, prior to beginning work. In addition, certificates of insurance evidencing the Prime Contractor's and any subcontractors' Commercial General Liability Insurance shall be issued to the Railway at the addresses below. The certificates of insurance shall state that the insurance coverage will not be suspended, voided, canceled, or reduced in coverage or limits without (30) days advance written notice to Railway and the Department. No work will be permitted by Railway on its rights-of-way until it has reviewed and approved the evidence of insurance required herein.

RAILWAY:

Risk Management
 Norfolk Southern Railway Company
 Three Commercial Place
 Norfolk, Virginia 23510-2191

- D. The insurance required herein shall in no way serve to limit the liability of Department or its Contractors under the terms of this agreement.

15. FAILURE TO COMPLY:

In the event the Contractor violates or fails to comply with any of the requirements of these Special Provisions:

- A. The Railway Engineer may require that the Contractor vacate Railway property.
- B. The Engineer may withhold all monies due the Contractor on monthly statements.

Any such orders shall remain in effect until the Contractor has remedied the situation to the satisfaction of the Railway Engineer and the Engineer.

16. PAYMENT FOR COST OF COMPLIANCE:

No separate payment will be made for any extra cost incurred on account of compliance with these special provisions. All such costs shall be included in prices bid for other items of the work as specified in the payment items.

Office of Chief Engineer
Bridges & Structures
Norfolk Southern Corporation
1200 Peachtree Street, N. E.
Internal Box 142
Atlanta, GA 30309

Date:
File:
Milepost:

(22) SECTION 108: PARTNERING:

(A) Covenant of Good Faith and Fair Dealing

This Contract imposes an obligation of good faith and fair dealing in its performance and enforcement. The CONTRACTOR and Department, with a positive commitment to honesty and integrity, agree to the following mutual duties:

- (1) Each will function within the laws and statutes applicable to their duties and responsibilities.
- (2) Each will avoid hindering the other's performance.
- (3) Each will proceed to fulfill its obligations diligently.
- (4) Each will cooperate in the common endeavor of the Contract.

(B) Partnering

The Department encourages the foundation of cohesive partnering with the CONTRACTOR and its principle subcontractors and suppliers. This partnering is not a legal partnership as defined by South Carolina law. Partnering will be structured to draw on the strengths of each organization to identify and achieve reciprocal goals. The objectives are effective and efficient contract performance and completion within budget, on schedule, and in accordance with the Contract.

The establishment of a partnering charter will not change the legal relationship of the parties to the contract nor relieve either party from any of the terms of the Contract. Any cost associated with effectuating partnering will be agreed to by the Department and the CONTRACTOR and will be shared equally between them.

(23) SECTION 108: PROJECT JOB FAIR

4.1. Location. The job fair shall be conducted within the area bounded by Cosgrove Avenue, Spruill Avenue-Meeting Street, Interstate Highway 26, and Discher Street. At a minimum, the facility shall be able to accommodate all participants outlined in Section 4.5. At a minimum, provide a table and two chairs for each participant.

4.2. Scheduling. The job fair shall be conducted at a time which allows for interviewing, selecting, and onboarding of new employees to be conducted before substantial project work is scheduled to begin, no later than 180 days after the NTP. Historic average period for these events may be used, but shall not be less than one month.

4.3. Advertisement. The job fair shall be advertised for a minimum 14 calendar days prior to the job fair date. Prior to publishing, all advertisement materials shall be submitted for review and

approval by SCDOT, City of Charleston, and City of North Charleston. Advertisement shall include, but are not limited to:

- a. Broadcast: A minimum of one (1) thirty second advertisement per hour between 7:00 AM and 9:00 AM and between 4:00 PM and 6:00 PM daily announcing time, place, and general nature of employees sought on the following radio stations: WWWZ, WMGL, WXST, WJNI and WMTA.
- b. Print: An advertisement to run daily in the Post and Courier and the Charleston Chronicle newspapers' classified section announcing time, place, and general nature of employees sought.
- c. Posters and flyers: Posters and flyers announcing time, place, and general nature of employees sought shall be provided in amounts requested to the following:
 - North Charleston Housing Authority
 - Felix Davis Community Center
 - Felix Pinckney Community Center
 - Whipper Barony Community Center
 - Gussie Greene Accabbee Community Center
 - Gethsemane Community Center
 - Garrett Academy of Technology
 - Greg Mathis Charter High School
 - Liberty Hill Academy
 - Military Magnet Academy
 - North Charleston High School
 - SCWorks Trident Office
 - Charleston Housing Authority
- d. Community: Conduct coordination of the date and time of the job fair with the following organizations at least 21 days prior to the job fair:
 - Lowcountry Alliance for Model Communities (LAMC)
 - Charleston Housing Authority
 - <http://www.lamcnc.org/index.htm>
 - City of North Charleston
 - City of Charleston
 - Charleston Metro Chamber of Commerce
 - Rosemont Community Homeowners Association
 - Silver Hill Neighborhood
 - Local Churches
- e. Internet and Social Media: Internet and social media shall be used as determined appropriate by SCDOT.
- f. Banners and Signs: 14 days prior to the job fair, post at the on-site office a large format sign or banner, visible by the public, showing the date, time, and location of the job fair.

4.4. Duration. The job fair shall be held from 12:00 p.m. to 7:00 p.m. Eastern Daylight Time. At all times during that period, representatives of the contractor shall be present with knowledge of all positions available and authority to accept applications.

4.5. Participants. The Contracting entity and subcontractors shall participate as potential employers. The Contractor shall invite the lead design firm, design subconsultants, material vendors, City of Charleston, and the City of North Charleston for optional participation. If appropriate, the Contractor may invite other potential employers. At a minimum, all participants shall provide one appropriate representative to attend the job fair.

(24) SECTION 109: REFERENCES TO UNIT PRICING:

Any references in the contract documents to unit price, measurement, and payment, are typical references for design-bid-build contracts and are not applicable to the extent they effect payment on Design-Build contracts. The Design-Build contractor's schedule of values shall provide sufficient detail to compare work progress to the contractor's schedule and determine appropriate periodic payments.

(25) SECTION 109: FUEL ADJUSTMENT INDEXES:

No fuel adjustment will be made on this Project.

(26) SECTION 202: RECLAIMING EXISTING ROADWAY:

1. Description:

This work consists of the restoration of paved areas. These areas are typically shown as hatched areas on the plans when outside the construction limits.

2. Materials:

None

3. Construction Requirements:

- 1.) Asphalt Pavement with Earth Base: Remove and dispose of areas of pavement shown as hatched areas on the plans. Grade the area to properly drain. Seed the area in accordance with Section 810.
- 2.) Asphalt Pavement with Stone Base: Remove and dispose of areas of pavement and base shown as hatched areas on the plans. Grade the area to properly drain. Seed the area in accordance with Section 810.
- 3.) Earth roadway or Bituminous Surfacing with Earth Base: Scarify existing areas of roadway. Grade the area to properly drain. Seed the area in accordance with Section 810.
- 4.) Bituminous Surfacing with Stone Base: Remove and dispose of areas of pavement and base shown as hatched areas on the plans. Grade the area to properly drain. Seed the area in accordance with Section 810.

Suitable materials may be used for embankment construction on the project. In the event that removed materials are used for embankment construction a corresponding deduction in Unclassified Excavation will be made by the Resident Construction Engineer.

4. Measurement:

Removed asphalt pavement greater than 2 inches in depth will be measured by the square yard. Removed bituminous surfacing with stone base will be measured by the cubic yard. Removed stone base will be measured by the cubic yard. Scarified areas will not be measured for payment.

5. Payment:

Removed asphalt pavement which is greater than 2 inches in depth will be paid at the unit price bid for Removal and Disposal of Existing Asphalt Pavement. Removed bituminous surfacing with stone base will be paid for at the unit price bid for Unclassified Excavation. Removed stone base will be paid for at the unit bid price for Unclassified Excavation. No payment will be made for scarifying earth roadway or bituminous surfacing with earth base. No separate or additional payment will be made for grading necessary to obtain proper drainage.

(27) SECTION 202: REMOVAL OF EXISTING GUARDRAIL:

Section 202.4.4.3 applies on this project.

(28) SECTION 203: MUCK EXCAVATION:

September 19, 2011

Section 203.2.1.3 is amended as follows:

Any areas identified on the plans and any additional areas defined by the RCE that are discovered to deflect or settle may require corrective action by the Contractor. This may include undercutting, placing granular aggregate, placing stone aggregate that is separated from other fine aggregate materials by a geotextile for separation of sub-grade and sub-base, and/or additional compacting to the approval of the Engineer.

In areas that require mucking or undercutting, borrow excavation soil may be placed as a bridge lift as long as the grade on which the material is being placed is at least 2 feet above ground water level. In the event that groundwater does not allow backfilling with a borrow excavation soil, a stone or granular material shall be used as the bridge lift material. This stone or granular material shall be in accordance with the Bridge Lift Materials Special Provision. Stone bridge lift materials shall have a thickness of 2 feet and shall extend a minimum of 6 inches above the ground/surface water level. Granular lift materials shall also have a thickness of 2 feet, but shall extend a minimum of 2 feet above ground/surface water level. Individual granular bridge lifts shall not exceed a 2-foot thickness without some type of limited compactive/tamping effort. The depth at which mucking or undercutting shall take place is dependent upon encountering a suitable bearing material within the excavation or a predetermined elevation or depth. In most cases, undercutting shall not exceed 3 to 5 feet in depth, but the final mucking or undercutting thickness shall be based on the decision of the RCE, unless otherwise specified in the project plans and/or specifications. If a suitable bearing soil is not encountered within this depth range or unless otherwise specified in the plans and/or specifications, a P1 biaxial geogrid with an aperture size of less than or equal to 1 inch shall be placed beneath the stone or granular bridge lift material. The geogrid shall be placed in the bottom of the excavation and up the excavation side slopes. If additional compacted borrow excavation soil is needed to reach grade, a geotextile for separation of sub-grade and sub-base shall be placed between any stone bridge lift material and the overlying compacted soil. A bridge lift consisting of borrow excavation soil or granular bridge lift material should not be placed within 3 feet of the base of the pavement section. Only compacted borrow excavation soil or stone bridge lift material shall be placed within this zone. The biaxial geogrid shall be in accordance with the Special Provision provided in the project documents.

The quantities associated with mucking and undercutting, i.e. mucking, stone and granular bridge lift materials, geogrid, and geotextile for separation of sub-grade and sub-base, are for bid estimation purposes only. These bid items shall not be purchased and stockpiled on site without written approval from the RCE unless specific areas and details are defined in the plans.

geotechnical design engineer of record. Conduct shear strength and soil classification testing (AASHTO M145) at the initial selection of the borrow pit, any subsequent changes in borrow pits, and for every 50,000 cubic yards of materials placed. This testing is in addition to the borrow sampling and testing requirements in Section 203 of the SCDOT Standard Specifications for Highway Construction that are used for daily acceptance.

Perform additional shear strength testing and/or soil classification testing at no additional cost to the Department when the Department deems that the materials being placed appear to be different from those originally tested. Submit all test results to the RCE for approval prior to use in embankment construction. The RCE will also submit copies of the test reports to the Quality Assurance Engineer at the Office of Materials and Research. Use only qualified laboratories that are appropriately accredited by AASHTO to perform the test procedures required by this specification.

Do not use material derived from Unclassified Excavation to construct embankments unless that material meets the requirements for Borrow Material as stated above.

(30) SECTION 203: BORROW EXCAVATION (FOR SHOULDERS):

This work shall consist of satisfactory placement of all materials necessary to bring the shoulder grade to within 2 inches of the final pavement edge grade. The Contractor shall furnish all earth material necessary to eliminate any edge of final pavement to shoulder gradient differential that exceeds 2 inches. The quantities shown on the plans are the Engineering estimate of the number of units that will be necessary for this project, actual field measurements may cause these quantities to vary.

Selected materials shall be used for this operation. The selected material shall consist of a friable material such as topsoil, etc., containing grass roots and having the properties of being comparatively porous, capable of growing grass and of a stable nature in that when compacted it will resist erosion and be capable of supporting vehicles when relatively wet. When the area where material is to be placed, is greater than 4 feet in width, it shall be scarified and/or disked to a minimum depth of 3 inches prior to placing any material. Scarifying or disked is not required for areas less than 4 feet in width. Borrow shall be mixed with the existing scarified and/or disked shoulder material in such a manner as to provide a seed bed in accord with Section 810.15 of the Standard Specifications. The Contractor has the option of placing the borrow material (a) Prior to placing final surface course or (b) Following the placing of the finished surface course.

The method of measurement will be the volume in cubic yards, determined in accordance with Section 203 of the Standard Specifications. The Contractor, at his option, may elect to base the quantity measured on the loose volume at the point of delivery by scaling and counting the loads, with a deduction of 35 percent made for shrinkage. All cost for borrow material including obtaining, hauling, and placing shall be included in the unit price.

(31) SECTION 203: BORROW PITS:

Permitting of Borrow Pits

Prior to using borrow material from commercial or other borrow pits located wholly or in part in wetland areas, the contractor shall submit written evidence that operations to obtain fill material from the borrow pit(s) have received all appropriate and necessary authorizations from federal, state, and/or local authorities.

Permitted Borrow Pits

If the appropriate federal, state, and local authorities have issued permits, the contractor shall provide to SCDOT copies of all permits issued for such borrow pit sites.

Borrow Pits Without Section 404 Permit

For borrow pit sites for which a Section 404 permit under the Clean Water Act has not been issued, the contractor shall provide SCDOT with copies of documentation provided by the contractor or its subcontractor(s) to the U.S. Army Corps of Engineers, which shall, at a minimum, clearly define the location of the borrow pits and any wetlands on the borrow pit site; describe the

proposed activities and processes that will be used to prepare the site, obtain fill material from the site, and store material at the site; and request the U.S. Army Corps of Engineers to confirm in writing that no Section 404 permit is required for those operations. No operations shall take place at the borrow sites for at least thirty days from the date of the submission of confirmation request to the U.S. Army Corps of Engineers. After thirty-one days the contractor may begin work. The contractor shall also provide copies to SCDOT of any response(s) provided by the U.S. Army Corps of Engineers to its documentation.

Responsibility

SCDOT has no obligation or duty to review, assess, evaluate, or act upon such documentation and maintains no authority or responsibility to alter, amend, reject, accept, or otherwise exercise any control over the contractor or subcontractor regarding compliance with Clean Water Act Section 404 and the implementing regulations for Section 404. Documentation submitted to SCDOT is for public information and coordination purposes only. The contractor is responsible for all costs related to the selection, operation, and/or activities at any borrow pit site in wetlands including fines, additional mitigation, and impact delays related to failure to obtain any and all necessary federal, state, and local permits and approvals for borrow pits and operations. Nothing herein shall affect in any way SCDOT's right to accept or reject any fill material not meeting the required technical specifications.

(32) SECTION 204: TEMPORARY SHORING WALL:

Subsection 204.4.5.2 of the Standard Specifications is amended to include the addition of the following section:

“The retaining wall system shall be designed to limit deformations (vertical and lateral displacements) that would affect the stability or performance of any adjacent structures (MSE walls, Bridge foundations, Pavement Structure, Approach Slabs, Embankment (stage construction), etc.). Deformations that must be limited shall include, but not be limited to, vertical settlement, sliding, bulging, bowing, bending, and buckling. Design criteria for allowable deformations shall be dependent on the type of structure that will be influenced by any deformation of the temporary shoring wall. Regardless of the type of structure being retained, the deformation criteria shall not exceed 3 inches without acceptance from the Geotechnical Design Support Engineer. An instrumentation plan for monitoring deformations of the temporary shoring and any adjacent structure shall be submitted along with the shop drawings. The instrumentation plan shall indicate the maximum allowable deformations of the temporary shoring and adjacent structures. Typical instrumentation used for monitoring deformations are survey targets, settlement monuments, crack gages, inclinometers, and tilt monitors. The monitoring locations shall be established in a manner that they can be monitored consistently and obtain repeatable measurements for the entire construction period. A monitoring schedule that the Contractor will use during construction will also be included with the instrumentation plan. The Contractor shall submit periodic monitoring reports to the RCE in accordance with the approved instrumentation plan. Any changes in frequency of monitoring or report submittal must be sent to the Geotechnical Design Support Engineer for acceptance. If the initial instrumentation plan is found not to be documenting adequately the movements of the temporary shoring or adjacent structures, the Contractor will revise the instrumentation plan and resubmit the revised plan for review and acceptance. If the measured deformations exceed the maximum allowable deformations shown in the instrumentation plan, the Contractor will be required to stop work immediately, and at his own expense, correct the situation to the satisfaction of the Department prior to resumption of construction activities. Extended monitoring after construction may be required if adjacent structures have been affected by the construction. The extended monitoring of the adjacent structures shall continue until the structures have stabilized and the Department concurs with the results and conclusions of the monitoring report. All costs associated with developing the instrumentation plan, purchasing instrumentation, installing instrumentation, and monitoring of the instrumentation shall be included in the unit cost of the temporary shoring item.”

(33) SECTION 205: LIGHTWEIGHT AGGREGATES:

July 23, 2010

1. Description.

This work shall consist of furnishing, loading, hauling, placing and compacting lightweight aggregates (either man-made or natural) for use as fill materials in accordance with these specifications. The lightweight aggregate must be manufactured by expanding shale, clay, or slate in a rotary kiln operation or be naturally made. Wood fiber, blast furnace slag, fly ash, shredded tires, or boiler slag will not be allowed. The material must be sub angular to angular conforming to ASTM C 330 (latest edition). The material requirements presented in this specification are appropriate for borrow materials placed in embankments or placed as retained materials. If lightweight aggregates are used as reinforced backfill materials for the construction of Mechanically Stabilized Earth (MSE) walls or other reinforced soil structures, additional material properties, construction, and testing frequency requirements may be required based on the appropriate specifications.

2. Material.

The Lightweight aggregate must have a proven record of durability, be non-corrosive, and conform to the following requirements:

- pH (AASHTO T-289): pH values shall range between 5 and 10.
- Organic Content (AASHTO T-267): Organic content shall be less than 0.1 percent (weight of organic material to weight of total sample).
- Soundness Loss (AASHTO T104): Soundness loss shall be less than 15% when subjected to 5 cycles of Sodium Sulfate.
- Los Angeles Abrasion (AASHTO T96): Abrasion loss shall be less than 45%.
- Chloride Content (AASHTO T291): Chloride content shall be less than 100 ppm.
- Sulfate (AASHTO T-290): Sulfate content shall be less than 200 ppm.
- Resistivity (ASTM D1125): Resistivity must be greater than 3000-ohm-cm. If resistivity is greater than 5000-ohm-cm, chloride and sulfate requirements and testing are waived.
- Absorption (AASHTO T19): Absorption must be less than 6%.
- Gradation (ASTM 136): The gradation will be as shown in the following Table. Other gradations may be acceptable upon approval by the Engineer.

Table – Lightweight Aggregate Gradation

Sieve Size or Number	Percent Passing
¾ inch	100
½ inch	90 – 100
3/8 inch	50 – 90
No. 4	0 – 50
No. 8	0 – 20
No. 16	Less than 10
No. 30	Less than 10
No. 50	Less than 5
No. 100	Less than 5

- The coefficient of uniformity, C_u , shall be 4 or greater. The coefficient of uniformity, C_u , shall be computed as follows:

$$C_u = \frac{D_{60}}{D_{10}}$$

Where D_{60} is the particle diameter at 60% passing and D_{10} is the particle diameter at 10% passing. Written approval from the DOC will be required to use soils with a coefficient of uniformity, C_u , less than 4.

- Aggregate loose unit weight (ASTM C29): The loose unit weight must be less than 45 lbs/ft³.
- In-place density: (ASTM D4253, and D4254): The in-place compacted dry unit weight must be between 55 and 60 lbs/ft³. Material must be compacted to a minimum 65% relative density as determined by ASTM D4253 and D4254. Use a vibratory table when determining the maximum index density and unit weight in accordance with

ASTM D4253. Determine the minimum index density and unit weight in accordance with ASTM D4254.

- Angle of Internal Friction (AASHTO T 236): The minimum angle of internal friction must be 40 degrees. Test a saturated representative sample (with particles larger than larger than 0.75 inch removed) in a round or square shear box that is a minimum of 12 inches across. Test sample shall be compacted to a minimum 65% relative density as determined by ASTM D4253 and D4254.

3. Construction.

Place the lightweight fill in uniform layers. When required by the Engineer, compact each layer using vibratory compaction equipment weighing no more than 10 tons. Place layers no more than 12 inches in depth loose thickness and compact. Compact with three passes of an 8 – 10 ton vibratory roller in the vibratory mode if necessary, or as directed by the Engineer. In confined areas use vibratory plate compaction equipment (5 hp to 20 hp) with a minimum of two passes in 6” lifts for a 5 hp plate and 12” lifts for a 20 hp plate. The contractor must take all necessary precautions when working on or near the lightweight fill to ensure that the material is not over compacted. Construction equipment, other than for placement and compaction, must not operate on the exposed lightweight fill. Low ground pressure equipment (D6 LGP or lighter) is recommended for spreading and placing the lightweight aggregate.

4. Testing Frequency.

All soil property requirements shall be tested during initial source evaluation or if a change in source is requested. Lightweight aggregate material shall be sampled once every 2,000 cubic yards and tested for gradation and pH. Lightweight aggregate material shall be sampled once every 5,000 cubic yards and tested for internal friction angle, organic content, resistivity, chloride content, and sulfate content. Chloride and sulfate content testing will not be required if resistivity test results indicate 5000 ohm-cm or greater. The internal friction angle shall be tested every 2,000 cubic yards if the gradation indicates that the coefficient of uniformity, C_u , is less than 4. A variation in testing frequency may be required if a variation in material gradation or composition is observed.

5. Measurement and Payment.

Measurement of lightweight aggregate shall be the actual volume in-place at the project site. All costs for furnishing, loading, hauling, placing and compacting lightweight aggregates (either man-made or natural) shall be included in the unit price of the lightweight aggregates.

Payment will be made under:

Item No.	Pay Item	Pay Unit
2033020	Borrow Excavation (Lightweight)	CY

(34) SECTION 205: GEOGRID SOIL REINFORCEMENT:

August 25, 2015

1. Description

This work shall consist of furnishing primary geogrid soil reinforcement in accordance with these specifications.

2. Reference Documents

The latest edition of the test standards shall be used. Substitution of standards will require the prior written approval of the Research and Materials Engineer.

3. Material

Geogrid design requirements shall be as shown in the plans and specified in the design drawings. Geogrid soil reinforcement shall consist of a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil, aggregate, or other material. The structure of the geogrid reinforcements shall be dimensionally stable and able to retain its geometry under construction stresses and shall have high resistance to damage during construction, to ultraviolet degradation, and to all forms of chemical and biological degradation encountered in the soil being reinforced.

3.1 Primary Reinforcement

Primary geogrids shall provide the following minimum allowable long-term reinforcement tension load, T_{al} .

Property	Method	P1 ⁽³⁾	P2	P3	P4	P5	P6	P7	P8
Allowable Long-term Tension Load, T_{al} ^{(1) (2)} (lb/ft)	FHWA NHI-00-043	450	800	1450	2300	3000	3600	4000	9000

(1) Minimum T_{al} in machine direction unless otherwise specified

(2) Minimum pullout friction factor $F^*=C_i \tan \Phi$, where soil interaction coefficient, $C_i \geq 0.6$

(3) Biaxial Geogrid – Minimum T_{al} in strong direction, minimum T_{al} in weak direction is 360 lb/ft.

where $T_{al} = \frac{T_{ult}}{RF}$ and $RF = RF_{CR} \times RF_D \times RF_{ID}$ and $RF \geq 3.0$

3.2 Secondary Reinforcement

Secondary reinforcement, Type S1, shall meet the following minimum average physical properties:

Property	Method	Value
1. Tensile Strength ⁽¹⁾		
a. 5% strain, lb/ft ⁽²⁾	ASTM D 4595	800
b. Ultimate Tensile Strength, T_{ult} (lb/ft)	ASTM D 4595	1400
c. Allowable Long-Term Strength, T_{al} (lb/ft)	FHWA NHI-00-043	200
2. Apparent Opening Size	ASTM D 4751	>50, <80

NOTE: ⁽¹⁾ In direction perpendicular to the slope face.

⁽²⁾ No offset allowance is permitted.

4.0 Certification

Prior to construction the Contractor shall submit to the Geotechnical Engineer of Record (GEOR) a Certification Package prepared by the geogrid reinforcement manufacturer. The Contractor shall allow 15 calendar days from the day the submittals are received by the GEOR for review and acceptance. The Certification shall state that the furnished geogrid soil reinforcement is in full compliance with the design requirements as stated in this specification and the design drawings and is fit for use in long-term critical soil reinforcement applications. The submittal shall certify the following values for each geogrid soil reinforcement used on the project:

1. The allowable long-term tensile load, T_{al} , for geogrid soil reinforcements
2. The ultimate tensile strength, T_{ULT} , (MARV) for geogrid soil reinforcements.

3. The geogrid's pullout coefficients (F^* , α)

The manufacturer shall also provide written certification that the material is capable of withstanding direct exposure to sunlight for 120 days with no measurable deterioration as measured per ASTM D 4355. The Contractor's submittal package shall include, but not be limited to, actual test results for tension, creep, durability, construction damage, joint strength, pullout and quality control. A person having the legal authority to bond the manufacturer shall attest to the certificate. Any tests required shall be performed at no additional cost to the Department. If in the opinion of the GEOR, the required documentation is not provided for individual reduction factors (RF) or pullout coefficients (F^* , α), default values for these design parameters shall be used in accordance with this specification.

The submittal shall certify the following values and document for each geogrid soil reinforcement used on the project:

4.1 Ultimate Tensile Strength (T_{ult}):

The ultimate tensile strength, T_{ult} , shall be determined from wide width tensile tests (ASTM D 4595) or rib tensile test for geogrids (ASTM D 6637). Geogrid samples tested in accordance with ASTM D 4595 shall have at least two geogrid apertures and a minimum gage length of 4 inches. All geogrid strength tests (ASTM D 4595 and ASTM D 6637) shall be conducted at a strain rate of 10% per minute based on actual gage length necessary to meet the testing sample dimension requirements. Laboratory test results documenting the ultimate tensile strength, T_{ult} , in the reinforcement direction shall be based on the minimum average roll values (MARV) for the product.

4.2 Allowable Long-term Tensile Load (T_{al}):

The allowable tensile load, T_{al} , per unit width of geosynthetic soil reinforcement in accordance to the backfill type used shall be computed as follows:

$$T_{al} = \frac{T_{ult}}{RF}$$

4.3 Reduction Factor (RF):

The total reduction factor, RF, is the combined reduction factor for long-term degradation due to installation damage, creep, and durability. The total reduction factor, RF, shall be defined as follows:

$$RF = RF_{ID} \times RF_{CR} \times RF_D \geq 3.0$$

The individual reduction factors shall be documented in accordance with the site conditions, design calculations, and specifications. When sufficient documentation is not provided for individual reduction factors, RF_{ID} , RF_{CR} , and RF_D , a reduction factor RF of 7.0 shall be used. The reinforcement manufacturer shall certify and document the individual reduction factors as follows:

4.3.1 Installation Damage Reduction Factor (RF_{ID}):

The reduction factor for installation damage, RF_{ID} , shall be documented by field and laboratory test results and literature review, as described in ASTM D 5818 for the reinforced backfill specified or for more severe soils. Samples subjected to installation damage shall be tested for tensile strength and deformation characteristics in accordance with ASTM D 4595 (modified for geogrid testing). Recommended values for reduction factors for installation damage (RF_{ID}) for various soils shall also be documented. The minimum installation damage reduction factor, RF_{ID} , shall be 1.1, regardless of product specific test results.

4.3.2 Creep Reduction Factor (RF_{CR}):

Laboratory test results documenting creep performance over a range of load levels, for a minimum duration of 10,000 hours based on tension creep test (ASTM D 5262) shall be required. Creep test samples shall be of sufficient width to be

representative of overall product creep response (fiber creep testing will not be accepted).

The creep-limiting strength, T_1 , shall be based on extrapolating the 10,000 hours (or longer duration) tension creep tests to a 75-year design life, unless a 100-year design life is specified in the plans. The creep extrapolation method shall be based on methods described in FHWA NHI-10-025, *"Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes"* - Appendix "D". Laboratory test results and extrapolation methodology shall be documented.

The reduction factor for creep, RF_{CR} , is defined as the ratio of the average lot specific ultimate tensile strength, T_{ULTLOT} , to the creep-limiting strength, T_1 . The average lot specific ultimate tensile strength, T_{ULTLOT} , for the lot of material used for creep testing, T_{ULTLOT} , shall be determined from wide width tensile test, ASTM D 4595, (modified for geogrid testing).

4.3.3 Durability Reduction Factor (RF_D):

The total reduction factor for durability, RF_D , shall be defined as the combined effects of chemical and biological degradation. Laboratory test results, extrapolation techniques, and a comprehensive literature review shall document the reduction factor for durability for all material components in accordance with FHWA NHI-00-044, *"Corrosion/Degradation of Soil Reinforcements for Mechanically Stabilized Earth Walls and Reinforced Soil Slopes"*. The minimum durability reduction factor, RF_D , shall be 1.1, regardless of product specific test results.

4.4 Soil Reinforcement Pullout Coefficients (F^* , α)

The Certification Package shall document the pullout coefficients (F^* , α) meet or exceed the required coefficients necessary to obtain the T_{al} provided above.

The pullout friction factor, F^* , and the scale effect correction factor, α , shall be documented by laboratory testing from pullout tests. Pullout testing shall be conducted for site-specific materials or for materials representative of the reinforced backfill at confining pressures specified by the Engineer. When laboratory tests are used from representative soils, the representative soils shall be documented by providing the soil's angle of internal friction, gradation, and coefficient of uniformity ($C_u = D_{60}/D_{10}$). Recommended pullout coefficients for various soil types shall also be documented. The pullout coefficients shall be determined by using the quick effective stress pullout tests ("Measuring Geosynthetic Pullout Resistance in Soil" per ASTM D 6706) and through-the-junction creep testing of the geogrid per ASTM D 5262. The soil interaction coefficient, C_i , shall be documented when computing the pullout friction factor, F^* . When sufficient documentation is not provided for pullout coefficients, F^* and α , and the coefficient of uniformity, C_u , is greater or equal to 4, the default values indicated in this specification can be used. If the coefficient of uniformity of the reinforced backfill is less than 4, laboratory pullout test shall be required to determine pullout friction factor, F^* , and the default scale effect factor, α .

5.0 Manufacturing Quality Control

The Contractor shall provide to the RCE a manufacturing quality control certificate and conformance testing results for all geosynthetic soil reinforcement delivered to the site. Sampling and conformance testing shall be in accordance with ASTM D 4354. Geosynthetic product acceptance shall be based on ASTM D 4759. Geogrid samples tested in accordance with ASTM D 4595 shall have at least two geogrid apertures and a minimum gage length of 4 inches. All geogrid strength tests (ASTM D 4595 and ASTM D 6637) shall be conducted at a strain rate of 10% per minute based on actual gage length necessary to meet the testing sample dimension requirements. Laboratory test results documenting the ultimate tensile strength, T_{ult} , in the reinforcement direction shall be based on the minimum average roll values (MARV) for the product. Conformance testing of the applicable index testing shown in Table 5.0 shall be provided for all geosynthetic

soil reinforcement. The quality control certificate shall include roll numbers and identification, sampling procedures, and results of the conformance testing with a description of test methods used. The geogrid manufacturer shall have a manufacturing quality control program that includes QC testing no less frequently than each 200,000 sf (20,000sm) of production.

Table 5.0 – Applicable Index Testing

Type	Property	Test Method	Criteria
Polypropylene (PP)	UV Oxidation Resistance	ASTM D 4355	Minimum 70% strength retained after 500 hrs. in weatherometer
	Melt Flow Rate	ASTM D 1238	≤ 12 g/10 min
Polyethylene (HPDE)	UV Oxidation Resistance	ASTM D 4355	Minimum 70% strength retained after 500 hrs. in weatherometer
	Melt Flow Rate	ASTM D 1238	< 0.4 g/10 min
	Specific Gravity	ASTM D 792	1.2 Average
Polyester (PET)	Hydrolysis Resistance	Intrinsic Viscosity Method (ASTM D 4603 and GRI Test Method GG8) with Correlation or Determine Directly Using Gel Permeation Chromatography	Minimum Number Average Molecular Weight of 25,000
	Hydrolysis Resistance	GRI GG7	Maximum Carboxyl End Group (CEG) Content of 30
All Polymers	Survivability	Weight per Unit Area ASTM D 5261	Minimum 270 g/m ² (7.9 oz/yd ²)
	% Post Consumer Recycled Material by Weight	Certification of Material Used	Maximum 0%

6.0 Measurement and Payment. All costs for installing the geogrid soil reinforcement (primary and secondary) is to be included in the amount bid for the pay items below.

Measurement of primary and secondary geogrid soil reinforcement is on a square yard basis and will be computed based on the total area of primary or secondary geogrid soil reinforcement shown in the plans, exclusive of the area of geogrids used in any overlaps. Overlaps and any geogrid waste are an incidental item. The quantity of primary geogrid soil reinforcement (biaxial or uniaxial) shall be paid at the contract unit price for Geogrid Reinforcement.

Payment will be made under:

Item No.	Pay Item	Pay Unit
2037000	Geogrid Reinforcement (Uniaxial)	SY
2037010	Geogrid Reinforcement (Biaxial)	SY

(35) SECTION 205: REINFORCED SOIL SLOPES (RSS):

February 11, 2013

1.0 Description.

This work shall consist of constructing a reinforced soil slope in accordance with these specifications, plans, or as directed by the RCE and in conformance with the lines, grades, dimensions, and design shown on the plans. The work addressed by this specification includes furnishing and placing of reinforced embankment backfill, placing geosynthetic soil reinforcements (primary and secondary), furnishing secondary soil reinforcement, furnishing and placing topsoil and any associated facing material, and temporary/permanent wire forms (excluding concrete slope protection).

2.0 Responsibility.

The Contractor shall be responsible for the satisfactory construction of the reinforced soil slope feature including materials, methods, and installation based on information provided in the plans, specifications, and the geosynthetic reinforcement supplier's recommendations. The Contractor shall purchase the geosynthetic reinforcement, facing material, geotextile erosion control blankets, sod, fasteners, hold-downs, splice or seaming hardware, wire forms, and all necessary incidentals. The Contractor shall cooperate with the Department in the event that the Department chooses to randomly sample the stock reinforcement geosynthetic reinforcement.

3.0 Materials.

3.1 Geosynthetic Materials:

The Contractor shall check the geogrid soil reinforcement upon delivery to ensure that the proper material has been received. Geosynthetic rolls shall be labeled per ASTM D 4873, Guide for Identification, Storage, and Handling of Geosynthetic Rolls. During all periods of shipment and storage, the geogrid shall be protected from temperatures greater than 60°C (140 degrees Fahrenheit), mud, dirt, dust, and debris. The manufacturer's recommendations regarding protection from direct sunlight shall be followed. At the time of installation, the geogrid shall be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. The Contractor, at no additional cost to the Department, shall replace any geosynthetic reinforcement damaged during storage or installation. However, if approved by the RCE, placing a patch over the damaged area may repair torn or punctured sections. Any rejected geosynthetic shall be replaced or repaired at no additional cost to the Department.

For primary and secondary reinforcement, see Special Provision entitled "Geogrid Soil Reinforcement".

For separation of the granitic stone face material and the reinforced soil backfill or for preservation of the RSS, see Special Provision entitled "Geotextile for Separation of Subgrade & Subbase or Base Course Materials", if shown on the plans.

For erosion control reinforcement, see 2007 Standard Specifications, if shown on the plans.

3.2 Reinforced Backfill Materials:

All backfill material used in the reinforced zone as shown in the plans shall have an internal friction angle equal to or greater than the friction angles specified in the plans for the design. The internal friction angles shall be determined on remolded specimens and shall be determined using either the direct shear (AASHTO T-236) or the triaxial test with pore pressure measurements (AASHTO T-234). The fill materials shall conform to the following gradation limits as determined in accordance with SC T-4 and SC T-5 and shall have a Coefficient of Uniformity, C_u , of four (4) or greater:

Sieve Size	Percent Passing
¾ inch	100
No. 4	20-100
No. 40	0 - 60
No. 100	0 – 30
No. 200	0 - 15

All reinforced backfill shall have the following soil properties:

1. pH values shall range between 4.5 and 9.0 (AASHTO T-289).
2. Organic content shall not exceed 1.0 percent (weight of organic material to weight of total sample) as determined by AASHTO T-267 for material finer than no. 10 sieve.
3. Internal friction angle shall not be less than the values specified above as determined by the standard direct shear test, AASHTO T-236 or the triaxial test, AASHTO T-234, on the portion finer than the No. 10 sieve. Material test samples shall be compacted to 95% AASHTO T-99 (Method C or D) of maximum density at optimum moisture content.
4. The coefficient of uniformity, C_u , shall be 4 or greater. The coefficient of uniformity, C_u , shall be computed as follows:

$$C_u = \frac{D_{60}}{D_{10}}$$

Where D_{60} is the particle diameter at 60% passing and D_{10} is the particle diameter at 10% passing.

5. Plasticity Index (PI) shall be less than or equal to 6 and the Liquid Limit (LL) shall be less than or equal to 30 as determined by AASHTO T-90.

3.3 Testing Frequency:

All soil property requirements shall be tested during initial source evaluation or if a change in source is requested. Reinforced backfill material shall be sampled once every 1,000 cubic yards and tested for gradation, organic content, liquid limit, plasticity index and pH. Reinforced backfill material shall be sampled once every 5,000 cubic yards and tested for internal friction angle. If the coefficient of uniformity, C_u , of the reinforced backfills is less than 4, the internal friction angle shall be tested every 2,000 cubic yards. A variation in testing frequency may be required if a variation in material gradation or composition is observed.

4.0 Construction.

4.1 Foundation Preparation:

The foundation shall be prepared in accordance with the specifications, except as noted herein or on the plans. Unless otherwise shown on the plans or directed by the RCE, all existing vegetation and all unsuitable foundation materials shall be removed in those areas where the geosynthetic reinforcement is to be used for slope reinforcement.

Foundation soil shall be excavated to the lines and grades as shown on the plans or as directed by the RCE. Over-excavated or muck excavated areas shall be filled with compacted backfill material or as outlined in the special provisions. At the discretion of the RCE, foundation soil shall be proofrolled prior to backfill and geogrid placement.

Where the geosynthetic application is for slope reinforcing on firm foundation soils, the graded area shall also be proofrolled with a vibratory roller weighing a minimum of eight tons for at least five passes in the presence of the RCE or as directed by the RCE. Any soft or loose foundation subsoils, in the opinion of the RCE, incapable of sustaining the required proofrolling shall be removed and replaced in accordance with the specifications.

Surfaces on which reinforcements are to be placed shall be uniform, smooth and free of abrupt changes in slope, debris and irregularities that could damage the reinforcement. Any areas outside the limits of disturbance shown on the plans that are damaged as part of this work shall be promptly repaired and restored to their original condition at the Contractor's expense. The Contractor shall make every possible effort to avoid such damage.

4.2 Fill Placement:

The moisture content of the backfill material prior to and during compaction shall be approximately uniform throughout each layer of material. Backfill material shall have an in-place moisture content on the dry side of the optimum moisture content. Excessively moist backfill materials shall not be transported to the site for any reason.

The reinforced embankment shall be constructed in accordance with Section 205. Reinforced backfill shall be compacted not less than 95 percent of the maximum dry density in accordance with AASHTO T-99 (Method A or C as applicable) or SC T-25 (Method A or C as applicable). Compaction control testing of the reinforced backfill shall be performed with a minimum frequency of one density test per every two lifts for every 25 feet of reinforced slope at bridge abutments (including the first 150 feet of reinforced slope parallel to the roadway) and every 75 feet of reinforced slopes along roadways (more than 150 feet away from bridge abutments). Sheepsfoot or grid-type rollers shall not be used for compacting backfill within the reinforced backfill.

Backfill shall be placed, spread, and compacted in such a manner that minimizes the development of wrinkles in and/or movement of the geogrid. Tracked construction equipment shall not be operated directly upon the geogrid. A minimum fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid. Rubber tired equipment may pass over the geogrid reinforcement at slow speeds, less than 10 mph. Sudden braking and sharp turning shall be avoided.

Backfill materials shall have a placement moisture content not more than 2 percentage points below the optimum moisture content and not more than the optimum moisture content. Backfill material with placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift.

The maximum soil lift thickness (loose) will be 8 inches. The contractor shall decrease this lift thickness if necessary to obtain the density. Backfill compaction shall be accomplished without disturbance or distortion of the reinforcement. A minimum of 6 inches of backfill material shall be maintained at all times between the contractor's equipment and the soil reinforcement.

At the end of each day's operations, the Contractor shall shape the last level of backfill to permit runoff of rainwater away from the slope face. In addition, the contractor shall not allow surface runoff from adjacent areas to enter the reinforcement zone until this zone is protected from infiltration. Any damage or movement caused by erosion, sloughing, or saturation of the reinforced backfill or retained backfill shall be repaired at the Contractor's expense.

4.3 Geosynthetic Placement:

Due to the unique nature of this type of construction, the Contractor shall negotiate with the geosynthetic supplier to provide a qualified and experienced representative of the geogrid manufacturer or its supplier for a minimum of one day of site assistance at the start of installation, to assist the Contractor and the RCE in the proper construction/installation techniques. Thereafter, the representative shall be available on an as needed basis, as requested by the RCE, during construction of the remainder of the project. The Contractor shall submit a copy of any instructions provided by the supplier to the RCE prior to beginning installation.

The geosynthetic shall be placed at the proper elevation, location, and orientation as shown on the plans. Geogrid shall be laid at the proper elevation and orientation as shown on the construction drawings or as directed by the RCE. Primary uniaxial strength geogrid shall be oriented perpendicular to the slope face or centerline. Primary biaxial strength geogrid may be laid out either perpendicular to the slope face or parallel to the slope face provided that it is being placed over a stable subgrade (not soft soils). If a biaxial geogrid is being placed over a soft foundation, the geogrid shall be placed perpendicular to the slope face. The Contractor shall verify correct orientation (roll direction) of the geogrid. Geogrid may be temporarily secured in-place with staples, pins, sand bags, or backfill as required by fill properties, fill placement procedures, or weather conditions, or as directed by the RCE. The geosynthetic material shall be pulled tight and secured as necessary to lay flat against the soil prior to fill placement.

Unless otherwise called for on the plans, adjacent rolls of geosynthetic shall be butted together to maintain 100% horizontal coverage. Vertical spacing of the primary soil reinforcing layers shall not exceed the locations shown in the plans.

Primary geogrid shall not be spliced or overlapped in the primary strength direction. No overlapping is required between adjacent rolls of primary soil reinforcement.

Secondary soil reinforcement shall be overlapped a minimum of 12 inches along the roll edges parallel to the reinforcement direction. Overlaps are not allowed for edges perpendicular to the reinforcement direction.

Only that amount of geosynthetic material (including reinforcement and drainage material) required for immediately pending work shall be placed to prevent undue damage to the materials. After a layer of geosynthetic has been placed, the next succeeding layer of soil shall be placed and compacted. After the specified soil layer has been placed and compacted, the next geosynthetic layer shall be installed. The process shall be repeated for each subsequent layer of geosynthetic and soil.

Equipment shall not operate directly on the geosynthetics. Equipment shall be operated such that no turning movements occur on the areas where geosynthetic is in place with less than 12 inches of fill cover. Ruts of more than three inches in depth shall be filled and compacted as they develop.

The Contractor at no additional cost to the Department shall replace any geogrid damaged during installation.

5.0 Method of Measurement and Basis of Payment.

The quantity of geosynthetic reinforced slope to be used for payment shall be the area, in square feet, of the vertical projection of the slope face, measured from the top of slope to the proposed final ground line at the toe of the slope and from the beginning to end limits as shown on the plans, regardless of the length or number of layers of geosynthetic within the reinforced volume and including any reinforcement required below the toe of the slope elevation.

The quantity, determined as provided above, shall be paid for at the contract unit price per vertical square foot of geosynthetic reinforced soil slope. Payment shall be full compensation for all work, materials, and services required including, the soil slope secondary

reinforcements, placement of reinforced embankment backfill, topsoil, any associated facing material (geotextile for slope preservation), and temporary wire forms (excluding concrete slope protection), installation, testing, and required submittals. The primary geosynthetic reinforcing will be measured and paid for as "Geogrid Reinforcement (Uniaxial)". The reinforced backfill zone material will be measured and paid for as "Borrow Excavation". Additional costs associated with using select material within the reinforced backfill zone will be included in the Reinforced Soil Slopes (RSS) item.

Payment will be made under:

Item No.	Pay Item	Pay Unit
2061200	Reinforced Soil Slopes (RSS)	SF

(36) SECTION 205: HIGH-STRENGTH GEOTEXTILE FOR EMBANKMENT REINFORCEMENT:

April 21, 2015

1.0 DESCRIPTION

This work shall consist of furnishing and installing construction geotextiles in accordance with the details shown in the plans, specifications, or as directed by the RCE.

2.0 MATERIALS

A geotextile is defined as any permeable polymeric textile used with foundation, soil, rock, earth, or any other geotechnical engineering related material, as an integral part of a civil engineering project, structure, or system. Use geotextiles and thread used in joining geotextiles manufactured from fibers consisting of long-chain polymers, composed of at least 95 percent by weight of polyolefins or polyesters. Use geotextiles with fibers formed into a stable network such that the fibers or yarns retain their dimensional stability relative to each other, including selvages (edges) during shipping, handling, placement, and in service. Use geotextile free from defects or tears.

A. Minimum Average Roll Values: All property values, with the exception of Apparent Opening Size (AOS), represent Minimum Average Roll Values (MARV) in the weakest principal direction. Provide geotextiles whose average test results from any roll sampled in a lot for conformance or quality assurance testing meets or exceeds minimum values provided in this Section.

B. Apparent Opening Size: Values for Apparent Opening Size (AOS) represent maximum average roll values. Acceptance will be based on ASTM D 4759.

C. Reinforcement Geotextile: Use reinforcement geotextile within existing and/or proposed fills for slope reinforcement.

Furnish geotextiles meeting the property requirements outlined in Table 1.

Table 1: High Strength Geotextile Properties (Design Requirements)^{1,2}

Property	Test Method	Geotextile Property Requirements
Long-Term Design Strength, T_{al} , MD		22,800 lb/ft
Long-Term Design Strength, T_{al} , XD		2,280 lb/ft
Sewn Seam Breaking Strength ³	ASTM D4884	900 lbs/ft
AOS	ASTM D4751	$\leq(1.0 \text{ to } 2.0)D_{85(\text{soil})}$
Permeability	ASTM D4491	$\geq 10k_{\text{soil}}$
Default Pullout Friction Factor, F^*	ASTM D6706	$0.6 \tan \Phi$
Default Alpha, α	ASTM D6706	0.6
Ultraviolet Stability	ASTM D4355	$\geq 50\%$ after 500 hrs of exposure

Notes: 1. The test procedures shall conform to the most recently approved ATSM geotextile test procedures.

2. All numeric values represent Minimum Average Roll Value (MARV).

3. Applies to factory or field sewn seams.

2.1 Source Approval and Certification.

Prior to construction, the Contractor shall submit to the Resident Construction Engineer (RCE) a Certification Package prepared by the geotextile reinforcement manufacturer. The Contractor shall allow 21 calendar days from the day the submittals are received by the RCE for review and acceptance. Submit the following information regarding each geotextile proposed for use:

- Manufacturer's name and current address;
- Full product name/number, including roll number;
- Geosynthetic material (i.e. polymer type) and structure (including fiber/yarn type);
- Proposed geotextile use(s); and
- Certified test results for the properties outlined in Table 1 and below in Section 2.

The Certification shall state that the furnished geotextile soil reinforcement is in full compliance with the design requirements as stated in this specification and the design drawings and is fit for use in long-term critical soil reinforcement applications. In addition to the minimum required properties in Table 1, the submittal shall also certify the following values for each geotextile soil reinforcement used on the project:

1. The ultimate tensile strength, T_{ULT} , (MARV) for geogrid soil reinforcements, MD/XD
2. The tensile strength at 5% strain, MD
3. The creep reduced tensile strength, MD
4. The geotextile's pullout coefficients (F^* , α)

The Contractor's submittal package shall include, but not be limited to, actual test results for tension, creep, durability, construction damage, joint/seam strength, pullout and quality control. A person having the legal authority to bond the manufacturer shall attest to the certificate. Any tests required shall be performed at no additional cost to the Department. If in the opinion of the RCE, the required documentation is not provided for individual reduction factors (RF) or pullout coefficients (F^* , α), default values for these design parameters shall be used in accordance with this specification.

2.1.1 Ultimate Tensile Strength (T_{ult}):

The ultimate tensile strength, T_{ult} , shall be determined from wide width tensile tests (ASTM D 4595). Geotextile samples tested in accordance with ASTM D 4595 shall be with an 8-inch width specimen, or a 4-inch specimen width with correlation to an 8-inch width. Correlation methodology shall be submitted to, and is subject to acceptance by the RCE. All geotextile strength tests (ASTM D 4595 and ASTM D 6637) shall be conducted at a strain rate of 10% per minute based on actual gage length necessary to meet the testing sample dimension requirements. Laboratory test results documenting the ultimate tensile strength, T_{ult} , in the reinforcement direction shall be based on the minimum average roll values (MARV) for the product.

2.1.2 Long-Term (Allowable) Design Tensile Strength (T_{al}):

The allowable tensile load per unit width of geotextile soil reinforcement, T_{al} , in accordance to the backfill type used shall be computed as follows:

$$T_{al} = \frac{T_{ult}}{RF}$$

2.1.3 Reduction Factor (RF):

The total reduction factor, RF, is the combined reduction factor for long-term degradation due to installation damage, creep, and durability. The total reduction factor, RF, shall be defined as follows:

$$RF = RF_{ID} \times RF_{CR} \times RF_D \geq 3.0$$

The individual reduction factors shall be documented in accordance with the site conditions, design calculations, and specifications. When sufficient documentation is not provided for individual reduction factors, RF_{ID} , RF_{CR} , and RF_D , a reduction factor RF of 7.0 shall be used. The reinforcement manufacturer shall certify and document the individual reduction factors as follows:

2.1.4 Installation Damage Reduction Factor (RF_{ID}):

The reduction factor for installation damage, RF_{ID} , shall be documented by field and laboratory test results and literature review, as described in ASTM D 5818 for the reinforced backfill specified or for more severe soils. Samples subjected to installation damage shall be tested for tensile strength and deformation characteristics in accordance with ASTM D 4595. Recommended values for reduction factors for installation damage (RF_{ID}) for various soils shall also be documented. The minimum installation damage reduction factor, RF_{ID} , shall be 1.1, regardless of product specific test results.

2.1.5 Creep Reduction Factor (RF_{CR}):

Laboratory test results documenting creep performance over a range of load levels, for a minimum duration of 10,000 hours based on tension creep test (ASTM D 5262) shall be required. Creep test samples shall be of sufficient width to be representative of overall product creep response (fiber creep testing will not be accepted).

The creep-limiting strength, T_1 , shall be based on extrapolating the 10,000 hours (or longer duration) tension creep tests to a 75-year design life, unless a 100-year design life is specified in the plans. The creep extrapolation method shall be based on methods described in FHWA NHI-10-025, *"Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes"* - Appendix "D". Laboratory test results and extrapolation methodology shall be documented.

The reduction factor for creep, RF_{CR} , is defined as the ratio of the average lot specific ultimate tensile strength, T_{ULTLOT} , to the creep-limiting strength, T_1 . The average lot specific ultimate tensile strength, T_{ULTLOT} , for the lot of material used for creep testing, T_{ULTLOT} , shall be determined from wide width tensile test, ASTM D 4595.

2.1.6 Durability Reduction Factor (RF_D):

The total reduction factor for durability, RF_D , shall be defined as the combined effects of chemical and biological degradation. Laboratory test results, extrapolation techniques, and a comprehensive literature review shall document the reduction factor for durability for all material components in accordance with FHWA NHI-09-087, *"Corrosion/Degradation of Soil Reinforcements for Mechanically Stabilized Earth Walls and Reinforced Soil Slopes"*. The minimum durability reduction factor, RF_D , shall be 1.1, regardless of product specific test results.

2.1.7 Soil Reinforcement Pullout Coefficients (F^* , α):

The Certification Package shall document the pullout coefficients (F^* , α) meet or exceed the required coefficients necessary to obtain the T_{ai} provided above where,

F^* = Minimum pullout friction factor = $C_i \tan \Phi$,

C_i = Soil interaction coefficient ≥ 0.6

Φ = Soil Angle of Internal Friction

The pullout friction factor, F^* , and the scale effect correction factor, α , shall be documented by laboratory testing from pullout tests. Pullout testing shall be conducted for site-specific materials or for materials representative of the reinforced backfill at confining pressures specified by the Engineer. When laboratory tests are used from representative soils, the representative soils shall be

documented by providing the soil's angle of internal friction, gradation, and coefficient of uniformity ($C_u = D_{60}/D_{10}$). Recommended pullout coefficients for various soil types shall also be documented. The pullout coefficients shall be determined by using the quick effective stress pullout tests ("Measuring Geosynthetic Pullout Resistance in Soil" per ASTM D 6706). The soil interaction coefficient, C_i , shall be documented when computing the pullout friction factor, F^* . When sufficient documentation is not provided for pullout coefficients, F^* and α , and the coefficient of uniformity, C_u , is greater or equal to 4, the default values indicated in this specification can be used. If the coefficient of uniformity of the reinforced backfill is less than 4, laboratory pullout test shall be required to determine pullout friction factor, F^* , and the default scale effect factor, α .

2.2 Sample Approval.

To confirm that the on-site geotextile meets the property values specified, random samples shall be submitted to the RCE for evaluation. The machine direction shall be marked clearly on each sample submitted for evaluation. The machine direction is defined as the direction perpendicular to the axis of the roll.

Cut a sample from the geotextile roll with the minimum dimensions of 4 feet by the full width of the roll beyond the first wrap. The geotextile samples shall be cut from the roll with scissors, sharp knife, or other suitable method that produces a smooth edge and does not cause geotextile ripping or tearing. Submit a manufacturer's certificate of compliance signed by an authorized manufacturer's official. The certificate must attest that the geotextile meets all the Minimum Average Roll Value (MARV) requirements specified in Table 1 as evaluated under the manufacturer's quality control program. Geotextiles supplied for construction of the project shall be certified in accordance with the following criteria. The tests described in the specification shall be conducted by the manufacturer or by an approved independent testing laboratory on samples taken from the same lot number as the material actually shipped to the project and at the specified frequency. The manufacturer or independent testing laboratory shall maintain the appropriate accreditations and must be preapproved by the Department. All rolls shall be marked with individual and distinct roll numbers. All roll numbers shall have traceable certified mill test reports from the given lot that they were manufactured. These test reports must be supplied to the Department prior to installation of any geotextile materials. After the sample and the required information have been submitted to the RCE, allow 30 calendar days for evaluation.

Product acceptance is determined by comparing the average test results of all specimens within a given sample to the Minimum Average Roll Values (MARV) listed in Table 1. Install geotextiles only after the material has been tested and/or evaluated and accepted. Replace all geotextiles installed prior to acceptance that do not meet specifications at Contractor's expense.

2.2.1 Sewn Seam Approval.

If the geotextile seams are to be sewn in the field, the Contractor shall provide a section of sewn seam that can be sampled by the RCE before the geotextile is installed. The sewn seam shall be in accordance with ASTM 6193.

The seam sewn for sampling shall be sewn using the same equipment and procedures as will be used to sew the production seams. The seam sewn for sampling must be at least 6 feet in length. If the seams are sewn in the factory, the Contractor shall provide samples of the factory seam at random from any of the rolls to be used. Regardless of whether the seam is to be sewn in the factory or the field, the manufacturer and/or Contractor shall certify that the strength meets the requirement set forth in Table 1. If seams are to be sewn in both the machine and cross-machine direction, provide samples of seams from both directions. The seam assembly description shall be submitted by the Contractor to the Engineer and will be included with the seam sample obtained for testing. This description shall include the seam type, stitch type, sewing thread type(s), and stitch density.

If sewn seams are used for seaming the geotextile, use thread that consists of high strength polypropylene or polyester. Do not use nylon thread. Use thread that is of contrasting color to that of the geotextile itself.

If the manufacturer can provide a T_{al} MD that is greater than the sum of the required T_{al} MD and sewn seam breaking strength (for each specified in the project plans), the sewn seams may be eliminated and a minimum overlap of 1 foot may be used.

2.3 Identification, Shipment and Storage.

Conform to ASTM D 4873, *Standard Guide for Identification, Storage, and Handling of Geotextiles*. Clearly label each roll of geotextile shipped to the project with the name and address of the manufacturer, full product name/number, quantity, and roll number.

The RCE will reject materials that are mislabeled or misrepresented. Wrap each roll with a material that protects the geotextile, including ends of the roll, from damage due to shipment, water, sunlight, and contaminants. Maintain the protective wrapping during periods of shipment and storage. Do not damage the geotextile or wrapping when unloading or transferring from one location to another. Do not drag the rolls.

During storage, elevate geotextile rolls off the ground and adequately cover to protect them from the following:

- Site construction damage;
- Precipitation;
- Ultraviolet radiation including sunlight;
- Chemicals that are strong acids or strong bases;
- Flames including welding sparks, temperatures in excess of 140 °F (60 °C); and
- Mud, dirt, dust, debris and any other environmental condition that may damage the physical property values of the geotextile.

3.0 CONSTRUCTION REQUIREMENTS

3.1 General.

Prepare the surface on which the geotextile is to be placed so that no damage occurs to the geotextile. Do not drive or operate any construction equipment on the geotextile. Dispose of material with defects, rips, holes, flaws, deterioration, or other damage. Do not use defective material in the work. The manufacturer shall be present on site for a minimum of two days of geotextile installation such that the manufacturer observes any field-sewn seams.

3.2 Installation Plan.

Within thirty (30) calendar days after award of the contract or no later than thirty (30) calendar days before beginning high-strength geotextile installation, the Contractor shall submit to the Department for review a high-strength geotextile installation plan that includes as a minimum the following information:

- a) The Contractor shall certify and provide proof to the Department of experience in the work described. The Contractor shall have successfully installed at least 500,000 square yards of any geotextile that has sewn seams during the last five years. In addition, the Contractor shall have successfully completed at least five projects within the last five years of similar size and complexity to that of the Project.

The Contractor's experience shall be documented by providing a project summary that includes for each referenced project, the project start and completion dates, total quantity of geotextile installed (specifically indicate if high-strength geotextile installed), and a detailed description of the project, site conditions, and subsurface conditions. The project description shall include

details of the geotextile materials, the equipment and technique used to install the geotextiles, the average and maximum area of geotextile installed, the client name and address, the name and telephone number of the representative of the consultant and owner for whom the work was performed and who can attest to the successful completion of the work, and any other information relevant to demonstrating the Contractor's qualifications.

- b) Resume of supervisor documenting experience and qualifications in the installation of both normal and high-strength geotextile. The Contractor shall have a full-time supervisor who has been in responsible charge of supervising geotextile installation operations for at least five projects in the last five years. The supervisor shall be present at the work site at all times during installation operations. The acceptability of the supervisor, as well as any replacement for the supervisor, will be subject to the approval of the Department.
- c) Shop drawings showing the planned locations and elevations of all high-strength geotextiles. The installation sequence shall also be provided including any required staging. The shop drawings shall also show the location of the bridge abutment, and the limits of the final embankment and construction staging.
- d) Detailed description of proposed installation procedures.
- e) Proposed methods and equipment for sewn seams.

3.3 Site Preparation.

Prepare the installation site by clearing, grubbing, and excavating or filling the area to the design grade. This includes removal of topsoil or vegetation. The RCE will identify soft spots and unsuitable areas during site preparation. This may include but not be limited to proof-rolling specific areas defined by the RCE. Excavate these areas and backfill with approved borrow or bridge lift material and compact as specified. The area to be covered by the geotextile shall be graded to a smooth, uniform condition free from ruts, potholes, and protruding objects such as rocks or sticks.

The Contractor may construct a working platform, up to 2 feet in thickness, in lieu of grading the existing ground surface. A working platform is required where stumps or other protruding objects which cannot be removed without excessively disturbing the subgrade are present. These areas shall be prepared in accordance with the 2007 Standard Specifications for Highway Construction. The stumps shall be covered with at least 6 inches of fill before placement of the first geotextile layer.

3.4 Geotextile Placement.

The geotextile shall be spread immediately ahead of the covering operation. The geotextile shall be laid with the machine direction perpendicular or parallel to centerline as shown in Plans. All seams shall be sewn. Seams to connect the geotextile strips end to end will not be allowed. The geotextile shall not be left exposed to sunlight during installation for a total of more than 14 calendar days. The geotextile shall be laid smooth without excessive wrinkles. Under no circumstances shall the geotextile be dragged through mud or over sharp objects, which could damage the geotextile.

Small soil piles or the manufacturer's recommended method shall be used as needed to hold the geotextile in place until the specified cover material is placed. Remove wrinkles and folds by pulling the geotextile taut as required.

Should the geotextile be torn or punctured or the sewn joints disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or roadbed distortion, the backfill around the damaged or displaced area shall be removed and the damaged area repaired or replaced by the Contractor at no expense to the Department. The repair shall consist of a patch of the same type of geotextile placed over the damaged area. The patch shall be sewn at all edges.

If geotextile seams are to be sewn in the field or at the factory, the seams shall consist of two parallel rows of stitching, or shall consist of a J-seam, Type SSn-2. The two rows of stitching shall be 1 inch apart with a tolerance of plus or minus 0.5 inches and shall not cross, except for restitching. The stitching shall be a lock-type stitch. The minimum seam allowance, i.e., the minimum distance from the geotextile edge to the stitch line nearest to that edge, shall be 1.5 inches if a flat or prayer seam, Type SSa-2, is used. The minimum seam allowance for all other seam types shall be 1 inches. The seam, stitch type, and the equipment used to perform the stitching shall be as recommended by the manufacturer of the geotextile and as approved by the RCE.

The seams shall be sewn in such a manner that the seam can be inspected readily by the RCE or his representative. The seam strength will be tested and shall meet the requirements stated herein.

3.5 Fill Placement.

Embankment construction shall be kept symmetrical at all times to prevent localized bearing capacity failures beneath the embankment or lateral tipping or sliding of the embankment. Place fill over the geotextile by dumping onto previously placed material and pushing the material into place. Stockpiling of fill on the geotextile will not be allowed.

The cover material shall be placed on the geotextile in such a manner that a minimum of 8 inches of uncompacted material will be between the equipment tires or tracks and the geotextile at all times. Construction vehicles shall be limited in size and weight such that rutting in the initial lift above the geotextile is not greater than 3 inches deep, to prevent overstressing the geotextile. Do not blade material down to remove ruts. Fill any ruts or depressions with additional material and compact to the specified density. Turning of vehicles on the first lift above the geotextile will not be permitted. If the geotextile is being placed on soft ground, compaction of the first lift above the geotextile shall be limited to routing of placement and spreading equipment only. If groundwater is present within 2 feet of the any lift, vibratory compaction shall not be used. If the subgrade is very soft with an undrained shear strength less than 500 psf minimize pile heights to less than 3 feet and spread piles as soon as possible after dumping to minimize the potential for localized subgrade failure due to overloading of the subgrade.

A sandy material that meets the requirements of an A-2 AASHTO soil classification shall be the only borrow excavation soil allowed for placement between the lowest elevation geotextile and the bottom of the pavement section. The embankment fill soils shall be compacted in accordance with the 2007 Standard Specifications for Highway Construction. Fill shall be placed in 12-inch maximum lift thicknesses where heavy compaction equipment is to be used and 6-inch maximum uncompacted lift thicknesses where hand-operated equipment is used.

The geotextile shall be pretensioned during installation using either Method 1 or Method 2 as described herein. The method selected will depend on whether or not a mudwave forms during placement of the first one or two lifts. If a mudwave forms as fill is pushed onto the first layer of geotextile, Method 1 shall be used. Method 1 shall continue to be used until the mudwave ceases to form as fill is placed and spread. Once mudwave formation ceased, Method 2 shall be used until the uppermost geotextile layer is covered with a minimum of 1 foot of compacted fill. These special construction methods are not needed for fill construction above this level. If a mudwave does not form as fill is pushed onto the first layer of geotextile, then Method 2 shall be used initially and until the uppermost geotextile layer is covered with at least 1 foot of compacted fill.

Method 1

After the working platform, if needed, has been constructed, the first layer of geotextile shall be laid as outlined in the project plans and the joints sewn together. The geotextile shall be stretched manually to ensure that no wrinkles are present in the geotextile. The fill shall be end-dumped and spread from the edge of the geotextile. The fill shall first be

place along the outside edges of the geotextile to form access roads. These access roads will serve three purposes: to lock the edges of the geotextile to form access roads, to contain the mudwave, and to provide access as needed to place fill in the center of the embankment. These access roads shall be approximately 16 feet wide. The access roads at the edges of the geotextile shall have a minimum height of 2 feet completed. Once the access roads are approximately 50 feet in length, fill shall be kept ahead of the filling operation, and the access roads shall be kept approximately 50 feet ahead of this filling operation. Keeping the mudwave ahead of this filling operation and keeping the edges of the geotextile from moving by use of the access roads will effectively pre-tension the geotextile. The geotextile shall be laid out no more than 20 feet ahead of the end of the access roads at any time to prevent overstressing of the geotextile seams.

Method 2

After the working platform, if needed, has been constructed, the first layer of geotextile shall be laid and sewn as in Method 1. The first lift of material shall be spread from the edge of the geotextile, keeping the center of the advancing fill lift ahead of the outside edges of the lift. The geotextile shall be manually pulled taut prior to fill placement. Embankment construction shall continue in this manner for subsequent lifts until the uppermost geotextile layer is completely covered with 1 foot of compacted fill.

4.0 METHOD OF MEASUREMENT

Measurement of geotextile is on a square yard basis and will be computed based on the total area of geotextile shown in the plans, exclusive of the area of geotextiles used in any overlaps, seams, and/or joints. This shall include all costs associated with installation of the geotextile. Overlaps and any geotextile waste are an incidental item.

5.0 BASIS OF PAYMENT

Payment at the contract unit price is full compensation for all resources necessary to complete the item of work under the contract. Payment for the completed and accepted quantities is made under the following:

Item No.	Pay Item	Unit
2037110	GEOTEX REINF.	SY

(37) SECTION 205: MONITORING DEVICES – PIEZOMETER:

May 09, 2013

Supplemental Specification for Monitoring Devices – Piezometer is revised as follows:

Section 2 Paragraphs 2 and 3 shall be replaced with the following:

“Piezometer shall be installed from the working surface to the depths shown on the plans. These depths refer to the middle of the piezometer referenced to the original ground surface. Enough cable shall be provided to run from the pressure cell to the location of the Vibrating Wire Data Collection Center (VW-DCC) plus 10 feet for each instrument. The cable used to connect the pressure cell to the VW-DCC shall meet the requirements of the instrument manufacturer/supplier. The Contractor shall supply non-conductive conduit to encase the cable between the pressure cell and VW-DCC. The conduit shall have a minimal nominal diameter of 1 inch and meet the requirements of Schedule 80 materials. Provide enough conduit to enclose all lengths of buried cable from the pressure cells to the VW-DCC. All connects in the conduit and in the cable between the pressure cell and VW-DCC shall be water proof.

During roadway construction and any delay period for settlement, the piezometers will be read and analyzed by the Engineer at the same times outlined in the Special Provision for Settlement Plates. If the piezometers indicate excessive excess pore pressures at a given location during embankment placement operations, the placing of embankment material shall be suspended.”

The following shall be added to the end of Section 2 Paragraph 4:

"Figure 1 depicts the installation of a single piezometer in a borehole; however, multiple piezometers may be placed in the same borehole. The installation of multiple piezometers is not shown for clarity."

Section 4 Paragraph1 shall be replaced with the following:

"Unit price bid for "Monitoring Devices-Piezometer" shall include all costs associated with supplying, installing, and maintaining the monitoring devices. The Contractor will monitor the devices throughout construction of the embankment and for up to a period of one year after the final delay period for settlement when embankment construction is completed. The Contractor will be responsible for ensuring the piezometers are in working order and accessible once the embankment is complete."

(38) SECTION 205: SETTLEMENT PLATES:

May 09, 2013

1.0 GENERAL

1.1 Scope

The work under this Section consists of furnishing all supervision, labor, material, equipment, and related services necessary to furnish and install settlement plates as indicated on the Drawings and specified herein. The Contractor shall accommodate the Engineer in the monitoring of settlement plates.

The purpose of the settlement-monitoring program is to:

1. Confirm estimates of the time rate of settlement of embankments and retaining walls during construction so that construction methods may be adjusted, if necessary, to meet the project schedule;
2. Confirm that settlement is sufficiently completed prior to final grading and paving of roadways supported on embankments and retaining walls.

Consolidation settlement of the foundation soils is expected to occur during and for a period after construction of new embankments and retaining walls. The magnitude and rate of the settlement will depend on the variation of the stratigraphy and consolidation properties of the foundation soils. To effectively manage the post-construction settlement, settlement plates shall be used to monitor the magnitude and rate of settlement during construction.

Settlement plates shall be furnished and installed by the Contractor in the presence of the Engineer. Settlement plates shall consist of a steel plate with coupling for attaching the central rod and protective PVC casing. A benchmark shall be established on stable ground that is not subject to settlement.

1.2 Responsibilities of Contractor:

The Contractor shall notify the Engineer at least five (5) working days prior to the installation of settlement plates.

The Contractor shall furnish and install the settlement plates in the presence of the Engineer.

The Contractor shall provide a licensed surveyor to stake out and provide as-built locations and elevations of all settlement plate locations and benchmarks.

The Contractor shall protect the settlement plates and benchmarks from damage for the duration of the Contract.

The Contractor shall provide the Engineer safe access to the settlement plates for the purpose of data collection for the duration of the Contract.

The Contractor shall be responsible for locating all settlement plates in the field and ensuring that no conflicts exist between settlement plates and existing and proposed structures, utilities or other construction proposed or present at the site.

1.3 Site Preparation

The Contractor shall ensure a firm base on which heavy equipment and/or other necessary equipment can be operated safely under its own power for installation of settlement plates.

The Contractor shall accurately locate all settlement plates in accordance with Drawings. Settlement plates may be adjusted by the Contractor, with the approval of the Engineer, to avoid utilities, foundations, and all other underground construction.

1.4 Existing Soil Conditions:

The subsurface conditions encountered at the site are presented in the Contract Plans and documents.

2.0 PRODUCTS

2.1 Settlement Plate

The settlement plate shall consist of a 30-in. square, 1/2-in. thick steel plate with a coupling centered on the plate for attaching a central steel rod. In addition, the plate shall have a means for keeping the protective PVC casing centered on the steel rod.

2.2 Central Steel Rod

A central steel rod shall extend from the plate vertically to allow for measurements of the elevation of the settlement plate. The rod shall be of sufficient diameter to prevent buckling or swaying over the height of the fill. In addition, the rod will either be threaded at both ends or will be threaded rod to allow for the addition of extensions. The central steel rod will include the necessary couplers to allow for the extension. Metal pipe may be substituted for the rod, provided the pipe is manufactured from similar material as the settlement plate.

2.3 Protective PVC Casing

A schedule 40 PVC pipe shall be installed around the central steel rod to protect the rod from compaction operations. The PVC casing will have an inside diameter of no less than 3 inches. The casing may have either glued or threaded joints. The joints should form a watertight seal. A protective cap shall be placed at the top of the PVC casing to prevent soil, water and other debris from being introduced into the casing. In addition, the casing shall extend a minimum of 1 foot and no more than 5 feet above the ground surface at the base of casing during fill placement. Further, the contractor shall visibly identify the location of the PVC casing to prevent damage to the casing during the placement of fill materials.

2.4 Incidentals

Incidental hardware, fasteners, tools, and the like, as necessary to install the system in accordance with these specifications, shall be provided.

3.0 SUBMITTALS

The Contractor shall submit a plan for the settlement plates indicating where the coupling and protective casing supports are to be located and the method to be used to attach the coupling and casing supports.

Within 1 week following installation, the contractor shall submit an installation record for each settlement plate, which includes the plate designation, station, offset, and elevation of the

Settlement plate. The settlement plate shall be located to an accuracy of 0.01 ft (both vertically and horizontally).

4.0 EXECUTION

4.1 Settlement Plate Installation

The Contractor shall furnish and install settlement plates in accordance with the Drawings and these specifications and in the presence of the Engineer. Settlement plates shall be installed prior to embankment or retaining wall construction and following installation of wick drains, stone columns, or other ground improvement, and grubbing and clearing in the immediate vicinity of each settlement plate. The Contractor, only with the approval of the Engineer, may adjust settlement plate locations. The settlement plates shall be placed on a firm, level area as indicated in the plans.

4.2 Allowance for Settlement Plate Monitoring

The Contractor shall accommodate the Engineer during construction to provide safe and timely access to settlement plates for the purpose of obtaining measurements, as construction progresses. The Contractor shall retain a licensed land surveyor to monitor the settlement of the plates. Evaluation of the settlement plate data will be the responsibility of the Engineer.

4.3 Fill Height Survey

The Contractor shall make a survey of the central rods daily while fill is being placed, and twice weekly after completion of fill placement, unless directed otherwise by the Engineer. Additionally, surveys shall be made at the addition of an extension rod. The measurements shall be obtained both before and after the addition of the extension rod. Surveys made by the Contractor shall be provided to the Engineer within one week. In addition, the Contractor shall provide all readings as the elevation of the plate to the nearest 0.01 ft. Further the Contractor will provide the temperature in degrees Fahrenheit (°F) and the time (actual) of obtaining the settlement plate elevations.

4.4 Protection of Settlement Plates

The Contractor shall protect settlement plates from damage and vandalism for the duration of the Contract and repair or replace damaged or inoperative settlement plates at no cost to the Department.

4.5 Abandonment of Settlement Plates

Once the Engineer has determined that the settlement plates have served their purpose and are no longer needed, they shall be abandoned in-place. The Contractor shall remove as much of the central steel rod as can be recovered and shall cut the PVC casing off two feet beneath the finished subgrade. The Contractor shall fill the PVC casings remaining in the ground with lean grout and shall place two feet of properly compacted fill on top of the testing location.

5.0 METHOD OF MEASUREMENT

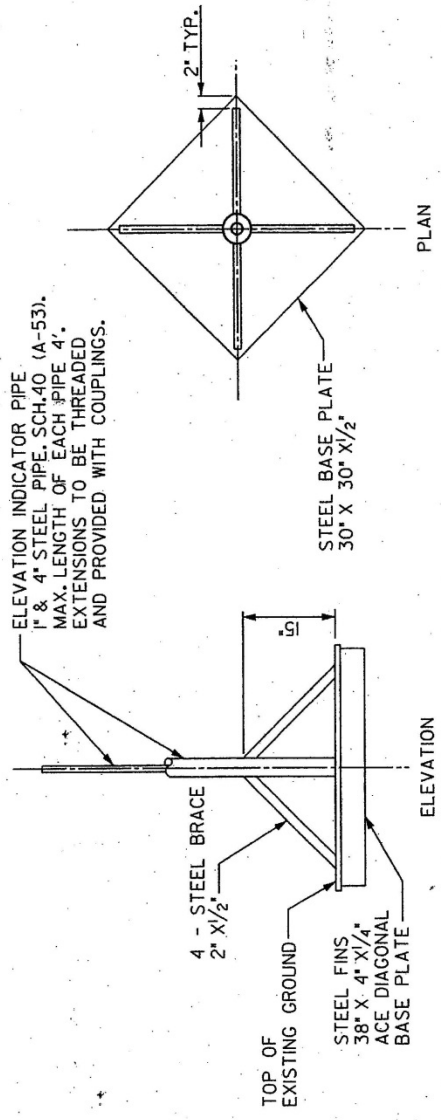
The number of settlement plates, as provided in the plans, will be paid for at the contract unit price bid for "Monitoring Device - Settlement Plates" which shall include all equipment, including but not limited to the settlement plates; mobilization; labor; surveys; materials; incidentals and abandonment required by these Specifications.

6.0 BASIS OF PAYMENT

The price and payment for this work shall be full compensation for furnishing the necessary Settlement Plates, including the settlement plates, surveys and incidental items based on the acceptance of the Settlement Plate installation by the Engineer.

Payments shall be made under:

Item No.	Pay Item	Pay Unit
2038110	MON. DEVICE – SETTLEMENT PLATE	EA



MONITORING DEVICE - SETTLEMENT PLATE DETAIL

NOT TO SCALE

(39) SECTION 205: SETTLEMENT SENSORS:

August 25, 2015

1.0 GENERAL

1.1 Scope

The work under this Section consists of furnishing all supervision, labor, material, equipment, and related services necessary to furnish and install settlement sensors as indicated on the Drawings and specified herein. The Contractor shall accommodate the Engineer in the monitoring of settlement sensors.

The purpose of the settlement-monitoring program is to:

1. Confirm estimates of the time rate of settlement of embankments and retaining walls during construction so that construction methods may be adjusted, if necessary, to meet the project schedule;
2. Confirm that settlement is sufficiently completed prior to final grading and paving of roadways supported on embankments and retaining walls.

Consolidation settlement of the foundation soils is expected to occur during and for a period after construction of new embankments and retaining walls. The magnitude and rate of the settlement will depend on the variation of the stratigraphy and consolidation properties of the foundation soils. To effectively manage the post-construction settlement, settlement sensors shall be used to monitor the magnitude and rate of settlement during construction.

Settlement sensors shall be furnished and installed by the Contractor in the presence of the Engineer. Settlement sensors shall consist of a steel plate with the attached sensor equipment designed to be buried within soil fill and connected to a liquid reservoir, which is set in stable ground that is not subject to settlement. Settlement measurements are referenced to the fluid level of the reservoir supported on stable ground.

1.2 Responsibilities of Contractor:

The Contractor shall notify the Engineer at least five (5) working days prior to the installation of settlement sensors.

The Contractor shall furnish and install the settlement sensors in the presence of the Engineer.

The Contractor shall provide a licensed surveyor to stake out and provide as-built locations and elevations of all settlement sensors and liquid reservoir locations.

The Contractor shall protect the settlement sensors and liquid reservoirs from damage for the duration of the Contract.

The Contractor shall provide the Engineer safe access to the settlement sensors for the purpose of data collection for the duration of the Contract.

The Contractor shall be responsible for locating all settlement sensors in the field and ensuring that no conflicts exist between settlement sensors, liquid reservoir locations and existing and proposed structures, utilities or other construction proposed or present at the site.

1.3 Site Preparation

The Contractor shall ensure a firm base on which heavy equipment and/or other necessary equipment can be operated safely under its own power for installation of settlement sensors.

The Contractor shall accurately locate all settlement sensors in accordance with Drawings. Settlement sensors shall be adjusted by the Contractor, with the approval of

the Engineer, to avoid utilities, foundations, and all other underground construction.

1.4 Existing Soil Conditions:

The subsurface conditions encountered at the site are presented in the Contract Plans and documents.

2.0 PRODUCTS

2.1 Settlement Sensor

The settlement sensor shall consist of a 12-in. square, ¼-in. thick steel plate with an attached vibrating wire pressure sensor. A liquid reservoir and readout panel shall also be supplied in a waterproof casing. The Contractor shall supply weather resistant locks and keys for the casings. The Contractor shall provide all keys to the Engineer. The liquid reservoir shall have a graduated scale attached so that the liquid level can be checked visually. The manufacturer's instruction and installation manual shall be supplied with the settlement sensor. The sensor shall have the signal cable and tubing attached and factory saturated with a 50% ethylene glycol antifreeze solution, ready for connection to the readout panel and liquid reservoir. The liquid reservoir shall have two tubing connections to the sensor to allow for flushing if necessary. Additional antifreeze solution shall be provided to fill the liquid reservoir and saturate the tubing connections. The vibrating wire pressure sensor shall be self-compensated for variations in barometric pressure, and have a built in temperature sensor for correction of temperature variations. The vibrating wire sensor shall be vented to the air space at the top of the liquid reservoir to accomplish the self-compensation for barometric pressure, and a moisture trap shall be included in series with the vent tubing. The settlement sensor shall have a minimum range of 5 ft, a resolution of 0.01 ft, and a system accuracy of ± 0.02 ft. All above ground components of the settlement sensor system shall be insulated.

Settlement sensor model 4650 manufactured by Geokon, Inc. of Lebanon, NH, or equivalent, shall be supplied. Catalog sheet for 4650 Settlement sensor is attached at the end of this specification for reference.

2.2 Support Post

A metal or wooden post shall be provided for mounting the liquid reservoir and readout panel. The post shall be long enough so that it can be set a minimum of 3-ft below the stable ground surface, and the readout panel will be mounted no less than 2-ft off of the ground.

2.3 Sand Backfill

Clean sand backfill with no particles larger than 3/8-in. shall be provided to backfill around the signal cable and tubing leading from the settlement plate to the liquid reservoir and readout panel.

2.4 Incidentals

Incidental conduit, hardware, fasteners, tools, electronic readouts and the like, as necessary to install the system in accordance with the manufacturer's manual, shall be provided.

3.0 SUBMITTALS

The Contractor shall submit the Specification sheet for the settlement sensor prior to purchase of settlement sensor for review and approval of the Engineer. Locations for the liquid reservoir shall also be submitted for approval, so that the proper length of signal cable and tubing can be purchased.

Upon receipt of the settlement sensor, the Contractor shall submit copies of calibration sheets and the manufacture's installation and instruction manual for review and approval of the Engineer, and shall make available the settlement sensor for inspection by the Engineer.

Within 1 week following installation, the contractor shall submit an installation record for each

settlement plate which includes the plate designation, station, offset, and elevation of the Settlement sensor, and station offset and elevation of the liquid reservoir. The settlement sensor shall be located to an accuracy of 0.01 ft (both vertically and horizontally).

4.0 EXECUTION

4.1 Settlement Sensor Installation

The Contractor shall furnish and install settlement sensors in accordance with the Drawings and these specifications and in the presence of the Engineer. Settlement sensors shall be installed prior to embankment or retaining wall construction and following installation of wick drains, stone columns, or other ground improvement, and grubbing and clearing in the immediate vicinity of each settlement plate. Settlement sensor locations shall be adjusted by the Contractor only with the approval of the Engineer.

Settlement sensor installation shall be in accordance with the manufacturer's recommendations as presented in their instruction and installation manual. The liquid reservoir shall be located clear of the construction area, in an area where no fill will be placed and no settlement is anticipated. The liquid reservoir and readout panel shall not be located in drainage swales, storm water detention ponds or other areas where the panel may become submerged. A licensed surveyor shall provide a survey of the installed sensor and liquid reservoir. The survey reference point for the liquid reservoir and readout panel shall be permanently marked so that subsequent surveys may be referenced to this mark.

4.2 Allowance for Settlement Sensor Monitoring

The contractor shall accommodate the Engineer during construction to provide safe and timely access to settlement sensors for the purpose of obtaining measurements, as construction progresses. Evaluation of the settlement sensor data will be the responsibility of the Engineer.

4.3 Fill Height Survey and Liquid Reservoir Survey

The Contractor shall make a survey of the ground surface elevation above each settlement sensor twice weekly while fill is being placed, and once every two weeks when fill is not being placed, unless directed otherwise by the Engineer. The purpose of these measurements is to provide the Engineer with a time-history of the embankment or retaining wall height for correlation with settlement measurements. Survey of the liquid reservoir and readout panel elevation shall be made every four weeks, or if disturbance of the liquid reservoir is suspected, or as directed by the Engineer. Surveys made by the Contractor shall be provided to the Engineer within one week.

4.4 Protection of Settlement Sensors

The Contractor shall protect settlement sensors from damage and vandalism for the duration of the Contract and repair or replace damaged or inoperative settlement sensors at no cost to the Department.

4.5 Abandonment of Settlement Sensors

Once the Engineer has determined that the settlement sensors have served their purpose and are no longer needed, they shall be abandoned in-place. The Contractor shall remove recoverable portions of the settlement sensor, likely consisting of only the liquid reservoir and readout panel. All recoverable instrumentation shall remain property of the Contractor. The Contractor shall remove the ethylene glycol antifreeze solution from the buried tubing that is left in place by use of either a vacuum pump or by blowing out the tubing with air pressure. The antifreeze solution shall be contained and disposed of offsite in a proper manner by the Contractor.

5.0 METHOD OF MEASUREMENT

The number of settlement sensors, as provided in the plans, will be paid for at the contract unit price bid for "Monitoring Device - Settlement Sensors" which shall

include all equipment, including but not limited to the settlement sensor, liquid reservoir, water proof casing; mobilization; labor; surveys; materials; incidentals and abandonment required by these Specifications.

6.0 BASIS OF PAYMENT

The price and payment for this work shall be full compensation for furnishing the necessary Settlement Sensor, including the settlement sensor, the liquid reservoir, the waterproof casing, surveys and incidental items based on the acceptance of the Settlement Sensor installation by the Engineer.

Payments shall be made under:

Item No.	Pay Item	Pay Unit
2038115	MON. DEVICE – SETTLEMENT SENSOR	EA

Model 4650 Settlement System



● Model 4650 Settlement System.

Applications

The Model 4650 is designed for remote measurement of the settlement of a point in or below fills, surcharges, embankments, etc. Systems with tube lengths of up to 300 m have been used successfully to measure settlements in earth dam embankments.

Operating Principle

A vibrating wire pressure sensor is attached to a settlement plate located at the point of settlement. The sensor is connected via two liquid-filled tubes, extending laterally, to a reservoir located on stable ground. The sensor measures the hydraulic head of liquid between the sensor and reservoir locations.

Advantages and Limitations

A vented cable runs from the sensor to the remote readout location and connects to the reservoir so that barometric pressure fluctuations do not affect the readings.

The liquid-filled tubes can be flushed to remove any air bubbles that might form.

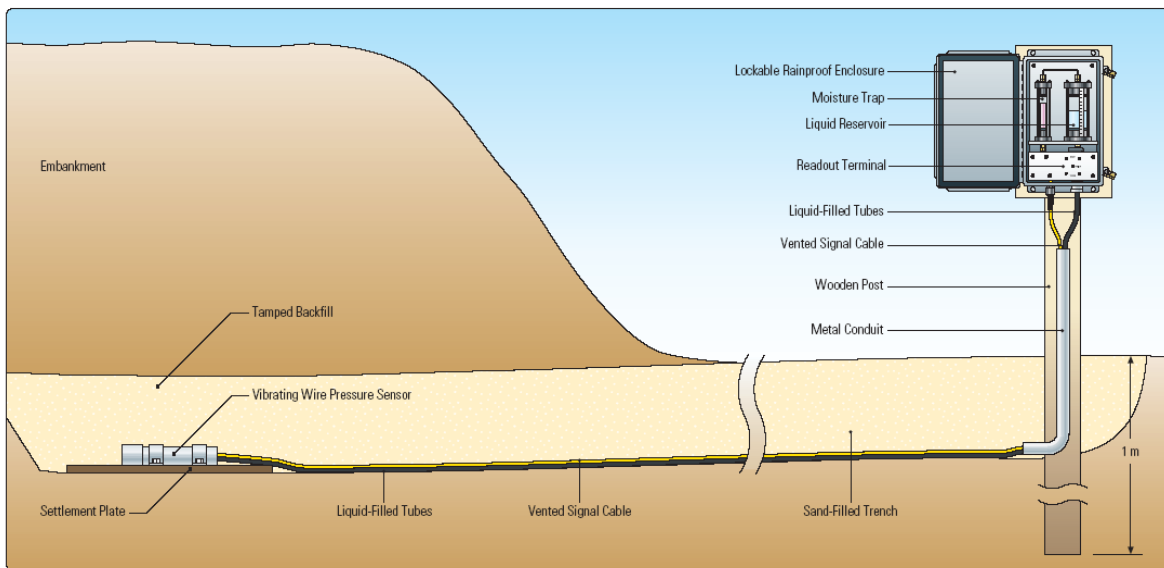
It is possible to perform in-situ checks at any time on both the calibration and zero stability.

Technical Specifications

Standard Ranges ¹	7, 17 m (20, 50 ft.)
Resolution/Sensitivity	2, 4 mm (0.08, 0.16 in.)
System Accuracy ²	±4 to ±6 mm (±0.16 to ±0.24 in.)
Temperature Range ¹	-20°C to +80°C

¹Other ranges available on request.

²Sensor accuracy 0.1% F.S.



• Model 4650 installation for the remote measurement of subsurface settlement beneath a large embankment.

(40) SECTION 205: VIBRATING WIRE ROD EXTENSOMETER:

May 24, 2013

1.0 Description.

This work includes furnishing all supervision, materials, equipment, labor, and related services necessary for providing, installing and maintaining a Vibrating Wire Rod Extensometer (VWRE) at the locations indicated in the plans and in accordance with these specifications. This item includes the furnishing of as-built drawings of actual locations where instrumentation was installed, survey data recorded during instrumentation installation, and installation field reports. Also included in this item of work is the initial and periodic/continuous recording of VWRE readings and reporting to the Engineer in accordance with the Department's Geotechnical Instrumentation Monitoring Plan for the entire duration of the project.

The purpose of the instrumentation monitoring program is to monitor settlement of the approach embankments.

The Contractor shall be familiar with project geotechnical conditions and recognize that geotechnical data is available with geotechnical boring logs, laboratory testing results, and other pertinent information.

2.0 Vibrating Wire Rod Extensometer.

The Vibrating Wire Rod Extensometer is an automated device for monitoring settlement. The VWRE shall contain 6 rod extensometers that will measure settlement at different depths below the ground surface. The depths of data collection are indicated in the project plans. The rod extensometers will be housed in a casing of sufficient diameter to allow for 6 rods in each casing. The VWRE shall be capable of measuring settlements of 18 inches. The VWRE shall have an accuracy ± 0.1 percent with a thermal effect of < 0.05 percent for a temperature range of -4°F to 176°F . In addition, the VWRE shall have a long-term stability of < 0.2 percent per year. The location of each rod extensometer cluster is indicated in the project plans. Each rod extensometer cluster will be connected to a data collection center. The cluster shall be installed in accordance with the manufacturer's recommendations. Each VWRE cluster shall be connected to the data collection center either via cable or via cellular communications. If cable is used, enough cable shall be provided to run from the VWRE to the location of the Vibrating Wire Data Collection Center (VW-DCC) plus 10 feet for each instrument.

The cable used to connect the VWRE to the VW-DCC shall meet the requirements of the instrument manufacturer/supplier. The Contractor shall supply non-conductive conduit to encase the cable between the VWRE and VW-DCC. The conduit shall have a minimal nominal diameter of 1 inch and meet the requirements of Schedule 80 materials. Provide enough conduit to enclose all lengths of buried cable from the VWRE to the VW-DCC. All connections in the conduit and in the cable between the VWRE and VW-DCC shall be water proof.

3.0 Submittals.

Within 30 calendar days before installing the VWRE, the Contractor shall submit to the Department for review the personnel qualification, installation plan, and monitoring plan. The submittals shall contain as a minimum the following information.

3.1 Qualifications:

The Contractor shall identify the licensed surveyor who shall be responsible for providing survey services during the installation of the VWRE. The Contractor shall identify the geotechnical engineer that will be responsible for installing and maintaining the VWRE. The same geotechnical engineer that is responsible for the VW-DCC and piezometers will also be responsible for the VWRE. The geotechnical engineer's experience in installing VWRE in accordance with the plans and Contract Documents shall be documented by providing a project summary, of at least three projects, that includes for each project the project name, role in providing instrumentation services, type of VWRE, equipment used, duration of the project (i.e. dates), magnitude of settlements, client name and address, name and phone number of representative of the consultant and owner for whom the work was performed and can attest to the successful completion of the work, and any other information relevant to demonstrating the geotechnical engineer's qualifications. In addition, the manufacturer/supplier shall also be on-site during the initial installation of the VWRE to ascertain that all instruments have been connected correctly. The manufacturer/supplier shall also be available for questions from either the geotechnical engineer responsible for maintaining the VWRE or from the Department concerning the data being collected.

3.2 Installation Plan:

The installation plan shall include as a minimum the following information:

1. The Contractor shall submit the Specification sheet for the proposed VWRE system for review and approval by the Engineer.
2. Submit locations where VWRE will be installed if different from the location shown on the plans.
3. Proposed installation method.
4. Proposed method to protect VWRE during construction from construction equipment, vandalism, weather.

3.3 Submittal Reviews:

Approval of the personnel qualification and installation plan by the Department shall not relieve the Contractor of its responsibility to successfully install the VWREs in accordance with the plans and specifications. Approval by the Department of the VWRE installation plan shall be contingent upon satisfactory demonstration that the VWRE is meeting the objectives of the Department's Geotechnical Instrumentation Monitoring Plan. If, at any time, the Department or the Engineer considers that the VWRE does not produce satisfactory results, the Contractor shall alter the method and/or equipment as necessary to comply with the Special Provisions and Department's Instrumentation Plan. The Department will be the sole judge in determining the adequacy of the Contractor's VWRE.

4.0 Delivery, Storage, and Handling.

The Contractor shall check all materials and equipment upon delivery to ensure that the proper items are received and are not damaged. All materials shall be stored and maintained in a clean, uncontaminated condition throughout the course of the project. Upon receipt of the

VWRE, the Contractor shall submit copies of the manufacturer's installation and instruction manual for review and approval by the Engineer, and shall make available the data logging system for inspection by the Engineer.

5.0 VWRE Installation.

Upon receipt of the VWRE, the Contractor shall submit copies of calibration sheets and the manufacturer's installation and instruction manual for review and approval by the Engineer, and shall make available the VWRE for inspection by the Engineer.

The Contractor shall notify the Engineer at least fourteen (14) days prior to the installation of VWRE. The VWREs shall be furnished and installed by the Contractor in accordance with the plans and this specification and in the presence of the Engineer.

The Contractor shall be responsible for locating all VWREs in the field and ensuring that no conflicts exist between VWREs and foundations, structures, utilities or other construction proposed or present at the site.

The Contractor shall provide a licensed surveyor to stake out and provide as-built locations and elevations of all VWREs locations.

VWREs shall be installed prior to construction of the embankment. VWRE installation shall be in accordance with the manufacturer's recommendations as presented in their instruction and installation manual. The VWRE will be connected to the VW-DCC in accordance with the plans, contract documents, and manufacturer's recommendations.

The Contractor shall accurately locate all VWREs in accordance with the plans. VWREs may be adjusted by the Contractor, with the approval of the Engineer, to avoid utilities, foundations, and all other underground construction.

Within 1 week following installation, the contractor shall submit an installation record for each VWRE, which includes the instrumentation identification as provided in the plans, station/alignment, offset, and elevation. The VWRE shall be located to an accuracy of 0.01 ft (both vertically and horizontally).

The Contractor shall protect VWRE locations from damage and vandalism for the duration of the Contract and repair or replace damaged or inoperative VWREs at no cost to the Department.

6.0 Abandonment of VWRE.

Once the Engineer has determined that the VWRE systems have served their purpose and are no longer needed, the VWRE systems shall be abandoned in-place. The Contractor shall remove recoverable portions of the VWRE. All recoverable instrumentation shall remain property of the Contractor. The Contractor shall remove no more than 2 feet of the conduit that extends into the embankment and shall seal the conduit left in place within the embankment using a lean grout mix.

7.0 Method of Measurement.

The number of VWRE provided in the plans, will be paid for at the contract unit price bid for "Vibrating Wire Rod Extensometer" which shall include all equipment, including but not limited to the VWRE, water proof casing; mobilization; labor; surveys; materials; incidentals and abandonment required by these Specifications along with VWRE data as outlined in the Geotechnical Instrumentation and Monitoring Plan. Payment will not be made for VWRE that malfunction or are rejected for their inability to perform, or do not meet the requirements in the plans and these specifications.

8.0 Basis of Payment.

The price and payment for this work shall be full compensation for furnishing the necessary data logging system, enclosure, protection from vandalism and construction equipment, data

as outlined in the Geotechnical Instrumentation and Monitoring Plan, and incidental items based on the successful implementation of the VWRE system.

Payments shall be made under:

Item No.	Pay Item	Pay Unit
2038140	Mon. Device - Vibrating Wire Rod Extensometers	EA

(41) SECTION 205: VIBRATING WIRE DATA COLLECTION CENTERS:

May 24, 2013

1.0 Description.

This work includes furnishing all supervision, materials, equipment, and labor, and related services necessary for providing and maintaining a Vibrating Wire Data Collection Center (VW-DCC) at the locations indicated in the plans and in accordance with these specifications. This work consists of automating the data collection for vibrating wire rod extensometers (RE), total pressure cells (TPC), and piezometers (PZ) with a real-time system that is accessible via the internet in accordance with the Department's Geotechnical Instrumentation Monitoring Plan for the entire duration of the project as determined necessary for evaluating the settlement and pressure instrumentation of the embankments being constructed.

2.0 Vibrating Wire Data Collection Center.

The Vibrating Wire Data Collection Center (VW-DCC) is an automated centralized vibrating wire data collection center. The VW-DCC will be used to collect VWRE, TPC and PZ readings. Temperature readings shall also be collected when instrumentation contains thermistors. The automated collection of VW data shall be accomplished by using a data logging system that is sufficiently capable to monitor the VW sensors indicated in the plans and with the capability of adding four additional rod extensometers and six piezometers to the system. Sufficient ports shall be provided to also monitor temperature. The reserve instrumentation monitoring capacity can be either achieved by using a data logging system with sufficient ports or by having the capability to expand the system if needed. The Contractor shall maintain compatibility between the data logging system and the rod extensometers, total pressure cells, and piezometer instrumentation. In order to maintain compatibility of the systems and be able to get technical assistance from the manufacturer during installation and throughout the project, the VW-DCC system should be supplied/manufactured by the same company that is supplying the VWRE, TPC, and PZ instrumentation. In addition, the VW-DCC shall have the following features:

1. Data logging system with sufficient capacity to read and save instrumentation readings.
2. The data logging system shall have the reserve capacity to add additional instrumentation if needed.
3. Powered by on-site AC current
4. Battery power back-up with surge suppression
5. Telephone/cellular access for transmitting data through the internet
6. Dedicated server for storing and running viewing software.
7. On-line instrumentation software for reviewing/downloading instrumentation data
8. Enclosure that protects the equipment from damage during construction, vandalism, and weather.

Data collected via the VW-DCC shall be provided to the Department in the format outlined in the Geotechnical Instrumentation and Monitoring Plan.

3.0 Submittals.

Within 30 calendar days before installing the VW-DCC, the Contractor shall submit to the Department for review the personnel qualification, installation plan, and monitoring plan. The submittals shall contain as a minimum the following information.

3.1 Qualifications:

The Contractor shall identify the geotechnical engineer that will be responsible for installing and maintaining the VW Data Collection Center. The same geotechnical engineer that is responsible for the vibrating wire REs, TPCs, and PZs will also be responsible for the VW-DCC. The geotechnical engineer's experience in providing automated data logging capabilities such as the VW-DCC in accordance with the plans and contract documents shall be documented by providing a project summary, of at least three projects, that includes for each project the project name, role in providing instrumentation services, type of data logging system, equipment used, duration of the project (i.e. dates), client name and address, name and phone number of representative of the consultant and owner for whom the work was performed and can attest to the successful completion of the work, and any other information relevant to demonstrating the geotechnical engineer's qualifications. In addition, the manufacturer/supplier shall also be on-site during the initial installation of the VW-DCC to ascertain that all instruments have been connected correctly. The manufacturer/supplier shall also be available for questions from either the geotechnical engineer responsible for maintaining the VW-DCC or from the Department concerning the data being collected.

3.2 Installation Plan:

The installation plan shall include as a minimum the following information:

1. The Contractor shall submit the Specification sheet for the proposed VW-DCC system for review and approval by the Engineer.
2. Submit locations where VW-DCC will be installed.
3. Proposed installation method.
4. Proposed method to protect VW-DCC during construction from construction equipment, vandalism, weather.

3.3 Submittal Reviews:

Approval of the personnel qualification and installation plan by the Department shall not relieve the Contractor of its responsibility to successfully install the VW REs, TPCs, and PZs and monitor this instrumentation with VW-DCC in accordance with the plans and specifications. Approval by the Department of the VW-DCC installation plan shall be contingent upon satisfactory demonstration that the VW-DCC is meeting the objectives of the Department's Geotechnical Instrumentation Monitoring Plan. If, at any time, the Department or the Engineer considers that the VW-DCC does not produce satisfactory results, the Contractor shall alter the method and/or equipment as necessary to comply with the Special Provisions and Department's Instrumentation Plan. The Department will be the sole judge in determining the adequacy of the Contractor's VW-DCC.

4.0 Delivery, Storage, and Handling.

The Contractor shall check all materials and equipment upon delivery to ensure that the proper items are received and are not damaged. All materials shall be stored and maintained in a clean, uncontaminated condition throughout the course of the project. Upon receipt of the VW-DCC, the Contractor shall submit copies of the manufacture's installation and instruction manual for review and approval by the Engineer, and shall make available the data logging system for inspection by the Engineer.

5.0 Abandonment of VW-DCC.

Once the Engineer has determined that VW-DCC systems have served their purpose and are no longer needed, the VW-DCC shall be abandoned by removing all equipment and signal wires a minimum of 2 feet of ground surface.

6.0 Method of Measurement.

The number of VW-DCC provided in the plans, will be paid for at the contract unit price bid for "Vibrating Wire Data Collection Center" which shall include, but not limited to, all labor, materials, and equipment necessary to install a vibrating wire data collection center along with data as outlined in the Geotechnical Instrumentation and Monitoring Plan. Payment will not be made for VW-DCC that malfunction or are rejected for their inability to perform, or do not meet the requirements in the plans and these specifications.

7.0 Basis of Payment.

The price and payment for this work shall be full compensation for furnishing the necessary data logging system, enclosure, protection from vandalism and construction equipment, data as outlined in the Geotechnical Instrumentation and Monitoring Plan, and incidental items based on the successful implementation of the VW-DCC system.

Payments shall be made under:

Item No.	Pay Item	Pay Unit
8990440	VW Data Collection Center	EA

(42) SECTION 205: VIBRO COMPACTION:

June 27, 2013

DESCRIPTION

This section presents administrative and procedural requirements for ground modification by Vibro-Compaction (VC). Vibro-compaction shall be implemented in and below the existing embankment fill material of both the beginning of bridge approach embankment and the end of bridge approach embankment. VC shall be provided as documented in the plans. The purpose of the vibro-compaction program is to densify the granular soils at the specified locations and depths to mitigate liquefaction potential.

The Contractor shall perform layouts and measurements for VC work. VC points may be surveyed in or located by measuring offsets from surveyed points (e.g., project stations) using a tape measure.

The Contractor shall notify the Engineer a minimum of 48 hours prior to commencement of the VC operations at each approach embankment location.

Any change in the predetermined VC program necessitated by a change in the field conditions shall be immediately reported and submitted to the Geotechnical Engineer. Upon completion of the work, the Contractor shall submit a drawing of as-built locations of vibro-compacted columns.

REFERENCES

The Geotechnical Engineer will coordinate all testing to determine compliance with the project design.

- A. Applicable Standards: The most recent version of the following testing methods or standards shall be employed:
 - 1. ASTM D1586 "Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils"
 - 2. ASTM D5778 "Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils" (CPT)
 - 3. ASTM D6635 "Standard Test Method for Performing the Flat Plate Dilatometer" (DMT)
- B. Reference Documents: Reference documents to be used by the Contractor shall include:
 - 1. This specification.
 - 2. Attached plans.
 - 3. Project geotechnical report prepared by the Geotechnical Engineer.

Prior to commencing work, the contractor shall examine the site, drawings, records of existing utilities and other existing subsurface structures, and soil test boring logs made available in the original bid documents and those performed by the Geotechnical Engineer to help determine VC installation conditions.

SUBMITTALS

This section details all submittals required prior to field work, at completion of the test section, during production work, and after the work is completed.

- A. Pre-Field Work Submittals: The following shall be submitted to the SCDOT by the Geotechnical Engineer prior to the start of the work. VC operations may not commence until approval by the SCDOT is granted.
 - 1. A Work Plan prepared by the Contractor for the production work outlining the anticipated spacing, location and depth to achieve the project design criteria.
 - 2. Drawing(s) for review, indicating the spacing, location, and depth of the VC probes to achieve the project design criteria.
- B. Post Test Section and Pre Production Work:
 - 1. Results of the test section evaluation.
 - 2. A revised work plan and VC layout should the test section results require a modification to the original work and production plans.
- C. During Production Submittals: The following shall be submitted to the SCDOT by the Geotechnical Engineer during the work:
 - 1. Any change in the predetermined VC program necessitated by a change in the field conditions.
- D. Closeout Submittal: The following shall be submitted to the SCDOT by the Geotechnical Engineer within 14 days of the completion of the VC work.
 - 1. As built drawings: Drawings documenting any significant changes to the shop drawing. If no changes are noted, then no as-built drawings are necessary following completion of the VC program.

EQUIPMENT AND MATERIALS

The Contractor shall supply equipment in good operating condition capable of performing the work specified herein. The Contractor shall use equipment capable of efficiently accomplishing the required soil densification. The probe shall have durable markings on one foot intervals allowing a visual determination of the depth of penetration when in use. The probe shall be of sufficient length to extend a minimum depth of thirty (30) feet below existing grade.

The VC procedure is not intended to be a 'wet' operation. Water shall be used sparingly to mitigate clogging of the VC equipment.

Settlement resulting from the VC operations is anticipated. Any required fill placement in the resulting deformations required to meet the design grade(s) shall meet the requirements outlined in the *Special Provision 40 – Section 203: Borrow Excavation* provided in the bid documents.

Groundwater is anticipated to emerge to the ground surface during VC operations. The Contractor shall implement Best Management Practices (BMP's) to efficiently control surface groundwater runoff in accordance with the contract documents.

CONSTRUCTION

Production VC criteria shall be as follows:

1. Depth of treatment: The probe tip shall penetrate to the minimum elevation specified in the above referenced documents and submittals.
2. Locations/Spacing: The center to center probe spacing shall adhere to the requirements in the above referenced documents and submittals. Probes shall be performed within 12 inches of the planned location
3. Limits of work: The limits of the VC work are shown on the drawings described in the above referenced documents and submittals.

QUALITY CONTROL

The details of the quality control program are as follows:

- A. Technical Oversight: All VC operations shall be performed under the inspection of the Geotechnical Engineer's representative.
- B. Monitoring and Logging: Monitoring and logging of all VC operations for the test area and production work shall be done by the Contractor.
- C. Test Section: The Geotechnical Engineer's representative shall monitor the performance of the test section and perform the testing indicated below:
 1. A test section shall be performed before production work, as follows:
 - a. The test section location shall be agreed upon by the Geotechnical Engineer and the Contractor within the treatment area. The test section will consist of a minimum of twelve (12) VC points in three (3) rows of four (4) points each. For preliminary design considerations, the vibro-densification program will utilize a five (5) foot triangular grid for the indicated treatment area(s).
 - b. The method of installation, materials, equipment, and procedures shall be the same as those to be used for production work.
 - c. Based on the results from the test section, modifications to the Work Plan may be implemented, as needed, to meet the project design. Any changes to the Work Plan will be submitted to the SCDOT following completion of the test program.
 2. The Geotechnical Engineer shall coordinate the following tests of the test section after a minimum wait period of four (4) days from completion of the VC activities of the test program: One (1) CPT (*or* SPT) test performed at the center of a VC probe location, and one (1) CPT (*or* SPT) test performed at the midpoint of adjacent VC probe locations.
 3. The primary method for determining the post-treatment soil strength parameters for production VC work will be from the phi angle correlations in Chapter 7 of the SCDOT Geotechnical Design Manual. These equations are based on either the blow counts as determined from the SPT test, the cone tip resistance as determined from the CPT test, or the horizontal stress index as determined from the DMT test.
 4. The production VC criteria will be based on a minimum applied relative energy for a given time rate. Following completion of the test program, the Geotechnical Engineer will establish criteria for the production VC work.
- D. Daily Records: Monitoring and logging of VC operations for the test area and production

work shall be performed by the Contractor. At a minimum, the following information shall be collected for each VC probe location:

- a. Equipment details and specifications
- b. Embankment location
- c. Probe ID (ie. A-27)
- d. Start and finish time
- e. Maximum recorded energy reading
- f. Depth of treatment
- g. Comments or unusual observations

A sample monitoring log for the VC work is provided with this specification.

- E. Monitoring of Existing Structures: There are no structures within 500 feet of the planned VC work, and, therefore, a vibration monitoring program is not required for the VC work.
- F. The Contractor shall ensure that procedures and documentation conform to these specifications.

METHOD OF MEASUREMENT

The acceptance of the VC work shall be solely based on the results from the pre-treatment test program outlined in this specification. The Geotechnical Engineer shall provide to the SCDOT a signed and sealed statement that the soil improvement conforms to requirements of the project design.

RESTRICTIONS

The Contractor shall be responsible for obtaining the necessary State and municipal permits for the intended construction. The Contractor shall be responsible for the precise delineation of all above and below ground utilities and obstructions and shall accurately mark their layout at the site. The following shall also be listed within this section when applicable:

1. Environmental restrictions
2. Work boundaries
3. Hours and days available for construction

(43) SECTION 205: DEEP SOIL MIXING (DSM):

September 22, 2011

1.0 Description

This work shall consist of using deep soil mixing (DSM) construction techniques (also known as deep mixing methods, DMM) to improve weak subsurface soils by mixing a binder material with in-situ soil to produce a DSM column composed of a soil-binder mixture that has increased compressive strength and stiffness properties compared to the original in-situ soil properties. A column is defined as the extent that the existing ground is improved by insertion and removal of the mixing tool to the full improvement depth required in the plans. DSM column mixing methods allowed are described in subsection 1.1 and DSM column spacing requirements are described in subsection 1.2. The purpose for constructing DSM columns is to improve weak subsurface soils in order to stabilize and/or improve performance of existing ground prior to constructing bridge foundations, embankments, mechanically stabilized earth (MSE) walls, retaining walls, and other transportation structures or facilities as specified herein and shown on the plans and contract documents. References listed in subsection 1.3 may be used in these special provisions and will be used to evaluate this work.

The work covered by this specification includes furnishing all necessary plant, labor, equipment, geotechnical subsurface investigation, pre-production laboratory testing, test section(s), surcharges/berms constructed at the DSM improved locations (if shown in the plans or required to meet DSM column performance requirements), in-situ testing, sampling/coring, QA/QC testing, reporting, and other work described below. The Contractor shall be familiar with project geotechnical conditions and recognize that geotechnical data is available with geotechnical boring logs, laboratory testing results, and other pertinent information.

1.1 DSM Mixing Methods:

This special provision contains specifications for construction of DSM columns by either the wet or dry mechanical mixing method. The Contractor shall use the DSM mechanical mixing method specified in the plans unless other methods are approved in writing by the Engineer. DSM column mixing method for the wet and dry mixing methods are defined as follows:

1. **Wet Method:** The wet method consist of mixing a binder in slurry form (i.e. cement grout) with existing soils using auger-type equipment (paddles, augers, and other rigid mixing tools), without use of externally directed high pressure jets, to form a DSM column consisting of a homogeneous mixture of cement grout and in-situ soils. The wet mixing method typically produces spoils in the range of 10 to 60 percent of the treated volume. A soil-cement column formed by the wet mixing method is abbreviated herein as DSM-SCC).
2. **Dry Method:** The dry method consists of mixing dry binders (i.e. lime-cement or cement) into the in-situ soils. The dry binder is injected into the soil by using air pressure. The mixing tool blends the binder material with the in-situ soil and water to form a DSM column of a homogeneous mixture of binder materials and in-situ soils. The dry mixing method typically produces spoils less than 10 percent of the treated volume. A DSM column (lime-cement or cement) formed by the dry mixing method is abbreviated herein as DSM-LCC.

1.2 DSM Column Spacing:

The DSM columns shall be spaced and arranged as indicated on the plans or as otherwise directed by the Engineer. DSM columns can be constructed by using group column spacing or by using block column spacing as described below:

1. **Group Column Spacing (GCS):** DSM group column spacing (GCS) consists of constructing a single column (no overlap with adjacent DSM columns) with a diameter of 20 to 36 inches or as required in the plans. The DSM columns group spacing is defined in the plans by specifying a pattern (i.e. triangular, grid, etc.) and a center-to-center spacing between DSM columns.
2. **Block Column Spacing (BCS):** DSM block columns spacing (BCS) consists of constructing an improved soil zone with DSM columns overlapping adjacent DSM columns. Since the improved soil zone is continuous, the size of the DSM column is not specified in the plans to accommodate variations in the Contractor's equipment dimensions. As a result of Contractor equipment variations in size, any variations in the dimensions of the zone of ground improvement shown in the plans will require written approval by the Engineer. The center-to-center spacing shall be determined by the Contractor based on the DSM construction equipment in order to provide continuous overlapped DSM columns in accordance with the plans and specifications. Continuous column spacing may be achieved by the use of DSM equipment capable of constructing multiple columns simultaneously. The DSM column overlap distance between adjacent DSM columns shall be a minimum of 20 percent of the DSM column diameter or as approved by the Engineer. The DSM column center-to-center spacing between adjacent columns shall be defined as the DSM column diameter minus the column overlap distance.

1.3 References:

The evaluation of this work, including the DSM Installation Plan, test section(s), QC testing, and QA testing will be based on, but not limited to, the following references:

1. Bruce, D.A. (2000). "An Introduction to the Deep Soil Mixing Methods as Used in Geotechnical Applications, Volume I," FHWA-RD-99-138.
2. Bruce, D.A. (2000). "An Introduction to the Deep Soil Mixing Methods as Used in Geotechnical Applications, Volume II: Appendices," FHWA-RD-99-149.
3. Bruce, D.A. (2001). "An Introduction to the Deep Mixing Methods as Used in Geotechnical Applications, Volume III: The Verification and Properties of treated Ground," FHWA-RD-99-167.
4. Elias, V., Welsh, J., Warren, J., Lukas, R., Collin, J.G., and Berg, R.R., (2006). "Ground Improvement Methods," Volumes I and II, FHWA NHI-06-019 and FHWA NHI-06-020, US Dept. of Transportation, Federal Highway Administration.
5. Filz, G. M., Hodges, D. E., Weatherby, D. E., and Marr, W. A. (2005). "Standardized Definitions and Laboratory Procedures for Soil-Cement Specimens Applicable to the Wet Method of Deep Mixing." *Innovations in Grouting and Soil Improvement*, Reston, Virginia, 13.
6. Filz, G. M. and Stewart, M. E. (2005). "Design of Bridging Layers in Geosynthetic-Reinforced, Column-Supported Embankments." Virginia Transportation Research Council, Charlottesville, VA
7. Jacobson, J. R., Filz, G. M., and Mitchell, J. K. (2003). "Factors Affecting Strength Gain in Lime-Cement Columns and Development of a Laboratory Testing Procedure," Report prepared for the Virginia Transportation Research Council, Virginia Polytechnic Institute and State University, Report No. 57565, FHWA/VTRC 03-CR16.
8. Jacobson, J. R., Filz, G. M., and Mitchell, J. K. (2005). "Factors Affecting Strength of Lime-Cement Columns Based on a Laboratory Study of Three Organic Soils." Deep Mixing'05: International conference on deep mixing best practice and recent advances.
9. Larsson, S. (2005a). "State of Practice Report – Execution, monitoring and quality control," Volume 2, Deep Mixing '05: International Conference on Deep Mixing Best Practice and Recent Advances.
10. Larsson, S. (2005b). "On the use of CPT for quality assessment of lime-cement columns." Deep Mixing '05: International Conference on Deep Mixing Best Practice and Recent Advances.
11. McGinn, A. J. and O'Rourke, T. D. (2003). "Performance of deep mixing methods at Fort Point Channel." Cornell University.

2.0 Materials

2.1 Wet Method (DSM-SCC):

Cement: Portland cement shall be low alkali Type II conforming to Section 701.2.1 and ASTM C150. Slag cement shall conform to Section 701.2.3 and ASTM C 989. All cement shall be homogeneous in composition and properties, and shall be manufactured using the same methods at one plant by one supplier. Tricalcium aluminate content shall not exceed 7 percent.

Water: Water shall conform to the requirements of Section 701.2.11.

Admixtures: Cement admixtures will not be allowed without written approval by the Engineer. Cement admixtures are ingredients that are used to permit efficient use of materials and proper workability of the binder material being mixed into the in-situ soils. The Contractor is required to submit any proposed admixtures and their intended effect when the binder mix design is submitted for approval by the Engineer.

Cement Grout: The cement grout shall be a stable homogeneous mixture of cement, admixtures (if approved), and water in proportions determined by the results of the test

section and approved by the Engineer. The cement grout is mixed with the in-situ soils to form DSM-SCC columns.

Soil-Cement Mixture: The DSM column shall be composed of a stable and uniform soil-cement mixture of cement grout and in-situ soil that meets the project compressive strength and other requirements in the plans and these special provisions. The proposed ratios of concrete grout to in-situ soils and quantities of various components shall be determined by the results of the test section and approved by the Engineer.

2.2 Dry Method (DSM-LCC):

Cement: Portland cement shall be low alkali Type II conforming to Section 701.2.1 and ASTM C150. Slag cement shall conform to Section 701.2.3 and ASTM C 989. All cement shall be homogeneous in composition and properties, and shall be manufactured using the same methods at one plant by one supplier. Tricalcium aluminate content shall not exceed 7 percent.

Quick Lime: Quick lime shall have at least 99 percent passing the #8 sieve (3.18 mm) and at least 90 percent passing a No. 12 Sieve (2.12 mm), an active CaO content greater than 80% and a floatability of 70.

Premixed Lime-Cement: If a premixed quick lime and cement is to be used, the manufacturer of the mixture must certify that the proportions of lime and cement provided are in accordance with the design requirements developed from the test section and approved by the Engineer.

Admixtures: Cement admixtures will not be allowed without written approval by the Engineer. Cement admixtures are ingredients that are used to permit efficient use of materials and proper workability of the binder material being mixed into the in-situ soils. The Contractor is required to submit any proposed admixtures and their intended effect when the binder mix design is submitted for approval by the Engineer.

Binder: The binder will be a stable homogeneous mixture of cement, lime (if applicable), and admixtures (if approved), in proportions determined by the results of the test section and approved by the Engineer. The binder material is delivered using air pressure and is mixed with the in-situ soils to form DSM-LCC columns.

Soil-Binder Mixture: The DSM column will be composed of a stable and uniform soil-binder mixture that meets the project design requirements and these special provisions. The proposed ratios of binder material to in-situ soils and quantities of various components shall be determined by the results of the test section and approved by the Engineer.

3.0 Submittals

A minimum of 45 calendar days prior to beginning the DSM work, the Contractor shall submit a DSM Construction Plan and Shop Plans/Working Drawings for review and approval by the Engineer. The DSM Construction Plan and Shop Plans/Working Drawings shall be prepared, signed, and sealed by an agent/representative of the DSM Contractor that is a professional engineer licensed in the State of South Carolina. The Contractor shall not commence DSM installation without the approval of all submittals by the Engineer. Approval by the Engineer will not relieve the Contractor of its responsibilities to provide materials and equipment necessary to install DSM columns in accordance with the plans and specifications. If, at any time, the Engineer considers that the Contractor's installation operation does not produce a satisfactory DSM column, the Contractor shall alter its method and/or equipment as necessary to comply with the plans and specifications at no additional cost to the Department.

The Contractor shall submit 8 sets of the DSM Construction Plan and 8 sets of Shop Plans/Working Drawings to the Preconstruction Support Engineer (PSE) for review in accordance with the requirements provided herein. Send DSM Construction Plan and Shop

Plans/Working Drawings for projects designed for the Department by a design consultant directly to the consultant. For DSM Construction Plan and Shop Plans/Working Drawings sent to the PSE, send a copy of the transmittal letter to the BCE, the OMR, and the RCE. For Shop Plans sent directly to a design consultant, send a copy of the transmittal letter to the PSE, the BCE, the OMR, and the RCE. Obtain the necessary mailing information at the Preconstruction Conference.

3.1 DSM Construction Plan:

The DSM Construction Plan shall document and provide, as a minimum, the following information:

1. *Qualifications:* Evidence of six years of accumulated experience over a period of 10 years and competence to construct the required DSM columns by the mixing method (i.e. wet or dry) required for the project shall be submitted. As a minimum, the Contractor shall submit a detailed description of three DSM projects completed using the required mixing method within the previous six years that demonstrate the Contractor's experience and competence. Jet grouting or penetration grouting projects will not be acceptable as representative of DSM construction techniques. Each DSM project submitted as proof of experience and competence shall have a minimum total treatment volume of not less than 20 percent of the DSM treatment volume for this project or 30,000 cubic yards of DSM treatment volume, whichever is greater, in high plasticity clay, sand, and silt. At least two of the submitted DSM projects using the required mixing method shall have average treatment depths greater than 60 feet. Each DSM project submitted shall have the following information:
 - a. Project name, location, and completion date.
 - b. Current contact information (address, phone number, and email) of project owner, designer, geotechnical consultant, and contract manager.
 - c. Surface and subsurface conditions, and strength (average, ranges, and means used to determine strength) of DSM columns installed.
 - d. Minimum, maximum, and average rates of DSM installation.
 - e. Project cost and duration of DSM installation.
 - f. Average depths and ranges of depths of DSM columns installed. Provide total linear footage and volume (cubic yards) of DSM columns installed.
 - g. Percent of project total based on QA/QC testing that met the project Acceptance Criteria and percent of project total based on QA/QC testing that required remediation techniques after initial DSM installation.

The Contractor shall also submit a list of completed ground improvement projects where they performed DSM column construction techniques over the past six years that includes items "a" and "e" listed above, type of DSM mixing, and DSM quantity constructed (similar to item "f" above).

The Contractor's proposed DSM superintendent shall have a minimum of three years of accumulated experience with DSM construction equipment and construction management within the past six years. The DSM superintendent shall have been employed by the Contractor for the most recent three years. The proposed DSM superintendent shall have been superintendent for the Contractor on at least one of the three DSM projects submitted by the Contractor as evidence of their experience. Experience and training records shall be submitted for proposed DSM superintendent and operators of construction equipment. Any changes in DSM construction personnel shall require submittal of qualifications for approval.

The Independent Testing Laboratory shall have at least 5-years' experience as a materials testing laboratory, including the performance of testing comparable to that required herein. The person in charge of the testing work for the Independent Testing Firm shall be a Professional Civil Engineer, registered in the

State of South Carolina. The Independent Testing Laboratory's supervisor and each field representative who will take samples in the field shall have at least 5-years' experience in taking concrete samples in the field and performing compressive strength tests in accordance with AASHTO requirements, and be accredited as required by SCDOT to obtain and form concrete test cylinders. The persons who will perform laboratory testing shall have at least 2-years' experience in performing the soil tests required herein.

2. *Protection of Utilities:* Location of all subsurface utilities in the area and the plan to protect them in place if the utilities are not being relocated out of the affected area.
3. *Construction Schedule:* A construction schedule for the DSM work identifying start dates and durations for all portions of the work, including equipment mobilization, equipment setup, test section(s) construction, production DSM construction at each location, and QC testing.
4. *DSM Mixing Method:* Provide the type of mixing method (Wet or Dry) that will be used in accordance with the plan documents to construct the DSM columns in accordance with the plans and these specifications.
5. *Equipment and Procedures:* A detailed description of the equipment (include catalog cut sheets of equipment dimensions) and procedures to be used during all facets of the project including, but not limited to the conduct of the following:
 - a. Test section(s)
 - b. Site preparation
 - c. Stage construction of DSM test section(s) and production DSM (if required)
 - d. Locating the DSM columns in the field
 - e. DSM spoil containment, handling, and disposal
 - f. Confirming method to check that the DSM are installed plumb
 - g. Quality control program
 - h. Monitoring quality control parameters
 - i. Sample collecting for laboratory confirmation testing
6. *DSM Test Section Subsurface Information and Location:* Submit the probe testing results used to pre-approve the location of the test section(s). Provide a minimum of two probe test at each test section in accordance with Section 8.2 for review and approval by the Engineer of the proposed location of the test section(s). Pre-approval of the test section location(s) shall be required before commencing Pre-production field and laboratory testing (Section 4.0). Probe testing shall be conducted to the production DSM depths plus 10 feet that the test section represents. Indicate on a plan drawing the location of the test section(s), dimensions and layout of the test section(s), number of DSM columns (include designation of each DSM column), and location of probe testing performed (Section 8.2). This information should be included in this submittal even if submitted previously during pre-approval of DSM test section location(s).
7. *Pre-Production DSM Binder Mix Design Report:* Final report of pre-production laboratory and field testing used to develop proposed wet or dry binder mix design for the construction of the test section(s). The pre-production laboratory and field testing shall conform to Section 4.0 of this special provision.
8. *Cement and Cement Grout Mix Design (Wet Mixing Method, DSM-SCC):* Proposed cement and cement grout mix design when DSM columns are constructed using the wet mixing method (DSM-SCC). The design shall include the following:
 - a. Cement type and Cement manufacturer's certificate of compliance.

- b. Cement grout water-cement ratio, by weight. Include details to fully describe and illustrate the methods for grout proportioning to achieve the design mix.
- c. Cement Factor (also known as Residual Cement Factor) which is the amount of cement, dry weight in pounds, that remains in the ground after mixing, per cubic yard of in-situ soil-cement.

These mix design parameters will be reviewed based on the pre-production field and laboratory testing results developed in accordance with Section 4.0. The acceptance of the proposed grout mix/soil/cement mix design shall be contingent on the test section(s) results meeting the acceptance criteria of Section 11.0. The Contractor may propose to expand the size of the test section to demonstrate that somewhat different grout water/cement ratio and/or cement factor is workable in achieving the required soil-cement strength under actual in-situ conditions. Provide documentation of calibration of the mixing plant.

- 9. *Binder Mix Design (Dry Mixing Method, DSM-LCC):* Proposed binder mix design(s) when DSM columns are constructed using the dry mixing method (DSM-LCC). Binder mix design shall include all materials, quantities, and dosages required to achieve the Acceptance Criteria (Section 11.0). The design shall include the following:
 - a. Cement type and Cement manufacturer's certificate of compliance.
 - b. Quick lime (if used) manufacturer's certificate of compliance.
 - c. Pre-mixed lime-cement (if used) manufacturer's certificate of compliance
 - d. Binder mix dosage of each material in the binder mix per volume.
 - e. Proportion of binder material to soil in the soil-binder mixture.

These mix design parameters will be reviewed based on the pre-production field and laboratory testing results developed in accordance with section 4.0. The acceptance of the proposed binder and soil/binder mix design shall be contingent on the test section(s) results meeting the acceptance criteria of section 11.0. The Contractor may propose to expand the size of the test section to demonstrate that somewhat different binder mix design is workable in achieving the required soil-binder strength under actual in-situ conditions. Provide documentation of calibration of the mixing plant.

- 10. *Independent Laboratory Testing:* Identification of all independent AASHTO certified materials laboratory testing facilities that will be used on the project and the type laboratory testing that will be conducted at each laboratory. All laboratory testing shall be performed at a materials laboratory with current AASHTO certification for the type of test being conducted. A single independent AASHTO certified materials testing laboratory shall be used to conduct all of the compressive strength testing that will be performed on the project.
- 11. *Calibrations:* Calibration tests for all metering equipment, including mixing systems, delivery systems, alignment systems, mixing tool rotational and vertical speed, injection pressure, rotation penetration/extraction rates, etc. that are applicable to the mixing method being used on the project.
- 12. *Surcharges/Berms:* Details of any surcharges/berms being constructed as indicated in the plans or required to obtain DSM column performance in accordance with plans and specifications. Provide a description of materials used (soil type, atterberg limits, moisture content, etc.), location, and removal schedule (if required). Surcharges that are required to obtain DSM column performance and are not shown in the plans shall be constructed after being approved by the Engineer and at no additional cost to the Department.

13. *Runoff and Spoil Containment (Wet Mixing Method Only)*: Details of all run-off and spoil containment structures will be required when DSM columns are constructed using the wet mixing method (DSM-SCC). These structures will be used to prevent the migration of either cement grout or soil-cement return spoils, disturbed in-situ soils, or other soil material beyond the immediate limits of the soil-cement mixing operation. Also provide description of processes and procedures to be used to collect and retain the soil-cement return and other spoil materials in such manner to allow the spoils to solidify for the necessary time to become a hardened material resembling a hard, dry cohesive material. The resulting hardened spoils shall be disposed of off-site, at no additional cost to the Department.

14. *Daily Production Control Report and Installation Log*: Provide a sample report and installation log in paper and electronic format that will be used to record the construction of all production DSM columns for the required mixing method. The Daily Production Control Report/Log shall contain at least the following information:
 - a. Project Name.
 - b. DSM column number and reference drawing number.
 - c. Date.
 - d. Name of DSM Superintendent and equipment operator.
 - e. Start/Finish time of DSM column installation.
 - f. Machine/Rig Number.
 - g. Type of mixing tool and indicate if single or multiple columns formed per stroke.
 - h. DSM column(s) diameter/size.
 - i. DSM column(s) total length (include top and bottom elevations).
 - j. DSM column center-to-center spacing from adjacent DSM column.
 - k. Verticality of mixing tool in two orthogonal planes for each DSM column.
 - l. Binder mix design designation used.
 - m. A description of obstructions, interruptions, DSM column construction out of tolerance or other difficulties encountered during installation of DSM column and how they were resolved.
 - n. *Material Certifications*: Supplier's certifications of binder materials quality and other additives, if used.

Wet Mixing Method (DSM-SCC) reports shall include the following:

- a. Final current draw for the drilling equipment at the bottom 2 feet of penetration or final hydraulic pressure, if hydraulic motors are used to turn the mixing tools.
- b. Grout injection pressure and volume
- c. Estimate of spoil volume
- d. Target and actual cement factors and grout specific gravity measurements per DSM-SCC column.
- e. Date, time, plan location, and elevation and other details of all soil-cement wet grab samples and any other samples taken during work shift.
- f. The following information shall be logged using automated computer technology for each DSM-SCC installed at intervals no greater than 4 feet and presented in table and graphical forms:
 - Elevation in feet.
 - Mixing tool rotation penetration and withdrawal speed in revolutions per minute vs. depth in feet.
 - Mixing tool rotation penetration and withdrawal rates in feet per minute vs. depth in feet.
 - Mixing tool withdrawal rate in mm/revolution vs. depth in feet.
 - Grout injection rate in gallons per minute vs. depth in feet.

- Average quantity of grout injected in gallons per foot injected per vertical foot of DSM-SCC vs. depth in feet.

Dry Mixing Method (DSM-LCC) reports shall include the following:

- a. Installation air pressure at tip and top of the lime-cement column.
- b. Target and actual binder dosage mixed per DSM-LCC column.
- c. The following information shall be logged using automated computer technology for each DSM-LCC installed at intervals no greater than 4 feet and presented in table and graphical forms:
 - Elevation in feet.
 - Mixing tool rotation penetration and withdrawal speed in revolutions per minute vs. depth in feet.
 - Mixing tool rotation penetration and withdrawal rates in feet per minute vs. depth in feet.
 - Mixing tool withdrawal rate in mm/revolution vs. depth in feet.
 - Quantity of binder reagent (i.e. quick lime, cement, and admixtures) injected in kg/ft
 - Average binder reagent injected in kg per foot injected per vertical foot of DSM-LCC vs. depth in feet.

3.2 Shop Plan/Working Drawing:

The Shop Plan/Working Drawing shall contain the location and extent of all production DSM columns that will be constructed as indicated in the plans. Indicate DSM column spacing and overlap dimensions, including overall dimensions of ground improvement area. Provide the production DSM column numbering system/identification for each location where DSM columns will be constructed. Provide the sequence of DSM column construction that will be used to minimize the effects of ground movements on adjacent existing structures (i.e. MSE walls). The Shop Plan/Working Drawing shall be prepared, signed, and sealed by a professional engineer licensed in the State of South Carolina.

4.0 Pre-Production Field and Laboratory Testing

A pre-production field and laboratory testing program will be required to develop the proposed DSM wet or dry binder mix design prior to the construction of the test section(s). The field testing program consists of conducting a geotechnical subsurface investigation in accordance with subsection 4.1 of this special provision. Soil samples obtained from the geotechnical subsurface investigation shall be used to develop and conduct the pre-production laboratory testing. The pre-production laboratory testing will be required to establish a “base line” of the degree of ground improvement that is possible under optimal construction circumstances for various DSM binder mixes for each distinct soil type that will be encountered during the conduct of the DSM ground improvement. It is recognized that the pre-production laboratory testing will be used as a general indicator of ground improvement that may be obtained in-situ because of substantial differences inherent between laboratory and in-situ mixing conditions. The Contractor shall take appropriate account of these differences, based on published documents and the Contractor’s experience, to develop a DSM binder mix design that can be used for constructing the test section(s) based on the results of the pre-production laboratory testing. A pre-production laboratory testing program shall be required for each test section. A DSM binder mix design shall be developed for each major soil type encountered throughout the depth of ground improvement. As a minimum, two binder mix designs for two types of soil shall be required per test section. The minimum pre-production laboratory testing requirements for wet and dry mixing methods are provided in subsections 4.2 and 4.3 of this special provision, respectively.

The Contractor shall submit the geotechnical subsurface investigation plan of the proposed field sampling and laboratory testing to the Engineer for review and approval a minimum of 14 calendar days prior to commencing the geotechnical subsurface investigation. The Contractor shall submit the results of the geotechnical subsurface investigation and the pre-production laboratory testing plan to the Engineer for review and approval a minimum of 14 calendar days prior to commencing the pre-production laboratory testing. The results of

the pre-production field and laboratory testing along with the proposed DSM binder mix designs shall be included in the DSM Installation Plan submittal in accordance with section 3.0.

4.1 Geotechnical Subsurface Investigation:

In-situ soils used for the pre-production laboratory testing shall be obtained from additional subsurface investigation conducted at or near the location of the approved test section(s) locations. The Contractor shall retain the services of a geotechnical consultant to drill several 3-inch continuously sampled soil borings to obtain sufficient material to perform the pre-production laboratory testing. The sampling shall be performed in such a manner that provides continuous, representative samples of the soil column. This can be effectively accomplished via Geo-probe sampling techniques, undisturbed sampling in fine-grained soils, split-spoon sampling, or any other sampling technique proposed by the Contractor and approved by the Engineer.

Contractor shall check for utility conflicts at boring locations with appropriate utility agencies, survey boring locations and survey locations tied to the project baseline alignment. The borings shall extend from the ground surface to the bottom elevation of the DSM columns shown in the plans to establish general soil and groundwater conditions in the vicinity of the work prior to construction of the test section(s). The geotechnical investigation shall be done in conformance with the latest version of the SCDOT Geotechnical Design Manual (GDM). SCDOT practices including but not limited to boring logs and laboratory data reporting shall be used. The geotechnical consultant shall classify and record soil types within 7 days of obtaining the samples in the field. The Geotechnical consultant shall perform laboratory testing on representative samples of the entire soil profile that will be subject to ground improvement. As a minimum, test six representative samples of cohesive soils taken from different locations and four representative samples of cohesionless soils taken from different locations. The laboratory testing, as a minimum, will consist of the following:

- Cohesive and organic soils (i.e. peat) will be subject to laboratory tests that include, but not be limited to, moisture content, Atterberg limits, organic content, and unconfined compression tests.
- Cohesionless soils will be subject to laboratory tests that include, but not be limited to, grain size analysis, fraction passing #200 sieve, Atterberg Limits, and moisture content.

All soil samples to be used for the pre-production laboratory testing shall be stored in a manner that prevents any loss of moisture and in accordance with ASTM. Do not allow field samples of the clay to lose moisture between the time of removal from ground and pre-production laboratory mixing/testing.

4.2 Pre-Production Laboratory Testing.

Pre-Production laboratory testing will require the development of a DSM binder mix testing program for each type of soil where ground improvement will be performed to demonstrate that the required 28-day compressive strength indicated in the plans will be achieved. The soils obtained from the geotechnical subsurface investigation performed (Subsection 4.1) will be used to perform the laboratory testing. All soil and mixed samples shall be kept out of sunlight at 70 degrees F and under fully humid conditions throughout storage and curing that prevents loss of sample moisture via evaporation.

DSM constructed using the wet mixing method (DSM-SCC) will require that the testing laboratory prepare the soil, mix the binder reagent (i.e. cement, etc.) and water to make grout, and then mix grout and soil together. The specimens shall be mixed using a minimum of four different DSM binder mixes to provide insight into the relationship of cement factor and grout water/cement ratio on the 28-day compressive strength of the soil-binder specimens. Binder materials and individual proportions of cement or admixtures (if used) used shall be documented for each specimen. The procedures

outlined by Filz and Stewart (2005) may be used to provide guidance in developing a laboratory testing program.

DSM constructed using the dry mixing method (DSM-LCC) will require that the testing laboratory prepare the soil, binder reagent, and then mix the soil (at the same in-situ moisture) and binder reagent together. The specimens shall be mixed using a minimum of four different DSM binder mixes to provide insight into the relationship of binder proportions on the 28-day compressive strength of the soil-binder specimens. Binder materials and individual proportions of lime, cement, and admixtures (if used) used shall be documented for each specimen. The procedures outlined by Jacobson et. al (2003, 2005) may be used to provide guidance in developing a laboratory testing program.

All test specimens shall be prepared using the lab mixing energy level similar to energy levels used by the Contractor's field equipment. Test specimen cylinders shall be prepared according to procedures submitted to the Department and approved. Strength test three cylinders of soil-binder mixture at 3, 7, 14, 28, and 56 days following mixing. Strength testing shall be performed in accordance with subsection 8.4.

5.0 Delivery, Storage, and Handling of Materials

5.1 DSM Wet Mixing Method (DSM-SCC):

Portland cement shall be measured, handled, transported, and stored in bulk in accordance with the manufacturer's recommendations. Portland cement packaged in cloth or paper bags shall be sealed with plastic or rubber vapor barriers. The Portland cement shall be stored to prevent damage by moisture. Materials that become caked due to moisture absorption shall not be used. Bags of cement shall be stacked no more than ten bags high to avoid compaction. Cement containing lumps or foreign matter of a nature that may be deleterious to the grout mixing or delivery or injection operations shall not be used.

5.2 DSM Dry Mixing Method (DSM-LCC):

The quicklime and cement shall be stored in closed pressure tanks suitable to be used as pressure vessels, for all pressures required, including those used to load and unload the materials. Delivery trucks shall be loaded at the manufacturer's plant unless approval is given for an intermediate storage facility. Each truck shall have a certified record of the weight of each load of material. The material shall be transported to the project site and blown into the on-site storage tanks using a pneumatic system. The air evacuated from the storage tanks during the loading process shall be filtered before being discharged to the atmosphere. A sealed refilling machine shall be used to transport material from the storage tanks to the DSM column mixing machine. This machine shall be refilled using a pneumatic system and an air filter, as specified above.

6.0 Installation Equipment

The DSM column construction equipment and support equipment shall be equipped with mixing tools that are capable of thoroughly blending the in situ soils and binder material into a homogeneous column of soil-binder to the depths and size required in the plans. The equipment shall be capable of advancing through previously installed and cured DSM columns as necessary for installing overlapping and end junction DSM columns. The DSM columns shall be constructed using computerized self-contained construction equipment.

6.1 DSM- SCC Construction Equipment:

The DSM-SCC construction equipment shall meet the following requirements:

1. DSM-SCC shall be constructed using real-time computerized self-contained DSM-SCC construction equipment capable of monitoring, controlling, and recording installation data. The DSM-SCC construction equipment shall be equipped with electronic sensors, built into the soil mixing equipment, to perform the following:

- a. Determine vertical alignment of the leads in two directions: fore-aft and left-right. The verticality shall be measured using instrumentation that is capable of measure deviations from verticality to an equivalent of 1-inch in 100-feet.
 - b. Monitor cement and water proportioning, grout mixing, and water-cement ratios.
 - c. Monitor the mixing tool depth and penetration/withdrawal speed, and mixing tool rotation speed.
 - d. Monitor mixing tool withdrawal speed, and mixing tool rotation speed.
 - e. Monitor injection quantities and pressure with flow meter and other measuring equipment having precision accuracy not less than 99.5 percent.
 - f. All output from the sensors shall be routed to a console that is visible to the operator and the Engineer during penetration and withdrawal.
 - g. The sensors shall be calibrated at the beginning of the project and calibration data provided to the Engineer. The calibration shall be repeated at intervals not to exceed one month.
 - h. All of these monitored functions shall be fully adjustable during operation of the equipment.
2. The DSM-SCC construction equipment power source for driving the mixing tool shall be sufficient to maintain the required revolutions per minute (RPM) or injection pressure and penetration rate from a stopped position at the maximum depth required as determined from the test section(s) for group and/or block DSM column spacing. The Contractor shall also consider the wide range of expected subsurface conditions, indicated by the available geotechnical information.
 3. The DSM-SCC construction equipment shall utilize sufficient mixing and injecting equipment to adequately produce a homogeneous distribution of cement grout throughout the mixed in-situ soils that meet the acceptable criteria. The mixing tools shall uniformly inject cement grout through hollow stem or other piping at locations that distribute the grout across the full diameter of the mixing tools and such that the full auger/mixing paddle assembly passes through the column of soil after the grout is introduced, on both the insertion and withdrawal strokes. Grout shall only be injected in direction within the diameter of the augers or mixing paddles. If grout injection jets are used, they shall not spray beyond the auger diameter.
 4. Continuous auger flights longer than 3 feet or with more than one full, uninterrupted revolution of auger are not allowed as part of the mixing tools. Auger flights and mixing paddles on a shaft shall all reach to the full column diameter, and shall have discontinuous lengths and be so oriented as to thoroughly break up the in-situ soils, and disperse and blend soils with injected cement grout to form a homogeneous soil-cement mixture.
 5. The auger mixing equipment shall form the required diameter and size of the DSM-SCC as submitted by the Contractor's approved submittals.
 6. Injection volume estimates shall be only made by precision inline flow meters. Counting or measuring grout pump strokes shall not be acceptable. Injection quantities must be measured in real time by direct measurements of volume and/or mass for each DSM column having injection capabilities, with flow meters and other measuring equipment having precision accuracy not less than 99.5%. Gages and flow meters and other measuring equipment shall be calibrated and certified as precise and accurate before the start of the equipment's work on the project, and then again every 4 months.
 7. The DSM-SCC construction equipment shall be adequately marked to allow the Engineer to confirm the penetration depth to within 6 inches during construction.
 8. The cement grout batching plant shall include all storage silos and sheds, pumps, scales, mixers, valves, gauges, and regulating devices required to continuously

measure and mix cement grout in real time. Grout shall be mixed in a mixing plant, using a batch process, which combines dry materials and water in predetermined proportions. The plant mixer shall consist of grout mixer, grout agitator, grout pump, automatic batching scales, and a computer control unit. The mixing plant shall meet the following requirements:

- a. To accurately control grout mix proportions, the addition of water and cement shall be determined by weight using automatic batch scales in the mixing plant.
 - b. Admixtures, if used, may be delivered to the mixing plant by calibrated auger provided the Contractor can demonstrate that the auger can deliver the material at the same accuracy as by weight.
 - c. The mixing components shall be calibrated prior to beginning the work and monthly thereafter. The calibration data shall be provided to the Engineer.
 - d. The mixing plant shall have tanks or silos with adequate storage for continuous production. The tanks shall be equipped with air filters.
9. Positive displacement pumps shall be used to transfer the grout from the mixing plant to the mixing tool. If the DSM-SCC construction equipment has multiple shafts, and multiple mixing tools, the grout shall be delivered to each shaft by an individual positive displacement pump.
10. All gauges, flow meters, metering equipment, and other measuring equipment shall be calibrated and certified as precise and accurate before starting DSM column construction (i.e. test section(s) or production DSM columns), and then again every 4 months or at least every 325,000 feet of DSM column installed, whichever is sooner. The calibrations and certifications shall be supplied to the Engineer.

6.2 DSM- LCC Construction Equipment:

The DSM-LCC construction equipment shall meet the following requirements:

1. DSM-LCC shall be constructed using real-time computerized self-contained DSM-LCC construction equipment capable of monitoring, controlling, and recording installation data. The DSM-LCC construction equipment shall be equipped with electronic sensors, built into the soil mixing equipment, to perform the following:
 - a. Determine vertical alignment of the leads in two directions: fore-aft and left-right. The verticality to an equivalent of 1-inch in 100-feet.
 - b. Monitor the mixing tool depth, penetration/withdrawal speed, mixing tool rotation speed, and injection pressure.
 - c. All output from the sensors shall be routed to a console that is visible to the operator and the Engineer during penetration and withdrawal.
 - d. The sensors shall be calibrated at the beginning of the project and calibration data provided to the Engineer. The calibration shall be repeated at intervals not to exceed one month.
 - e. An alternative display/monitoring system may be used subject to review and approval by the Engineer prior to use.
 - f. All of these monitored functions shall be fully adjustable during operation of the equipment.
2. The DSM-LCC construction equipment power source for driving the mixing tool shall be sufficient to maintain the required revolutions per minute (RPM) or injection pressure and penetration rate from a stopped position at the maximum depth required as determined from the test section. The Contractor shall also consider the wide range of expected subsurface conditions, indicated by the available geotechnical information.
3. The DSM-LCC construction equipment shall be adequately marked to allow the Engineer to confirm the penetration depth to within 6 inches during construction.

4. All gauges, flow meters, metering equipment, and other measuring equipment shall be calibrated and certified as precise and accurate before the starting DSM column construction (i.e. test section(s) or production DSM columns), and then again every 4 months or at least every 325,000 feet of DSM column installed, whichever is sooner. The calibrations and certifications shall be supplied to the Engineer.

7.0 Construction Requirements

The Contractor shall furnish all materials, labor and equipment necessary to construct the DSM columns in accordance with the plans and specification. The DSM columns shall be constructed to the lines, grades, and cross sections indicated in the Plans. The completed DSM improved zone shall be a homogeneous mixture of binder material constructed in accordance with the method of mixing and column spacing indicated in the plans.

Production DSM shall be constructed using the same equipment and construction criteria (i.e. mix design, mixing parameters, etc.) established in the accepted test section construction (subsection 9.0). DSM construction that is out of tolerance (subsection 7.4) or is subject to unforeseen conditions (subsection 7.5) shall be evaluated and corrected as approved by the Engineer with no additional cost or schedule impact to the Department.

7.1 Site Preparation:

The presence and location of buried pipes, sewers, and other utilities shall be identified and precautions taken to protect the utilities from damage during the construction of the DSM columns. The Contractor shall be responsible for any damage resulting from the construction of the DSM columns. The site shall be cleared and grubbed in accordance with the Contract documents. Limit grubbing to that needed to remove previous construction materials, trees, stumps, and large roots. Fill in holes left by construction materials, stumps and root extraction and grade to provide level working surface. Place bridge lift materials as required in the plans and contract documents.

Establish DSM column limits and locations by a licensed surveyor. Individual column locations shall be marked. Sufficient horizontal and vertical control shall be provided to establish that DSM columns are located accurately and reach the required plan depths.

7.2 DSM-SCC Soil-Grout Mixing:

Soil shall be broken up and blended with grout in place by the pugmill type action of the soil mixing equipment. The completed DSM-SCC shall be a uniform mixture of cement and the in situ soils. The soil-grout mixture shall achieve an average unconfined compressive strength in 28 days as indicated in the plans. Soil mixing shall be performed with the following minimum requirements:

1. *Grout Preparation:* The dry materials shall be fed to the mixers for agitation and shearing. The mixing ratio of the grout shall be controlled by measuring the weight of grout components using automatic batch scales in the mixing plant. Grout mixture shall be mixed for a minimum of three minutes, with a maximum holding time of two hours, calculated from the beginning of initial mixing. The specific gravity of the grout (determined in the test section) shall be tested at least once per shift per rig, using the methods outlined in ASTM D 4380, and shall not deviate more than three percent from the calculated specific gravity for the design cement ratio. Additional tests may be required by the Engineer. If the specific gravity or density is lower than the design mix, the Contractor shall add additional cement, remix, and/or recalibrate batch scales and retest the grout until the design density is achieved, at no additional cost to the Department.
2. *Grout Injection:* The grout shall be pumped through and injected from the mixing tool. The grout injection rate per vertical foot of DSM-SCC shall be in accordance with the requirements of the design mix established during the test section. Injection rates falling below this requirement, shall require the DSM-SCC to be remixed and additional grout injected (at the design grout-soil ratio) to a depth at

least three feet below the deficient zone, at no additional cost to the Department. The Contractor may sample using wet grab methods for his own purposes. The Department will not accept results from wet sampling for quality control purposes.

3. *Rotation Speeds:* The mixing tool rotational speeds (measured in RPM) and penetration/withdrawal rates shall be in accordance with the parameters established during the test section(s). If these parameters are varied more than 15 percent from those determined during the test section(s), the DSM-SCC section shall be remixed while injecting grout at the design grout ratio to a depth at least three feet below the deficient zone, at no additional cost to the Department.
4. *On-Board Computer:* The preset data in the on-board computer shall be verified for each column as correct and adjusted if necessary. The operator shall monitor and adjust as necessary during column installation the feeding of material, the grout injection rate, the mixing tool rates of rotation, and penetration/withdrawal rates of the mixing tool.
5. *Changes in Grout Mix Design:* The Contractor may request that the established grout mix be modified during the production DSM-SCC installation. To verify acceptable results for the modified mix design, the Engineer may require additional testing or a new test section, at no additional cost to the Department.
6. *Spoils:* During the course of soil-cement stabilization, return/spoil material shall not be dumped into or otherwise be allowed to enter the soil-cement column. The Contractor shall develop a spoil containment system that allows the channeling of the spoils to the temporary holding pit in such a direction and manner as to keep the spoils away from the site perimeter, and out of the traveled paths. Soil-cement return and spoil material shall be piped or channeled to holding ponds or other retention structures within the work area. The Contractor shall remove all excess grout and grout mixed soil generated from ground improvement activities from the construction site in accordance with the approved DSM Installation Plan.

The Contractor shall take all necessary precautions and implement measures to prevent any soil-cement return, other spoil material or stockpiled materials from entering storm drain structures, drainage courses, other utility lines, or from leaving the site via surface runoff. The Contractor shall prevent soil-cement return, fluid, ponded spoil material, or stockpiled solidified materials from migrating into any water body. In the event soil-cement return, spoil material or stockpiled materials enter storm drain structures, drainage courses, or other utilities, including, but not limited to, surface water bodies beyond site limits of soil-cement mixing operations, the Contractor shall collect and remove all of these materials, and perform all other required/necessary remediation that may be directed by the Engineer or responsible environmental agency, at no additional cost or schedule impact to the Department. The Contractor shall conduct all soil-cement operations to conform to sedimentation and turbidity control requirements of federal, state, and local agencies having jurisdiction over the work.

7. *Delays:* The installation of each DSM-SCC column shall be continuous without interruption. If an interruption of more than two hour occurs, the DSM-SCC shall be remixed for the entire column height using fresh cement grout as though there had not been any cement grout installed, or the column may be abandoned, at no cost or schedule impact to the Department. The Contractor shall install additional columns if the interrupted columns cannot be acceptably remixed.
8. *Instability:* Soil-cement column which exhibits partial or total instability at any time, or collapses as a result of mechanical failure of any equipment; inadequacy of cement, water supplies, cement grout; improper drilling, injection or mixing

procedures; or other cause, the Contractor shall halt DSM-SCC construction and backfill to ground surface with cement grout. After the backfill has attained sufficient strength to stabilize the ground, complete the required installation by re-drilling from ground surface, at no additional expense to the Department. The Engineer will evaluate the potential impacts of the instability and may require one or more additional re-drilled columns at overlapping or adjacent locations as determined by the Engineer, and at no additional expense to the Department.

9. *Daily Quality Control Report:* The Contractor shall submit a Daily Quality Control Report for each day that DSM-SCC work is performed. The log shall contain as a minimum the information listed in Section 3.0. The report shall be delivered to the Engineer by the end of the next working day following the report date.
10. *Protective Covers:* Immediately after completing a soil-cement column, the Contractor shall install protective covers to prevent persons from falling or stepping into the unhardened soil-cement column.

7.3 DSM-LCC Soil-Binder Mixing:

Soil shall be broken up with the mixing tool. As the mixing tool is raised the binder material (i.e. lime-cement or cement) is injected using air pressure. The binder-soil mixture shall achieve an average unconfined compressive strength in 28 days as indicated in the plans. Soil mixing shall be performed with the following minimum requirements:

1. *Binder Injection:* The binder (i.e. lime-cement or cement) volume flow rate per vertical foot of DSM-LCC shall be in accordance with the requirements of the design mix established during the test section. Injection rates falling 10 percent below this requirement, shall require the DSM-LCC to be remixed and additional binder injected (at the design rate) to a depth at least three feet below the deficient zone, at no additional cost to the Department.
2. *Rotation Speeds:* The mixing tool rotational speeds (RPM) and the penetration/withdrawal rates shall be in accordance with the parameters established during the test section(s). If these parameters are varied by more than 15 percent from those determined during the test section(s), the DSM-LCC section shall be remixed using the design binder volume flow rate to a depth of at least three feet below the deficient zone, at no additional cost to the Department.
3. *On-Board Computer:* The preset data in the on-board computer shall be verified for each column as correct and adjusted if necessary. The operator shall monitor and adjust as necessary during DSM column installation the feeding of material, the injection air pressure, and the rates of rotation and rise.
4. *Changes in Binder Mix Design:* The Contractor may request that the established mixing parameters be modified during the production DSM-LCC installation. To verify acceptable results for the modified parameters, the Engineer may require additional testing or a new test section, at no additional cost to the Department.
5. *Delays:* The installation of each DSM-LCC column shall be continuous without interruption. If an interruption of more than two hours occurs, the DSM-LCC shall be remixed for the entire column height using design binder rates as though there had not been any binder installed, or the column may be abandoned, at no cost or schedule impact to the Department. The Contractor shall install additional columns if the interrupted columns cannot be acceptably remixed.
6. *Daily Quality Control Report:* The Contractor shall submit a Daily Quality Control Report for each day that DSM-LCC work is performed. The log shall contain as a minimum the information listed in Section 3.0. The report shall be delivered to the Engineer by the end of the next working day following the report date.

7.4 DSM Column Construction Tolerances:

1. *Horizontal Alignment:* The location of the DSM column shown in the Plans shall be accurately staked by a licensed surveyor before beginning installation. The horizontal alignment of DSM columns with group column spacing (GCS) shall be within 4 inches of the planned DSM top location. The horizontal alignment of DSM columns with block column spacing (BCS) shall be within 20 percent of the DSM column diameter, not to less than four inches, of the planned DSM top location in order to obtain sufficient DSM column overlap.
2. *Vertical Alignment:* The equipment operator shall control vertical alignment of the equipment and constructed DSM column. Two measures of verticality shall be monitored, longitudinal and transverse to the DSM column alignment. The DSM column shall be installed at an inclination that deviates no more than 1:100 (horizontal to vertical).
3. *DSM Column Lengths:* The tops of the DSM columns shall begin at the ground surface. The top of DSM column elevations shown in the plans are approximate. Natural soils above the water table, at the completion of DSM installation, shall have been treated to produce the full column design strengths up to within 3 feet of the ground surface. If the top of the DSM columns is being constructed within a surcharge or berm, the top of DSM column elevations shown in the plans shall be used.

The bottom of DSM columns shall extend to the line and grades shown in the plans. The DSM column bottom elevations indicated in the Plans provide the minimum required penetration of the DSM columns. The Engineer may require the Contractor to shorten or deepen the bottom of DSM columns indicated in the plans.

4. *DSM-LCC Width:* When DSM columns are constructed using group column spacing (GCS) the DSM column diameter shown in the plans shall be the minimum required diameter. The diameter of DSM columns constructed using block column spacing (BCS) may vary to accommodate variations in the Contractor's equipment dimensions, provided that the plan area of ground improvement does not exceed the dimensions shown in the Plans more than six inches and is approved by the Engineer.

7.5 Unforeseen Conditions and Corrective Remediation:

Unforeseen conditions that result in deficient DSM column construction shall be remediated by the DSM Contractor at no additional cost to the Department. DSM column construction deficiencies and how they were addressed shall be noted in the DSM Daily Production Control Report and Installation Log. DSM column deficiencies that result from changes in rotation speeds of mixing tools, rate of penetration/withdrawal of mixing tools, changes in the rate of grout/binder injection, delays, or changes in binder mix shall be corrected as indicated in subsections 7.2 and 7.3 for DSM-SCC mixing and DSM-LCC mixing, respectively.

If unforeseen conditions result in DSM column interruptions that do not meet the DSM construction requirements (subsections 7.2 or 7.3), the DSM column installation shall be re-drilled a minimum of 1 foot below the elevation of the interruption and the DSM column construction restarted.

When interruption of the installation process occurs because of unknown obstructions or a very dense layer above the planned tip elevation, the Contractor shall document the interruption on the DSM Daily Production Control Report and Installation Log and notify the Engineer in writing by the end of that day of such encounter and shall provide all pertinent information relating to DSM column identification, plan location coordinates, depth, and expected extent of the obstruction. The Contractor shall be prepared to

penetrate very dense layers by first removing mixing tools from the excavation and then using auger drilling equipment or other approved methods to allow the installation of the DSM column. When unknown obstructions are encountered, the Contractor shall submit a proposal to the Engineer for review that delineates the Contractor's proposed means and methods to overcome the unknown obstruction, including equipment and labor time estimated for this operation. Such construction to remove an unanticipated obstruction shall only be performed with the written authorization of the Engineer. When the obstruction cannot be penetrated or removed, the DSM column shall be completed to the maximum depth penetrated. The need for an alternate design or remedial construction shall then be determined by the Engineer.

Deficient DSM columns due to out of tolerances (subsection 7.4) or not in compliance with DSM construction acceptance (subsection 7.6) will require that the DSM Contractor to submit proposed remedial measures to the Engineer for review and approval. Remedial plans shall show the location, depth, construction exceptions requested, and proposed method of remediating the deficient DSM ground improved areas. Remedial plans, if accepted, shall be at no cost or schedule impact to the Department.

7.6 DSM Construction Acceptance:

The QC reporting (logs), testing, and acceptance procedures for the DSM test section(s) and production DSM columns shall be the same. QC testing methods are described in Section 8.0 and Acceptance Criteria are provided in Section 11.0.

8.0 DSM Testing Methods

QC testing of DSM columns consists of using field and laboratory testing techniques to evaluate the integrity, consistency, and strength of the DSM column for the entire full depth of soil improvement. QC testing methods that will be used include probe testing (subsection 8.1), soil borings and undisturbed sampling with Shelby tubes (subsection 8.2), and coring and sampling (subsection 8.3). Samples obtained by undisturbed sampling with Shelby Tubes or coring shall have samples tested for compressive strength testing (subsection 8.4). DSM testing shall be conducted in accordance with the SCDOT Geotechnical Design Manual, version 1.1 (2010), or later.

The results of the compressive testing shall be used to develop correlations for use with probe testing and therefore improve the reliability of the probe testing results. This will be accomplished by performing continuous undisturbed Shelby tube sampling and/or coring in one quadrant of the DSM column and probe testing in another quadrant of the same DSM column.

Any of the DSM testing methods presented may be used on production DSM columns to evaluate deficiencies based on construction records or field observations.

8.1 Probe testing:

1. Probe testing shall be conducted using the seismic cone penetrometer test with pore pressure measurements (SCPTu). The SCPTu testing results (i.e. tip resistance, friction sleeve resistance, pore pressure, and shear wave velocity vs. depth of penetration) shall be provided graphically and in electronic file format to the Engineer.
2. Probe testing shall be performed in the presence of the Engineer, unless otherwise directed. The Contractor shall notify the Engineer at least seven calendar days in advance and confirmed 2-days (48 hours) prior to beginning SCPTu operations.
3. The SCPTu testing shall be conducted in accordance with the SCDOT Geotechnical Design Manual.
4. Probe testing shall be performed after the soil-binder mixture has hardened sufficiently, but before it has cured to the extent to cause refusal to the SCPTu equipment.
5. Unless directed otherwise by the Engineer, probe tests shall be performed along an essentially vertical alignment located within one of the quadrants of the DSM column and shall include inclinometer measurements that confirm the verticality of the SCPTu test data such that the entire probe test is determined to have been

advanced within the DSM column. The SCPTu shall be taken at a distance of $2/5$ the DSM column radius from the center of the DSM column.

6. If seismic cone shear wave testing results are inconclusive, the SCPTu may be discontinued and cone penetrometer test with pore pressure measurements (CPTu) may be used with written approval from the Engineer.
7. The CPT testing equipment shall be sized to allow full penetration and testing to the depth of the planned test DSM column plus 10 feet.
8. If standard full-size CPT truck equipment (i.e. 20-30 ton reaction truck) is not capable of testing to the desired depths, the Contractor shall conduct SPT testing in accordance with the SCDOT Geotechnical Design Manual, at no additional cost to the Department. SPT shall be conducted on a maximum five foot center interval to the depth of the planned test DSM column plus 10 feet.
9. All probe test holes shall be filled with cement grout that will obtain 28-day strength equal to or greater than the DSM column compressive design strength required in the plans.

8.2 Soil Borings and Undisturbed Sampling:

1. Soil borings and undisturbed Shelby tube sampling shall be performed in the presence of the Engineer, unless otherwise directed. The Contractor shall notify the Engineer at least seven calendar days in advance and confirmed 2-days (48 hours) prior to beginning soil boring operations.
2. Soil borings and sampling shall be conducted in accordance with the SCDOT Geotechnical Design Manual.
3. High quality undisturbed sampling shall be obtained after the soil-binder mixture has hardened sufficiently to a minimum compressive strength of 3 psi (430 psf) but not greater than 55 psi (7,900 psf).
4. Unless directed otherwise by the Engineer, soil borings shall be obtained along an essentially vertical alignment located within one of the quadrants of the DSM column. The soil boring shall be taken at a distance of $2/5$ the DSM column radius from the center of the DSM column.
5. Sampling shall be conducted using a thin wall Shelby tube sampler and/or pitcher barrel sampler in accordance with the SCDOT Geotechnical Design Manual.
6. Upon Shelby tube retrieval, the samples shall be logged visually without extraction of the samples from the Shelby tube and sealed to prevent loss of moisture during transport.
7. Undisturbed samples shall be transported by the Contractor to the independent AASHTO certified materials testing laboratory where the samples will be extracted, stored, and tested.
8. Upon extraction of the samples at the independent materials testing laboratory, the samples shall be logged and documented by taking pictures. The percent recovery per Shelby tube sampler based on the sampler penetration shall be documented. Samples shall be selected for testing and submitted to the Engineer for approval. Samples shall be stored and cured in accordance with ASTM D 1632 until the test date.
9. All soil boring holes shall be filled with cement grout that will obtain 28-day strength equal to or greater than the DSM column compressive design strength required in the plans.

8.3 Coring and Sampling:

1. Coring/sampling shall be performed in the presence of the Engineer, unless otherwise directed. The Contractor shall notify the Engineer at least seven calendar days in advance and confirmed 2-days (48 hours) prior to beginning coring/sampling operations.
2. High quality continuous core sampling shall be obtained after the soil-binder mixture has hardened sufficiently to approximately a compressive strength of 42 psi (6,050 psf).
3. Unless directed otherwise by the Engineer, core runs shall be obtained along an essentially vertical alignment located within one of the quadrants of the DSM column.

The core run shall be taken at a distance of 2/5 the DSM column radius from the center of the DSM column.

4. Coring shall be conducted using double or triple tube samplers to obtain samples of 2.5 inches in diameter or greater. Triple tube core barrel may be required by the Engineer, at no additional cost to the Department, if the sample quality of the double tube core barrel is not providing high quality samples suitable for compression strength testing.
5. Each core run shall be at least four feet in length and contain at least four acceptable test specimens. Three samples per core run are required to perform compressive strength testing with one reserve sample.
6. A minimum core run recovery of 85 percent for each 4-foot-long core run shall be achieved. During coring, the elevation of the bottom of the holes shall be measured after each core run in order that the core recovery for each run can be calculated. The core recovery and RQD for every core run shall be reported in the logs. Additional cores may be required, at no additional cost to the Department, if core run recovery is less than 85 percent.
7. Upon retrieval, the samples shall be field logged and documented by taking pictures. Samples shall be selected for testing and submitted to the Engineer for approval.
8. Following logging and test specimen selection, the entire full-depth sample, including the designated test specimens, shall be immediately sealed in plastic wrap to prevent drying, placed in suitable core boxes, and transported to the materials testing laboratory by the Contractor within 24 hours.
9. All core holes shall be filled with cement grout that will obtain 28-day strength equal to or greater than the DSM column compressive design strength required in the plans.
10. Cores shall be transported by the Contractor to the independent AASHTO certified materials testing laboratory where the samples will be stored and tested. Samples shall be stored and cured in accordance with ASTM D 1632 until the test date.

8.4 Strength Testing of Samples:

1. All samples shall be kept out of sunlight at 70 degrees F and under fully humid conditions throughout storage and curing that prevents loss of sample moisture via evaporation.
2. Samples suitable for strength testing shall have a height to diameter ratio of 2.0.
3. Strength testing shall be performed by unconfined compression testing method per AASHTO specification T-208-96, but with strain rate not faster than 0.5% per minute, but not slower than 0.25%/minute, and with test equipment set up to record in both tabular and graphical form the axial stress and strain constant increments of axial strain no larger than every 0.05% axial strain. The Contractor will be permitted to perform UU Triaxial Compressive Tests, with approval of the Engineer, in lieu of performing unconfined compressive strength test, at no additional cost to the Department.
4. Compressive strength testing results shall be transmitted to the Engineer for review within 24 hours of the compression test completion. The remaining portions of the full-depth samples that are not tested shall be retained by the Contractor, until completion and acceptance of the work, for possible inspection and confirmation testing by the Engineer.

9.0 DSM Test Section and QC Testing Program

The QC testing program for each test section will be submitted to the Engineer within 5 days after test section DSM column installation and shall be based on the results of DSM pre-production laboratory testing, early probe testing (3 and 5 days after column installation), and review of samples obtained for strength testing. The approved compressive strength testing program (i.e. Plan location, sample depth, and elapsed time after construction to perform compressive testing) shall then be submitted to the Contractor's independent AASHTO certified laboratory testing firm.

Unless otherwise directed by the Engineer, a minimum of four Plan locations shall have QC testing, per test section. QC testing at each Plan location shall consist of full-depth continuous soil borings or corings per subsections 8.2 and 8.3, respectively. Soil boring or coring sampling shall be performed in one DSM column quadrant, while probe testing, per subsection 8.1, shall be performed in another DSM column quadrant. A minimum of six samples at each QC testing Plan location shall be selected by the Contractor and approved by the Engineer for compressive strength testing. Compressive strength testing of cores (subsection 8.4) and probe testing (Section 8.1) at QC testing Plan locations shall be conducted at 7, 14, 28, and 56 days after test DSM column installation. The results of the compressive testing shall be used to develop correlations for use with probe testing and therefore improve the reliability of the probe testing results. A test DSM column compressive strength testing report shall be compiled by the independent testing company and submitted to the Contractor and the Engineer. The compressive strength testing report shall document the soil boring/core sampling and compressive strength testing conducted on the cores.

In addition to probe testing conducted at QC testing Plan locations, full depth probe testing shall be conducted at two separate plan locations within the test section in separate DSM column quadrants at 3, 7, 14 and 28 days after test DSM column installation. A probe testing report shall be compiled of all testing results in accordance with Section 7.2.

The Contractor shall use the results of the test sections to establish the DSM production construction criteria. The DSM production construction criteria shall be developed to produce DSM columns that meet the Acceptance Criteria in Section 11.0. DSM production construction criteria for DSM columns shall include as a minimum, the following criteria.

DSM-SCC Production Construction Criteria:

1. Grout mix design including ratios of all materials mixed to form the grout.
2. Grout specific gravity.
3. Grout injection rates.
4. Type of equipment.
5. Mixing tool penetration and withdrawal rates.
6. Mixing tool rotation speed.
7. Construction procedures and techniques.

DSM-LCC Production Criteria:

1. Binder mix design including ratios of all materials (i.e. lime-cement or cement) mixed to form the soil-binder material.
2. Lime-cement injection rates.
3. Type of equipment.
4. Mixing tool penetration and withdrawal rates.
5. Mixing tool rotation speed.
6. Construction procedures and techniques.

The Contractor shall use the results of the test sections to establish the Production Quality Control (QC) testing program per Section 10.0.

Construction of production DSM columns may begin only after written acceptance by the Engineer of the "DSM Production Construction Criteria" and the "Production Quality Control (QC) Testing Program." If construction criteria, construction procedures, equipment, new mobilizations, or changes in personnel are made, following acceptance of the test sections, the Department reserves the right to require the Contractor to construct a new test section at no additional cost to the Department.

10.0 Production QC Testing Program

The Production QC Testing program shall be developed by the Contractor and approved by the Engineer. The Production QC Testing program will be required to include probe testing per subsection 8.1 and strength testing of samples per subsection 8.4. The following minimum requirements shall be used to developing the Production QC Testing Program:

DSM QC Testing Program Minimum Requirements:

1. The Production QC Testing Program goal is to establish continuity/integrity of the columns and to obtain a measure of their strength. This is accomplished by using the QC Testing to evaluate if the DSM ground improvement is meeting the Acceptance Criteria in Section 11.0.
2. Provided that acceptable correlations can be developed between probe testing and compression strength testing, QC probe testing per subsection 8.1 shall be performed at a minimum frequency of 5 percent of production columns (1:20) but not less than 1 QC probe test for every 200 cubic yards of DSM stabilized volume.
3. One Soil boring/Coring full depth of DSM columns plus 10 feet with a minimum of one strength test per 5 feet of penetration of stabilized soil (Section 8.0) shall be obtained adjacent to probe testing (adjacent DSM quadrant) at a minimum frequency of 0.5 percent of production columns (1:200) but not less than 1 QC probe test for every 2,000 cubic yards of DSM stabilized volume.
4. If acceptable correlations cannot be developed between probe testing and compression strength testing, one Soil boring/Coring full depth of DSM columns plus 10 feet with a minimum of one strength test per 5 feet of penetration of stabilized soil (Section 8.0) shall be obtained adjacent to probe testing (adjacent DSM quadrant) at a minimum frequency of 1.0 percent of production columns (1:100) but not less than 1 QC probe test for every 1,000 cubic yards of DSM stabilized volume.
5. The QC Testing program shall define the limits of the production DSM testing based on the number of rigs operating, anticipated production schedule, and the minimum QC testing criteria defined above.
6. The QC Testing program shall include provisions for revising QC testing frequency as a result of failing DSM Acceptance Criteria, changes in construction criteria, construction procedures, equipment changes, new mobilizations, or changes in personnel that are made following acceptance of the test sections.
7. The Department reserves the right to require the Contractor to perform additional QC testing after review of the daily Quality Control Report/Log of the production DSM columns and/or review of QC Testing results. Although coring and conducting compressive strength testing of cores (Section 7.1) is not intended to be a routine QC testing method, the Engineer reserves the right to use this QC testing method based on the results of the probe testing at anytime.
8. The Contractor shall determine the time interval between DSM installation and QC testing. QC testing shall be performed on columns cured for a minimum of 3 days but no longer than 28 days, or as directed by the Engineer.
9. Only probe testing equipment and methods that have been calibrated during the test section shall be used for QC testing. If production DSM columns are being installed differently from the test section DSM column installation, a calibration of the probe testing with coring and compression testing shall be required unless approved otherwise by the Engineer.

11.0 Acceptance Criteria

Determination that the DSM columns meet the Acceptance Criteria (for DSM construction, DSM column continuity, and DSM compressive strength requirements) shall be evaluated solely by the Engineer based on a review of daily Quality Control Report/Log of the production DSM columns and QC testing results conducted by an independent testing company.

11.1 DSM Construction Acceptance Criteria:

DSM columns shall be considered acceptable when daily Quality Control Report/Log of the production DSM columns and any remediation reports indicate that the:

1. Location of the top of the columns has been verified to be within design tolerances
2. Penetration of the column has been verified as correct by the Engineer.
3. Continuously recorded injection quantity of cement grout for DSM-SCC and binder (lime-cement or cement) for DSM-LCC columns has been verified to be within 10% of the design (preset) value established for the production DSM

construction criteria based on the results of approved production DSM construction design criteria.

11.2 Evaluation of DSM Column Continuity:

Lumps of unimproved soils shall not amount to more than 15 percent of the total volume of any 4-foot section of continuous full-depth evaluation by either conducting continuous probe testing, soil borings, or coring. Any individual or aggregation of lumps of unimproved soil shall not be larger than 6 inches in greatest dimension. For evaluating the volume of unimproved lumps of soil, all of the unrecovered samples shall be assumed to be unimproved soil. In addition, within a sample, the sum length of unmixed or poorly mixed soil regions or lumps that extend entirely across or a portion thereof the diameter of the sample will be considered unimproved.

11.3 Design Compressive Strength Acceptance:

Unless directed otherwise by the Engineer, all DSM QC compressive strength test results shall indicate a minimum of 60 percent of the design compressive strength at 5 days or less. Failure to meet this criterion shall deem the DSM column to be in non-conformance of the DSM compressive strength acceptance criterion. The DSM column shall be retested (same DSM column, different quadrant) at 28 days where the average QC strength testing shall indicate 100 percent or more of the compressive design strength with no sample testing less than 85 percent of the compressive design strength. Failure to meet the 28 day QC strength testing criterion shall deem the DSM column to be in non-conformance of the DSM compressive strength acceptance criteria. The Contractor may elect to conduct additional QC strength testing in excess of 28 days, with approval of the Engineer, at no additional cost to the Department. Unless otherwise determined by the Engineer, the extent of the non-conformance QC test area shall be considered to include all DSM constructed during all rig shifts that occurred after construction when passing tests were achieved. Non-conforming DSM QC test areas shall be remedied by the Contractor by conducting the following procedures.

The Contractor may conduct two or more additional QC probe tests (locations designated by the Contractor and approved by the Engineer) to better define the limits of the non-conformance and submit the results of those tests for review by the Engineer at no additional cost to the Department. If a minimum of 60 percent of the design strength has been achieved at 5 days or less, the Engineer shall evaluate the DSM construction documentation to determine which DSM columns are in conformance. If compressive strength criteria are achieved, with approval of the Engineer, all or a portion of the production DSM QC testing area may be approved provided that any deficient production DSM columns are remedied by one of the following two options. Failure to meet the required design strength of the additional DSM QC testing shall require that the DSM QC test area be remedied by one of the following options as approved by the Engineer.

1. Provide 2 or more additional QC tests (locations designated by the Engineer) within the DSM QC test area which demonstrate that at 28 days, the average QC strength testing is 100 percent or more of the compressive design strength with no sample testing less than 85 percent of the compressive design strength.
2. Re-drilling all or a portion of the nonconforming DSM QC test area and mixing additional cement grout for DSM-SCC columns or binder material (lime-cement or cement) for DSM-LCC, while raising the mixing tool. The Contractor shall submit a proposed plan for remixing or repair of failed sections for review and approval by the Engineer. Repair work of failed DSM columns shall be performed at no additional cost to the Department. Changing grout or binder quantities may require additional QC testing to calibrate QC probe testing. After reconstruction of the production DSM-LCC testing section, the affected DSM-LCC testing section will be subject to the compressive strength acceptance criteria as defined in this section.

12.0 As-Built Plans

Following completion of the production DSM column construction, the Contractor shall furnish to the Engineer a set of as-built plans detailing the locations of the DSM columns in terms of project coordinates, top and bottom elevations, QC compressive strength testing results, and any other dimensions of the DSM columns that are pertinent to the project.

13.0 Measurement and Payment.

DSM constructed using group columns spacing (GCS) will be measured per linear foot of DSM column constructed and then accepted by the Engineer. DSM constructed using block column spacing (BCS) will be measured by the total neat-line ground improved volume (in cubic yards) accepted by the Engineer, where the neat-line is the rectangular plan area of the required ground improvement zone times the specified improvement depth. Material located outside of the tolerances specified will not be measured. Material used to remix an area found to be unacceptable to the Engineer will not be measured. The test section(s) will not be measured, and is considered incidental to the production DSM ground improvement.

Payment will be made at the unit contract price per linear feet for DSM constructed using group columns spacing (GCS) and per cubic yard for DSM constructed using block column spacing (BCS). Payment for DSM columns will be full pay to perform the work as specified including construction and testing of test sections, QC testing, construction and removal of surcharges and berms, handling and hauling of excavated spoils, and site cleanup.

Payment will be made under:

Item No.	Pay Item	Pay Unit
2051201	Ground Improvement (Deep Soil Mixing Soil-Cement Columns - BCS)	CY
2051202	Ground Improvement (Deep Soil Mixing Soil-Cement Columns - GCS)	LF
2051203	Ground Improvement (Deep Soil Mixing Lime-Cement Columns- BCS)	CY
2051204	Ground Improvement (Deep Soil Mixing Lime-Cement Columns- GCS)	LF

(44) SECTION 205: GROUND MODIFICATION – COMPACTION GROUTING COLUMNS:

June 28, 2013

1.0 GENERAL

1.1 Scope:

The work under this Section consists of furnishing all supervision, labor, material, equipment, and related services necessary to perform ground improvement by the compaction grout technique as indicated on the Contract Drawings and specified herein.

For this project, the purpose of the compaction grouting is to reinforce the loose sand layers below embankments. The compaction grouting will serve to reinforce loose sand in the event of liquefaction during an earthquake.

The work includes the delivery and placement of all concrete/grout material necessary for compaction grouting construction.

1.2 Compaction Grout Column Construction

The work is to be accomplished using specifically-designed equipment for compaction grouting. The drill is to be advanced to the specified compaction grouting depth.

Concrete/grout shall then be injected through the drill pipe as the pipe is being withdrawn, in such a way as to exert a positive lateral pressure on the soil surrounding the concrete/grout filled grout hole.

1.3 Methods and Contractor Qualifications:

The Specialty Contractor performing the compaction grouting installation shall be one who can provide a minimum 3-year experience record documenting 5 recent, successful projects completed with these general site conditions and improvement criteria. References asserting this documentation shall be submitted with the bid.

A detailed description of the proposed construction method (including equipment and personnel) and the qualifications of the proposed Specialty Subcontractor shall be submitted with the bid.

1.4 References:

American Society for Testing and Materials (ASTM) Standards.

American Concrete Institute (ACI) Standards.

Prior to commencing work, the Contractor shall examine the site, drawings, records or existing utilities and other existing subsurface structures, and soil boring logs made available by the Engineer to help determine compaction grouting installation conditions.

Any subsurface data provided by the Department are provided solely as general information for convenience of Contractor. It is expressly understood that the Department, Engineer, or the Engineer's consultants will not be responsible for interpretations or conclusions drawn there from by the Contractor. The Department and Engineer expressly encourage the Contractor to perform soil test borings or other subsurface explorations to determine whether the Contractor's proposed ground modification method is capable of installing the specified compaction grout columns. Additional test borings and other exploratory operations may be made by the Contractor at no additional cost to the Department.

1.5 Submittals:

The following data shall be submitted for the approval of the Engineer prior to beginning of work.

- a. A detailed written procedure to be followed in installing the compaction grout columns and confirming that the specified work requirements have been achieved. The written procedure shall include a detailed description of the specialized equipment to be used.
- b. Proposed compaction grout design mix and descriptions of materials to be used. These shall be in sufficient detail to indicate their compliance with the specifications and either 1.) Laboratory tests of trial mixes made with the proposed mix or 2.) Laboratory tests of the proposed mix used on previous projects.
- c. The Contractor shall be responsible for providing all lines and grades for compaction grouting, including locations of all utilities and surveying markers.
- d. The Contractor shall be responsible for all health and safety requirements including those associated with the handling and disposal of contaminated materials. The Contractor shall be responsible for providing written procedures including a Health and Safety Plan.

1.6 Site Preparation:

The Contractor shall ensure a firm base on which heavy equipment can be operated safely under its own power.

The Contractor shall accurately locate all compaction grout columns in accordance with approved drawings. Compaction grouting shall be adjusted, as approved by the Engineer, to avoid utilities, foundations, and all other underground construction.

The Contractor shall provide access and maintenance thereof, for the compaction grouting equipment, work force and delivery of materials to the work site.

2.0 PRODUCTS

2.1 Materials:

- 2.1.1 Portland Cement: Portland Cement shall conform to current ASTM standards, designation C 150. The use of cement replacement materials will be permitted subject to the approval of the Engineer and provided that they can be shown to have beneficial effects on concrete impermeability, heat generation during setting and general durability. The mix proportions of use shall be approved. For onsite batching, all cement and cement replacement materials shall be stored in separate containers according to type in waterproof stores or silos.
- 2.1.2 Mineral Admixture: Mineral admixture, if used, shall be flyash or natural pozzolan which possesses the property of combining with the lime liberated during the process of hydration of Portland Cement to form compounds containing cementitious properties. The material shall conform to ASTM C 618, Class C or Class F.
- 2.1.3 Fluidifier: Fluidifier shall be a compound possessing characteristics which will increase the fluidity of the mixture, act as water reducing agent and retardant.
- 2.1.4 Water: Water shall be potable, fresh, clean and free of sewage, oil, acid, alkali, salts or organic matter.
- 2.1.5 Fine Aggregate: Sand shall meet the requirements of current ASTM standards, designation C 33.

2.2 Grout Mixes:

The concrete/grout mix shall consist of Portland cement, sand, and water, and may also contain a mineral admixture and approved fluidifier. The components shall be proportioned and mixed to produce a concrete capable of maintaining the solids in suspension, which may be pumped without difficulty. These materials shall be proportioned to produce a hardened concrete/grout which will achieve the design strength within 28 days. The design 28-day concrete strength for this project shall be 2500 psi.

All materials shall be accurately measured by volume or weight as they are fed to the mixer. Time of mixing shall be not less than one minute at the site. If agitated continuously, the concrete/grout may be held in the mixer or agitator for a period not exceeding two and one half hours at concrete temperatures below 70 degrees F and for a period not exceeding two hours at higher temperatures, not exceeding 100 degrees F. Concrete/grout shall not be placed when its temperature exceeds 100 degrees F.

Protect concrete/grout from physical damage or reduced strength which could be caused by frost, freezing actions or low temperatures or from damage during high temperatures in accordance with ACI 305/306.

The concrete/grout mix shall be tested by making a minimum of six 2-inch cubes for each day during which compaction grouting is performed. A set of six cubes shall consist of two cubes to be tested at seven days, and two cubes to be tested at 28 days and two cubes held in reserve. Test cubes shall be cured and tested in accordance with ASTM C 109. Test the flow of each batch of concrete mix.

2.3 Concrete/Grout Testing:

- 2.3.1. Sampling: Concrete/grout for the columns shall be sampled in accordance with ACI standards.
- 2.3.2. Workability: The workability of concrete/grout shall be determined by the slump test as described in ACI standards or by an alternative approved method.
- 2.3.3. Cube Tests: For each mix design of concrete, six cubes shall be made from a single batch when required for 65 cy of concrete/grout or part thereof in each day's work. Testing shall be carried out by an independent and approved laboratory. Two cubes shall be tested at an age of 7 days, two at 28 days, and two cubes shall be held in reserve for further testing, if required. Alternatively, cubes may be tested in accordance with an approved accelerated testing regime. The Contractor shall submit certified copies of the results of all tests to the Engineer.
- 2.3.4. Standard of Acceptance: The standard of acceptance of the concrete mix cubes shall be in accordance with ACI standards or as otherwise approved.
- 2.3.5. Record of Tests: The contractor shall keep a detailed record of the results of all tests on concrete/grout and concrete materials. Each test shall be clearly identified with the columns to which it relates.

2.4 Batching Concrete/Grout:

- 2.4.1. General: Facilities shall be provided for the Engineer to inspect the concrete/grout mixing plant or plants when requested. Unless otherwise specified the requirements in Clauses 2.5.2, 2.5.3, 2.5.4 shall be met.
- 2.4.2. Accuracy of Weighing and Measuring Equipment: The weighing and water-dispensing mechanisms shall be maintained at all times to within the limits of accuracy described in ACI standards.
- 2.4.3. Tolerance in Weights: The weights of the quantities of each size of aggregate and of cement shall be within 2% of the respective weights per batch after due allowance has been made for the presence of free water in the aggregates, which shall be determined by the Contractor by an approved method.
- 2.4.4. Moisture Content of Aggregates: The moisture content of aggregates shall be measured immediately before mixing and as frequently thereafter as is necessary to maintain consistency of mix.

2.5 Mixing Concrete/Grout

- 2.5.1 Type of Mixer: The mixer shall be of the batch type, specifically designed for concrete/grout mixing.
- 2.5.2 Tolerance of Mixer Blades: The mixing blades of pan mixers shall be maintained within the tolerances specified by the manufacturers of the mixers, and the blades shall be replaced when it is no longer possible to maintain the tolerances by adjustment.
- 2.5.3 Cleaning of Mixers: Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned between the mixing of different types of cement.
- 2.5.4 Minimum Temperature: The temperature of fresh concrete/grout shall not be allowed to fall below 37° F. No frozen material or materials containing ice shall be used. Newly cast columns are to be covered to protect them against freezing unless the final cut off level is at least 0.8 ft. below the final head level as cast. Where a column is cast in frozen ground, appropriate precautions shall be taken to protect any section of the column in contact with the frozen soil where this occurs below the cut off level.

2.6 Transporting Concrete/Grout

2.6.1. Method of Transporting: The method of transporting concrete/grout shall be submitted for approval. Concrete/grout shall be transported in uncontaminated watertight containers in such a manner that loss of material and segregation are prevented.

2.6.2. Pumping Concrete/Grout: Pumped concrete/grout complying with this Specification may be used. The methods employed in its use shall be subject to approval.

2.7 Ready-mixed Concrete/Grout

2.7.1. Conditions of Use: Subject to approval, the Contractor may use ready-mixed concrete/grout in accordance with ACI standards. Approval shall be obtained for each proposed use of ready-mixed concrete/grout in different sections of the Works and for each different mix, which shall comply with this Specification.

2.7.2. Mixing Plant: Unless otherwise agreed by the Engineer, truck mixer units and their mixing and discharge performance shall comply with the requirements of ACI standards.

3.0 EXECUTION

3.1 General

The Compaction grout column technology employs a drill stem for both penetration and maintaining borehole stability. The concrete/grout is pumped into the column from the base of the drill stem. All materials and work shall be in accordance with Sections 1, 2 and 3 of this Specification.

3.2 Layout

The procedure for layout of columns and checking their positions shall be approved by the Engineer. The actual compaction grout columns shall be installed within 3 inches of the design location shown on the Drawings, approved shop drawings or as otherwise directed by the Engineer.

3.3 Diameter of Columns

The diameter of a column shall be not less than 24-in.

3.4 Equipment

The contractor shall use a drill rig capable of penetrating all necessary soil layers or obstructions.

3.5 Penetration

3.5.1. Penetration Near Recently Cast Columns: Columns shall not be advanced so close to other columns which have recently been cast and which contain workable or unset concrete/grout that a flow of concrete could be induced from or damage caused to any of the columns. A minimum distance of 8 ft (center-to-center) shall be kept between columns less than 24-hours old and on-going column installations.

3.5.2. Removal of Drill Pipe from the Ground: Drill Pipe shall not be extracted from the ground during the penetration or construction of a column in such a way that an open unsupported void or inflow of water into the column section would result.

3.5.3. Depth of Columns: Any failure of a column to reach the required depth, as given in the Specification or shown on the Drawings, shall be reported to the Engineer without delay and a full statement of the reasons given.

3.6 Placing of Concrete/Grout

- 3.6.1. Mix Design and Workability: Where not otherwise stated in this Section, the concrete shall comply with Section 2 of this Specification. The design and workability of concrete to be used in the formation of a column shall produce a mix which is suitable for pumping. It shall have a target slump of 4 to 6 inches unless otherwise approved and a minimum cement content of 580 lbs/yd³. The fine aggregate shall be in accordance with ACI standards. This mix shall be designed so that segregation does not occur during the placing process, and bleeding of the mix shall be minimized.
- 3.6.2. Equipment for Supply of Concrete/Grout to Columns: Concrete/Grout shall be supplied to the column through suitable tubing and hoses.
- 3.6.3. Commencement of Concrete/Grout Supply to Each Column: The technique and equipment used to initiate and maintain the concrete flow shall be such that a column of the full specified cross-section is obtained from the maximum depth to the final cut off level.
- 3.6.4. Rate of Supply of Concrete/Grout: The concrete/grout shall be supplied to the column at a sufficient rate during drill pipe withdrawal to ensure that a continuous monolithic shaft of the full specified cross-section is formed, free from debris or any segregated concrete/grout. The rate of withdrawal of the drill pipe and pressures of concrete/grout shall be measured and recorded throughout the phase of vibrator withdrawal for each column. The Contractor shall submit proposals for his method of monitoring construction for approval prior to the commencement of the Works.
- 3.6.5. Completion of Columns: If the concrete/grout placing in any column cannot be completed in the normal manner, then the column shall be repenetrated before concrete/grout has hardened and shall be completely replaced.
- 3.6.6. Casting Level of Column Head: Concrete shall be cast to the commencing surface level or slightly above unless otherwise specified.
- 3.6.7. Disposal of Contaminated Material: The Contractor is responsible for disposal of all excavated soil, excess water, and spoil generated during installation of the compaction grouting installation at no extra cost. Manifests necessary for waste disposal shall be executed by the Engineer.

3.7 Cutting of Column Heads

When cutting off and trimming columns to the specified cut off level, the Contractor shall take care to avoid shattering or otherwise damaging the rest of the column. Any latence, or contaminated, cracked or defective concrete/grout shall be cut away and the column made good in an approved manner to provide a full and sound section up to the cut off level.

3.8 Documentation:

Any proposed change in the approved construction program, necessitated by a change in the subsurface conditions, shall be submitted in writing to the Engineer for approval.

A daily log shall be submitted to the Engineer by the Contractor to include hole number, start/finish time of treatment, depth of treatment, diameter of drill hole, description of soil penetrated, and volume of grout/concrete placed at depth in no more than 2-ft increments.

4.0 CONSTRUCTION

The compaction grout columns shall be constructed prior to bridge foundations. Positive site drainage shall be established prior to construction of compaction grouting. Contractor shall control all spoils generated during compaction grouting and prevent spoils from flowing offsite. Spoils generated by compaction grouting shall be disposed of properly and removed from the site by the Contractor. No additional compensation shall be made for handling spoil.

Compaction grouting columns shall be constructed to the lines and elevation shown on the plans, and in accordance with the Special Provisions.

Compaction grout columns shall extend from the existing ground surface to the elevations outlined in the plans. No payment will be made for compaction grout columns installed within areas that are later excavated. The contractor shall be responsible to construct compaction grout columns to the depths required, and shall use the methods necessary to penetrate to the required depth, including but not limited to drilling through stiff and dense layers that may be present, as well as obstructions from existing construction.

The compaction grout columns shall be installed to the minimum required Area Replacement Ratio. The required minimum area replacement ratio (A_r) achieved at any depth by the compaction grouting shall be that which is equivalent to the diameter of the grout columns at the center-to-center (c-c) spacing shown in the plans and on a triangular pattern. The area replacement ratio shall be defined by the following relationships:

$$A_r = \frac{\text{Column Area}}{\text{Tributary Area}} \times 100\%$$

Where: Column Area = Area of circle based on column diameter as defined below.
 Tributary Area = $0.866 (\text{Column Spacing})^2$ for triangular spacing.

Acceptance of the constructed column will be based on the theoretical column diameter determined from the volume of concrete/grout installed.

The Contractor shall, at all times, protect structures, underground utilities and other construction from damage caused by grouting operations. Damaged material shall be replaced or repaired to the satisfaction of the Engineer at no additional cost to the Department.

5.0 METHOD OF MEASUREMENT

The bid item for compaction grouting shall include the delivery and placement of all concrete material necessary for compaction grout column construction. It shall also include disposal of all spoil (surface water, soil, etc.) in a manner acceptable to the Department of Health and Environmental Control and to the Engineer.

6.0 BASIS OF PAYMENT

The quantity of ground modification measured for payments shall be the actual length of the installed compaction grout columns acceptable to the Engineer. No payment will be made for ground modification beyond the limits required by the Contract Documents, unless such increases in the specified area are directed in writing by the Engineer.

The accepted quantity, measured as above, will be paid for at the contract unit price per linear foot for compaction grout columns constructed at the diameter specified in the plans, which price and payment shall be full compensation for furnishing, hauling, treating, compacting of materials, removal of spoils and for all labor, equipment, tools, maintenance, and incidentals necessary to complete this item of work.

Payment will be made under:

<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
8990353	Ground modification – Compaction Grouting Columns	Linear ft

(45) SECTION 205: GROUND MODIFICATION – VIBRO-STONE COLUMN (VIBRO-DISPL.):

1.0 DESCRIPTION

This section presents vibro-displacement requirements for ground modification by stone column (SC) construction at both bridge approaches using the dry bottom feed method. This Special Provision details the technical and quality assurance requirements for furnishing all supervision, labor, material, equipment, and related services necessary to construct all soil improvements by vibro-displacement. The construction work includes subsurface soil improvement by vibro-displacement and delivery and placement of all backfill necessary in the improvement process. Soil improvement by vibro-displacement method shall be provided in the areas shown in the roadway plans and as required by this Special Provision. Ground modification is for mitigation of settlement due to consolidation, settlement due to liquefaction and embankment stability.

The Contractor or Sub-contractor performing the vibro-displacement construction shall be one who can provide a minimum 5 year experience record documenting 15 recent successful projects completed with specific application to these site conditions, ground modification technique, and soil improvement criteria. References asserting this documentation shall be provided upon request. The Contractor must have sufficient production capacity to produce the required work without causing delay to the project.

The Contractor shall layout, and measure the locations for vibro work. Vibro points may be surveyed in or located by measuring offsets from surveyed points (e.g., project stations) using a tape measure.

The Contractor shall notify the Engineer 48 hours prior to commencement of the vibro operations.

The Contractor shall submit plans and shop drawings to the Engineer for review and approval at least 30 days prior to work beginning, indicating the sequence, spacing, location, and depth of the vibro points to achieve the criteria outlined in this specification and shown in the roadway plans. Any change in the predetermined vibro program necessitated by a change in the subsurface conditions shall be immediately reported and submitted to the Engineer. Upon completion of the work, the Contractor shall submit a drawing of as-built locations of the stone columns.

2.0 MATERIALS

The backfill for vibro-displacement shall consist of hard, durable crushed gravel or crushed stone with a gradation consistent with #57 sized crushed aggregate (meeting ASTM C33 coarse aggregate requirements). Fossiliferous or soft limestone materials shall not be used.

The Contractor shall submit certifications and test reports that indicate the backfill materials meet specified requirements prior to commencing field work.

3.0 CONSTRUCTION METHODS

Prior to commencing work, the Contractor shall examine the following: site conditions, drawings, records of existing utilities and other existing subsurface structures, and Geotechnical Reports, including soil boring logs. This data will be made available by the Engineer to help determine vibro-displacement installation conditions.

Data on indicated subsurface conditions is provided solely for convenience of the Contractor. It is expressly understood that the Department, Engineer, or the Engineer's sub-consultants will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. The Department and Engineer expressly encourage the Contractor to perform soil test borings or other subsurface explorations to determine whether the Contractor's proposed ground modification method is capable of installing the specified vibro-displacement stone columns. If the Contractor needs additional test borings and other exploratory operations, they may be conducted at no additional cost to the Department.

The vibro-displacement stone columns shall be constructed prior to bridge foundations. Positive site drainage shall be established prior to construction of the vibro-displacement stone columns. Contractor shall control all spoils generated during vibro-displacement stone column construction and prevent spoils from flowing offsite. Spoils generated by vibro-displacement stone column construction shall be disposed of properly and removed from the site by the Contractor. No additional compensation shall be made for handling spoil.

Vibro-displacement stone columns shall be constructed at the locations shown on the project roadway plans and in accordance with this special provision.

If stone columns are installed through embankment fill that will be later excavated, #57 stone should be used to backfill the portion above the excavation limit. No payment will be made for stone columns installed within areas that are later excavated. The contractor shall be responsible to construct vibro-displacement stone columns to the depths required, and shall use the methods necessary to penetrate to the required depth, including but not limited to pre-augering through stiff and dense layers that may be present, as well as obstructions from existing construction.

The stone columns shall be installed to the minimum required Area Replacement Ratio. The required minimum area replacement ratio (A_r) achieved at any depth by the vibro-displacement stone columns shall be that which is equivalent to the design diameter of the stone columns spaced at the design center-to-center (c-c) on a triangular pattern.

The area replacement ratio shall be defined by the following relationships:

$$A_r = \frac{\text{Stone Column Area}}{\text{Tributary Area}} \times 100\%$$

Where: Stone Column Area = Area of circle based on column diameter as defined below.
Tributary Area = $0.866 (\text{Column Spacing})^2$ for triangular spacing

Acceptance of the constructed column will be based on the theoretical column diameter determined from the volume of backfill installed and an assumed relative density of compacted washed stone equal to 90%.

The Contractor shall, at all times, protect structures, underground utilities and other construction from damage caused by vibro operations. Damaged material shall be replaced or repaired to the satisfaction of the Engineer at no additional cost to the Department.

At no time during stone column installation will the use of water be allowed to flush soil cuttings from mitigated zone.

The Contractor shall:

1. Verify the location of existing underground utilities by excavation before starting vibro operations. If utility lines are to remain in place, provide protection from damage during vibro operations.
2. Consult the Engineer immediately for directions as to procedure if uncharted or incorrectly charted piping or other utilities are encountered during excavation or execution of work. Cooperate with Department and public or private utility companies in keeping their respective service and facilities in operation. Repair damaged utilities to satisfaction of utility Department at no additional cost to Department.
3. Ensure that existing utilities serving facilities occupied by Department or others are not interrupted, except when permitted in writing by Engineer and then only after temporary utility services have been provided.
4. To ensure that stone columns for vibro-displacement are not installed at locations

designated for future structural piles, installation should only be conducted at the locations shown on the roadway plans.

A pre-job conference is required between Engineer and Contractor(s), to review special requirements for work. Conference shall be arranged by Contractor and shall be planned sufficiently in advance of work to allow required attendees adequate notice (one week minimum) to make arrangements to attend.

The Contractor shall use a down-hole vibrator capable of providing at least 160 horsepower and 20 tons of force.

Specific equipment and procedural specifications are left to the Contractor to achieve the specified criteria. However, the following general guidelines are identified:

1. After penetration to the treatment depth, the vibrator should be slowly retrieved in 12-inch to 18-inch increments to allow backfill placement.
2. The vibrator should be re-driven through each increment into a recently treated depth interval to observe amperage buildup or increase (or equivalent pressure increase for hydraulic vibrators).
3. Amperage buildup and backfill quantities are contingent to the type of vibrator, type of backfill, in situ soil conditions, and Contractor's procedure. Discussion between the Engineer and Contractor shall be conducted prior to work regarding individual equipment capabilities and expectations.

4.0 QUALITY CONTROL

Various production columns shall be evaluated by the Engineer on the basis of volume backfill installed per vibro point. Standard and/or Cone Penetration Testing (SPT and/or CPT) will also be performed by the Engineer to explore specific production columns. The test locations shall be determined by the Engineer once the plans and shop drawings have been received from the Contractor and reviewed, but will typically be as shown on the SC Testing Detail in the project plan sheets. The Contractor shall inform the Engineer 30 days prior to the installation of the first production column so that the field testing can be scheduled appropriately.

The Engineer reserves the right to perform tests and to prepare test reports on items stated below.

The Engineer will make continuous inspections of vibro operations to determine the following:

- a. Proper depth of penetration is obtained
- b. Volume of backfill material installed per vibro point
- c. Theoretical column diameter

The Contractor shall furnish a complete log for each vibro point on the project, to include the following:

- a. Column identification
- b. Date of installation
- c. Recording of probe number
- d. Start/finish time of probe
- e. Approximate backfill quantities
- f. Diameter of column
- g. Location of column
- h. Existing ground surface elevation
- i. Top and bottom elevation of each column

The acceptance criteria for the stone columns shall be the diameter and spacing to create the

required minimum area replacement ratio.

5.0 MEASUREMENT AND PAYMENT

The quantity of ground modification measured for payments shall be the actual length of the installed stone columns acceptable to the Engineer. No payment will be made for ground modification beyond the limits required by the Contract Documents, unless such increases in the specified area are ordered by the Engineer in writing.

The accepted quantity, measured as above, will be paid for at the contract unit price per linear foot for Ground Modification, which price and payment shall be full compensation for mobilization, demobilization, furnishing, hauling, treating, compacting of materials, removal of spoils, constructing working platform, pre-augering/obstructions and for all labor, equipment, tools, maintenance, and incidentals necessary to complete this item of work.

Payment will be made under:

Item No.	Pay Item	Pay Unit
2051112	Ground Modification – Vibro-Stone Column	Linear feet

(46) SECTION 205: PREFABRICATED VERTICAL DRAIN WITH FABRIC:

August 24, 2011

1.0 DESCRIPTION OF WORK

This work shall consist of furnishing all necessary submittals, materials, labor, equipment, and incidentals for the installation of prefabricated vertical drains in accordance with the details shown on the plans and the requirements of the Supplemental Specifications. The vertical drains shall consist of a band-shaped plastic core enclosed in a suitable jacket material. The vertical drains shall be installed at locations show on the plans, unless otherwise directed by the Department.

2.0 QUALITY ASSURANCE

2.1 Quality Control:

The vertical drains shall be installed with equipment that will minimize the disturbance of the subsoil during the installation operation and maintain the mandrel in a vertical position. The Contractor shall consider the subsoils at the site when selecting equipment and developing the prefabricated vertical drain installation plan. The equipment shall have sufficient push force necessary to install the vertical drains through all existing subsurface material to the depths shown on the plans. The equipment shall have sufficient power to penetrate into the materials underlying the compressible stratum. The equipment shall have the capability of installing the vertical drains to a depth of not less than 20 feet greater than the maximum vertical drain depth shown on the plans. The equipment shall be selected such that it will not force the fill soil into the existing soil, nor disturb the fill soil, nor cause any bearing capacity problems with the subgrade soils due to the weight of the equipment.

Approval of the sample vertical drain material by the Engineer will be required prior to delivery of the vertical drain material to the Project. The vertical drain manufacturer shall be a specialist in the manufacture of vertical drains and shall have produced a minimum of 1,000,000 linear feet of the vertical drain material proposed for the Project that have been used in successful applications within the past five years.

The vertical drains shall be free of defects, rips, holes, and/or flaws. During shipment and storage, the vertical drains shall be wrapped in a protective covering. The vertical drains shall be protected from sunlight, mud, dirt, dust, debris, and detrimental substances during shipping and on-site storage.

The Contractor shall certify and provide proof to the Department of experience in the work described. The Contractor shall have successfully installed at least 1,000,000 linear feet of vertical drains during the last five years and shall be a certified installer of the vertical drain manufacturer. In addition, the Contractor shall have successfully completed at least five projects within the last five years of similar size and complexity to that of the Project.

The Contractor's experience shall be documented by providing a project summary that includes for each referenced project, the project start and completion dates, total quantity of vertical drains installed, and a detailed description of the project, site conditions, and subsurface conditions. The project description shall include details of the vertical drain materials, the equipment and technique used to install the vertical drains, the average and maximum length of vertical drain installed, the client name and address, the name and telephone number of the representative of the consultant and owner for whom the work was performed and who can attest to the successful completion of the work, and any other information relevant to demonstrating the Contractor's qualifications.

The Contractor shall have a full-time supervisor who has been in responsible charge of supervising vertical drain installation operations for at least five projects in the last five years. The supervisor shall be present at the work site at all times during vertical drain installation operations. The Contractor shall provide a detailed resume of the supervisor's experience and qualifications. The acceptability of the supervisor, as well as any replacement for the supervisor, will be subject to the approval of the Department.

3.0 SUBMITTALS

3.1 Prefabricated Vertical Drain Installation Plan:

Within thirty (30) calendar days after award of the contract or no later than thirty (30) calendar days before beginning prefabricated vertical drain installation, the Contractor shall submit to the Department for review a prefabricated vertical drain installation plan that includes as a minimum the following information:

- a) Size, type, weight, maximum pushing force, vibratory hammer rated energy, and configuration of the installation rig.
- b) Dimensions and length of the mandrel.
- c) Details of vertical drain anchorage.
- d) Detailed description of proposed installation procedures.
- e) Proposed methods for splicing the vertical drains.
- f) Proposed methods and equipment for pre-augering or spudding.
- g) Submit documentation of the successful application of the proposed vertical drain installation operations.
- h) Submit shop drawings showing the planned locations and bottom elevations of all vertical drains and showing a unique identification number for each vertical drain. The installation sequence shall also be provided. The shop drawings shall also show the location of all settlement sensors or plates, the location of the abutment, and the limits of the final embankment.

3.2 Prefabricated Vertical Drain Material:

At least thirty (30) calendar days before beginning vertical drain installation, the Contractor shall:

- a) Submit to the Department for testing three samples of the unspliced vertical drain to be used and three samples of proposed splices, with the accompanying manufacturer specifications for the vertical drain material. The samples of unspliced vertical drain shall be at least five feet long. Samples of spliced vertical drain shall be long enough to include the splice plus two feet of unspliced drain on both sides of the splice. The samples shall be stamped or labeled by the manufacturer as being representative of the vertical drain material having its specified trade name.
- b) Submit to the Department three samples of the proposed anchor plate to be used to anchor the vertical drains at the design depth shown on the plans.
- c) Submit to the Department manufacturer's literature documenting the physical and mechanical properties of the vertical drain and other similar projects where the same drain has been installed, including details on prior performance on these projects.
- d) The Contractor shall identify the proposed source of the materials prior to delivery to the site. The Contractor shall supply a manufacturer's material certification that the prefabricated vertical drain with fabric meets or exceeds the material requirements of this specification.

3.3 Submittal Reviews:

Approval of the proposed materials, equipment, construction sequence, and method by the Department shall not relieve the Contractor of its responsibility to install the vertical drains in accordance with the plans and specifications. Approval by the Department of the method and equipment to be used to install the vertical drains shall be contingent upon satisfactory demonstration of vertical drain installation at the project site. If, at any time, the Department or the Engineer considers that the method of installation does not produce satisfactory vertical drains, the Contractor shall alter the method and/or equipment as necessary to comply with the Supplemental Specifications. The Department will be the sole judge in determining the adequacy of the Contractor's methods and equipment.

3.4 As-Built Plans:

The Contractor shall provide the Department with "as-built" plans of the vertical drain installation. Such plans shall include the locations of the vertical drains, the date the drains were installed, the length of each drain below the fill soil surface elevation, the fill soil surface elevation at the drain installation, the "as-built" vertical drain tip elevation, and shall identify any rejected or abandoned drain installations. "As-built" plans shall be submitted at least weekly during vertical drain installation operations. A final "as-built" plan shall be submitted within seven calendar days of the completion of vertical drain installation in all embankment locations. The final "as-built" plans will be subject to the approval of the Department.

4.0 MATERIALS

- 4.1 The prefabricated vertical drain shall consist of newly manufactured materials and shall consist of a continuous plastic drainage core wrapped in a nonwoven geotextile material jacket. The jacket shall allow free passage of pore water to the core without loss of soil material or piping. The core shall provide continuous vertical drainage. The prefabricated vertical drain material shall have a minimum perimeter of 7-1/2 inches and a minimum thickness of 1/8 inch.
- 4.2 The jacket and core components shall conform to the following:
 - a) The jacket shall be synthetic nonwoven geotextile capable of resisting bending, punching and tensile forces imposed during installation and during the design life of the vertical drain.

- b) The jacket material shall not be subject to localized damage (e.g., punching through the filter by sand/gravel particles).
- c) The jacket material shall be rigid enough to withstand lateral earth pressures due to embedment and surcharge so that the vertical flow capacity through the core will not be adversely affected.
- d) The jacket material shall be flexible enough to bend smoothly during installation and induced consolidation settlement without damage.
- e) The jacket material shall not undergo cracking and peeling during installation of the vertical drain.
- f) The core shall be continuous plastic material fabricated to promote drainage along the axis of the vertical drain. The assembled vertical drain shall be resistant against wet rot, mildew, bacterial action, insects, salts in solution in the ground water, acids, alkalis, solvents, and other ingredients in the site ground water.

- 4.3** Vertical drain materials shall be labeled or tagged in such a manner that the information for sample identification and other quality control purposes can be read from the label. As a minimum, each roll shall be identified by the manufacturer as to lot or control numbers, individual roll number, date of manufacture, manufacturer and product identification of the jacket and core.

During shipment and storage, the vertical drain shall be wrapped in burlap or similar heavy duty protective covering. The vertical drain shall be protected from sunlight, mud, dirt, dust, debris, and other detrimental substances during shipping and on-site storage.

Material which is damaged during shipment, unloading, storage, or handling, or which does not meet the requirements of the drain material will be rejected by the Department. No payment will be made for rejected material.

5.0 INSTALLATION

- 5.1** Prefabricated vertical drains shall be installed as indicated on the plans or as directed by the Department. The vertical drains shall be installed with equipment that will cause minimum disturbance of the subsoil during installation operations and maintain the mandrel in a vertical position. The vertical drains shall be installed using a mandrel or sleeve that shall be advanced through the soils to the required depth. The mandrel or sleeve shall protect the drain material from tears, cuts, and abrasion during installation and shall be retracted after each vertical drain is installed. To minimize disturbance of the subsoil, the mandrel or sleeve shall have a maximum cross-sectional area of 10 square inches. The mandrel or sleeve shall be sufficiently stiff to prevent wobble or deflection during installation.
- 5.2** Constant load or constant rate of advancement methods shall be used. A vibrator shall only be used when approved by the Engineer in areas where constant load or constant rate of advancement methods cannot install the vertical drains to the design depths. The use of an impact hammer will not be allowed.
- 5.3** The vertical drain shall be provided with an “anchor” plate or similar arrangement to anchor the bottom of the drain at the required depth during mandrel removal and to prevent soil from entering the bottom of the mandrel during drain installation. The anchorage shall be adequate to keep the bottom of the vertical drain at the required depth subject to approval and field verification by the Department. The corresponding dimension of the anchor shall conform as closely as possible to the breadth dimensions

of the mandrel to minimize soil disturbance. The projected cross-sectional area of the mandrel and anchor combination shall not be greater than 14 square inches.

- 5.4** The Contractor shall notify the Department at least 24 hours prior to installation of the initial vertical drains at each embankment location to allow the Department sufficient time to provide the necessary inspection for the initial vertical drain installation. Installation of the initial vertical drains at each area shall not proceed without the presence of the Department's inspector. During the installation of the initial ten vertical drains at each embankment location, the Contractor shall demonstrate that the equipment, method, and material produce a satisfactory installation, as determined by the Department. Following completion of the initial drain installations at each embankment location, the Contractor shall not proceed with the installation of the remaining vertical drains at the embankment location until authorized by the Department.
- 5.5** If foundations have been previously installed, the prefabricated vertical drains shall be installed in a manner as to avoid foundations piles or spread footings. The location of the vertical drains relative to the foundations shall be determined and staked out prior to the installation of the prefabricated vertical drains. In addition, the Contractor shall be responsible for taking precautions to preserve the stake locations and is responsible for re-staking, if necessary.
- 5.6** Vertical drains shall be located, numbered, and staked out using a baseline and benchmark provided by the Contractor. The Contractor shall be responsible for all other construction staking, for taking precautions to preserve the stake locations, and is responsible for re-staking, if necessary. The as-installed locations of the vertical drains shall not vary by more than six inches from the locations designated on the plans or approved shop drawings.
- 5.7** Vertical Drains that deviate from the plan locations by more than six inches, that are damaged, or improperly installed will be rejected. Rejected vertical drains shall be abandoned in place. Replacement vertical drains shall be placed as close as possible to the correct original locations.
- 5.8** The Contractor shall provide the Department with a means of verifying the plumbness of the mandrel and determining the depth of the vertical drains. The equipment shall be checked for plumbness prior to installing each drain and shall not deviate from the vertical more than two percent (2%) during installation.
- 5.9** Splices or connections in the vertical drain material shall be done in accordance with the manufacturer's instructions and in a manner to insure continuity of the vertical drain material. Splicing of vertical drains shall be done by stapling to provide structural and hydraulic continuity of the drain. The jacket and core shall be overlapped a minimum of six inches.
- 5.10** Vertical drains shall be installed as shown on the plans and as directed by the Department. The replacement of settlement sensors or plates damaged because of the Contractor's activities will be the responsibility of the Contractor, as described in the Supplemental Specifications for Settlement Sensors or Settlement Plates.
- 5.11** Vertical drains shall be installed from the working surface (top of fill soil) to the vertical drain bottom elevations shown on the plans or to refusal in the stratum underlying the compressible stratum. The vertical drains shall penetrate through the compressible stratum, including any granular layers or lenses, and anchored in the underlying stratum. Refusal shall be defined as the point where the soils resist a reasonable effort at further penetration of the vertical drains. The refusal criteria shall be established by the Engineer on the basis of existing soil borings and the initial vertical drain installations to be performed by the Contractor in the presence of the Department's inspector, as specified herein. No vertical drains shall be terminated above the design

vertical drain bottom elevations shown on the plans without the approval of the Engineer. The Engineer may vary the depths, spacing, and/or number of vertical drains to be installed, and may revise the plan limits for this work based on the actual subsurface conditions encountered.

- 5.12** The prefabricated vertical drains shall be cut off neatly at least six inches above the working layer, unless otherwise shown on the plans.
- 5.13** During vertical drain installation, the Contractor shall provide the Department with a means of determining the depth of the advancing vertical drain at any given time and the length of the drain installed at each location. A summary tabulation of the number and length (to nearest tenth of a foot) of acceptable vertical drains shall be submitted daily to the Department.
- 5.14** Where obstructions are encountered below the working surface, the Contractor shall install a new drain within a 1-foot radius of the original location of the obstructed drain. A maximum of two additional attempts shall be made as directed by the Department for each obstructed vertical drain. If the drain still cannot be installed to the design tip elevation, the drain location shall be abandoned and a new drain installed at a location directed by the Department. Locations where vertical drains do not meet the depth criteria due to obstructions shall be clearly marked in the field. The Engineer will have the right to waive the replacement vertical drain requirement upon written notice to the Contractor.
- 5.15** Pre-augering or spudding for the vertical drain installation shall be allowed to advance the drains through compacted fill material or other obstructions. The Contractor shall be responsible for penetrating the overlying fill material or any dense layers or obstructions when encountered to satisfactorily install the vertical drains. Satisfactory installation shall allow for clearing obstructions defined as any man-made or natural object or strata that prevents the proper insertion of the mandrel and installation of the vertical drain.

The Contractor may use augering, spudding, or other approved methods to loosen the soil and obstructing material prior to the installation of the drains. The obstruction clearance procedure is subject to the approval of the Engineer; however, such approval shall not relieve the Contractor of the responsibility to clear obstructions in accordance with the specifications.

If augering is the selected method, the augers shall have a minimum outside diameter equal to the largest horizontal dimension of the mandrel, shoe, or anchor, whichever is greatest. The maximum outside diameter of the auger shall be no more than three inches greater than the maximum dimension of the mandrel.

Obstruction clearance procedures shall be kept to a minimum and shall be used only when approved by the Engineer. Augering or other obstruction removal techniques shall not penetrate more than two feet into the underlying compressible soil.

Where obstructions are encountered, the following procedure shall be implemented in the listed sequence:

- a) The Contractor shall immediately notify the Department prior to completing the drain and prior to installing other drains.
- b) The Contractor shall then attempt to install drains adjacent to the obstructed location. Based upon the results of these installations and the at the direction of the Department, the Contractor shall:
 - 1. Attempt to install an offset drain within 1 foot horizontally of the obstructed drain, or

2. Implement obstruction clearance procedures and install the drain at the design location. Obstruction clearance procedures shall be used only as approved by the Engineer.

5.16 Vertical drains shall be installed using a continuous push using either static weight or, when approved by the Engineer, vibration. Jetting or the use of an impact hammer will not be allowed to install the vertical drains.

5.17 A mandrel shall be used to protect the vertical drains during installation. The mandrel shall be withdrawn after installation of the vertical drains. In no case will alternative raising and lowering of the mandrel during advancement be permitted. Raising of the mandrel will be permitted only after completion of the vertical drain installation to the bottom of the drain elevation shown on the plans or otherwise authorized by the Engineer.

6.0 MEASUREMENT

6.1 Vertical Drains: This item shall include the furnishing of all supervision, equipment, crews, tools, required permits, survey stake out of vertical drain locations, and other equipment and materials as necessary to properly execute the work.

Vertical drains shall be measured to the nearest tenth of a foot. The length of the vertical drains to be paid for shall be the distance the installation mandrel tip penetrates below the working grade plus the required cut-off length above the working surface (top of fill soil). Payment will not be made for drains that are not anchored to the required depth.

No payment will be made for vertical drains placed deeper than the tip elevation designated on the plans unless authorized in writing by the Engineer.

6.2 Obstructions: Obstruction clearance by augering or spudding method shall be measured by the linear foot. The length of obstruction clearance to be paid for shall be the length from the working surface at the time of installation to the depth penetrated by the auger or spud, or to a depth two (2) feet into the underlying compressible soil, whichever is the lesser depth. The obstruction clearance depth is subject to verification by the Department.

Obstruction clearance by other methods shall be measured on a time and materials basis, subject to prior approval of the Department.

7.0 BASIS OF PAYMENT

7.1 Vertical Drains: Payment for vertical drains shall be made at the contract unit price per linear foot for acceptable drains, which price shall be full compensation for the cost of furnishing the full length of the vertical drain material, installing the vertical drain, altering of the equipment and methods of installation in order to produce the required end result in accordance with the contract documents, and shall also include the cost of furnishing all tools, materials, labor, equipment, supervision, survey stake out of vertical drain locations, and all other costs necessary to complete the required work.

The Engineer may vary the depths, spacing, or numbers of vertical drains to be installed and may revise the vertical drain installation limits shown on the plans based on the actual subsurface conditions encountered. Such changes or revisions may increase or decrease the total quantity of the vertical drains estimated based on the

plans. In the event of such changes in required vertical drain quantity, the payment for vertical drains shall be made on the basis of the contract unit price per linear foot.

No payment will be made for vertical drains, or for any delays or expenses incurred through changes necessitated by improper material or equipment.

7.2 Obstructions: Payment for obstruction clearance using augering or spudding shall be made at the contract unit price per linear foot, which price shall be full compensation for the cost of preaugering, spudding, or performing other acceptable methods to clear obstruction and to satisfactorily install the vertical drains, including the cost of disposal of any surplus preaugered or obstruction clearance materials. The contract unit price shall include the cost of furnishing all tools, materials, labor, equipment, permits if required, and all other costs necessary to complete the required work.

Payment for the removal of obstructions using methods other than augering or spudding shall be on a time and materials basis as authorized the Department.

Payments shall be made under:

Item No.	Pay Item	Pay Unit
8012300	Prefabricated Vertical Drain with Fabric	LF
8990204	Obstructions	LF

(47) SECTION 205: PREFABRICATED EARTHQUAKE DRAIN WITH FILTER FABRIC:

January 24, 2012

1.0 DESCRIPTION OF WORK

This work shall consist of furnishing all necessary submittals, materials, labor, equipment, and incidentals for the installation of prefabricated earthquake drains in accordance with the details shown on the plans and the requirements of the Supplemental Specifications. The earthquake drains shall consist of a corrugated pipe with slot type perforations enclosed by a geotextile filter fabric. Space within the pipes above the ground water table provides a reservoir for water expelled from the ground for liquefaction prevention. If required, additional reservoir space shall be constructed in accordance with details shown on the project drawings. The earthquake drains shall be installed at locations shown on the plans, unless otherwise directed by the Engineer. The earthquake drains shall be installed to full length without splicing. If splicing is required the Contractor shall contact the Department for instruction and additional requirements.

2.0 QUALITY ASSURANCE

2.1 Standards:

American Society for Testing and Material (ASTM)

ASTM D3776 Standard Test Method for Measuring Mass per Unit Area of Geotextiles

ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics – Diaphragm Bursting Strength Tester Method

ASTM D4491 Standard Test Method for Water Permeability of Geotextiles by Permittivity

ASTM D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles

ASTM D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

2.2 Quality Control:

The earthquake drains shall be installed with equipment that will maintain the mandrel in a vertical position. The Contractor shall consider the subsoils at the site when selecting equipment and developing the earthquake drain installation plan. The equipment shall generate sufficient pressure necessary to install the earthquake drains through all existing subsurface material to the depths shown on the plans. The equipment shall have the capability of installing the earthquake drains to a depth of not less than 10 feet greater than the maximum earthquake drain depth shown on the plans.

Approval of the sample earthquake drain material by the Engineer will be required prior to delivery of the earthquake drain material to the Project. The earthquake drain manufacturer shall be a specialist in the manufacture of earthquake drains, and shall have produced a minimum of 1,000,000 linear feet of the earthquake drain material proposed for the Project, that have been used in successful applications within the past five years.

The earthquake drains shall be free of defects, rips, holes, and/or flaws. During shipment and storage, the earthquake drains shall be wrapped in a protective covering. The earthquake drains shall be protected from sunlight, mud, dirt, dust, debris, and detrimental substances during shipping and on-site storage.

The Contractor shall certify and provide proof to the Department of experience in the work described. The Contractor shall have successfully installed at least 2,000,000 linear feet of earthquake drains during the last five years. In addition, the Contractor shall have successfully completed at least five projects within the last five years of similar size and complexity to that of the Project.

The Contractor's experience shall be documented by providing a project summary that includes for each referenced project, the project start and completion dates, total quantity of earthquake drains installed, and a detailed description of the project, site conditions, and subsurface conditions. The project description shall include details of the earthquake drain materials, the equipment and technique used to install the earthquake drains, the average and maximum length of earthquake drain installed, the client name and address, the name and telephone number of the representative of the consultant and owner for whom the work was performed and who can attest to the successful completion of the work, and any other information relevant to demonstrating the Contractor's qualifications.

The Contractor shall have a full-time supervisor who has been in responsible charge of supervising earthquake drain installation operations for at least five projects in the last five years. The supervisor shall be present at the work site at all times during earthquake drain installation operations. The acceptability of the supervisor, as well as any replacement for the supervisor, will be subject to the approval of the Department.

3.0 SUBMITTALS

3.1 Prefabricated Earthquake Drain Installation Plan:

Within thirty (30) calendar days after award of the contract or no later than thirty (30) calendar days before beginning earthquake drain installation, the Contractor shall submit to the Department for review an earthquake drain installation plan that includes as a minimum the following information:

- a) Size, type, weight, maximum pushing force, vibratory-hammer rated energy, and configuration of the installation rig.
- b) Dimensions and length of the mandrel.
- c) Details of earthquake drain anchorage.

- d) Detailed description of proposed installation procedures.
- e) Proposed methods and equipment for pre-augering.
- f) Documentation of the successful application of the proposed earthquake drain installation operations.
- g) Method of measuring the installed length of the earthquake drain.
- h) Shop drawings showing the planned locations and bottom elevations of all earthquake drains and showing a unique identification number for each earthquake drain. The installation sequence shall also be provided. The shop drawings shall also show the location of the bridge abutment, and the limits of the final embankment and construction staging.
- i) Resume of supervisor documenting experience and qualifications in the installation of earthquake drains.

3.2 Prefabricated Earthquake Drain Material:

At least thirty (30) calendar days before beginning earthquake drain installation, the Contractor shall:

- a) Submit to the Department for testing three samples of the earthquake drain to be used, with the accompanying manufacturer specifications for the earthquake drain material. The samples of the earthquake drain shall be at least five feet long. The samples shall be stamped or labeled by the manufacturer as being representative of the earthquake drain material having its specified trade name.
- b) Submit to the Department three samples of the proposed anchor plate to be used to anchor the earthquake drains at the design depth shown on the plans.
- c) Submit to the Department manufacturer's literature documenting the physical and mechanical properties of the earthquake drain components. Submit to the Department a manufacturer's list of other similar projects where the same drain has been installed, including details on prior performance on these projects.
- d) The Contractor shall identify the proposed source of the materials prior to delivery to the site. The Contractor shall supply a manufacturer's material certification that the earthquake drain with filter fabric meets or exceeds the material requirements of this Special Provision.

3.3 Submittal Reviews:

All submittals to the Department shall be reviewed according to Section 725 of the SCDOT Standard Specifications for Highway Construction. The submittals shall be reviewed and accepted or rejected within twenty-one (21) calendar days of receipt by the Department. Acceptance of the proposed materials, equipment, construction sequence, and method by the Department shall not relieve the Contractor of its responsibility to install the earthquake drains in accordance with the plans and Special Provision. Approval by the Department of the method and equipment to be used to install the earthquake drains shall be contingent upon satisfactory demonstration of earthquake drain installation at the project site. If, at any time, the Department or the Engineer considers that the method of installation does not produce satisfactory earthquake drains, the Contractor shall alter the method and/or equipment as necessary to comply with the Special Provision. The Department will be the sole judge in determining the adequacy of the Contractor's methods and equipment.

3.4 As-Built Plans:

The Contractor shall provide the Department with "as-built" plans of the earthquake drain installation. Such plans shall include the locations of the earthquake drains, the date the drains were installed, the surface elevation at the drain installation, the "as-built" vertical drain tip elevation, and shall identify any rejected or abandoned drain installations. "As-built" plans shall be submitted at least weekly during earthquake drain installation operations. A final "as-built" plan shall be submitted within seven calendar days of the completion of earthquake drain installation in all embankment locations. The final "as-built" plans will be subject to the approval of the Department.

4.0 MATERIALS

4.1 The earthquake drains shall consist of newly manufactured materials and shall consist of an annular-corrugated interior and exterior plastic drainage core wrapped in a non-woven geotextile filter fabric. The filter fabric shall allow free passage of pore water to the core without loss of soil material or piping. The core shall provide drainage through slot type perforations and a reservoir in the space above the ground water table. Optional, additional reservoir space may take the form of a naturally occurring permeable soil layer if such layer is present. In other cases an artificial reservoir may need to be provided. This artificial reservoir may take any of several forms, ranging from a layer of open graded stone applied over the area, to individually constructed reservoirs at each drain as specified in the plans. The prefabricated earthquake drain material shall meet the following specifications:

Nominal Inside Diameter	As indicated on the plans
Minimum Pipe Stiffness @ 5% Deflection:	35psi
Minimum Drainage Slot Area:	0.013 ft ² /ft
Minimum Water Permeability, fabric:	0.01 in/sec (K-value) (ASTM D4491)
Minimum Water Permittivity, fabric:	0.1 sec ⁻¹ (ASTM D4491)
Minimum Tear Strength, fabric:	50 lb (ASTM D4533)
Minimum Tensile Strength, fabric:	90 lb (ASTM 4632)
Minimum Elongation at break:	60 percent (ASTM D4632)
Minimum Puncture Strength, fabric:	35 lb (ASTM 4833)
Minimum Mullen Burst, fabric:	150 psi (ASTM D3786)

4.2 The filter fabric and core components shall conform to the following:

- a) The filter fabric shall be synthetic non-woven geotextile capable of resisting bending, punching and tensile forces imposed during installation and during the design life of the earthquake drain.
- b) The filter fabric shall not be subject to localized damage (e.g., punching through the filter by sand/gravel particles).
- c) The filter fabric shall be rigid enough to withstand lateral earth pressures due to embedment and surcharge so that the vertical flow capacity through the core will not be adversely affected.
- d) The filter fabric shall be flexible enough to bend smoothly during installation and induced densification without damage.
- e) The filter fabric shall not undergo cracking and peeling during installation of the earthquake drain.

The core shall have an annular-corrugated interior and exterior. The assembled earthquake drain shall be resistant against wet rot, mildew, bacterial action, insects, salts

in solution in the ground water, acids, alkalis, solvents, and other ingredients in the site ground water.

- 4.3** Earthquake drain materials shall be labeled or tagged in such a manner that the information for sample identification and other quality control purposes can be read from the label. As a minimum, each roll shall be identified by the manufacturer as to lot or control numbers, individual roll number, date of manufacture, manufacturer and product identification of the filter fabric and core.

During shipment and storage, the earthquake drain shall be wrapped in burlap or similar heavy duty protective covering. The earthquake drain shall be protected from sunlight, mud, dirt, dust, debris, and other detrimental substances during shipping and on-site storage.

Material which is damaged during shipment, unloading, storage, or handling, or which does not meet the requirements of the earthquake drain material will be rejected by the Department. No payment will be made for rejected material.

5.0 INSTALLATION

- 5.1** Earthquake drains shall be installed as indicated on the plans or as directed by the Department. Earthquake drains shall be spaced as indicated on the plans. Earthquake drains shall be installed in stages coinciding with construction stages. Earthquake drains shall be installed using a mandrel or a sleeve that shall advance through the soils to the elevations shown on the plans. The earthquake drains shall be installed using equipment that will maintain the mandrel in a vertical position. The mandrel or sleeve shall protect the drain material from tears, cuts, and abrasion during installation and shall be retracted after each earthquake drain is installed. The mandrel shall be fitted with three symmetrically spaced fins for transmitting vibrations to the soil during installation.
- 5.2** The installation rig shall utilize a vibrator with an eccentric moment sufficient to generate vertical vibration to the mandrel during installation. The equipment shall also generate sufficient vertical force (static crowd) to the mandrel to install the earthquake drains through all existing subsurface materials to the depths shown on the plans.
- 5.3** The earthquake drain shall be provided with an “anchor” plate or similar arrangement to anchor the bottom of the drain at the required depth during mandrel removal and to prevent soil from entering the bottom of the mandrel during drain installation. The anchorage shall be adequate to keep the bottom of the earthquake drain at the required depth subject to approval and field verification by the Department. The corresponding dimension of the anchor shall conform as closely as possible to the breadth dimensions of the mandrel to minimize soil disturbance.
- 5.4** The Contractor shall notify the Department at least 24 hours prior to installation of the initial earthquake drains, to allow the Department sufficient time to provide the necessary inspection for the initial earthquake drain installation. Installation of the initial earthquake drains shall not proceed without the presence of the Department's inspector. During the installation of the initial ten earthquake drains, the Contractor shall demonstrate that the equipment, method, and material produce a satisfactory installation, as determined by the Department. Following completion of the initial earthquake drain installations, the Contractor shall not proceed with the installation of the remaining earthquake drains until authorized by the Department.
- 5.5** If foundations have been previously installed, the prefabricated earthquake drains shall be installed in a manner as to avoid foundation piles or spread footings. The location of the earthquake drains relative to the foundations shall be determined and staked out prior to the installation of the prefabricated earthquake drains. In addition, the Contractor

shall be responsible for taking precautions to preserve the stake locations and is responsible for re-staking, if necessary.

- 5.6** Earthquake drains shall be located, numbered, and staked out using a baseline and benchmark provided by the Contractor. The Contractor shall be responsible for all other construction staking, for taking precautions to preserve the stake locations, and is responsible for re-staking, if necessary. The as-installed locations of the earthquake drains shall not vary by more than six inches from the locations designated on the plans or approved shop drawings.
- 5.7** Earthquake drains that deviate from the plan locations by more than six inches, that are damaged, or improperly installed will be rejected. Rejected earthquake drains shall be abandoned in place. Replacement earthquake drains shall be placed as close as possible to the correct original locations.
- 5.8** The Contractor shall provide the Department with a means of verifying the plumbness of the mandrel and determining the depth of the earthquake drains. The equipment shall be checked for plumbness prior to installing each drain and shall not deviate from the vertical more than two percent (2%) during installation.
- 5.9** Earthquake drains shall be installed as shown on the plans and as directed by the Department. The replacement of existing geotechnical instrumentation, if present, damaged because of the Contractor's activities will be the responsibility of the Contractor, as described in the Special Provision for the geotechnical instrumentation, if required on the project.
- 5.10** Earthquake drains shall be installed from the working surface (top of fill soil) to the earthquake drain bottom elevations shown on the plans or to refusal. Refusal shall be defined as the point where the soils resist a reasonable effort at further penetration of the earthquake drains. The refusal criteria shall be established by the Engineer on the basis of existing soil borings and the initial earthquake drain installations to be performed by the Contractor in the presence of the Department's inspector, as specified herein. No earthquake drains shall be terminated above the design earthquake drain bottom elevations shown on the plans without the approval of the Engineer. The Engineer may vary the depths, spacing, and/or number of earthquake drains to be installed, and may revise the plan limits for this work based on the actual subsurface conditions encountered.
- 5.11** The prefabricated earthquake drains shall be cut off neatly at least six inches above the working layer, unless otherwise shown on the plans. The filter fabric shall be knotted at the top of the drain to prevent soil from entering the drain.
- 5.12** During earthquake drain installation, the Contractor shall provide the Department with a means of determining the depth of the advancing earthquake drain at any given time and the length of the drain installed at each location. A summary tabulation of the number and length (to the nearest ½-foot) of acceptable earthquake drains shall be submitted daily to the Department.
- 5.13** Where obstructions are encountered below the working surface, the Contractor shall install a new drain within an 18 inch radius of the original location of the obstructed drain. A maximum of two additional attempts shall be made as directed by the Department for each obstructed earthquake drain. If the drain still cannot be installed to the design tip elevation, the drain location shall be abandoned and a new drain installed at a location directed by the Department. Locations where earthquake drains do not meet the depth criteria due to obstructions shall be clearly marked in the field. The Engineer will have the right to waive the replacement earthquake drain requirement upon written notice to the Contractor.

5.14 Pre-augering for the earthquake drain installation shall be allowed to advance the drains through compacted fill material or other obstructions. The Contractor shall be responsible for penetrating the overlying fill material or any dense layers or obstructions when encountered to satisfactorily install the earthquake drains. Satisfactory installation shall allow for clearing obstructions defined as any man-made or natural object or a stratum that prevents the proper insertion of the mandrel and installation of the earthquake drain. Pre-augering shall not be allowed for the first stage of construction where earthquake drains will penetrate through geotextile, if present.

The Contractor may use augering or other approved methods to loosen the soil and obstructing material prior to the installation of the drains. The obstruction clearance procedure is subject to the approval of the Engineer; however, such approval shall not relieve the Contractor of the responsibility to clear obstructions in accordance with the specifications.

If augering is the selected method, the augers shall have a minimum outside diameter equal to the largest horizontal dimension of the mandrel, shoe, or anchor, whichever is greatest. The maximum outside diameter of the auger shall be no more than three inches greater than the maximum dimension of the mandrel.

Obstruction clearance procedures shall be kept to a minimum and shall be used only when approved by the Engineer. Augering or other obstruction removal techniques shall not penetrate more than two feet into the underlying compressible soil.

Where obstructions are encountered, the following procedure shall be implemented in the listed sequence:

- a) The Contractor shall immediately notify the Department prior to completing the drain and prior to installing other drains.
- b) The Contractor shall then attempt to install drains adjacent to the obstructed location. Based upon the results of these installations and at the direction of the Department, the Contractor shall:
 1. Attempt to install an offset drain within 18 inches horizontally of the obstructed drain, or
 2. Implement obstruction clearance procedures and install the drain at the design location. Obstruction clearance procedures shall be used only as approved by the Engineer.

5.15 Earthquake drains shall be installed using a continuous push using static weight and vibration. Jetting or the use of an impact hammer will not be allowed to install the earthquake drains.

5.16 A mandrel shall be used to protect the earthquake drains during installation. The mandrel shall be withdrawn after installation of the earthquake drains. In no case will alternative raising and lowering of the mandrel during advancement be permitted. Raising the mandrel will be permitted only after completion of the earthquake drain installation to the bottom of the drain elevation shown on the plans or otherwise authorized by the Engineer.

6.0 MEASUREMENT

6.1 Prefabricated Earthquake Drains: This item shall include the furnishing of all materials, supervision, equipment, crews, tools, required permits, survey stake out of earthquake drain locations, and other equipment and materials as necessary to properly execute the work.

The total length of earthquake drains for liquefaction mitigation shall be measured to the nearest one-half foot. The total length of earthquake drains to be paid for shall be as indicated on the plans.

7.0 BASIS OF PAYMENT

- 7.1 **Prefabricated Earthquake Drains:** Payment for earthquake drains shall be made at the contract unit price per linear foot of earthquake drains installed, which price shall be full compensation for the cost of furnishing the full length of the earthquake drain material, installing the earthquake drain, obstruction clearance, altering of the equipment and methods of installation in order to produce the required end result in accordance with the contract documents, and shall also include the cost of furnishing all tools, mobilization, materials, labor, equipment, supervision, survey stake out of earthquake drain locations, and all other costs necessary to complete the required work.

The Engineer may vary the depths, spacing, or numbers of earthquake drains to be installed and may revise the earthquake drain installation limits shown on the plans based on the actual subsurface conditions encountered. Such changes or revisions may increase or decrease the total quantity of the earthquake drains estimated based on the plans. In the event of such changes in required earthquake drain quantity, the payment for earthquake drains shall be made on the basis of the contract unit price per linear foot.

No payment will be made for earthquake drains, or for any delays or expenses incurred through changes necessitated by improper material or equipment.

Payments shall be made under:

Item No.	Pay Item	Pay Unit
2052210	Prefabricated Earthquake Drain with Filter Fabric	LF

(48) SECTION 208: GEOTEXTILES FOR SEPARATION AND STABILIZATION:

December 23, 2009

1.0 DESCRIPTION

This work is furnishing and installing geotextiles.

2.0 MATERIALS

A geotextile is defined as any permeable polymeric textile used with foundation, soil, rock, earth, or any other geotechnical engineering related material, as an integral part of a civil engineering project, structure, or system. Use geotextiles and thread used in joining geotextiles manufactured from fibers consisting of long-chain polymers, composed of at least 95 percent by weight of polyolefins or polyesters. Use geotextiles with fibers formed into a stable network such that the fibers or yarns retain their dimensional stability relative to each other, including selvages (edges) during shipping, handling, placement, and in service. Use geotextile free from defects or tears.

- A. **Minimum Average Roll Values.** All property values, with the exception of Apparent Opening Size (AOS), represent Minimum Average Roll Values (MARV) in the weakest principal direction. Provide geotextiles whose average test results from any roll sampled in a lot for conformance or quality assurance testing meets or exceeds minimum values provided in this Section.
- B. **Apparent Opening Size.** Values for Apparent Opening Size (AOS) represent maximum average roll values. Acceptance will be based on ASTM D 4759.
- C. **Separation Geotextile.** Use separation geotextile for unsaturated firm subgrade conditions.
- D. **Stabilization Geotextile.** Use stabilization geotextile for soft, wet, saturated subgrade conditions.

Furnish geotextiles meeting the strength property requirements of Table 1 and the AOS, permittivity, and ultraviolet stability requirements of Table 2 for separation geotextile, Table 3

for stabilization geotextile. The geotextile properties required for each class of survivability are dependent upon geotextile type, i.e. woven or nonwoven. When sewn seams are used, the strength of the sewn seams must be equal to or greater than 90 percent of the specified grab tensile strength.

TABLE 1 - GEOTEXTILE STRENGTH PROPERTY REQUIREMENTS

			GEOTEXTILE SURVIVABILITY ¹			
			Moderate Survivability (CBR ≥ 3; c _u ≥ 1,800 psf)		High Survivability (CBR < 3; c _u < 1,800 psf)	
PROPERTY	TEST METHODS	UNITS	Woven	Non-woven	Woven	Non-woven
Grab Elongation	ASTM D 4632	%	< 50	≥ 50	< 50	≥ 50
Grab Strength	ASTM D 4632	lbs.	250	160	315	200
Sewn Seam Strength ²	ASTM D 4632	lbs.	225	145	285	180
Tear Strength	ASTM D 4533	lbs.	90	55	110	80
Puncture Strength	ASTM D 4833	lbs.	90	55	110	80
Apparent Opening Size	ASTM D 4751	Sieve Size	Required property values for AOS, permittivity, and UV stability are based on the geotextile applications. Refer to Table 2 for separation geotextile, Table 3 for stabilization geotextile.			
Permittivity	ASTM D 4491	sec. ⁻¹				
Ultraviolet Stability (retained strength)	ASTM D 4355	%				

Notes:

1. All numeric values represent Minimum Average Roll Value (MARV) in the weaker principal direction.
2. When sewn seams are required. Refer to Section 3, Table 4 for overlap requirements.

2.1 Separation Geotextile.

Provide geotextile meeting the strength requirements from Table 1 for the level of survivability specified on the plans or in the special provisions. Provide geotextile meeting the permittivity, apparent opening size, and ultraviolet stability requirements of Table 2.

TABLE 2 - SEPARATION GEOTEXTILE PROPERTY REQUIREMENTS

	TEST METHODS	UNITS	REQUIREMENTS
Geotextile Survivability	As specified from Table 1		
Permittivity ¹	ASTM D 4491	sec. ⁻¹	≥ 0.02
Apparent Opening Size	ASTM D 4751	Sieve Size (mm)	#30 (≤ 0.60)
Ultraviolet Stability (Retained Strength)	ASTM D 4355	%	≥ 50 after 500 hrs. of exposure

Notes:

1. Minimum value. Permittivity of the geotextile must be greater than that required for the soil. Use greater value as specified on the plans or in the special provisions.

2.2 Stabilization Geotextile.

Do not use woven slit film geotextiles (i.e. geotextiles made from yarns of a flat, tape-like character). Provide geotextile meeting the strength requirements for high survivability from Table 1. Provide geotextile meeting the permittivity, apparent opening size, and ultraviolet stability requirements of Table 3.

TABLE 3 - STABILIZATION GEOTEXTILE PROPERTY REQUIREMENTS¹

	TEST METHODS	UNITS	REQUIREMENTS
Geotextile Survivability	High Survivability from Table 1		
Permittivity ²	ASTM D 4491	sec. ⁻¹	≥ 0.10
Apparent Opening Size	ASTM D 4751	Sieve Size (mm)	#40 (≤ 0.43)
Ultraviolet Stability (Retained Strength)	ASTM D 4355	%	≥ 50 after 500 hrs. of exposure

Notes:

1. Do not use woven slit film geotextiles.
2. Minimum value. Permittivity of the geotextile must be greater than that required for the soil. Use greater value as specified on the plans or in the special provisions.

2.3 Source Approval.

Submit the following information regarding each geotextile proposed for use:

- Manufacturer’s name and current address;
- Full product name/number;
- Geosynthetic material and structure; and
- Proposed geotextile use(s).

Submit a sample to the RCE for evaluation. Product acceptance is determined by comparing the average test results of all specimens within a given sample to the Minimum Average Roll Values (MARV) listed in Table 1.

Install geotextiles only after the material has been tested and accepted. Replace all geotextiles installed prior to acceptance that do not meet specifications at Contractor’s expense.

2.4 Sampling.

Cut a sample from the geotextile roll with the minimum dimensions of 4 feet by the full width of the roll beyond the first wrap. After the sample and the required information have been submitted to the RCE, allow 30 calendar days for evaluation.

2.5 Identification, Shipment and Storage.

Conform to ASTM D 4873, *Standard Guide for Identification, Storage, and Handling of Geotextiles*. Clearly label each roll of geotextile shipped to the project with the name and address of the manufacturer, full product name/number, quantity, and roll number. Submit a manufacturer’s certificate of compliance signed by an authorized manufacturer’s official. The certificate must attest that the geotextile meets all the Minimum Average Roll Value (MARV) requirements specified in Table 1 as evaluated under the manufacturer’s quality control program.

The RCE will reject materials that are mislabeled or misrepresented. Wrap each roll with a material that protects the geotextile, including ends of the roll, from damage due to shipment, water, sunlight, and contaminants. Maintain the protective wrapping during periods of shipment and storage. Do not damage the geotextile or wrapping when unloading or transferring from one location to another. Do not drag the rolls.

During storage, elevate geotextile rolls off the ground and adequately cover to protect them from the following:

- Site construction damage;
- Precipitation;
- Ultraviolet radiation including sunlight;
- Chemicals that are strong acids or strong bases;
- Flames including welding sparks, temperatures in excess of 140 °F (60 °C); and
- Mud, dirt, dust, debris and any other environmental condition that may damage the physical property values of the geotextile.

3.0 CONSTRUCTION REQUIREMENTS

3.1 General.

Prepare the surface on which the geotextile is to be placed so that no damage occurs to the geotextile. Do not drive construction equipment on the geotextile. Dispose of material with defects, rips, holes, flaws, deterioration, or other damage. Do not use defective material in the work.

If sewn seams are used for seaming the geotextile, use thread that consists of high strength polypropylene or polyester. Do not use nylon thread. Use thread that is of contrasting color to that of the geotextile itself.

For seams that are sewn in the field, provide at least a 10-foot length of sewn seam for sampling by the RCE before the geotextile is installed. For seams that are sewn in the factory, provide samples as directed and witnessed by the RCE at random from any roll of geotextile that is used on the project.

For seams that are field sewn, use the same equipment and procedures for both the sampling and production seams. If seams are to be sewn in both the machine and cross-machine direction, provide samples of seams from both directions.

Submit the seam assembly description along with the sample of the seam. Include in the description the seam type, stitch type, sewing thread, and stitch density.

3.2 Separation/Stabilization Geotextile.

Prepare the installation site by clearing, grubbing, and excavating or filling the area to the design grade. This includes removal of topsoil or vegetation. The RCE will identify soft spots and unsuitable areas during site preparation. Excavate these areas and backfill with approved granular material and compact as specified. Grade the area to be covered by the geotextile to a smooth, uniform condition, free from ruts, potholes, and protruding objects such as rocks or sticks.

Spread the geotextile immediately ahead of the covering operation. Lay the geotextile smooth without wrinkles or folds on the prepared subgrade in the direction of construction traffic. Remove wrinkles and folds by pulling the geotextile taut as required. Use soil piles or the manufacturer's recommended method (as approved by the RCE) to hold the geotextile in place until the specified cover material is placed. Overlap, sew or join adjacent geotextile rolls and roll ends as shown on the plans or as directed by the RCE. Overlap in the direction shown on the plans. Overlap in accordance with the requirements of Table 4, or as specified on the plans or in the special provisions.

TABLE 4 - OVERLAP REQUIREMENTS

UNDRAINED SHEAR STRENGTH OF SUBGRADE	MINIMUM OVERLAP
> 2,000 psf	1 foot
500-2,000 psf	3 feet or Sewn
< 500 psf	Sewn

All roll ends	3 feet or Sewn
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On curves, cut or fold the geotextile to conform to the curve. Fold or overlap in the direction of construction and hold in place using pins, staples, or piles of fill or rock.

Do not cover the geotextile until inspected for damage by the RCE. Repair or replace all damaged geotextile at Contractor's expense. Make repairs following the manufacturer's recommendation or use a patch of the same material placed over the damaged area, overlapped at least 3 feet from the edge of any part of the damage. Sewing repairs are an acceptable alternative.

Place fill over the geotextile by dumping onto previously placed material and pushing the material into place. Do not operate any construction equipment directly on the geotextile under any circumstances. Place the fill material in uniform layers so that there is the minimum specified lift thickness between the geotextile and equipment tires or tracks at all times. The minimum thickness of the first lift is 8 inches. Do not allow construction equipment to turn on the first lift of material above the geotextile. Do not blade the first lift placed over the geotextile. If the subgrade is very soft with an undrained shear strength less than 500 psf minimize pile heights to less than 3 feet and spread piles as soon as possible after dumping to minimize the potential for localized subgrade failure due to overloading of the subgrade.

Do not use sheepsfoot or studded compaction equipment on the first lift placed over the geotextile. Stop vibrator on compaction equipment if pumping occurs. Do not operate any construction equipment that results in rutting in excess of 3 inches on the first lift. If rutting exceeds 3 inches, decrease the construction equipment size and/or weight or increase the lift thickness. Use only rubber-tired rollers for compaction if any foundation failures occur when placing subsequent lifts. Compact all lifts to the moisture and density requirements for earth embankment specified in the Standard Construction Specifications. Do not blade material down to remove ruts. Fill any ruts or depressions with additional material and compact to the specified density.

4.0 METHOD OF MEASUREMENT

Geotextiles are measured by the square yard as staked by the RCE. Measurement excludes laps, seams, and joints.

5.0 BASIS OF PAYMENT

Payment at the contract unit price is full compensation for all resources necessary to complete the item of work under the contract. Payment for the completed and accepted quantities is made under the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Geotextile, Separation/Stabilization	Square Yard

(49) SECTION 305: MAINTENANCE STONE:

Maintenance Stone used on this project shall conform to the gradation requirements of Section 305, or to the gradation specified for Aggregate No. CR-14 in the Standard Specifications.

(50) SECTION 401: DRESSING OF SHOULDERS:

Prior to the placement of asphalt mixtures on existing roadways, the contractor will be required to remove all vegetation adjacent to the edge of pavement which impedes the placement of the asphalt mixture to the specified width. The contractor shall also remove and dispose of all excess asphalt which is disturbed during minor grading for widening, or during removal of debris or grass from existing surface during preparation of surface for new lift. After the asphalt mixture has been placed, the contractor shall blade the disturbed material to the extent that the shoulder is left in a neat and presentable condition. All excess material shall be removed from the project. No direct payment shall be made for this work; all costs are to be included in the price of other items of work.

(51) SECTION 401: HOT MIX ASPHALT (HMA) QUALITY ASSURANCE:

Reference is made to the Supplemental Technical Specification "Hot Mix Asphalt (HMA) Quality Assurance." For the purposes of applying this Supplemental Technical Specification, there will be no pay factor adjustment greater than 100% for any given lot. When applying pay factor adjustments of less than 100%, a unit price of \$75 per ton will be used.

(52) SECTION 401: HOT-MIX ASPHALT RIDEABILITY:

Reference is made to the Supplemental Technical Specification "Hot-Mix Asphalt Rideability." For the purposes of applying this Supplemental Technical Specification, there will be no pay factor adjustment greater than 100%. When applying pay factor adjustments of less than 100%, price Adjustments will be calculated based on \$75 per ton.

(53) SECTION 401: ASPHALT BINDER ADJUSTMENT INDEX:

No liquid asphalt binder adjustments will be made on this Project.

(54) SECTION 403: PAVING UNDER GUARDRAIL:

August 17, 2011

Section 403 is expanded as follows:

GENERAL:

Provide paving under guardrail as shown in the plans, in accordance with plan details and these special provisions. Pavement under guardrail shall only be placed where shown in the plans or as directed by the Engineer.

MATERIALS:

Pavement material under guardrail shall be the same as the hot mix asphaltic concrete surfacing being used on the adjacent roadway. Liquid asphalt binder shall be the same as that used for paving on the adjacent roadway.

Low-density Flowable Fill with a maximum 28-day compressive strength of 120PSI shall be used to fill leave out areas.

CONSTRUCTION:

Place hot mix asphaltic concrete surfacing under guardrail in accordance with Section 401 of the Standard Specifications where indicated on the plans or as directed by the Engineer. Refer to details provided in this special provision for typical limits of paving and requirements for leave out areas around guardrail posts.

Pave area between the edge of pavement and the face of the guardrail when that distance is less than 20 feet.

Extend paving under guardrail to bridge end at locations where concrete approach slabs are used.

When at least one opening between parallel lines of guardrail is less than 20 feet wide, pave the entire area between the lines of guardrail.

When openings between parallel lines of guardrail are more than 20 feet wide, but obstructions such as bridge columns reduce the access between the guardrail and the obstruction to less than 20 feet and/or the distance between any two obstructions is less than 20 feet then the area with any single point of access less than 20 feet wide shall be paved.

When areas around obstructions are paved, no area should remain unpaved that will sustain plant life.

The top of pavement shall be constructed to be flush with surrounding earth shoulders and slopes.

Damage to pavement during subsequent construction, especially during driving of guardrail posts, should be minimized. Any damaged pavement must be restored to its original line and grade to the satisfaction of the Engineer.

Leave outs shown in the details shall be either formed or sawcut.

MEASUREMENT AND PAYMENT:

Hot mix asphalt surface course shall be measured and paid for in accordance with Section 401 of the Standard Specifications.

Liquid asphalt binder shall be measured and paid for in accordance with Section 401 of the Standard Specifications.

When additional excavation is required to obtain the depth of pavement specified, this additional excavation will be measured separately and paid for by the cubic yard as unclassified excavation in accordance with section 203 of the Standard Specifications.

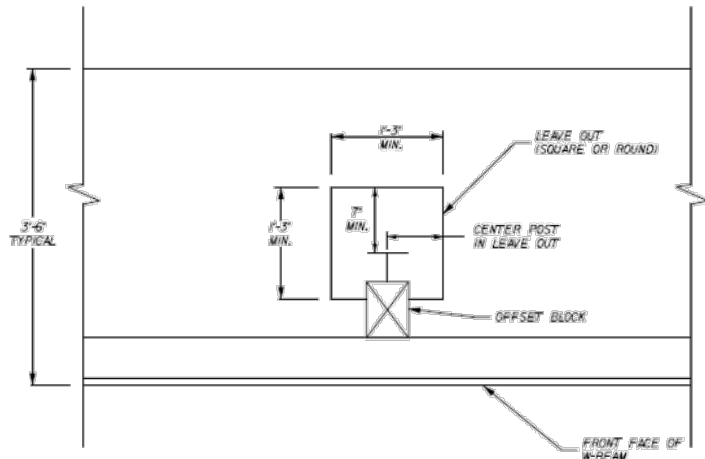
When borrow is needed to construct the area to be paved to meet the typical section, this borrow excavation will be measured and paid for separately as borrow excavation in accordance with section 203 of the Standard Specifications.

The costs to provide the leave outs shall be considered incidental to the hot mix asphalt surface course and no separate measurement or payment shall be made for providing leave out areas.

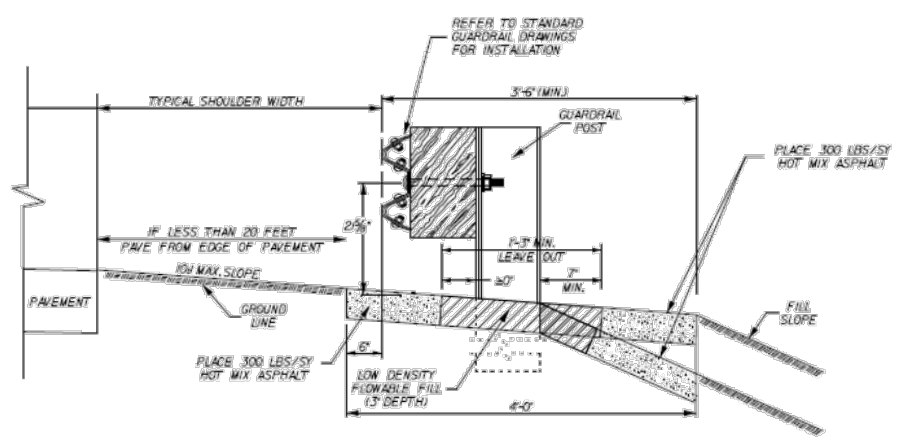
Flowable fill for leave out areas will be measured and paid for in accordance with section 210 of the Standard Specifications.

Payment under this section will include the following:

<u>Item No.</u>	<u>Pay Item</u>	<u>Unit</u>
2031000	UNCLASSIFIED EXCAVATION	CY
2033000	BORROW EXCAVATION	CY
2103000	FLOWABLE FILL	CY
40110XX	LIQUID ASPHALT BINDER PG__-22	TON
40303XX	HOT MIX ASPHALT CONCRETE SURFACE COURSE TYPE _	TON



LEAVE OUT DETAIL
PLAN VIEW



PAVING AROUND POST
CROSS SECTION

(55) DIVISION 400 & 500: CROSS SLOPE VERIFICATION:

August 26, 2015
Updated

1 DESCRIPTION

The cross slopes of the roadway are to be constructed as detailed in the plans and within the tolerances listed in this specification. It is the responsibility of the Contractor to ensure that the roadway cross slopes meet the requirements of the plans and this specification.

2 RESPONSIBILITIES

Carefully review the plans to determine the amount of information that has been provided by SCDOT prior to bidding. The following paragraphs explain the Contractor responsibilities based on the information contained in the plans.

2.1 SURVEY CONTROL:

The Contractor shall be responsible for establishing the survey control information. This information will include control points, horizontal alignment, and stationing. Surveys shall be in accordance with the SCDOT Pre-Construction Survey Manual (Latest Edition). <http://www.scdot.org/doing/survman.shtml>

2.2 SUPERELEVATION:

The Contractor shall be responsible for establishing the superelevation transition points with station reference at the following points along horizontal curves: begin and end of superelevation, flat cross slopes within superelevation transition, remove crown, begin and end of maximum superelevation, PC's, PT's, and cross slopes on begin and end of bridges. The Contractor shall establish superelevation in accordance with the SCDOT Highway Design Manual (Latest Edition).

2.3 EXISTING CROSS SLOPE DATA:

The Contractor shall be responsible for obtaining existing cross slope data.

2.4 SUBMITTALS:

The Contractor shall ensure that all deliverable documents are signed and sealed by a Professional Engineer qualified to practice in South Carolina. The Contractor and/or Professional Engineer shall give depositions and testify in court to the methodology, the accuracy of obtained cross slope, and that all criteria stated in this provision were met upon the request of the Department.

3 CONTRACTOR PLANNING PROCESS

3.1 INITIAL PAVEMENT DATA SURVEY:

The Contractor shall be responsible for collecting elevation data for the edge of each travel lane at even 100-foot stations in tangents and 50-foot stations in curves, begin and end of superelevation, flat cross slopes within superelevation transition, remove crown, begin and end of maximum superelevation, PC's, PT's, and cross slopes on begin and end of bridges. Record elevation data to the hundredth of a foot.

3.2 CALCULATING CROSS SLOPE:

The cross slope of a travel lane in the cross section view is the ratio or percent based on the change in horizontal compared to the change in vertical. Cross slope is calculated by subtracting the difference in elevation between the two edges of the travel lane and dividing this difference by the lane width. For example, a typical 48:1 Normal Crown (NC) pavement cross slope is calculated as -0.0208 ft/ft or -2.08% for a 12 foot lane (Figure 1). Figure 2 shows an example of a Remove Crown (RC) pavement cross slope which is calculated as $+0.0208 \text{ ft/ft}$ or $+2.08\%$ for the 12 foot lane on the high side of superelevation.

3.3 ACCEPTABLE TOLERANCES OF CROSS SLOPES:

Tolerance Level 1 for cross slopes shall be + 0.00174 ft/ft of the design cross slopes.
Tolerance Level 2 for cross slopes shall be + 0.00348 ft/ft of the design cross slopes.

3.4 INITIAL CORRECTIVE MEASURES PLAN:

Submit to the RCE a summary of the Initial Pavement Data Survey. The data submitted for review shall include the following information for each travel lane:

Station	LETL Elevation	RETL Elevation	Lane Width	Calculated X-slope	Plan X-slope	Deviation	Tolerance Level
---------	----------------	----------------	------------	--------------------	--------------	-----------	-----------------

1. Station
2. Left Edge of Travel Lane Elevation (LETL) in ft
3. Right Edge of Travel Lane Elevation (RETL) in ft
4. Lane width in ft
5. Calculated cross slope in ft/ft
6. Plan cross slope in ft/ft
7. Deviation between calculated cross slope and plan cross slope
8. Tolerance Level (1, 2, or Out of tolerance)

The Contractor is required to prepare a plan to correct the cross slopes in the areas that are **outside of Tolerance Level 2**. The Contractor shall identify the areas that require corrective action. Submit an Initial Corrective Measures Plan to the Resident Construction Engineer for approval. The submittal will include the elevations, milling depths, and buildup thicknesses for HMA, and areas of grinding and replacement for PCC for each edge of the travel lane and shoulder break points including the face of concrete barrier wall required to achieve the plan cross slopes and proper superelevation. The Contractor shall include an estimated quantity of corrective actions.

The RCE must approve the Initial Corrective Measures Plan prior to beginning corrective measures.

4 CONSTRUCTION PROCESS

4.1 INITIAL CORRECTIVE MEASURES:

For HMA pavement, perform all initial corrective measures prior to placing the first uniform overlay. For PCC pavement, corrective measures will be completed as a part of the application of a final surface texture. Follow the plan that was approved by the RCE.

4.2 PROGRESS MEASUREMENTS:

The Contractor shall verify cross slope measurements after the following work activities:

1. Completion of initial corrective measures (milling and/or build-up for HMA, grinding and replacement for PCC)
2. After each uniform lift of pavement prior to the final surface overlay (HMA)

Elevation data is to be collected at the edge of each travel lane perpendicular to the roadway centerline at the following locations:

1. Minimum of one random location every 300 feet in tangent sections as determined by the Department
2. Begin and end of superelevation, flat cross slopes within superelevation transition, remove crown, begin and end of maximum superelevation, PC's, and PT's
3. Cross slopes on begin and end of bridges

Submit to the RCE a summary of the progress measurements for information only. The data submitted for review shall include the following information for each travel lane in the shown format:

Station	LETL Elevation	RETL Elevation	Lane Width	Calculated X-slope	Plan X-slope	Deviation	Tolerance Level
---------	----------------	----------------	------------	--------------------	--------------	-----------	-----------------

1. Station
2. Left Edge of Travel Lane Elevation (LETL) in ft
3. Right Edge of Travel Lane Elevation (RETL) in ft
4. Lane width in ft
5. Calculated cross slope in ft/ft
6. Plan cross slope in ft/ft
7. Deviation between calculated cross slope and plan cross slope
8. Tolerance Level (1, 2, or Out of tolerance)

4.3 CONSTRUCT UNIFORM LIFTS OF ASPHALT:

Construct uniform lifts of asphalt in accordance with the plan typical sections. Continue to monitor the construction process by conducting a Progress Measurement after each uniform lift of asphalt prior to the final lift (excluding Open Graded Friction Course (OGFC) if specified). For information only, submit the results to the RCE for each lift. Areas outside of Tolerance Level 2 will require correction prior to placing subsequent uniform lifts.

4.4 FINAL PAVEMENT MEASUREMENT:

Calculate the pavement cross slopes after placing the final surface (prior to OGFC if specified). Verify that the correct cross slopes have been obtained. Elevation data is to be collected at the edge of each travel lane perpendicular to the roadway centerline at the following locations:

1. Even 100-foot stations in tangent sections and even 50-foot stations in curves
2. Begin and end of superelevation, flat cross slopes within superelevation transition, remove crown, begin and end of maximum superelevation, PC's, and PT's
3. Cross slopes on begin and end of bridges

Submit to the RCE a summary of the final pavement measurements. The data submitted for review shall include the following information for each travel lane:

Station	LETL Elevation	RETL Elevation	Lane Width	Calculated X-slope	Plan X-slope	Deviation	Tolerance Level
---------	----------------	----------------	------------	--------------------	--------------	-----------	-----------------

1. Station
2. Left Edge of Travel Lane Elevation (LETL) in ft
3. Right Edge of Travel Lane Elevation (RETL) in ft
4. Lane width in ft
5. Calculated cross slope in ft/ft
6. Plan cross slope in ft/ft
7. Deviation between calculated cross slope and plan cross slope
8. Tolerance Level (1, 2, or Out of tolerance)

Areas outside of **Tolerance Level 1 and within Tolerance Level 2** will be subject to review by the RCE and the DCE. The DCE will either require corrective measures at the Contractor's expense, or will provide a memo of acceptance with a pay reduction.

Areas outside of **Tolerance Level 2** will be subject to review by the DCE and the Director of Construction. The Director of Construction will either require corrective measures at the Contractor's expense, or will provide a memo of acceptance with a pay reduction.

4.5 PERFORMANCE ADJUSTMENTS

For Final Pavement Measurements within **Tolerance Level 1**, no pay adjustment will be made.

For Final Pavement Measurements outside of **Tolerance Level 1**, the DCE will either require corrective measures at the Contractor's expense, or will provide a memo of acceptance with a pay reduction of \$200/100' for each travel lane over the length of the section. The section length(s) will be determined as follows:

The beginning of each section will be halfway between the first point outside Tolerance Level 1 and the previous (adjacent) point within full compliance. The end of each section will be halfway between the last point outside Tolerance Level 1 and the adjacent point which is within full compliance. The minimum section length will be 100 feet. This amount will be deducted from monies due for pavement mixes.

For Final Pavement Measurements outside of **Tolerance Level 2**, the DOC will either require corrective measures at the Contractor's expense, or will provide a memo of acceptance with a pay reduction of \$300/100' for each travel lane over the length of the section. (This pay reduction will be in addition to the \$200 pay reduction for being outside of Tolerance Level 1.) The section length(s) will be determined as follows:

The beginning of each section will be halfway between the first point outside Tolerance Level 2 and the previous (adjacent) point within Tolerance Level 2. The end of each section will be halfway between the last point outside Tolerance Level 2 and the adjacent point which is within Tolerance Level 2. The minimum section length will be 100 feet. This amount will be deducted from monies due for pavement mixes.

For PCC pavements if corrective actions are made, refer to SC-M-503 for determining Thickness Tolerances.

5 AS-BUILT PLAN SHEETS AND ELECTRONIC DELIVERABLES

After any Performance Adjustments have been settled, provide final pavement cross sections on full size (22" x 36") plans sheets and submit to the RCE for inclusion in the as-built plans. Include the final disposition of cross slopes outside of the specified tolerances (i.e. corrected survey data, memo of acceptance from DOC, etc).

The as-built construction plans should include the following:

1. Control points, horizontal alignment, and stationing used to construct the project.
2. Superelevation with horizontal curve data.
3. Cross sections at even 100-foot stations in tangents and 50-foot stations in curves.
4. Cross sections at the begin and end of superelevation, flat cross slopes within superelevation transition, remove crown, begin and end of maximum superelevation, PC's, PT's, and cross slopes on begin and end of bridges.
5. Corresponding electronic files on CD-ROM or DVD to include all files used to develop the survey for the project, all files used to verify the cross slopes for the project, superelevation calculations, and any Microstation CADD files that pertain to the cross sections.

6 METHOD OF MEASUREMENT:

- 6.1 Measurement will be made for Cross Slope Verification after the RCE has reviewed and approved the work, including all submittals. Measurement is one lump sum.
- 6.2 No measurement will be made for any items of work required to make corrections to the final pavement cross slopes as deemed necessary by the Department.

7 BASIS OF PAYMENT:

- 7.1 Cross Slope Verification will include any costs for interpreting the data, electronic and hard copies of survey data for the Engineer, traffic control, and any and all, tools, labor, and equipment necessary to perform the cross slope verification. The RCE will approve payment based on the following schedule:

Approval of the Initial Corrective Measures Plan	40%
Submittal of Progress Measurement for First Uniform Lift	60%
Submittal of the Final Pavement Cross Slope Measurements	80%
Acceptance of the As-Built Plan Sheets and Electronic Data	100%

- 7.2 The bid item number and description is:

ITEM NUMBER	DESCRIPTION	UNIT
1055102	CROSS SLOPE VERIFICATION	LS

(56) SECTION 501: ROLLER COMPACTED CONCRETE:

1. GENERAL

- 1.1 Description: Roller Compacted Concrete (RCC) consists of aggregate, portland cement and possibly other supplementary cementitious materials (fly ash, slag), and water. RCC is proportioned, mixed, placed, compacted, and cured in accordance with these specifications. Ensure that the RCC conforms to the lines, grades, thickness, and typical cross section shown in the plans or otherwise established by the RCE. When used as base course, it will be covered with one or more lifts of asphalt as shown on the Plans. Otherwise, the RCC will provide the final riding surface.

2. SUBMITTALS

- 2.1 Proposed RCC mix design: At least 45 days prior to the beginning of placing of RCC in the roadway, submit a proposed mix design to the State Materials Engineer at the SCDOT Office of Materials and Research for review. If the mix design appears satisfactory to the SCDOT, prepare and test a trial batch mixture at the Contractor's facilities to verify that the design criteria for strength are met. Perform batch mixture preparation and testing in the presence of representatives of the SCDOT Office of Materials and Research. Make no production until an approved mix design has been obtained.

3. MATERIALS

- 3.1 General: The RCE will approve all materials to be used for RCC construction based on laboratory tests or certifications of representative materials that will be used in the actual construction. All materials must conform to Section 700 of the *SCDOT Standard Specifications for Highway Construction*, unless otherwise modified herein.
- 3.2 Portland Cement, Fly Ash, and Water-Granulated Blast Furnace Slag: All cementitious material must conform to Section 501.2.1. Pozzolanic substitution for portland cement shall be allowed as specified in Section 701.4.9. If the use of silica fume is desired, have the type and usage pre-approved by the SCDOT State Materials Engineer.
- 3.3 Aggregates: Obtain all aggregates to be used from qualified sources appearing on the SCDOT Qualified Products Listing for aggregates. Use no aggregate where the plasticity index of the aggregate exceeds 5. Aggregates may be obtained from a single source or borrow pit, or may be a blend of fine and coarse aggregates. Use well-graded aggregate without gradation gaps and conforming to the following gradation:

Sieve Size	Percent Passing by Weight
1 inch	100

¾ inch	90-100
½ inch	70-100
3/8 inch	60-85
#4	40-60
#16	20-40
#100	6-18
#200	2-8

3.4 Water: Use only water conforming to Section 701.2.11 of the Standard Specifications.

3.5 Curing Compound: Where curing compounds are used, only those white-pigmented products shown in the current edition of SCDOT Qualified Products List 33 shall be used.

4. DESIGN STRENGTH

Use a mix design that demonstrates a compressive strength of 4000 psi within 28 days when specimens prepared according to ASTM C 1435 are tested according to AASHTO T 22. At least two sets of three cylinders will be produced, with one set being tested at 4 days and the other at 28 days. To determine the compressive strength for a set, two of the specimens will be tested. If the weaker of the two specimens is at least 90 percent of the strength of the stronger specimen, then the two values will be averaged to determine the overall compressive strength. If the weaker specimen has less than 90 percent of the strength of the stronger specimen, then the third specimen will be broken and all three specimens will be averaged. If one individual result is much lower or much higher than the other two due to defects in the specimen, that value may be discarded at the State Materials Engineer's discretion.

5. EQUIPMENT

5.1 General: Construct roller compacted concrete with any combination of equipment that will produce a completed pavement meeting the requirements for mixing, transporting, placing, compacting, finishing, and curing as provided in this specification.

5.2 Mixing Plant: Locate the mixing plant within a thirty-minute haul time from the point of RCC placement. Use only plants capable of producing an RCC pavement mixture in the proportions defined by the final approved mix design and within the specified tolerances. The capacity of the plant must be sufficient to produce a uniform mixture at a rate compatible with the placement equipment. If the plant is unable to produce material at a rate adequate to prevent unnecessary cold joints and frequent paver stoppages, the RCE may halt production until such time that a plant of appropriate capacity is used. Have the plant inspected and approved by the SCDOT Office of Materials and Research prior to production of material under these specifications.

5.2.1 Pugmill Plant: Use only pugmill plants of the central plant type with a twin-shaft pugmill mixer, capable of batch or continuous mixing, equipped with synchronized metering devices and feeders to maintain the correct proportions of aggregate, cement, pozzolan, and water. Other pugmill plant requirements are as follows:

5.2.1.1 *Aggregate Storage*: If previously blended aggregate is furnished, storage may be in a stockpile from which it is fed directly to a conveyor feeding the mixer. If aggregate is furnished in two size groups, follow proper stockpiling techniques to ensure aggregate separation.

5.2.1.2 *Aggregate Feed Rate*: Use aggregate bins with a feed rate controlled by a variable speed belt, or an operable gate calibrated to accurately deliver any specified quantity of material. If two aggregate size stockpile sources are used, the feed rate from each bin must be readily adjustable to change aggregate proportions, when required. Feed rate controls must maintain the established proportions of aggregate from

each stockpile bin when the combined aggregate delivery is increased or decreased.

5.2.1.3 *Plant Scales:* Plant scales, if utilized, for any weigh box or hopper must comply with Section 701.3.2.

5.2.1.4 *Cement and Pozzolan Material Storage:* Supply separate and independent storage silos for portland cement and pozzolan. At plants with two or more silos in which different types of cement or cementitious materials are stored, ensure that each silo has a sign at each fill inlet to reduce the potential for loading errors. Make the sign from a durable material, with minimum two-inch high by ¼-inch wide letters that are raised, indented, or cut. Ensure that the sign clearly identifies the material that is in the silo and may be easily read even when completely coated with dust. Flat signs with painted or applied letters are not acceptable.

5.2.1.5 *Preblended Portland Cement and Pozzolan:* If using preblended portland cement and pozzolan (such as fly ash or slag), employ blending equipment acceptable to the RCE and demonstrate, with a testing plan, the ability to successfully produce a uniform blended material meeting the mix design requirements. Perform testing on at least a daily basis to ensure both uniformity and proper quantities.

5.2.1.6 *Cement and Pozzolan Feed Unit:* Provide a satisfactory means of dispensing portland cement and pozzolan, volumetrically or by weight, to ensure a uniform and accurate quantity of cementitious material enters the mixer.

5.2.1.7 *Water Control Unit:* Use a water control unit capable of measuring the required amount of water for the approved mix by weight or volume. Ensure that the unit is equipped with an accurate metering device. Vary the amount of water to be used only with the approval of the RCE.

5.2.1.8 *Gob Hopper:* For continuous operating pugmills, provide a gob hopper attached to the end of the final discharge belt to temporarily hold the RCC discharge in order to allow the plant to operate continuously.

5.2.2 *Rotary Drum Mixer:* Provide a rotary drum batch mixer capable of producing a homogeneous mixture, uniform in color, and having all coarse aggregate coated with mortar. Equip the mixer with batching equipment to meet the following requirements:

5.2.2.1 *Weighing Equipment:* Measure the amounts of cement, pozzolan, and aggregate entering into each batch of RCC by direct weighing equipment. Use only weighing equipment that is readily adjustable in order to compensate for the moisture content of the aggregate or to change the proportionate batch weights. Include a visible dial or equally suitable device that will accurately register the scale load from zero to full capacity. The cement and pozzolan may be weighed separately or cumulatively in the same hopper on the same scale, provided the cement is weighed first.

5.2.2.2 *Weigh Hoppers:* Use only bulk cement and pozzolan weigh hoppers that are equipped with vibrators to operate automatically and continuously while weighing hoppers are being dumped. Ensure that

the weigh hopper has sufficient capacity to hold not less than 10 percent in excess of the cementitious material required for one batch.

5.2.2.3 *Water Metering:* Measure the amount of water entering each batch of RCC by weight or volume. Use only equipment capable of measuring the water to within a tolerance of plus or minus one percent and equipped with an accurate gauge or dial measuring device. Vary the amount of water to be used only with the approval of the RCE. During batching, admit water to the mixer only through the water measuring device and then only at the time of charging.

5.2.2.4 *Mixing Time:* Use only drum mixers equipped with an accurate clock or timing device, capable of being locked, for visibly indicating the time of mixing after all the materials, including the water, are in the mixer.

5.2.2.5 *Recharging:* Discharge all material in the drum before recharging. Ensure that the volume of mixed material per batch does not exceed the manufacturer's rated capacity of the mixer.

5.3 Paver: Place RCC with a high-density asphalt-type paver subject to approval by the RCE. Use only pavers equipped with compacting devices capable of producing an RCC pavement with a minimum of 90 percent of the maximum density in accordance with AASHTO T 180, Method D prior to any additional compaction. Ensure that the paver is of suitable weight and stability to spread and finish the RCC material, without segregation, to the required thickness, smoothness, surface texture, cross-section, and grade.

5.4 Compactors: Use self-propelled steel drum vibratory rollers having a minimum static weight of 10 tons for primary compaction. For final compaction, use either a steel drum roller, operated in a static mode, or a rubber-tired roller of equal or greater weight. Only use walk-behind vibratory rollers or plate tampers for compacting areas inaccessible to large rollers.

5.5 Haul Trucks: Use trucks for hauling the RCC material from the plant to the paver with covers available to protect the material from inclement weather. To ensure adequate and continuous supply of RCC material to the paver, have a sufficient number of trucks. If the number of trucks is inadequate to prevent frequent starts and stops of the paver, cease production until additional trucks are obtained.

5.6 Water Trucks: Keep at least one water truck, or other similar equipment, on-site and available for use throughout the paving and curing process. Equip such equipment with a spreader pipe containing fog spray nozzles capable of evenly applying a fine spray of water to the surface of the RCC without damaging the final surface.

5.7 Inspection of Equipment: Before start-up, the Contractor's equipment will be carefully inspected. Should any of the equipment fail to operate properly, cease work until the deficiencies are corrected.

5.8 Access for Inspection and Calibration: Provide the RCE or RCE's representative access at all times for any plant, equipment, or machinery to be used in order to check calibration, scales, controls, or operating adjustments.

6. CONSTRUCTION REQUIREMENTS

6.1 Preparation of Subgrade: Before the RCC processing begins, prepare the subgrade in accordance with Section 208 of the SCDOT Standard Specifications.

6.2 Quality Control Test Specimens: For each day's production, up to 1500 cubic yards of mix produced, prepare at least three sets of test specimens in accordance with ASTM C 1435 under the direct observation of the RCE or RCE's representative. A set of

specimens consists of three cylinders. Make an additional three sets for each additional 1500 cubic yards or fraction thereof. Cure and transport the specimens to the Contractor's (or mix producer's) Office of Materials and Research-approved laboratory in accordance with ASTM C 31. Test two cylinders for compressive strength in accordance with ASTM C 39 at 3 days, 7 days, and 28 days under the direct observation of the RCE or RCE's representative. If the measured compressive strength between two cylinders varies by more than 10 percent of the stronger cylinder, test the third cylinder and average the results of the three cylinders. Otherwise, average the measured compressive strengths of the two cylinders tested at 28 days to determine the compressive strength of the lot. Retain the compressive strength test results for inspection by the RCE.

If the compressive strength measured at 3 days indicates that the 28-day compressive strength will be less than 3500 psi, investigate the potential causes of the low strengths and report to the RCE within 24 hours. If the compressive strength measured at 3 days indicates 28-day compressive strengths less than 3200 psi, immediately stop production and notify the RCE. Do not resume production until the cause of the discrepancy has been determined to the satisfaction of the RCE. The RCE may adjust compressive strength targets at 3 days as production continues based on field experience.

6.3 Mixing Process: Use the same mixture for the entire project unless otherwise stated in the project documents. If, during production, the source of portland cement, pozzolan, or aggregates is changed, then suspend production and submit a new mix design to the RCE for approval. Do not exceed the manufacturer's rated capacity for dry concrete mixtures in the mixing chamber. Keep the sides of the mixer and mixer blades free of hardened RCC or other buildups. Routinely check mixer blades for wear and replace if wear is sufficient to cause inadequate mixing.

6.3.1 *Mixing Time*: Use a mixing time adequate to ensure a thorough and complete mixing of all materials. Do not allow the mixing time, after all materials including water are in the mixer, to be less than 1½ minutes for one cubic yard and 20 seconds for each additional cubic yard.

6.3.2 *Mixture Ingredient Tolerances*: Ensure that the mixing plant receives the quantities of individual ingredients to within the following tolerances:

Material	Variation by Weight
Cementitious Material	±2.0%
Water	±3.0%
Aggregates	±4.0%

6.3.3 *Plant Calibration*: Prior to commencement of RCC production, carry out a complete and comprehensive calibration of the plant in accordance with the manufacturer's recommended practice. Provide all scales, containers, and other items necessary to complete the calibration. After completion of the initial calibration, calibrate the plant periodically as directed by the RCE. Plants listed on SCDOT Qualified Product List 28 at the time of RCC production are exempt from this requirement, although the SCDOT reserves the right to require additional calibration if variation in mixture quantities are suspected.

6.3.4 *Daily Reports*: Supply daily plant records of production and quantities of materials used that day to the RCE. These records may be used as a check on plant calibration.

6.4 Transportation: Transport the RCC pavement material from the plant to the areas to be paved in dump trucks equipped with retractable protective covers for protection from rain or excessive evaporation. Ensure that the trucks are dumped clean with no buildup or hanging of RCC material in the corners. Have the dump trucks deposit the RCC material directly into the hopper of the paver or into a secondary material distribution system that

deposits the material into the paver hopper. Dump truck delivery must be timed and scheduled so that RCC material is spread and compacted within the specified time limits.

6.5 Placing:

6.5.1 Subbase Condition: Prior to RCC placement, ensure that the surface of the subbase is clean and free of foreign material, ponded water, and frost. Ensure that the subbase is uniformly moist at the time of RCC placement. If sprinkling of water is required to remoisten certain areas, ensure that the method of sprinkling will not form mud or pools of freestanding water. Correct soft or yielding subbase areas prior to placement of RCC as specified in Section 6.1 above.

6.5.2 Weather Conditions:

6.5.2.1 Cold Weather Precautions: Employ cold weather precautions as detailed in Section 501.4.6 of the Standard Specifications.

6.5.2.2 Hot Weather Precautions: During periods of hot weather or windy conditions, take special precautions to minimize moisture loss due to evaporation. Cooling of aggregate stockpiles by shading or the use of a fine mist may be required. Protective covers may be required on dump trucks. Keep the surface of the newly placed RCC pavement continuously moist.

6.5.2.3 Rain Limitations: Conduct no placement of RCC pavement during rain conditions sufficient to be detrimental to the finished product. Placement may continue during light rain or mists provided the surface of the RCC pavement is not eroded or damaged in any way. Use dump truck covers during these periods. The RCE may terminate paving at any time when, in the RCE's judgement, the rain is detrimental to the finished product.

6.5.3 Paver Requirements: Place all RCC with an approved paver as specified in Section 5.3 and also meet the following requirements:

6.5.3.1 Filling the Paver: Do not allow the quantity of RCC material in the paver to approach empty between loads. Maintain the material above the auger at all times during paving.

Stopping the Paver: Ensure that the paver proceeds in a steady, continuous operation with minimal starts and stops, except to begin a new lane. Maximum paver speed during laydown is 10 feet per minute. Higher paver speeds may be allowed at the discretion of the RCE if the higher speeds may be obtained without distress to the final product or cause additional starts and stops.

6.5.3.2 Surface Condition: Ensure that the surface of the RCC pavement is smooth, uniform, and continuous without excessive tears, ridges, or aggregate segregation once it leaves the paver.

6.5.4 Inaccessible Areas: Pave all areas inaccessible to either roller or paver with cast-in-place concrete meeting the compressive strength requirements of these specifications.

6.5.5 Adjacent Lane Pavement: Place adjacent paving lanes within 60 minutes. If more than 60 minutes elapses between placement of adjacent lanes, the vertical joint must be considered a cold joint and prepared in accordance with Section 6.7 below. At the discretion of the RCE, this time may be increased or decreased

depending on ambient conditions of temperature, wind, and humidity. Multiple pavers may be used in tandem to reduce the occurrence of cold joints.

6.5.6 *Hand Spreading:* Broadcasting or fanning the RCC material across areas being compacted is not permissible. Such additions of materials may only be done immediately behind the paver and before any compaction has taken place. Any segregated coarse aggregate shall be removed from the surface before rolling.

6.5.7 *Segregation:* If segregation occurs in the RCC during paving operations, placement shall cease until the cause is determined and corrected to the satisfaction of the RCE. If the segregation is judged by the RCE to be severe, remove and replace the segregated area at no additional cost to the Department.

6.6 Compaction:

6.6.1 *Time to Compaction Start:* Ensure that compaction begins with the placement process and is completed within 60 minutes of the start of the mixing at the plant. The time may be increased or decreased at the discretion of the RCE depending on ambient conditions of temperature and humidity. Do not permit delays in rolling unless approved by the RCE. Plan operations and supply sufficient equipment to ensure that these criteria are met.

6.6.2 *Rolling:* Determine the sequence and number of passes by vibratory and non-vibratory rollers to obtain the specified density and surface finish. Only operate rollers in the vibratory mode while in motion. Rubber-tire rollers may be used for final compaction. Use additional rollers if specific density requirements are not obtained or if placing operations get ahead of the rolling operations.

6.6.3 *Rolling Longitudinal and Transverse Joints:* Do not operate the roller within 2 feet of the edge of a freshly placed lane until the adjacent lane is placed. Then, roll both edges of the two lanes together within the allowable time. If a cold joint is planned, then roll the complete lane and follow cold joint procedures as specified in Section 6.7 below.

6.6.4 *Inaccessible Areas:* Compact areas inaccessible to large rollers using walk-behind rollers or hand tampers.

6.6.5 *Density Requirements:* Field density tests will be performed in accordance with SC-T-33 as soon as possible, but no later than 30 minutes after the completion of the rolling. Only wet density is used for evaluation. The required minimum density is 98 percent of the maximum laboratory density obtained according to AASHTO T 180 (Method D). The in-place density and moisture content may be determined with a nuclear moisture-density gauge. The gauge will be calibrated for moisture content at the beginning of the work and at any time during the work. RCC properly placed and compacted, but not meeting the density requirements, shall be cored and tested at the Contractor's expense. If the tested area achieves 28-day design strength, it will be paid at the full unit price. If the tested area indicates strength less than 3500 psi but greater than 3150 psi, payment will be made as follows:

Compressive Strength (psi)	Price Reduction (Percent of Unit Bid Price)
3300-3499	5
3150-3299	15

If the cores indicate strengths less than 3150 psi at 28 days or longer, the Department will evaluate the results and may reject the affected area and require removal and replacement or elect to pay at a reduced rate.

6.7 Joints:

6.7.1 *Fresh Vertical Joints:* A joint is considered a fresh joint when an adjacent RCC lane is placed within 60 minutes of placing the previous lane or as specified by the RCE based on ambient conditions. Fresh joints do not require special treatment.

6.7.2 *Cold Vertical Joints:* Any planned or unplanned construction joints that do not qualify as fresh joints are considered cold joints. Prior to placing fresh RCC mixture against a compacted cold vertical joint, thoroughly clean the cold joint of loose or foreign material. Wet the vertical joint face and maintain it in a moist condition immediately prior to placement of the adjacent lane.

6.7.2.1 *Sawing Cold Vertical Joints:* For uncompacted surfaces or slopes more than 15 degrees from the vertical, cut the joint vertically for the full depth. Within 2 hours of final compaction, the edge of a cold joint may be cut with approved mechanical equipment. For edges cut after 2 hours, sawcut to the full depth of the pavement. Demonstrate any modification or substitution of the sawcutting procedure to the RCE for approval prior to use. In no case allow cutting of the edge to cause raveling or tearing of the surface. Moisten the cut edge immediately prior to placement of the adjacent lane.

6.7.3 *RCC Pavement Joints at Structures:* Line structures such as manholes, valves, or concrete curb and gutter with joint filler as defined in Section 501.2.6.1 of the Standard Specifications.

6.7.4 *Control Joints:* Construct transverse contraction joints at regular intervals up to 20-feet in the RCC pavement to induce cracking at pre-selected locations unless otherwise indicated on the Plans or as directed by the RCE. At the option of the Contractor, soft-cut or green-cut saws may be utilized as soon as possible behind the rolling operation and set to manufacturer's recommendations. Conventional cut saws must be used as soon as the sawing operation will not result in raveling or other damage to the RCC pavement, but not more than 18 hours after RCC placement. Cut all joints to 1/4 the depth of the RCC pavement to a single saw blade width.

6.8 Finishing:

Ensure that the finished surface of the RCC pavement, when tested with a 10-foot straightedge or crown surface template, does not vary from the straightedge or template by more than 1/4 inch at any one point and shall be within 5/8 inch of the specified finished grade. When surface irregularities are outside these tolerances, diamond-grind the surface to meet the tolerance at no additional cost to the SCDOT.

6.9 Curing:

Immediately after final rolling and compaction testing, keep the surface of the RCC pavement continuously moist until an approved curing compound, a suitable prime coat, or a layer of asphalt concrete is applied.

6.9.1 *Water Cure:* Apply water cure by water trucks equipped with fog spray nozzles, soaking hoses, sprinkling system, or other means such that a uniform moist condition on the surface of the RCC is ensured. Apply this moisture in a manner that will not erode or damage the surface of the finished RCC pavement.

6.9.2 *Curing Compound:* Do not use curing compounds when the RCC material is to be promptly covered with asphalt. Apply curing compound as indicated in Section 501.4.11 of the Standard Specifications, except that the minimum rate of curing compound application is 0.09 gallons per square yard (11 square yards per gallon) unless a higher rate is specified by the curing compound manufacturer.

- 6.10 Traffic: Protect the RCC from vehicular traffic during the curing period. Completed portions of the RCC pavement may be opened to automotive and light truck traffic as soon as the strength is sufficient to prevent damage to the RCC. The pavement may be opened to unrestricted traffic after 4 days. If the temperature drops below 40° F, then the period of time the temperature is below 40° F will be added to the minimum time to opening.
- 6.11 Maintenance: Maintain the RCC pavement in good condition until all work is completed and accepted. Perform such maintenance at no additional cost to the SCDOT.
- 6.12 Thickness: Provide and operate equipment capable of extracting a small (approximately 1 inch diameter or greater) core to determine the pavement thickness. Extract samples in the presence of the RCE or RCE's representative unless otherwise directed .
- 6.13 Thickness Tolerance - The thickness of the completed RCC is measured at staggered intervals not to exceed 250 feet in length for two-lane roads. Measure the core to the nearest 1/8 inch at three different, evenly spaced locations and record the average. Where the RCC is deficient by more than 1/2 inch, correct such areas by removal and replacement. Where the measured thickness is more than 1/2 inch thicker than shown on the Plans, it is considered as the specified thickness, plus 1/2 inch. The average job thickness is the average of the depth measurements determined as specified above. Should this average thickness be more than 1/4 inch below the specified thickness, an adjusted unit price is used in calculating payment. This adjusted contract unit price bears the same ratio to the contract unit price as the square of the average thickness bears to the square of the specified thickness. When the contract includes more than one road, each road is considered separately.

7. MEASUREMENT AND PAYMENT

- 7.1 Measurement: The quantity measured for payment under this supplemental specification is the number of square yards of RCC Pavement completed and accepted, and measured in place along the surface of normal width of through-lane pavement. Pavement constructed outside the area designated to be paved will be disregarded in computing the number of square yards. Construction of control joints will not be measured separately and no direct payment will be made for this work.
- 7.2 Basis of Payment: The quantity, as measured above, will be paid for at the contract unit price for RCC Pavement, of the thickness specified, which price and payment will be full compensation for furnishing all materials, equipment, tools, labor, and incidentals necessary to satisfactorily complete the work. Pavement that is deficient in thickness, but is permitted to be left in place, will be paid at the reduced unit price as provided in Section 6.13. No compensation will be allowed for the materials or labor involved in the removal of defective material.

Payment includes all direct and indirect costs and expenses required to complete the work. Payment will be made under:

Item Number	Description	Unit
5010100	ROLLER COMPACTED CONCRETE PAVEMENT	SY

(57) SECTION 501: NONWOVEN GEOTEXTILE INTERLAYER FABRIC:

This Special Provision describes the construction and material requirements for installation of an interlayer fabric to be used between concrete pavement and cement stabilized aggregate base.

REFERENCED DOCUMENTS

ASTM D 4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.

ASTM D 4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

ASTM D 4595 Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

ASTM D 4716 Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

ASTM D 5199 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.

ASTM D 5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles.

1 GENERAL

- 1.1 Provide and install a non-woven geotextile interlayer to be placed between concrete pavements and cement stabilized aggregate bases. The fabric is intended to provide limited drainage, separation between the base and pavement to retard the transmission of cracking, and relief of bedding stress due to movement of the concrete pavement on a stiff base. Attach the fabric firmly to the base to prevent movement during paving operations. Conduct paving operations to minimize fabric damage due to vehicle movements. Repair any damage prior to paving to ensure complete coverage of the base.

2 MATERIAL REQUIREMENTS

2.1 Geotextile requirements:

- 2.1.1 Fabric type: Provide a nonwoven needle-punched geotextile. Thermal treatment (calendaring or IR) is not acceptable.
- 2.1.2 Color: Ensure that the color is uniform and uses nominally the same color fibers throughout.
- 2.1.3 The following requirements must be met by 95% of samples. Minimum Average Roll Values(MARV) are also acceptable:
 - 2.1.3.1 Mass per unit area: Ensure that mass per unit area is greater than 450 grams per square meter (13.3 ounces per square yard) and less than or equal to 550 grams per square meter (16.2 ounces per square yard) when tested in accordance with ASTM D 5261.
 - 2.1.3.2 Thickness under load (pressure): Ensure that the thickness under load is greater than or equal to 3.0 mm at 2 kPa (0.12 inch at 0.29 psi), greater than 2.5 mm at 20 kPa (0.10 inch at 2.9 psi), and greater than 1.0 mm at 200 kPa (0.04 inch at 29 psi) when tested in accordance with ASTM D 5199.
 - 2.1.3.3 Wide-width tensile strength: Ensure the tensile strength is greater than 10 kN per meter (685 pounds per foot) when tested in accordance with ASTM D 4595.
 - 2.1.3.4 Maximum elongation: Ensure that the maximum elongation is less than or equal to 60 percent when tested in accordance with ASTM D 4595.
 - 2.1.3.5 Water permeability in normal direction under load (pressure): Ensure that the water permeability in the normal direction under load (pressure) is greater than or equal to 1×10^{-4} meters per second (3.3×10^{-4} feet per second) when tested in accordance with modified ASTM D 4491 at 20 kPa (2.9 psi) or ASTM D 5493.

- 2.1.3.6 In-plane water permeability: Ensure that the in-plane water permeability (transmissivity) under load (pressure) is greater than or equal to 5×10^{-4} meters per second (1.6×10^{-3} feet per second) when tested in accordance with modified ASTM D 4716 at 20 kPa (2.9 psi) and is greater than or equal to 2×10^{-4} meters per second (6.6×10^{-4} feet per second) when tested in accordance with modified ASTM D 4716 at 200 kPa (29 psi) or ASTM D 6574.
- 2.1.3.7 Weather resistance: Ensure that the retained strength after 500 hours of weathering is greater than or equal to 60 percent of the initial strength when tested in accordance with ASTM D 4355.
- 2.1.3.8 Alkali resistance: Provide a manufacturer certification that the supplied material is composed of 96% or more polypropylene/polyethylene.
- 2.1.4 Certification: Prior to incorporation in the work, provide the RCE with a manufacturer's certification stating that the material being used meets all requirements of this Special Provision for each batch or lot of material. Ensure that the provided certification references the batch number(s) supplied and is attested to by the notarized signature of an officer of the manufacturing company. Also provide the RCE with a copy of the manufacturer's independent test data showing results for all the properties given in this section obtained by the test methods provided. Test data does not have to be batch or lot-specific.
- 2.2 Anchor system requirements:
 - 2.2.1 Fasteners: Use hardened steel pin fasteners with a galvanized finish intended for insertion in concrete by a powered fastening tool. Select a diameter and length adequate to anchor the geotextile such that normal paving operations do not dislodge the pins and the base is not damaged by the insertion.
 - 2.2.2 Discs: Provide thin, galvanized steel discs ranging from 2.0 to 2.8 inches in diameter with small stamped claws for holding the fabric and distributing the anchoring load.

3 CONSTRUCTION

- 3.1 Preparation of base: Repair any damaged or defective areas in the base to the satisfaction of the RCE. Thoroughly sweep the base immediately prior to fabric placement and ensure that the surface is free of loose debris.
- 3.2 Timing of placement: Place fabric no more than 3 days ahead of paving operations. If concrete is being placed by trucks directly in front of the paver, do not place fabric more than 650 feet ahead of the paver.
- 3.3 Placement: Roll the material onto the base, keeping the fabric tight with no wrinkles or folds. Roll out the sections of the fabric in a sequence that will facilitate good overfapping, prevent folding or tearing by construction traffic. and minimize the potential that the material will be disturbed by the paver. Overlap sections of the fabric a minimum of 6 inches and a maximum of 10 inches. Ensure that no more than three layers overlap at any point. Extend the fabric a minimum of 12 inches beyond the edge of the concrete pavement.
- 3.4 Anchoring: Secure the fabric with fasteners punched through the steel discs into the base. Space the anchors as necessary to securely hold the fabric in position during paving operations. However, maintain a maximum anchor spacing of 6 feet under all circumstances.
- 3.5 Construction traffic: Keep all nonessential traffic off of the fabric. Ensure that operations are staged such that no vehicles make sharp turning motions on the fabric. Remove and replace damaged fabric using required placement overlaps and sufficient anchors.

3.6 Moisture: Lightly but completely dampen the fabric ahead of the paving operations to ensure that the fabric does not draw water from the concrete. If the fabric is wetted due to precipitation or other reasons to the point of standing water or that free water appears when the fabric is walked on, allow the fabric to dry to a moist condition before continuing paving operations.

(58) SECTION 503: PORTLAND CEMENT CONCRETE PAVEMENT UNIT COST:

The Contractor is obligated to comply with the 2007 Standard Specifications regarding compressive strength and thickness. This Special Provision establishes the Portland Cement Concrete unit cost for any payment adjustments associated with Supplemental Technical Specification SC-M-503, regarding thickness variance. For purposes of applying any payment adjustments associated with this Supplemental Technical Specification, a unit price of \$30/SY will be used. There will be no pay factor adjustment greater than 100%.

(59) DIVISION 600: EVALUATION OF RETROREFLECTIVITY:

Within 20 days of initial application, the Contractor shall arrange for an independent party to evaluate the retroreflectivity of the pavement markings using a mobile retroreflectometer utilizing 30 meter CEN geometry. All lines shall be measured in both directions. The independent party conducting the measurements shall furnish directly to the Department a report detailing the average of the readings over one mile segments for each type of long line (white edgeline, white lane lines, yellow edgelines) along the length of the project. Average measurements shall also be provided along each ramp. Interstate mile markers may be used for beginning and ending points, with the first and last segments in each direction being less than one mile in length. The initial minimum retroreflectivity values shall be as follows:

Retroreflectivity (mcd/lux/m²)

<u>White</u>	<u>Yellow</u>
450	350

A second evaluation shall take place within 20 days prior to the end of the 180 day observation period. The evaluation method shall be the same as described above. The 180 day minimum retroreflectivity values shall be as follows:

Retroreflectivity (mcd/lux/m²)

<u>White</u>	<u>Yellow</u>
400	300

All markings failing to meet the initial minimum retroreflectivity requirements by more than 50 mcd/lux/m² shall be replaced immediately at the Contractor's expense. All markings failing to meet initial requirements by less than 50 mcd/lux/m² may be reevaluated at the time of the 180 day evaluation unless the defect causing the lower readings is obvious to the Engineer.

(60) DIVISION 600: MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES:

The Contractor is advised that all work involving design or installation of traffic control devices, including but not limited to signs, pavement markings, elements of work zone traffic control, signals, etc., shall be in compliance with the FHWA's Manual on Uniform Traffic Control Devices (MUTCD), latest edition. The latest edition is defined as the edition that the Traffic Engineering Division of SCDOT recognizes as having been officially adopted (Engineering Directive, Memorandum 19) at the time the project is let, unless stated otherwise in the Special Provisions.

(61) SECTION 601: PENALTY FOR VIOLATING LANE CLOSURE RESTRICTIONS:

The Contractor is advised that the Lane Closure Restrictions outlined in the Traffic Control Special Provisions will be strictly enforced. Should lane closures remain in place or not be completely removed by the time specified in the Traffic Control Special Provisions, a penalty will be assessed at the rate of **\$2,500.00 (Two Thousand Five hundred Dollars)** for each 1/4 hour interval (or any portion thereof). Should lane closures remain in place or not be completely

removed for a period of longer than one hour beyond the time specified by the Traffic Control Special Provisions the penalty will increase to **\$5,000.00 (Five Thousand Dollars)** for each 1/4 hour interval (or any portion thereof).

(62) SECTION 605: PERMANENT CONSTRUCTION SIGNS:

Utility locations must be performed prior to the placement of Permanent Construction Signs. State Law requires that the location of each sign be marked with a white line in the roadway or a stake in the shoulder. The locator company will mark 25 feet on either side of the location. The responsibility for marking the sign locations prior to the contractor calling PUPS for utility locate lies with the party responsible for lines and grades on the project. If Construction Lines and Grades is a pay item, then the Prime Contractor is responsible for marking the sign location. If this is not included, it is the Department's responsibility to mark the locations.

Prior to marking the sign location, care must be taken when marking the signs to ensure that there are no obstructions or other mitigating factors that will cause the sign to be moved outside of the 50 foot utility window. Any costs associated with staking out the sign locations are considered incidental to the cost of Permanent Construction Signs.

Requests for utility locates must be specific and isolated to the sign locations if no ground disturbing activities are occurring outside of the sign placement.

(63) SECTION 610: WORK ZONE TRAFFIC CONTROL PROCEDURES:

The first sentence of Section 610.3 of the 2007 Standard Specifications is hereby revised to:

"Ensure that background color of personal protective apparel is either fluorescent Yellow-Green or fluorescent Orange-Red, and meets ANSI Standard 107-2004 National Standard for High Visibility Apparel Class 2 (or Class 3 as necessary) Performance Criteria, or latest edition."

Note #12 of Standard Drawing 610-005-00 is hereby revised to:

"During nighttime flagging operations, flaggers shall wear a Safety Vest and Safety Pants meeting ANSI Standard 107-2004 National Standard for High Visibility Apparel Class 3 Performance Criteria, or Latest Edition, and a Hardhat. The color of the apparel background material shall be either fluorescent Yellow-Green or fluorescent Orange-Red."

(64) SECTION 650: SIGN LIGHTING SYSTEMS

September 25, 1998

1 DESCRIPTION: The Contractor shall be required to furnish all necessary supervision, labor, materials, tools, plant and equipment, including materials and equipment not specifically mentioned but necessary to install a complete lighting system on each overhead structure so specified for the exterior illumination of signs thereon. Each complete lighting system shall consist of furnishing and installing all materials and components as detailed in the plans as necessary to complete the project in accordance with the Plans and Specifications. Contractor shall install metering equipment which, if required, will be furnished by the Electrical Utility.

Without restricting the generality of the foregoing, it is the intent of these Supplemental Specifications to secure a complete lighting system at such location to be served. The principal equipment and work to be done is generally described herein. All equipment, material, and labor necessary for the work to be completed, but not specifically referred to herein, shall be included as a part of the work in this contract.

2 GENERAL REQUIREMENTS:

Regulations: The electrical installation shall meet the Electrical Regulations of the Department of Labor and Industry and otherwise as contained in the latest edition of the National Electrical Code of the National Board of Fire Underwriters. In addition, any State,

municipal, or local ordinance, rules, codes or regulations applicable to the work shall be followed. It is also the responsibility of the Contractor to secure and to pay the fees for any local, state or municipal permits and inspections.

Standards: All material and equipment shall be designed, manufactured and tested in accordance with the latest standards of the National Electric Light Association (NELA), the Association of Edison Illuminating Companies (AEIC), the Institute of Electrical and Electronic Engineers (IEEE), the American Society of Testing Materials (ASTM), the National Electrical Manufacturer's Association (NEMA) and the American National Standards Institute (ANSI) and shall bear the label of approval of the National Board of Fire Underwriters' Laboratory where applicable.

Workmanship and Materials: All work shall be installed in a first-class, neat and workmanlike manner acceptable to the Engineer, by electricians and/or mechanics, depending upon the category of the work, who are experienced in the trade involved. All details of the installation shall be mechanically and electrically correct.

All materials and equipment shall be new, unless otherwise noted, of the best of their several kinds, without imperfections or blemishes and shall be made by a manufacturer of established recognized reputation.

Guarantee of Electrical Work: Final acceptance of the lighting system will be delayed for a period of thirty (30) days after the final inspection. During this period the Contractor shall be responsible for the functional operation of the lighting system and shall replace all defective equipment or perform other required work necessary to correct all defects or malfunctions. He shall provide the Department with the warranty of any materials or equipment that is normally guaranteed by the manufacturer or supplier.

Inspection and Testing: All lighting circuits shall be energized and operated prior to acceptance.

The Contractor shall furnish and employ suitable instruments, such as ammeters, voltmeters, 1000-volt meggers, etc., for the testing of the electrical installations, and a color and cosine-corrected foot-candle meter for testing illumination.

All test and trials shall be made in the presence of the Engineer, or his duly authorized representative, and shall demonstrate to the Engineer's satisfaction that (1) all circuits are continuous and free from short circuits, (2) that all circuits are free of unspecified grounds, (3) that the resistance to ground (of non-grounded conductors) is at least 1 megohm at 60oF. measured with a 1000-volt megger, and (4) that all circuits are properly connected in accordance with the approved circuit diagrams. It shall further be demonstrated, using photometric equipment as necessary, that the level of illumination attained on the sign is within the specified range of illumination.

Defects in materials or workmanship in the installation, as disclosed by the tests, shall be corrected or replaced by the Contractor without additional compensation. Tests, trials and necessary adjustment to any equipment shall be conducted at no expense to the Department.

Voltage readings shall be made at each branch breaker panel with load and without load on load side of each circuit breaker. Readings shall be made with lighting systems in normal operation. The voltage drop under full load at the branch breaker panel shall not exceed 5% of the rated voltage at the service point.

Current readings shall be made on the load side of each safety switch, phase and neutral. Readings shall be made with lighting systems in normal operation.

Electrical Energy: The Contractor shall be responsible for notifying the Engineer when the

electrical installations for all structures are ready for electrical service. The Engineer will notify the Electrical Utility Company and request service for these installations. The Contractor shall perform the necessary tests on these installations immediately after the Utility Company provides the service and after all adjustments are completed and lighting for these installations shall remain in operation. The Contractor shall, however, remain responsible for the electrical installations in operation until final acceptance of the project and in accordance with the hereinbefore stated guarantee.

Existing Conditions: The Contractor will be held responsible for having visited the site and having familiarized himself with the existing conditions prior to submitting his bid. No adjustment in the contract unit prices will be allowed for field conditions with which the Contractor did not appraise during his field visit.

The existence of existing underground utilities such as piping, conduit and duct, and wiring is not shown on the plans. The Contractor shall be responsible for consulting with the various utilities, and local underground utility location services to determine the exact locations of Utilities. The Contractor will bear all cost for location services and will pay all cost for repairs to damaged utilities caused by his workmen or subcontractors.

Coordination: All work under this section shall be coordinated with other contractors to insure proper location of outlets and equipment connections, and to minimize conflicts with structural members, piping, grading, etc. Conflicts between equipment and/or material locations shall be corrected as directed by the Engineer at no additional cost to the Owner.

3 DESCRIPTION OF WORK:

The power supply shall be 240 volt, three wire, single phase, for each new sign lighting system. Where the Contractor is to tie-in to or retain the existing system, it will be his responsibility to determine the existing voltage and to supply new components that are compatible with the existing system. The Contractor shall furnish and install service poles as required and at the locations shown on the Plans. He shall install on the service pole a weatherhead and service riser, Metering Equipment (if required), a service disconnect which consists of 30 amp breakers encased in a Nema 4x enclosure with a lockable safety disconnect switch located so as to be operable with the cover of the enclosure closed and single conductor cables as necessary (encased in 2" diameter rigid galvanized conduit where exposed; encased in 2" diameter galvanized steel conduit where jacked or bored; and encased in 2" Polyvinylchloride (PVC) Schedule 40 Pipe where buried). On the service pole the cable shall be enclosed in galvanized steel conduit to a point a minimum of 24" below ground surface. Ground rods shall be driven at each service pole connected to the ground bus in the main service panel. An additional ground rod shall be driven at each structure and grounds shall be furnished and installed for the electric system, equipment and the structure support shaft. The cable shall be run into the structural support column through a galvanized steel conduit provided in the footing. The conduit shall extend 3" minimum clear above the base plate and outside the side of the footing at an elevation of 2'- 0" minimum below ground level. Where cable passes beneath a roadway, it shall be encased in 2" diameter galvanized steel conduit suitable for jacking. A lighting panel shall be installed on the support of the overhead structure which consists of a Nema 4X enclosure with padlocking provision, a Combination Lighting Contactor with H-O-A Selector Switch, Lightning Arrestor, photoelectric control and a Multiple Control Relay. Luminaires shall be installed on brackets provided on the overhead structure. Conductors shall be run inside the structure members from the lighting panel on the structure support to junction boxes through conduit nipples located on the lower front chord member of the structure. Transfer of wiring from upright support to chord member may be made by use of flexible conduit and conduit nipples furnished on the structure. From chord member to junction and luminaires, conductors shall be run in intermediate metal conduit or galvanized steel conduit, attached to structure members with stainless steel hardware.

4 MATERIALS:

General: The Contractor shall submit, or make available to the Engineer, samples of the following materials for testing and approval: junction and pull boxes, weatherproof and rain-tight enclosures, lighting units, weatherheads, conduit, wire and cables, ground rods, conduit straps, expansion bolts, conduit fittings and such other materials as may be directed by the Engineer.

Shop Drawings: The Contractor shall submit for approval to the Engineer, six (6) copies of detailed shop drawings, wiring diagrams, catalog cuts data sheets, etc., of all material as called for herein and as directed by the Engineer. The approval of the Engineer of the shop drawings, catalog cuts, data sheets, etc., of the equipment and for their installations does not relieve the Contractor from responsibility for errors on these drawings. Wattage consumption for each system shall be indicated. No work shown on any submission shall be executed or no equipment shall be installed until such drawings are approved.

The approval of these drawings by the Engineer does not relieve the Contractor for his responsibility for the installation and proper operation of the electrical systems.

The Contractor will be required to maintain one set of clean full-size plans sheets for "As - Built Drawings". All changes, revisions, or modifications to the project shall be recorded daily on these drawings with red-line pencil. Upon completion of the project, these drawings shall be turned over to the Engineer for preparation of final plans.

Electrical Service Pole: Service poles shall meet the latest edition of American Wood-Preservers' Association (AWPA) Standards CI, P8 and P9, Federal Specifications TT-W-570, and ANSI. Poles shall be Southern Yellow Pine, 30 foot, Class 5, Pressure Treated Pentachlorophenol in Heavy Oil with a minimum retention of 0.38 pounds per cubic foot of wood.

Photoelectric Control Device: This device shall have a weatherproof glass or acrylic plastic housing which shall not be susceptible to distortion, discoloration, cracking or crazing and shall be adaptable for hub mounting on the top of the lighting panel. The photo cell shall be of the cadmium sulfide type, be hermetically sealed and be subjected to a pre-aging process which shall contribute improved stability of the cell.

The unit shall have a built-in surge protective device for protection from induced high voltage and follow-through currents; shall have a turn-off time delay to prevent false turn-off due to lightning, stray or flashing lights; shall be especially sensitive to north sky brightness; shall have a turn-off adjustable setting from at least 1.0 to 2.0 footcandles ambient light at the window and shall be adaptable to screwdriver adjustment without removing the housing. A window shield shall provide protection from both stray light sources below the horizontal, and from direct sun exposure. Unit shall be placed to achieve proper performance due to natural light conditions. The unit shall be adjusted to provide on and off operation below and above the ambient light level as instructed by the Engineer.

This control device shall be designed for 120 volt circuit operation, shall have a wattage capability of at least 1000 watts incandescent load and 1800 VA of HID load, shall operate satisfactorily between -20oF to +120oF, ambient temperature and shall have performance characteristics equal to or exceeding all EEI and NEMA standards.

The base of the unit shall be constructed of a durable molded Phenolic or cycolac (a bakelite like substance) material which shall be noncorrosive and nonconductive. A three-prong twist lock plug with sealing design in accordance with EEI and NEMA specifications for twist-lock adaptations shall be installed in the base. Photoelectric control shall be as manufactured by General Electric Company, Catalog No. C402G660, or Fisher-Pierce, Precision, Lumotrol or equal, suitable for controlling the following Multiple Control Relay.

Combination Lighting Contactors: The combination lighting contactors shall be rated 600 volts, 3 pole, 60 Hertz and shall be electrically operated and held. Each combination lighting contactor shall be furnished in a NEMA 4X enclosure with a 3 pole, 600 volt circuit breaker,

H-O-A selector switch, fused 120 volt control circuit transformer and a 650 volt lightning arrester. The ampere rating shall be 30, 60, 100, or 200 as determined by the Contractor. Each unit shall have a padlockable disconnecting means. Each unit shall be UL listed per UL 508 as service entrance equipment and suitable for use with ballast (HID), tungsten, and general use loads. The disconnecting means shall have safety interlocks with the door to prevent energized components with the door open. Combination lighting contactors shall be Square D, Class 8903, General Electric, or equal.

Circuit Breakers: Circuit breakers shall be quick-made, quick-break, having tumbler mechanism, full contact, positive pressure until time of opening, whether operated automatically or manually. Stationary contact shall be an integral part of the breaker and all contact shall be nonwelding under operating conditions. The mechanism shall trip free from the handle so that the contact cannot be held closed against short circuit or abnormal overload. The breaker shall be operative in any position and removable from the front of steel enclosure. Breakers shall be housed in stainless steel cabinets as herein-before specified.

Operating handle shall be in front of the cabinet and shall be clearly marked as to position of breaker, normally on-off-tripped. Position of handle shall indicate position of breaker. Breaker shall be of size indicated hereinbefore and shall be the plug-in type.

Concrete Junction Boxes: In runs over 200' in length concrete junction boxes shall be furnished and installed flush with finished grade. The boxes shall be concrete or polymer concrete with a vertical test load of 20,000 lbs. The junction box shall have a recessed lid with penta-head locking bolts and shall be molded with the word "Electrical" on the lid. The Contractor shall submit the design of such junction boxes for the approval of the Engineer.

Metal Junction Boxes Attached to Sign Structures: Should metal junction boxes attached to structures be required, their design, location and application shall be approved by the Engineer and shall be of sufficient size to make all required splices in conformance with NEC code requirements and shall be weatherproof and watertight. The boxes shall conform to NEMA 4X (stainless steel)

Conduit: Electrical conduits shall be furnished and placed as indicated on the Plans and in these Specifications and at locations as may be ordered by the Engineer.

Steel conduits shall conform to ASTM Specifications A153, latest issue, the American National Standards Institute Specification C80.1 latest issue, the Underwriters Laboratories' specifications and to all current amendments thereto for the above. The rigid conduits shall be hot dipped galvanized having hard-baked enamel or heavy lacquer finish both inside and outside.

The manufacturer's coat of zinc shall be of uniform thickness applied either by the electrolytic or hot metal dip process to not only the inside and the outside surfaces of the conduit but also to the cut threads of the finished conduit. Rigid conduit shall be of mild steel piping, zinc coated. It shall be sufficient weight and toughness to withstand cracking and peeling during the bending.

Each piece of conduit shall be straight, free from blisters and other defects; cut square and taper reamed and shall be furnished in 10-foot lengths, threaded at each end. Couplings shall be applied to one end of each length of conduit and color-coded plastic thread protectors (on sizes " through 1") and combination metal and fiber lined color-coded protectors (on 2" or larger) to the other end. All threads shall be clearly cut and each length of conduit shall bear the Underwriters' Laboratories, Inc. label.

Polyvinylchloride (PVC) conduit shall conform to NEMA Standards TC2 and TC3, latest issue.

Conduit Fittings: All conduit fittings and elbows shall be made from the same grade of mild steel piping as rigid steel conduit. They shall be galvanized so that not only the exterior and interior surfaces shall have a galvanized coating of zinc but also the threaded areas, thereby assuring 100% galvanized protection on all surfaces. The processes of galvanizing, sherardizing and providing a protective coating shall be as hereinbefore specified for rigid conduit. Fittings for PVC conduit shall be of the same materials as specified elsewhere in this Special Provision.

Electrical Cable: All wire furnished under this specification shall be not less than 98 percent conductivity tinned, annealed copper in accordance with ASTM Specification B3 and B8, latest issue. Insulation shall be RHH-RHW-USE 75C, 600-volt in accordance with ICEA Specifications, NEMA WC-7, and UL Standards 44 and 854, for neoprene jacket. All conductors shall be stranded single conductor of adequate size as determined by the Contractor.

Sign Lighting Luminaires: Enclosed, bottom-mounted, single-lamp luminaires shall be furnished and installed. Lamps shall be 250 Watt Delux White Mercury. 400 Watt Delux White Mercury may be used on signs 11' in height or higher, if necessary to provide required illumination level. A uniform illumination shall be provided across all signs on the structure such that the ratio of maximum brightness to minimum brightness is 4:1 or less, excluding the one foot wide edge and the highest intensity on the remainder of the signs. The level of illumination incident to the sign face is to be 30 footcandles average maintained at 60°F. This intensity is to be considered a minimum average after applying a lamp lumen depreciation factor of .80 and a luminaire dirt depreciation factor of .90.

The luminaire shall have a main housing of die cast aluminum which encloses the reflector, socket assembly and terminal block. The reflector is to be fastened to the housing in a manner to facilitate easy removal and replacement. The reflector is to be specular anodized aluminum. An extruded aluminum frame shall be form-fitted to the refractor. This assembly shall have a single piece gasket that effectively seals the assembly and housing. The assembly shall fasten to the housing by means of separable hinges on one side and with spring-tempered, stainless steel latches on the other side or captive, Phillips-head screws. The refractor shall be tempered glass. When indicated in the Plans, the refractor shall be shielded to protect it from breakage caused by vandalism. The luminaire shall be a maximum of ten inches high. The luminaire shall have an integral mounted multi-tap ballast and quick-disconnect mounted inside the fixture. Luminaires are to be Holophane SIGNVUE or an approved equal.

Each sign lighting luminaire shall be guaranteed against defects in material, workmanship, design and performance for a period of one year after acceptance and final payment for the sign lighting installation. Contractor shall repair or replace any fixture that allows water to enter, or that has a ballast or lamp failure, and shall extend the guarantee on such fixture to one year from the date restored to service.

Before approval of the luminaire is granted, a chart is to be provided for each lighting system giving the color and cosine-corrected footcandle reading on one-foot squares over the entire sign face with the luminaires spaced as indicated in the Plans. The readings are to indicate the initial illumination level after applying the maintenance factors. The uniformity ratio is also to be indicated.

Fittings: Fittings, nipples, weatherproof and rain tight enclosures, luminaires, and weatherhead outlets shall be of an approved standard factory-made design and shall be watertight.

Buried Cable and Conduit Markers: The exact routing of all buried cable and conduit runs shall be indicated by installing permanent identification markers directly over the buried cable runs and set one inch above finished grade. A marker shall be installed for approximately every 100 feet of cable and conduit run and for every change in direction of the cable and conduit run and, at the termination points of rigid conduit.

Identification Markers shall be concrete posts, pre-cast or poured in place using Class "A" concrete. The markers can be either square or circular but must have a top area of approximately sixteen (16) square or inches in area. The letters "EC" with arrows showing the conduit direction shall be inscribed in the top of the marker. The letters shall be one and one-half (1 1/2) inches high and one (1) inch wide. The marker shall be eighteen (18) inches long with seventeen (17) inches buried in the ground.

5 INSTALLATION AND CONSTRUCTION:

General: No drilling, except as shown on the approved drawings, of structural members of sign support structures shall be permitted for attaching electrical items.

All weatherproof service entrance caps attached to sign structures for the installation of sign lighting cables will be furnished and installed on the structure.

The conduit nipples, locknuts and bushings in addition to the entrance holes and mounting channel for mounting the circuit breaker lighting panel on the sign structure shall be furnished and installed on the structure.

The Contractor shall take extreme care to avoid damaging the sign structure or signs and their finish and shall be held responsible for any damage that he causes. Any work required shall be done at the Contractor's expense.

Any painted surface on existing bridges that is damaged by the Contractor shall be repainted by the Contractor at his expense.

Excavation: All top soil encountered in the excavation shall be removed, stored, and replaced after backfilling. Disturbed areas shall be seeded.

Trenches for a cable or conduit run shall be excavated and backfilled the same day except with prior approval of the Engineer.

The Contractor shall be responsible for the removal and disposal of all excess excavation.

Cable and Conduit: All conductors must be handles with care. They shall not be trampled on or run over by vehicles. Each reel shall be examined and the wire shall be inspected for cuts, kinks or other injuries. Any injured portion of a conductor shall not be installed in the work.

The Contractor shall provide adequate equipment for pulling all cable through conduits and structure tubing in such a manner as not to over stress or stretch it, and shall use such precautions as not to cut, twist, score or damage the protective covering, insulation or conductor surface in any way. To prevent said injury or strain to cable, a Pull-In-Guide or Cable Feeder shall be used by the Contractor at the conduit mouth. To facilitate the pulling of the cable and/or to reduce the strain on the cable, the Contractor shall use an approved powdered soap-stone or Electro Compound Company "Y-ER-EAS", Ideal's "Yellow 77" or approved equal.

A sufficient length of slack shall be allowed for each cable in all junction and pull boxes and equipment enclosures, and on sign structures to provide for neat racking, splicing, movements due to thermal expansion and contraction in conduit and for maintenance work where condition applies to installation.

The layout of PVC and galvanized steel conduit as shown on the Plans is not absolute, unless so stated herein or on the drawings, and it shall be subject to such changes as will facilitate the work. Where necessary to overcome obstacles in the construction of the work the Contractor may deviate from the layout as shown on the contract plans providing he submits shop drawings showing all deviations and receives the approval of the Engineer.

However, the Contractor shall not install any work before receiving the Engineer's approval.

Conduit placed under roadways shall be located at a minimum depth of two (2) feet below the surface of the sub-base and shall extend at least two (2) feet beyond the shoulder edge.

Trenches for PVC and galvanized steel conduit shall be excavated so as to provide a minimum depth of 2' 0" and shall be of adequate width so as to allow 4 inch minimum separation between cables or conduits where more than one cable or conduit are in the trench layers not exceeding 4 inches in depth, and each layer shall be thoroughly compacted by mechanical tampers before material for the next layer is placed in the trench.

The cables occupying the same conduit shall be drawn in together and kept parallel to each other by the use of pulling head.

The ends of all conductors, whether pulled into conduit or installed exposed, shall be taped and made moisture-proof until subsequent splices are made and the lighting equipment is connected.

Cable splicing shall be permitted only at junction boxes, and at handholes inside the sign structure support shafts, and all splices shall be made in the manner as approved and recommended by the manufacturer of the cable with extreme care being employed in all operations. All splices shall be insulated for 600 volts, and the entire joint made watertight.

Conduit runs on the structures shall be attached to the sign support structures with stainless steel straps at intervals not exceeding 3' 0" and as required and directed by the Engineer.

Electrical conduits shall be furnished and installed as indicated on the contract and approved drawings and at locations as may be ordered by the Engineer.

All conduit lengths when placed in final position shall be free of dirt and obstructions and shall be cleaned just prior to placement by pulling through them a stiff brush, larger than the bore of the conduit.

As required, conduits shall be cut with hacksaws or by other approved means of cutting without distorting or crushing the conduits. The use of pipe cutters will not be permitted. The cuts shall be square and ends shall be reamed. In no case shall deformed, split or otherwise defective conduits be installed.

Metal conduit bends and offsets may be made either in the factory or in the field and shall have a minimum radius of 24 inches, unless otherwise indicated on the approved drawings or directed by the Engineer.

Conduits installed exposed shall be attached to steel bridge structures with steel supports and U-bolts, to concrete structures with steel supports and U-bolts or two-hole straps with spacer, and expansion bolts, and to walkway supports on overhead sign structures with special straps and bolts. All mounting bolts and hardware shall be stainless steel.

A conduit expansion joint fitting assembly shall be furnished and installed in each metal conduit run at each pavement break, at each deck and wall expansion joint and/or dam. The conduit expansion joint fitting assembly shall be O-Z Electrical Manufacturing Company, Incorporated, Type "EX", Appleton Electrical Company, or approved equal. The expansion fitting shall be assembled in accordance with the manufacturer's instructions.

A conduit bonding jumper, Burndy Engineering Company, Incorporated, Flexible Copper Braid Type B (length as required), Appleton Electric Company or approved equal, shall be installed across each metal conduit expansion joint fitting and shall be connected to the conduits with Burndy Engineering Company, Incorporated, Ground Connector Type "GG", Appleton Electric Company, O-z Electrical Mfg. Company or approved equal. The contact

surface on the conduits shall be polished before attaching jumper.

All conduits shall be securely and rigidly fastened in place during the construction and progress of the work.

The conduits shall be securely fastened to electrical equipment with approved type galvanized locknuts (inside and outside) and insulated bushing (inside).

All threaded conduit joints shall be made watertight. The ends of all conduit runs shall be plugged or capped, immediately after installation, with approved standard factory made plugs or caps to prevent seepage of grout, water or dirt into them.

The ends of partially installed conduit runs on which work may be temporarily suspended shall be plugged or capped, immediately after installation, with approved standard factory made plugs or caps to prevent seepage of grout, water or dirt into them. Any conduit section having a defective joint shall not be installed.

Conduit plugs and caps shall not be removed until lighting fixtures, box covers, etc., are set in place and the necessary and required splicing of cable is performed.

Each conduit connected to the side, top or bottom of the panel switch or double-throw safety switch enclosure shall be provided with a conduit fitting, conforming to the enclosure manufacturer's recommendations, or Crouse Hinds Company, Form B Series or equal.

Conduits shall be attached to the wood poles with 2-hole, 1/8" thick steel straps and $\frac{3}{8}$ " x 4" long lag screws, all galvanized. The maximum spacing between straps shall be 5' 0".

Galvanized steel conduit, 2" trade size, shall be used under all paved roads. Galvanized steel conduit shall be used from the electrical service equipment mounted on the service pole to a point 2 feet below ground at the base of the pole. This conduit shall be a minimum of 2" diameter and shall be sized in accordance with the latest NEC for the installation of the necessary conductors indicated on the drawings.

Conduit placed under paved roads shall be installed by employing approved boring or jacking methods.

All underground steel conduit runs shall be PVC coated or painted with two (2) coats of black asphaltum paint. Each coat shall be permitted to dry thoroughly before applying another coat of paint or before backfilling.

Wood Service Pole: The service poles shall be positioned as shown on the plans. Adjustment may be necessary to avoid existing underground appurtenances or to provide more direct access for attachment of service lines.

The setting of each wood pole in soil and in rock, as regards depth, shall be inspected by the Engineer and the Engineer's approval shall be given before the hole shall be back-filled.

On sloping ground, the depth of the hole always shall be measured from the low side of the hole.

All holes shall be dug large enough to admit the tamping bar on all sides of the pole and shall be at least as large at the bottom as at the top.

The minimum depth for setting wood poles shall be 5' for 25' poles, 6' for 30' and 40' poles.

Approved backfilling material shall be deposited in the hole around pole in layers not

exceeding four (4) inches in depth, and each layer shall be thoroughly compacted, by mechanical tampers before material for the next layer is placed in the hole. Some of the surplus backfilling material shall be placed around the butt of the pole in order to allow water to drain away.

Installation of poles shall comply with the latest specifications and standards of the National Elec. Light Assoc, the Association of Edison Illuminating Companies, and the National Electrical Safety Code which is a U.S. Bureau of Standards Handbook.

All electrical service equipment mounted on the service poles shall conform to the equipment hereinbefore described and as shown on approved drawings unless otherwise specified or directed. The enclosures for the Meter Base and system disconnect switch shall be mounted on the pole centered at approximate heights of 5'0" and 4'4" above finished grade.

The wood poles shall be back guyed if necessary. The guys shall be single down guy, and shall consist of a 12" dia. (Mm.) Cone type anchor, 3-bolt heavy duty guy clamps, strain insulator, strain and load plates (on pole), angle thimble-eye through bolt (required length), curved washer and nuts. The hardware shall be galvanized. The cone anchor shall be installed 7' below finished ground level.

The hole, after the anchor has been set in place, shall be backfilled with coarse crushed rock for two (2) feet above the anchor, tamping during the filling; and the remainder shall be completely filled and tamped the full depth.

The guys shall be placed before conductors are strung and shall be approved by the Engineer.

A guy guard shall be installed where the guy is adjacent to the roadway or shoulder.

Pull or Junction Boxes: Pull or junction boxes shall be installed at 200 foot intervals, off the shoulder of the roadway with covers installed in the plane of the existing grade elevations or the surrounding ground where indicated on the approved drawings.

Any necessary deviation from the above, resulting from existing grade conditions, shall be done only under the direct approval of the Engineer in which case the method of installation for the pull or junction box shall be determined by job conditions.

At each location in the electrical cable runs where the Contractor elects to make cable splices other than those shown on the drawings or as hereinbefore specified, a junction box of a type as hereinbefore specified and as indicated on the drawings for similar installations shall be furnished and installed at no additional cost to the Department.

Mercury Vapor Luminaires, Lamps and Ballasts: After the mercury vapor luminaires, lamps and ballasts have been installed in place, the Contractor shall furnish to the Engineer six (6) copies of data, supplied by the manufacturer regarding the operation of these items as follows:

1. **Luminaires** - Photometric data, showing initial candlepower distribution curves, efficiency and any other available pertinent information. Also, the manufacturer's luminaire identification numbers.
2. **Lamp Ballasts** - Open circuit volts, line current, watts loss, ballast factor rating, power factor and manufacturer's ballast identification number.

Grounding: The Contractor shall furnish and install grounding wires, ground rods and connections for completely and adequately grounding the electric system and equipment including the sign structure support shaft and conduits at each illuminated sign installation. Each conduit and inside the shaft shall be provided with an insulated ground bushing and

shall be coupled and connected to assure electrical grounding continuity throughout.

The ground from the breaker panel to the ground rod shall pass through conduit in the footing to an individual ground rod. The sign support shaft shall be grounded through conduit from a lug inside the shaft to an individual ground rod.

Each conduit and ground wire shall be connected to the ground rod with a bronze clamp, similar to Anderson Electric Corporation Ground Clamp Type GC-5, Blackburn "WB 5/8", or equal. All wire shall be stranded bare copper. The ground rod shall be 5/8" x 8'0" and shall be copperweld, or equal, and shall be driven vertically into the ground a horizontal distance of 1'0" from the foundation opposite the roadway side of the shaft where possible. The resistance to ground shall not exceed 25 ohms. The installation shall conform to the latest requirements of the NEC.

Junction Box Markers: The "ELECTRICAL" shall be inscribed in the top of concrete junction boxes.

A permanent identification marker of the type as earlier specified for buried cable and conduit runs shall be installed directly over each buried junction box and set one (1) inch above finished grade. The identification letters "JB" shall be inscribed in the top of the marker.

6 MEASUREMENT AND PAYMENT

Overhead Sign Lighting Systems: Measurement and payment of each Bid Item designated an "Overhead Sign Lighting System" shall be paid at the contract unit price for each sign lighting system. The price and payment shall be full compensation for removal or shifting of existing luminaires, or furnishing and installing sign lighting luminaires, service poles, disconnect switches, combination lighting contactors, lightning arrestors, lighting panels, ground rods, photoelectric cells, metering equipment (if not furnished by electrical utility), cables, conduits, mounting brackets, and/or adjustments made to existing mounting brackets, junction boxes, cable markers and any other electrical items not specifically mentioned but necessary for the proper operation of the sign lighting system, and all other materials, tools, supplies, labor, equipment, work and incidentals necessary to satisfactorily complete the work specified.

(65) SECTION 653: RETROREFLECTIVE SIGN POST PANELS: Section 653 is hereby modified as follows:

653.2 Materials - Add the following paragraph:

Use retroreflective sign post panels constructed of a nonmetallic composite or 3mm aluminum composite material approved by the SCDOT covered with a 3-inch wide type III sheeting. Use sheeting that meets the requirements of Section 651.2.3. Use approved panels included on the Approved Products List For Traffic Control Devices in Work Zones.

653.4.2 Erection - Add the following paragraph:

Mount the panel for the full length of the post from the sign to within 6 inches above the edge of the roadway. Mount panel only on post specified in the plans or special provisions. Secure the panel to the post with a minimum of 3 5/16-inch bolts and a lock washer and flat washer between post and nut, or tamper-resistant and rust-resistant screws. Use bolts, washers and nuts meeting the requirements of section 651.2.2. Provide the sheeting in the color that matches the background color of the sign except that the color for the "Yield" and "Do No Enter" signs shall be red. Install panels to both posts, if there are two posts supporting the sign.

653.5 Measurement is replaced with the following:

653.5 Measurement

The quantity for the pay item U-Section Post for Sign Support – (2 or 3)P, U-Section Post for Sign Bracing –2P or retroreflective sign post panel is the length of U-section post used for sign support or bracing or panel and is measured to the nearest 1/100 of a linear foot (LF) of the required post or panel, complete and accepted.

653.6 Payment is replaced with the following:

653.6 Payment

Payment for the accepted quantity for U-Section Post for Sign Support – (2or 3)P, U-Section Post for Sign Bracing –2P or Retroreflective Sign Post Panel, measured in accordance with **Subsection 653.5**, is determined using the contract unit bid price for the applicable pay item, and the payment includes all direct and indirect cost and expenses necessary to complete the work.

Payment is full compensation for fabricating and erecting U-section posts or braces or panels as specified or directed and includes providing mounting hardware; removing and disposing of existing signs supports, braces, and mounting hardware removed or replaced; replacing or relocating supports or braces shown on the Plans or directed by the RCE; and all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to fulfill the requirements of the pay item in accordance with the Plans, the Specifications, and other terms of the Contract.

Pay items under this section include the following:

Item No.	Pay Item	Unit
6531205	U-Section Post for Sign Supports – 2P	LF
6531210	U-Section Post for Sign Supports – 3P	LF
6531215	U-Section Post for Sign Bracing – 2P	LF
6531500	Reflective Sign Post Panels	LF

(66) DIVISION 700: ANTI-GRAFFITI COATING:

July 27, 2015

1. GENERAL

The anti-graffiti coating system shall be applied to locations as described in Exhibit 4 and in accordance with this Specification. Anti-graffiti coatings intended for use under this Specification shall be of a composition capable of preventing the adhesion of and facilitating the removal of acrylic, polyurethane, and alkyd spray paint. Use a clear, non-sacrificial anti-graffiti coating for all applications.

2. MATERIALS

All anti-graffiti coatings must possess the physical and handling characteristics that are compatible with the requirements of this Specification. Anti-graffiti coating shall be manufactured by one of the approved manufacturers listed on the most recent Qualified Product List 7, titled "Qualified Spray-On/Brush-On Surface Coatings for Concrete Finish". Contractor shall ensure that the anti-graffiti coating is compatible with the selected applied Finish Coating, if applicable.

Anti-graffiti coatings shall contain less than 5.0 lb/gal volatile organic compounds (VOC) as defined by 40 CFR Part 59, Subpart D. The manufacturer shall supply the following additional information:

- a. Technical data sheet that includes installation instructions and graffiti removal instructions, including any solvents or other materials, as necessary. Graffiti removal must be accomplished with nonproprietary cleaners as defined in ASTM D 6578.
- b. Certification that non-sacrificial anti-graffiti coating shall not blister, crack, check, chalk, delaminate, or exhibit a color change of more than 8 dE94 (or dE76) CIELAB units for a period of one year after installation.

Clear coating must contain a UV degradable color for inspection purposes. UV degradable color must dissipate in a reasonable time period to allow inspection but not detract from visual impact of the structure.

Additionally, submit a certification that the coating meets the following laboratory performance requirements:

Additional Laboratory Performance and Tests		
Test	Method	Limits
Graffiti Resistance	ASTM D 6578; Use identified marking materials; initial and re-cleanability; and after exposure initial and re-cleanability	Cleanability Level 1, 2, or 3
Fluid Resistance	ASTM D 1308; Paint thinner, gasoline	No blistering, discoloration, softening, or adhesion loss

3. APPLICATION

Apply an anti-graffiti coating or coating system in accordance with manufacturer's product data sheet and as specified herein, when the ambient temperature is between 40° and 90°F, and the surface temperature is between 50° and 85°F and rising.

Ensure all concrete has cured a minimum of 30 days before applying anti-graffiti coating. Do not apply coating when precipitation is expected within 12 hours of the completion of application or the relative humidity is above 88%.

4. PROTECTION OF ADJACENT SURFACES

Consider wind direction, velocity and geographic location as having a major impact on all cleaning and anti-graffiti coating operations. Use all necessary precautions to prevent cleaning and anti-graffiti coating materials from being dispersed outside the work site. If conditions are such that material is dispersed to areas where vehicles or other property may be damaged, suspend operations until conditions improve and work can continue without affecting adjacent property.

Protect all surfaces not intended to be coated, which are adjacent to, or in close proximity to the surfaces to be coated, during the application of anti-graffiti coating. Clean surfaces that are to be coated, as per the manufacturer's product data sheet.

5. SURFACE PREPERATION

Prior to applying any anti-graffiti coatings, prepare all surfaces to be coated in accordance with ASTM D 4261 or ASTM D 4258 and the manufacturer's product data sheet. When the anti-graffiti coating or coating system is to be applied over an existing coating, apply a test patch (minimum area of 4 square feet) in accordance with this Specification. Allow the test patch to cure a minimum of 7 days without any defects. No time extension will be granted as a result of this test requirement.

6. BASE COAT

Apply the base coat, if part of the system, as specified by the manufacturer. Unless otherwise specified by the manufacturer, ensure the cured base coat has a minimum dry film thickness of 4.0-8.0 mils.

7. FINISH COAT

When applicable, ensure the base coat surface is clean and cured to a dry hard state according to the manufacturer's instructions before applying the finish coat. Mix finish coat and apply in accordance with the manufacturer's instructions. Ensure the cured finish coat of the two coat system has a minimum dry film thickness of 2.5-5.0 mils. Apply as many coats as necessary to provide a finish coat which is a uniform continuous film over the entire surface, free of pinholes, runs, sags, or any other deficiencies. Finish coat shall be considered "non-sacrificial".

8. CORRECTION OF DEFICIENCIES

Remove all applied anti-graffiti coatings identified by the Engineer as damaged, defective, or otherwise not meeting these Specifications, in accordance with the manufacturer's recommendations. Prepare the surface and reapply the coating in accordance with the manufacturer's recommendations and as specified herein, at no additional cost to the Department.

9. REMOVAL OF GRAFFITI BEFORE ACCEPTANCE

Remove all graffiti from areas receiving anti-graffiti coating, at no additional cost to the Department. Ensure all federal, state, and local environmental regulations are met when removing graffiti. Removal shall be in accordance with manufacturer's recommendations.

(67) DIVISION 700: SOUND BARRIER WALLS:

August 24, 2015

Design, furnish, and construct Sound Barrier Walls in accordance with the requirements of Exhibit 4 and this Specification.

General

Place embankment fill along the Sound Barrier Wall at least 30 days before the commencement of wall construction.

Secure joints and connections in such a manner as to be structurally sufficient with no visible openings for sound transmission and as to not be a secondary source of sound transmission due to vibration.

Conform top of walls to the elevation shown and construct walls to conform to the horizontal alignments, corners and offsets shown in the plans. Provide all drainage related items in order to control the buildup of moisture from storm water runoff. Follow the design requirements for the type, gradation, and method of placement of backfill required. Exercise due caution in placing backfill at sound barrier wall foundation so as to maintain proper wall alignment.

When items are shown on the plans and are not covered in this Specification, the plans and SCDOT Standard Specifications shall govern the Work.

Precast Concrete Panels

Precast concrete panels shall conform to the following requirements:

- a. Cast all precast panels in a precasting facility approved by the Materials and Research Engineer.
- b. Prior to construction of test wall, provide three 2-ft. minimum by 4-ft. minimum sample models (full scale texture) of the proposed texture to the RCE for approval.
- c. Fabricate wall panels using a deep fractured fin finish (Standard Drawing 701-950-01) on the interstate side and a broom finish on the back side. On the interstate side of the top panel, provide a broom finish on the top two feet of the panel to provide the appearance of a concrete coping. Fabricate posts using smooth or brushed finish.
- d. Acceptability of the panels will be determined from the compressive strength of cylinders made and cured in the same manner as the panels, and by inspection during the manufacturing process. The manufacturer of the panels shall furnish such facilities and assistance as may be required to carry out the sampling and daily testing in an expeditious and satisfactory manner.
- e. Cast panels on a steel surface with steel side forms prepared so that there is no damage to panel finish. Do not strip forms until a minimum concrete strength of 2400 psi is attained. Vertical forms are required to provide the surface relief specified on each side of the panel.
- f. Place concrete in each panel without interruption, and consolidate by the use of vibrators supplemented by hand tamping and rodding so as to force the concrete into the corners of the forms and eliminate stone pockets, cleavage planes, and air bubbles.

- g. Repair minor honeycombing and voids within 24 hours of the removal of forms.
- f. Cure the panels as specified in SCDOT Standard Specification Subsection 702.4.4 for a sufficient length of time so that the concrete will develop the specified compressive strength. Do not use a curing period less than 72 hours under normal summer temperature conditions. In colder weather extend the curing period, as directed by the RCE, to provide equivalent curing. Protect the curing panels from freezing and evaporation from the time the concrete is placed until curing is complete. As an alternate to the wet cure method, steam cure the panels as specified in Section 704.
- g. On each panel, include the date cast and the Inspector's approval stamp. Acceptance by the Inspector at the precast yard will not preclude rejection at the erection point if any damage or defects are discovered.
- h. Erect the panels in accordance with plan details and dimensions.
- i. After erection is complete and before final acceptance of the project, clean the Sound Barrier Wall to remove any dirt or stain in an environmentally safe procedure.
- j. Panels will be subject to rejection due to failure to meet any of the requirements specified above. In addition, any of the following defects will be cause for rejection:
 - (1) Defects that indicate imperfect mixing and casting.
 - (2) Honeycomb or open texture.
 - (3) Exposure of the reinforcement.
 - (4) Failure to meet the specified concrete compressive strength at 28 days.
- k. When specified in the plans, finish the posts with a precast finial (color & geometry in the same material and finish as the post). Cope the top panel sections if shown on plans. If finials are required, cut off post as necessary to provide sufficient room above panels for finial installation. When finials and coping are not shown in the plans, construct posts between 1 and 3 inches above the highest attached panel.
- l. For items damaged during shipment or installation, repair/replace procedure shall be approved by the RCE.
- m. Handle and ship panels in as close to vertical position as possible as directed by the manufacturer to prevent damage to the finish.

Test Wall

Erect a portion of the wall as directed by the RCE (not less than 50 feet in length) which will be used for testing and acceptance. The RCE will use this portion of the wall to determine if the Contractor's methods and equipment are sufficient to produce a Sound Barrier Wall that meets the requirements of the contract documents including sound reduction performance, appearance, and texture. The Contractor may revise his methods and equipment as necessary in order to satisfactorily meet all contract requirements. If this portion of wall does not meet the requirements of the contract documents, remove and dispose of any rejected portions at no expense to the Department.

Tolerances

Limit vertical deviation from plumb for walls and posts to: ½ inch for wall heights less than 10 feet; 1 inch for wall heights 10 feet to 20 feet; and 1 ½ inches for wall heights greater than 20 feet.

Limit horizontal tolerance for walls to prevent panels from slipping out of the post joints.

Set posts within ½ inch of their intended location. For Sound Barrier Walls that are built on top of earth berms, construct the berms of earthwork fill material and compacted to ninety-five percent (95%) of the maximum density as determined by AASHTO T 99.

(68) SECTION 701: NON-CONFORMING CONCRETE:

For purposes of applying the reduced payment and below strength provisions of Subsection 701.2.12.4 of the Standard Specifications, a unit price of 750 dollars per cubic yard will be used.

(69) SECTION 711: PILE AND DRIVING EQUIPMENT DATA FORM:

Pile and Driving Equipment Data Form is included in Attachment B.

(70) SECTION 711: GALVANIZED STEEL H PILING AND SWAY BRACES:

March 16, 1999

GENERAL:

This Supplemental Specification covers the cleaning, hot dip shop galvanizing, field cleaning and field repair of galvanizing for new Steel H Bearing Piling and Steel Sway Bracing where required and detailed in the plans.

SURFACE PREPARATION:

The coating applicator shall pre-clean the material to be galvanized in accordance with accepted methods to produce an acceptable surface for hot dip galvanizing.

SHOP GALVANIZING:

Hot dip galvanizing of iron and structural steel shapes shall be produced utilizing lead free technology. Steel H Bearing Piling and Steel Sway Braces shall be hot dip galvanized in accordance with the latest ASTM A 123 Specification to provide a uniform minimum coating thickness of 3.5 mils (89 requirements will not be allowed.

□m). Shop rep

Galvanizing practices and procedures shall protect against possible embrittlement of the steel as described in ASTM A 143.

Inspection and testing of hot dip galvanized coatings shall be done under the requirements of ASTM A 123.

The coating applicator shall have available for inspection a quality assurance manual and shall submit an original and two copies of the coating applicator's notarized Certificate of Compliance that the hot dip galvanized coating meets or exceeds the specified requirements of ASTM A 123 as modified by this Specification.

Galvanized members shall be stored, protected, handled and loaded in accordance with industry standards to protect the coating.

SHOP INSPECTION:

Inspection of galvanizing practices and procedures will be performed by the Department's Research and Materials Laboratory. As soon as the project has been awarded, the Contractor shall notify the Research and Materials Laboratory at (803) 737-6698, P. O. Box 191, Columbia, South Carolina 29202. The Contractor shall provide the name and address of the coating applicator so that the inspection arrangements can be made.

FIELD REPAIR OF GALVANIZING:

Field repair of galvanized coatings may be used to repair damaged areas, weld areas at pile splices, weld areas at sway braces to piles or other areas of coating damage. All field repairs shall be made in accordance with ASTM A 780. The Engineer shall be the sole judge of damaged areas that require field repair of the galvanized coating.

When galvanized members are to be field welded the Contractor shall clean the area at the weld location for a distance sufficient to provide an area free of coating for the weld metal to be deposited. The Contractor's cleaning method shall be pre-approved by the Engineer and cleaned areas shall be inspected and approved prior to field welding.

METHOD OF MEASUREMENT:

The galvanizing of Steel H Bearing Piling and Sway Braces will not be measured for payment. All cost for galvanizing shall be included in the price bid for the item galvanized.

BASIS OF PAYMENT:

All costs for labor, materials, equipment, tools and other incidentals required to galvanize the Steel H Bearing Piling and Sway Braces shall be included in the price bid for those items. No separate payment will be made for galvanizing.

(71) SECTION 712: DRILLED SHAFT FORMS:

Drilled Shaft Forms are included in Attachment B.

(72) SECTION 714: SMOOTH WALL PIPE:

REFERENCE:

SCDOT Supplemental Technical Specification SC-M-714

DESCRIPTION:

When bid items for smooth wall pipe are listed in the EBS file and/or proposal, the SCDOT will allow the use of reinforced concrete pipe, spiral ribbed aluminum pipe or high density polyethylene pipe in accordance with the specifications found in SC-M-714 (latest edition), the Standard Drawings, and this Special Provision. The plans may indicate reinforced concrete pipe only and are hereby superseded by this Special Provision.

MATERIALS:

Smooth wall pipe is either Reinforced Concrete Pipe (RCP: 714-205-XX), Spiral Ribbed Aluminum Pipe (SRAP: 714-605-XX), or High Density Polyethylene pipe (HDPE: 714-705-XX) as described in SCDOT Supplemental Technical Specification SC-M-714 and in the SCDOT Standard Drawings. Use smooth wall pipe culvert from manufacturers listed on Qualified Product Lists 30, 68, or 69. No value engineering application is required in order to use alternate pipe.

For the following counties: Berkeley, Beaufort, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper, provide pipe joints meeting AASHTO M 315 for RCP or passing the 13 psi pressure test as indicated on the QPL for SRAP or HDPE. Take care to properly lubricate and equalize pipe gaskets as indicated in the **SCDOT Standard Drawings** and **SC-M-714** to prevent gaskets from "rolling" during installation. For all other counties, provide pipe joints meeting AASHTO M 198, M 315, or passing the minimum 10 psi pressure test unless specific pipe joints are indicated in the plans or special provisions.

No other pipe type will be accepted as an alternate.

CONSTRUCTION REQUIREMENTS:

Use only pipe that conforms to the minimum and maximum fill height limitations indicated on the appropriate standard drawing. Unless indicated otherwise in the plans, determine pipe fill height based on the following formula:

Fill Height = Elevation (top of curb or max grade above pipe) – Elevation (pipe crown)

For all locations where new pipe is being attached to an existing system, use one of the following options:

1. Any existing pipe may be extended using any acceptable alternate pipe type by using a drainage structure at the interface between the different pipe types. The drainage structure* may consist of standard junction boxes, manholes, catch basins, drop inlets, or

circular drainage structures detailed on **SCDOT Standard Drawings**. For larger diameter pipe, custom drainage structures may be required. Field cut existing pipe to remove damaged joint (if applicable) and install new drainage structure at the field cut interface. Always fully clean existing pipe and pipe joints before installing joint sealant or gaskets and attaching new pipe.

2. For locations where existing pipe properties cannot be directly matched, use a custom designed interface* (concrete collar, proprietary mastic wrap, custom coupling band, etc.) appropriate to interface the existing pipe to the new pipe of the same type. Submit interface drawings and design for review by the Engineer of Record and the Design Standards Engineer. Always fully clean existing pipe and pipe joints before installing joint sealant or gaskets and attaching new pipe. Replace existing pipe that has joint damage before connecting new pipe to the system.
3. Any existing pipe may be extended using new pipe with the same joint profile and wall properties of the existing pipe. Always fully clean existing pipe and pipe joints before installing joint sealant or gaskets and attaching new pipe. Verify* the following parameters before ordering new pipe:
 - a. For RCP to RCP, confirm wall thickness, joint profile shape, and compatibility with existing manufacturer's pipe. Replace existing pipe that has joint damage before connecting new pipe to the system.
 - b. For SRAP to SRAP, replace existing pipe that has joint damage before connecting new pipe to the system.
 - c. For HDPE to HDPE, confirm the manufacturer of the existing pipe and the joint compatibility with the new pipe. Provide a new gasket when connecting to existing spigot end of HDPE pipe. Replace existing pipe that has joint damage before connecting new pipe to the system.
 - d. For CAAP to CAAP, confirm the type and size of end corrugations of the pipe. When existing pipe has full helical corrugations, provide new connecting pipe with one end fully helical and fully helical coupling band. When end corrugation size does not match the corrugation size shown on SCDOT Standard Drawings, provide a drainage structure (described above) at the interface. Replace existing pipe that has joint damage before connecting new pipe to the system. Do not install CAAP as smooth wall pipe; however, use these requirements when plans specify installing new CAAP.

The **RCE** will verify that connections between existing pipe and new installed pipe have been handled with one of the options listed above. Repair or replace all existing to new joint interfaces that do not meet the requirements above at no additional cost to **SCDOT**.

In all installations, provide the RCE with a complete pipe table indicating the following: Plan Pay Item, Plan Pipe Description, Plan Quantity, Installed Pipe (diameter, type, class/gage), Installed Quantity, and description of interface used to join new pipe to existing pipe for each occurrence.

In cases where 2 or more different pipe types are installed, provide a copy of the proposed installation layout on the drainage/plan sheets to the RCE indicating which pipe is installed at each location.

MEASUREMENT:

Measure smooth wall pipe in accordance with methods specified in SC-M-714 for the pipe material installed.

*No measurement will be made for drainage structure, designed interface, or field verification performed at each interface between existing pipe and new pipe unless drainage structure/interface is specified in the plans.

PAYMENT:

Payment will be made for smooth wall pipe regardless of the type of material installed. Payment for smooth wall pipe is as specified in SC-M-714 for the pipe material installed.

*Include all costs for work related to connecting new pipe to existing pipe in the unit bid price of the new pipe. This connection work includes: drainage structure at the interface, custom designed interface, field verification of existing pipe and compatibility with new pipe, new gaskets, new joint sealant, new coupling bands, removal, and disposal of damaged sections of existing pipe.

ITEM NO.	DESCRIPTION	UNIT
7143XXX	X" SMOOTH WALL PIPE	LF
7143XXX	X"x X" SMOOTH WALL PIPE CUL.TEE	EA
714XXXX	X" x X" SMOOTH WALL PIPE CUL.WYE	EA
7144XXX	X" SMOOTH WALL PIPE X DEG BEND	EA
7144XXX	SMOOTH WALL PIPE INCR.- X" TO X"	EA

(73) SECTION 714: PIPE END TREATMENTS (2/5/2010):

REFERENCE: SCDOT Supplemental Technical Specification SC-M-714

DESCRIPTION:

For exposed pipe culvert ends, provide an end treatment in accordance with this special provision.

MATERIALS:

Rigid pipe culvert is Reinforced Concrete Pipe (RCP: 714-205-00). Flexible pipe culvert is either Spiral Ribbed Aluminum Pipe (SRAP: 714-610-00), High Density Polyethylene pipe (HDPE: 714-705-00), or Corrugated Aluminum Alloy Pipe (CAAP: 714-605-00).

Use minimum Class B riprap for pipe up to 84" diameter. Use minimum Class C riprap for pipe 84" diameter or larger.

Use minimum Class 4000 concrete (4000P for precast).

Use ASTM A-706 grade 60, low-alloy steel deformed rebar.

Use minimum AASHTO M-196 Alclad 3004-H32 alloy aluminum.

Use Type M Mortar Grout unless specified otherwise.

CONSTRUCTION REQUIREMENTS:

Use one of the following end treatments as specified in the plans or special provisions:



For all exposed crossline pipe ends, when an end treatment is not specified in the plans, use **Pipe Riprap Protection** (804-3xx-xx). For flexible pipe larger than 24" diameter, install pipe straight headwall, pipe end structure, flared end section, or wingwall section in addition to riprap. For all exposed driveway pipe ends where no end treatment is specified in the plans, use **Pipe Riprap Protection** (804-3xx-xx) unless directed otherwise by the engineer.



Use **Beveling of Pipe End** (719-610-00) when specified in the plans or special provisions. Beveled ends may only be used on flexible pipe up to 24" diameter and on rigid pipe up to 60" diameter. When beveling of pipe ends is specified on flexible pipe larger than 24" diameter, install pipe straight headwall, pipe end structure, flared end section, or wingwall section. Use factory fabricated beveled ends for all pipe types unless approved by the Engineer.



Use **Pipe Straight Headwall** (719-605-00) when specified in the plans or special provisions. Use straight headwall only in locations where pipe exposed end does not face the direction of traffic.



Use **Pipe End Structure** (719-615-00) when specified in the plans or special provisions. Use pipe end structure in locations where pipe exposed end faces the direction of traffic. Pipe end structures may be used in other locations if approved by the RCE.



Use **Pipe Flared End Section** when specified in the plans or special provisions.



Use **Pipe Wingwall**

Section when specified in the plans or special provisions.

Completely seal interface between pipe and end treatment with grout. If bricks or shims are used to place pipe, take care to remove all air pockets and voids when grouting.

For systems not designed in the SCDOT Standard Drawings, provide shop drawings, installation procedure and design calculations for review by RCE. Design must include provision to control erosion around the structure and prevent the separation of the end treatment from the pipe system. Design must provide for a proper seal at all construction joints including the interface between the pipe and the structure. Design must be self-supporting and not induce any additional loads on the pipe. Submit designs for consideration as new standard drawings to the Design Standards Engineer at the address listed in the SCDOT Standard Drawings book.

MEASUREMENT:

Measure pipe in accordance with SC-M-714

Measure end treatments in accordance with Standard Specifications, Standard Drawings, or Special Provisions.

PAYMENT:

Beveling of pipe ends will be in addition to the standard pipe pay item. Payment for the item Beveling of Pipe Ends includes all labor required to factory (or field, if approved) fabricate a bevel on one end of pipe.

Pipe culvert and end treatments, measured as provided in **SC-M-714 Subsection x.4**, are paid for at the contract unit price for the respective items, which price and payment is compensation for furnishing all material, labor, equipment, tools including hauling and placing all pipe sections and materials, excavation of the entire standard trench, bedding, and pipe backfill as described in the measurement section (both structural and embankment backfill in this region), removal of existing pipe to be replaced, constructing pipe joints, removal of old end treatments, cleaning out pipe, disposal of surplus materials, all visual inspection, and all incidentals necessary to complete the work.

Add the following paragraph to SC-M-714 subsections x.5:

Payment for riprap and geotextile for erosion control under riprap as measured in subsection x.4 includes all direct and indirect costs and expenses necessary to complete the work.

(74) SECTION 719: CAST IN PLACE CONCRETE PIPE COLLAR:

1.0 DESCRIPTION

A cast in place concrete pipe collar is used to provide a permanent connection between two pipe culverts of the same diameter but different joint profiles. Pipe collars can be used between two pipe of the same material or different material. Use only pipe that conforms to SC-M-714, Permanent Pipe Culverts.

2.0 MATERIAL

Use minimum class 4000 concrete.

Use reinforcement steel conforming to ASTM A706 Grade 60.
See SCDOT Standard Drawings or Project Plans for other material requirements and design details.

3.0 CONSTRUCTION REQUIREMENTS - GENERAL

Follow SCDOT Standard Drawings 719-705-xx for minimum dimensions and details. Use geotextile wrap on joint to minimize concrete intrusion into the joint during the forming and curing process.

4.0 MEASUREMENT

Measure concrete pipe collars by each location where pipe diameter of different joint profiles are to be connected. Include in measurement all materials and work to complete the pipe collar as shown in the Standard Drawings or plans.

5.0 PAYMENT

Payment will be made for each location.

Pay Items

7197051	CONCRETE COLLAR FOR UP TO 12" PIPE	EA
7197052	CONCRETE COLLAR FOR UP TO 24" PIPE	EA
7197053	CONCRETE COLLAR FOR UP TO 36" PIPE	EA
7197054	CONCRETE COLLAR FOR UP TO 48" PIPE	EA
7197055	CONCRETE COLLAR FOR UP TO 60" PIPE	EA
7197056	CONCRETE COLLAR FOR UP TO 72" PIPE	EA

(75) SECTION 727: CROSSHOLE SONIC LOGGING OF DRILLED SHAFT FOUNDATIONS:

Crosshole Sonic Logging (CSL) Testing is required for all drilled shafts. SCDOT shall be responsible for all CSL Testing.

(76) DIVISION 800: GEOTEXTILE FOR DRAINAGE FILTRATION:

October 15, 1991

I. ACCEPTANCE:

The Contractor shall supply to the Resident Engineer, prior to placing the material, certified test results from a recognized laboratory of those tests specified herein. Acceptance will be based on the test results meeting these requirements¹ and the material meeting all stated specifications. The Resident Engineer shall submit the certified test results to the Research and Material Engineer for acceptance. Test data shall be no more than 1 year old at the time it is furnished to the Department. Once a fabric has been accepted, it will be listed on an Approval Sheet, and only those materials listed will be acceptable. Test data must be resubmitted for reapproval every 2 years. No fabric will be used nor will payment be made for fabric until the fabric certification is received and approved by the Research and Materials Engineer. The Department reserves the right to sample and test any of the fabrics, or other materials used in drainage filtration, at any time.

II. PIPING RESISTANCE: (soil retention - all applications)

A. Soils with 50% or less particles by weight passing U.S. No. 200 sieve:

$$EOS \text{ No. (fabric)} \geq 30 \text{ U.S. Std. Sieve No.}$$

B. Soils with more than 50% particles by weight passing U.S. No. 200 sieve:

$$EOS \text{ No. (fabric)} \geq 50 \text{ U.S. Std. Sieve No.}$$

Note:

- a. Whenever possible, fabric with the lowest possible EOS No. should be specified.

- b. When the protected soil contains particles from 1 inch size to those passing the U.S. No. 200 sieve, use only the gradation of soil passing the U.S. No. 4 sieve in selecting the fabric.

III. PERMEABILITY:

$$\frac{\text{Critical/Severe Applications}^*}{k(\text{fabric}) \geq 10 k(\text{soil})^2} \qquad \frac{\text{Normal Applications}}{k(\text{Fabric}) \geq k(\text{soil})^2}$$

* Woven monofilament fabrics only; percent open area ≥ 4.0 and EOS No. ≤ 100 sieve.

IV. CHEMICAL COMPOSITION REQUIREMENTS/CONSIDERATIONS:

- A. Fibers used in the manufacture of civil engineering fabrics shall consist of long chain synthetic polymers, composed of at least 85% by weight of polyolefins, polyesters, or polyamides. These fabrics shall resist deterioration from ultraviolet exposure.
- B. The engineering fabric shall be exposed to ultraviolet radiation (sunlight) for no more than 30 days total in the period of time following manufacture until the fabric is covered with soil, rock, concrete, etc.

V. PHYSICAL PROPERTY REQUIREMENTS (all fabrics)

	Class 1 Fabric ³ Protected	Class 2 Fabric ³ Unprotected
Grab Strength (ASTM D-4632 or ASTM D-1682)	80 lbs.	180 lbs.
Seam Strength ⁴ (ASTM D-4632 or ASTM D-1682)	70 lbs.	160 lbs.
Puncture Strength (ASTM D-3787)	25 lbs.	80 lbs.
Burst Strength (ASTM D-3786)	130 psi.	290 psi.
Trapezoid Tear (ASTM D-4533)	25 lbs.	50 lbs.
Ultraviolet Degradation at 150 hours (ASTM D-4355)	70%	70%

¹ All numerical values represent minimum average roll values (i.e., any roll in a lot should meet or exceed the minimum values in the table). Use values for the weaker principal direction. Lots should be sampled according to ASTM D-4354.

² Permeability should be based on the actual fabric open area available for flow. For example, if 50% of the fabric area is to be covered by flat concrete blocks, the effective flow area is reduced by 50%.

³ Fabric is said to be protected when used in drainage trenches or beneath/behind concrete (Portland or asphalt cement) slabs. All other conditions are said to be unprotected,

Examples of each condition are:

Protected: highway edge drains, blanket drains, smooth stable trenches < 10 feet in depth. In trenches, in which the aggregate is extra sharp, additional puncture resistance may be necessary.

Unprotected: stabilization trenches, interceptor drains on cut slopes, rocky or caving trenches or smooth stable trenches > 10 feet in depth.

⁴ Values apply to both field and manufactured seams.

(77) DIVISION 800: GEOCOMPOSITE WALL DRAIN:

May 6, 2003

1.0 DESCRIPTION

A geocomposite wall drain is a prefabricated drain system that is used to provide drainage behind retaining walls. The geocomposite drain consists of a flexible plastic drainage core bonded to a non woven geotextile. Geocomposite wall drains shall be placed continuously along the back of the wall as shown in the plans or as otherwise directed by the Engineer. The Contractor shall furnish all necessary labor, equipment, and materials and perform all operations necessary for the installation of geocomposite wall drains in accordance with the details shown on the plans and with the requirements of this specification.

2.0 ACCEPTANCE CRITERIA

The Contractor shall supply to the Engineer, prior to placing the material, certified test results of those tests specified herein from a recognized laboratory. Acceptance will be based on the test results meeting the geocomposite system properties, drainage core properties, and geotextile properties stated in this specification. The Engineer shall submit the certified test results to the Research and Material Engineer for acceptance. Test data shall be no more than one year old at the time it is furnished to the Department. Geocomposite wall drains shall not be installed until the material certification is received and approved by the Research and Materials Engineer. The Department reserves the right to sample and test any of the materials used in the geocomposite wall drain system.

Labeling, shipment, and storage of the geocomposite wall drain materials shall follow ASTM D 4837. Product labels shall clearly show the manufacturer or supplier name, style number, and roll number. Geocomposite rolls shall be wrapped with a material that will protect the geocomposite drain from damage due to shipment, water, sunlight, and contaminants. The protective wrapping shall be maintained during periods of shipment and storage.

3.0 MATERIAL

The geocomposite wall drain shall be prefabricated type made up of a lightweight, high impact polymeric drainage core bonded to the geotextile at intervals not exceeding 1.5 inches. The geocomposite wall drain shall be solid backed allowing drainage of water on only one side. The non woven geotextile is thermal (heat) bonded or fungicide glue bonded to the polymeric drainage core. The geocomposite product sheets or rolls shall have a minimum width of 3 feet with a minimum coverage area of 40 square feet. A geotextile flap shall be provided along all drainage core edges. This flap shall be of sufficient width for sealing the geocomposite drain edge to prevent soil intrusion into the drainage core during and after installation. The geotextile shall cover the full length of the drainage core.

The wall drainage system shall meet the following geocomposite system properties in addition to the individual component properties of the polymeric drainage core and the non woven geotextile. All numerical values listed in the required property tables shown below represent minimum average roll values (MARV) per ASTM D 4759 unless indicated otherwise. Values for the weaker principal direction should be used. Testing shall be

performed in accordance with the methods referenced in this specification. Sampling of lots shall be in accordance with ASTM D 4354.

GEOCOMPOSITE SYSTEM PROPERTIES		
TEST	METHOD	LIMIT
Flow Capacity (gpm/ft. width) At a hydraulic gradient of 1.0 and a minimum normal stress of 3600 psf (Normal load maintained for 300 hours or until equilibrium)	ASTM D 4716	14

DRAINAGE CORE PROPERTIES		
TEST	METHOD	LIMIT
Thickness (inches)	ASTM D 1777	0.3 minimum / 0.5 maximum
Compressive Strength (psf) At 20% Deformation (10,000 hour minimum duration)	ASTM D 1621	14,000

GEOTEXTILE PROPERTIES		
TEST	METHOD	LIMIT
AOS (Equiv. U.S. Sieve)	ASTM D 4751	50 maximum average roll value
Permittivity (sec ⁻¹)	ASTM D 4991	1.0
Grab Tensile Strength (lbs.)	ASTM D 4632	80
Grab Tensile Elongation (%)	ASTM D 4632	50
Trapezoidal Tear Strength (lbs.)	ASTM D 4533	40
Puncture Strength (lbs.)	ASTM D 4833	50
Burst Strength (psi)	ASTM D 3786	150
Ultraviolet Stability (%) (Retained strength after 500 hours of exposure)	ASTM D 4355	70

4.0 CONSTRUCTION REQUIREMENTS - GENERAL

The Contractor shall check the geocomposite wall drain upon delivery to ensure that the proper material has been received. The geocomposite wall drain shall be protected during shipment and storage at the construction site from temperatures greater than 71 C, mud, dirt, debris, and any other environmental condition that may damage the material's physical property values. The wall drainage system shall be protected from direct sunlight in accordance with the manufacturer's recommendations.

The geocomposite wall drain will be rejected at the time of installation if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, shipment, or storage. Torn or punctured sections shall be removed or repaired as directed by the Engineer. Any geocomposite wall drain damaged during manufacture, shipment, or storage shall be replaced by the Contractor at no additional cost.

If at any time the Engineer determines that the method of installation does not produce a satisfactory wall drainage system, the Contractor shall alter his method and/or equipment as necessary to comply with this specification.

The geocomposite wall drain shall be installed in accordance with the plans and specifications. The surface that the geocomposite drain will be placed against shall be cleaned by removing all soil, debris, and irregularities that will prevent intimate contact between the surface and the geocomposite drain. The geocomposite wall drain shall be secured to the wall using metal stick clips, adhesives, or as recommended by the manufacturer. The geocomposite wall drain shall be installed so as to allow weepholes, as shown in the plans, to drain water from the drainage core and underdrain pipes.

All joints shall be formed by peeling or trimming the geotextile off the attached section to expose 3 inches of the drainage core. The drainage core of the second section being attached is then overlapped 2 inches over the first drainage core. The joint is then covered by reattaching the geotextile flap and securely fastening it to the lower geotextile by means of a continuous strip of 3 inch wide waterproof plastic tape. Each overlapping course shall be shingled in the direction of water flow. If joints cannot be formed by interlocking the cuspatations, then the drainage core should be butted together and covered with continuous, 6 inch wide geotextile. The geotextile fabric shall be centered over the joint and securely fastened to the two geocomposite drains with 3 inch wide waterproof plastic tape.

All exposed edges of the geocomposite wall drain shall be covered with geotextile by tucking and securing a minimum of 4 inches of geotextile behind the drainage core. This may be done by using the geotextile flaps at the edges or using a 12 inch wide continuous strip in the same manner, taping it to the exposed fabric 4 inches in from the edge with a continuous strip of 3 inch wide waterproof plastic tape, and folding the remaining geotextile and tucking it behind the drainage core edge.

If the geotextile is torn, perforated, or ripped during installation, it shall be patched or replaced as directed by the Engineer. The damaged section shall be cut out and replaced completely or repaired by placing a piece of geotextile over the damaged area and providing a minimum of 4 inches of overlap on all sides over the damaged area and secured with 3 inch wide waterproof plastic tape. Damaged drainage core sections shall be discarded and replaced. Any geocomposite wall drain damaged during installation shall be replaced or repaired by the contractor at no additional cost.

The underdrain pipes and free draining aggregate shall be placed as shown in the plans or as directed by the Engineer. A positive outlet for the water in the geocomposite drain shall be maintained at all locations. Weepholes shall not be sealed or made ineffective by the wall drain material. This may involve making a hole in the drainage core at the weephole location. The geotextile drainage filtration fabric used to envelop the underdrain system shall be tucked 6 inches behind the geocomposite drain and overlapped over the geocomposite drain a distance of 12 inches and continuously secured with 3 inch wide waterproof plastic tape.

Backfill shall be placed immediately over the geocomposite wall drain. The contractor shall backfill against the wall in a manner that does not damage the geocomposite drainage system. Care shall be taken to avoid excessive settlement of the backfill material. The geocomposite wall drain shall not be exposed for more than seven days prior to backfilling. Any geocomposite drainage system component that is damaged during the backfilling operation shall be replaced or repaired as directed by the Engineer.

5.0 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Geocomposite wall drains will not be measured for payment. The cost of the geocomposite wall drain shall be included in the cost of the retaining wall or wall system where the drainage system is being installed.

(78) SECTION 805: THREAD LOCKING GUARDRAIL HARDWARE:

Use a permanent thread locking compound meeting Military Specification Mil-S-46163A Type I, Grade L. Follow the thread locking compound manufacturer's directions and apply compound to all the fasteners within Type T End Treatments, Impact Attenuators, and Crash Cushions. Apply compound to all guardrail fasteners across bridges or on base plate mounted posts, or in locations directed by the Resident.

(79) SECTION 805: TL3 TYPE T TANGENT END TERMINALS:

Qualified Product List 49 provides minimum length of continuous w-beam from the impact head for each proprietary Test Level 3 product. All radius, kinks, and transition sections must occur outside of the continuous w-beam section. SCDOT Standard Drawing 805-710-00 shows the required installation for systems with a 50' w-beam requirement. Where the design requires immediate transition from w-beam to thrie-beam at the end of the Type-T, confirm that adequate space exists in advance of the impact head before selecting a system that requires any length greater than 50'. The pay length for the TL3 Type T end terminal is shown in Special Provision Drawing 805-710-SP. No additional measurement or payment will be made for additional w-beam required by the selection of a proprietary product. Where sites do not accommodate longer end treatments, use a system with a 50' continuous w-beam section. When design includes a tangent installation of standard w-beam rail behind the 50' section, the designed rail will be measured and paid at 50' from the impact head as shown in the plan quantities.

For products with a 62'-6" requirement, see drawing 805-710-SP in Attachment B for additional guidance.

(80) SECTION 805: INSPECTION AND REPAIR OF DAMAGED GUARDRAIL:

Inspect and repair existing guardrail as defined in Engineering Directive 42.

(81) SECTION 806: REPAIR EXISTING CONTROL OF ACCESS FENCE:

Repair, replace or reset any damaged control of access fencing or fence components within the project limits, as directed by the RCE. Clear and remove from the project any vegetation or debris that has accumulated on the fences and either has damaged or is prohibiting the visual inspection of existing control of access fence. CONTRACTOR's bid shall include 500 linear feet of Repair of Existing Control of Access Fence. Should the actual length of fence rehabilitation vary from this estimated value by more than 25%, a change order will be generated by the RCE to adjust the contract value based on the actual rehabilitated length of fence as measured by SCDOT inspectors, utilizing a unit price of **\$15.00/LF**, regardless of fence type. Ensure all waste materials and debris generated during this work is disposed of promptly and at appropriate waste facilities.

(82) SECTION 815: EROSION CONTROL MEASURES:

In addition to the erosion control measures specified in the Plans, Standard Specifications, Supplemental Technical Specifications and the Special Provisions, the CONTRACTOR is advised that all land disturbing activities (clearing and grubbing, excavation, borrow and fill) are subject to the requirements set forth in the following permits and regulations:

- South Carolina Code of Regulations 63-380, Standard Plan for Erosion, Sediment, and Stormwater Runoff Control.
- Erosion and Sediment Reduction Act of 1983 (Title 48, Chapter 18 of the South Carolina Code of Laws of 1983, as amended). Section 70 of this code authorized the South Carolina Department of Health and Environmental Control (SCDHEC) to administer this regulation with respect to lands under the jurisdiction of the South Carolina Department of Transportation.
- National Pollutant Discharge Elimination System (NPDES) General Permit Number SCR160000, effective January 1, 2013: The Environmental Protection Agency, in accordance with the Federal Clean Water Act, has granted to the South Carolina Department of Health and Environmental Control (SCDHEC) the authority to administer the Federal NPDES permit program in the State of South Carolina.

In accordance with the NPDES General Permit, the Contractor must sign a Contractor Certification. The certification is incorporated into the proposal form for the Contract. By signing this form, the Contractor acknowledges that upon award and execution of the Contract, he/she accepts/ understands the terms and conditions of the *Storm Water Pollution Prevention Plan (SWPPP)* as required by the NPDES General Permit and may be legally accountable to SCDHEC

for compliance with the terms and conditions of the *SWPPP*. In addition, the Contractor certifies that the NPDES certification statement status is made part of all its subcontracts.

The Contractor will complete and forward an updated SCDOT approved *Notice of Intent (NOI)* to the SCDOT Construction office to submit to SCDHEC. If the Coastal Zone Consistency (CZC) permit has not been approved it shall be forwarded by the Contractor to SCDOT to submit to SCDHEC as part of *NOI* package. If SCDHEC does not send a letter within 10 business days of receipt of the *NOI*, authorizing coverage, denying coverage, or advising that a review of the *CECP* will take place, coverage will be automatically granted.

Prepare and submit a *Contractor's Erosion Control Plan (CECP)* to the RCE before the pre-construction conference. Ensure that the plan meets the requirements of the NPDES General Permit. The plan will be reviewed and approved by the Department before commencing any land disturbing activities.

At the pre-construction conference, with contactors performing land-disturbing activities present, the *CECP* will be explained and discussed so that the Contractor is made aware of their responsibilities in the *CECP*.

Once approved, fully implement the *CECP*. Coordinate the prompt installation of erosion control devices with construction activities to maintain compliance with the above regulations and NPDES General Permit.

Conduct an Erosion and Sediment Control Inspection by an appointed Certified Erosion Prevention and Sediment Control Inspector (CEPSCI) from the Contractor and the Department at least every 7-calendar days. Both parties will acknowledge participation in the inspection by signing the inspection report and include their inspector's CEPSCI number on the report. Correct deficiencies noted during these inspections within the assigned priority period. If deficiencies are not corrected within this timeframe, the RCE will stop all work (except erosion and sediment control measures) until the deficiencies are corrected.

Give special attention to critical areas within the project limits (i.e., running streams, water bodies, wetlands, etc.). In these areas, the RCE may direct the Contractor to undertake immediate corrective action, but in no case allow these deficiencies to remain unresolved more than 7 days or 48 hours in accordance with their assigned priority after being identified during the Erosion and Sediment Control Inspection.

Closely follow the grading operations with the seeding operations. Shape and prepare the slopes for seeding as the grading progresses. Unless the RCE grants prior written approval, limit the amount of surface area exposed by land disturbing activities to 750,000 square feet. Commence seeding operations within 7 days following completion of construction activities within an area.

Initiate stabilization measures within 7 days for an area where construction activities will be temporarily or permanently ceased for 14 days or longer.

Coordinate the installation of all other permanent erosion control items with the grading and seeding operations. These items include, but are not limited to, asphalt gutter and riprap. Construct gutter work before or promptly after the seeding is performed. Place riprap at the ends of pipe immediately after the pipe is laid and promptly install riprap ditch checks after ditch work has been performed.

Within existing right of way, clean and repair existing concrete paved ditches that will be retained. Within existing right of way, clean and repair existing asphalt paved ditches that are to be retained and overlay with 200 lbs/sy HMA Surface Course Type C or D. Stabilize new ditches in accordance with the *SCDOT Requirements for Hydraulic Design Studies* (May 26, 2009), the *SCDOT Water Quality Design Manual* (December 2014) and as needed for erosion control utilizing SCDHEC Best Management Practices (BMP's).

Failure to adequately comply with the provisions as detailed above or any other required erosion control measures will result in stoppage of all contract operations (except erosion and sediment control measures) until corrective action has been taken. Additional sanctions may be invoked by the SCDHEC in accordance with their authority.

Keep the following documents at the RCE's office from the start of construction until the site is finally stabilized:

- Copy of the *CECP*,
- Copies of Contractor Certification statements,
- Copy of the permit,
- Letter from DHEC authorizing permit coverage if provided by SCDHEC, and
- A marked-up set of site plans.

When uniform perennial vegetation achieves a cover density of 70%, submit a *Notice of Termination (NOT)* to SCDHEC to terminate coverage. Include a signed statement with the *NOT* certifying that all work on the site has been completed in accordance with the *SWPPP* and the NPDES General Permit for all sites one acre or greater.

Fines assessed on the Department by SCDHEC as the result of the CONTRACTOR's non-compliance or violation of said permit provisions will be paid by the Department and will subsequently be deducted from any monies due or that may become due to the CONTRACTOR. In case no monies are due or available, the fines incurred will be charged against the CONTRACTOR's Surety.

(83) SECTION 815: ANIONIC POLYACRYLAMIDE FOR EROSION CONTROL:

Description:

This work consists of applying a product containing anionic polyacrylamide to disturbed land areas as a means of controlling erosion. The work also consists of the use of solid form anionic polyacrylamide as a means of sediment control.

Materials:

The product to be used is to be specific to the area to be treated. Product selection and application rate is to be determined by a testing laboratory acceptable to SCDOT. Preliminary site-specific assessment (soil and water testing) by a qualified manufacturer must be conducted to select media, additives, application rate, application method and maintenance procedure tailored to site-specific soil characteristics, topography, hydrology, and the type of erosion targeted. A copy of the test results is to be provided to the Engineer.

Anionic polyacrylamide, in pure form, shall have less than or equal to 0.05% acrylamide monomer by weight, as established by the Food and Drug Administration and the Environmental Protection Agency. The maximum application rate of polyacrylamide, in pure form, shall not exceed 200 pounds/acre/year, or 10 pounds/acre per single application event.

The polyacrylamide shall have a charge density of 10% to 55%, by weight. The polyacrylamide shall have a molecular weight of 6 to 24 Mg/mole.

The polyacrylamide and polyacrylamide mixtures shall be noncombustible.

Cationic forms of polyacrylamide are not allowed for use due to their high level of toxicity.

Polyacrylamide shall be non-toxic. A toxicity report is required to be submitted to the Engineer.

Construction Requirements:

Liquid and powder forms of polyacrylamide are to be either applied directly to the exposed soil surface or applied as a tackifier with temporary seeding to prevent detachment of soil particles during the establishment of vegetation.

In the solid form, the polymer is to be placed directly into the storm water runoff to enhance eroded particle settlement in a trapping device.

Polyacrylamide shall be mixed and/or applied in accordance with all Occupational Safety and Health Administration (OSHA) Material Safety Data Sheet (MSDS) requirements and the manufacturer's recommendations for the specified use conforming to all federal, state and local laws, rules and regulations. The Contractor is responsible for obtaining all required permits.

Emulsion batches shall be mixed following recommendations of a testing laboratory that determines the proper product and rate to meet site requirements.

Additives such as fertilizers, solubility promoters, or inhibitors, etc. to polyacrylamide shall be nontoxic.

Care is to be taken when using polyacrylamide adjacent to natural water bodies.

Method of Measurement:

The application of polyacrylamide for erosion control will be measured by the surface area treated at the recommended rate of application. Quantities are to be computed to the nearest MSY (Thousand Square Yards). Solid form anionic polyacrylamide is to be measured by weight in pounds, in place and accepted. The Contractor is required to provide, to the Engineer, invoices for all polyacrylamide products used on the project.

Basis of Payment:

The accepted quantity of "Anionic Polyacrylamide For Erosion Control" will be paid at the contract unit price, which price and payment shall be full compensation for all materials, labor, tools equipment, and incidentals necessary to complete the work herein described in a workmanlike and acceptable manner. Solid form anionic polyacrylamide is to be paid for by the pound. Bid Item Numbers and Descriptions are as follows:

<u>Bid Item Number</u>	<u>Description</u>	<u>Unit</u>
8152020	Anionic Polyacrylamide for Erosion Control	MSY
8152025	Solid Form Anionic Polyacrylamide	LBS

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecemeal, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release,

or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal

opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement

has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the

performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for

employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. Davis-Bacon and Related Act Provisions

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program. Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her

agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor,

Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any

employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements.

The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this

contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be

necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible.

Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise

ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal 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) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

h. 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 this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not

less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)

1. The Offeror's or Bidders attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
2. The goals and timetables for minority and female participation expressed in percentage terms for the Contractor's aggregate work force in each trade on all construction work in the covered area are as follows:

Goals for Women Apply Nationwide

GOALS AND TIMETABLES

<i>Timetable</i>	<i>Goals (percent)</i>
From Apr. 1, 1976 until March 31, 1979----- --	3.1
From Apr. 1, 1979 until March 31, 1980----- --	5.1
From Apr. 1, 1980 until March 31, 1981----- --	6.9

Goals for Minority Participation

South Carolina

SMSA Counties:..... Greenville, Pickens, Spartanburg	16.0
Non-SMSA Counties:..... Abbeville, Anderson, Cherokee, Greenwood, Laurens, Oconee, Union	17.8
SMSA Counties:..... Lexington, Richland	23.4
Non-SMSA Counties..... Calhoun, Clarendon, Fairfield, Kershaw, Lee, Newberry, Orangeburg, Saluda, Sumter	32.0
Non-SMSA Counties..... Chesterfield, Darlington, Dillon, Florence, Georgetown, Horry, Marion, Marlboro, Williamsburg	33.0
SMSA Counties:..... Berkeley, Charleston, Dorchester	30.0
Non-SMSA Counties..... Colleton	30.7
Non-SMSA Counties..... Beaufort, Hampton, Jasper	29.8
Non-SMSA Counties..... Chester Lancaster York	15.7
Non-SMSA Counties..... Barnwell, Edgefield, McCormick, Allendale, Bamberg	32.8
SMSA Counties:..... Aiken	27.2

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical areas where the work is actually performed. With regard to this second area, the Contractor is also subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications

set forth in 41 CFR 60-4.3(a) and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees of trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor, employer identification number, estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.
4. As used in this Notice and in the contract resulting from this solicitation, the "covered area" is (insert description of the geographical areas where the contract is to be performed giving the state, county, and city, if any). The "covered area is the SMSA County or Counties or Non-SMSA County or Counties in which the contract work is performed.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)

1. As used in these specifications:
 - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
 - b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
 - c. "Employer identification number" means the Federal Social Security number used on the Employers Quarterly Federal Tax Return, U. S. Treasury Department Form 941.
 - d. "Minority" includes:
 - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin regardless of race);
 - (iii) Asian or Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U. S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in which it has employees in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notices form and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.
5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U. S. Department of Labor.
7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
 - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority of female individuals working at such sites or in such facilities.
 - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available and maintain a record of the organization's responses.
- c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may taken.
- d. Provide immediate written notification to the Director when union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet his obligations.
- e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.
- f. Disseminate the Contractor's EEO policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
- g. Review at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initialization of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall sent written notification to organizations such as the above, describing the openings, screening procedures and tests to be used in the selection process.
- j. Encourage present minority and female employees to recruit other minority persons and women and where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

- k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
 - l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
 - m. Ensure that all seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
 - n. Ensure that all facilities and company activities are non-segregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
 - o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
 - p. Conduct a review, at least annually of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.
 9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
 10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
 11. The Contractor shall not enter into any Subcontract with any person or firm debarred from the Government contracts pursuant to the executive Order 11246.
 12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and the Equal Opportunity Clause, including suspensions, termination and cancellation of the existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended. and its implementing regulations, by the Office if the Federal Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of the specifications and Executive Order 11246, as amended.
 13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4-8.
 14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any employee identification number when assigned, social security number, race, sex status(e.g., Mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and location at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that the existing records satisfy this requirement, contractors shall not be required to maintain separate records.
 15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents(e.g. those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

Dorchester.....\$ 11.62
 Asphalt, Includes Asphalt
 Distributor, Shoveler and
 Spreader
 Horry.....\$ 11.54
 Common or General
 Berkeley.....\$ 10.06
 Charleston.....\$ 10.16
 Dorchester.....\$ 11.69
 Horry.....\$ 9.72
 Luteman.....\$ 11.61
 Mason Tender-
 Cement/Concrete.....\$ 10.40
 Pipelayer.....\$ 13.98
 Traffic Control-Cone Setter
 Berkeley, Charleston,
 Dorechester.....\$ 13.19
 Horry.....\$ 12.63
 Traffic Control-Flagger.....\$ 11.07

POWER EQUIPMENT OPERATOR:

Backhoe/Excavator/Trackhoe
 Berkeley.....\$ 15.68
 Charleston.....\$ 16.09
 Dorchester.....\$ 16.06
 Horry.....\$ 15.04
 Bulldozer.....\$ 14.81
 Crane
 Berkeley, Dorchester.....\$ 20.00 4.73
 Charleston.....\$ 20.08
 Horry.....\$ 20.58
 Grader/Blade.....\$ 14.61
 Hydroseeder.....\$ 11.00
 Loader (Front End/Track)....\$ 16.80
 Mechanic
 Berkeley, Dorchester.....\$ 19.07
 Charleston.....\$ 19.21
 Horry.....\$ 19.48
 Milling Machine.....\$ 11.84
 Paver
 Berkeley, Charleston,
 Dorchester.....\$ 18.85
 Horry.....\$ 13.29
 Roller.....\$ 15.17
 Scraper.....\$ 12.71
 Screed.....\$ 13.56
 Tractor.....\$ 13.28

TRUCK DRIVER

Dump Truck.....\$ 10.67
 Lowboy Truck.....\$ 15.55

 WELDERS - Receive rate prescribed for craft performing
 operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters, PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rate.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination

- * a survey underlying a wage determination
 - * a Wage and Hour Division letter setting forth a position on a wage determination matter
 - * a conformance (additional classification and rate) ruling
- On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
 Wage and Hour Division
 U.S. Department of Labor
 200 Constitution Avenue, N.W.
 Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
 U.S. Department of Labor
 200 Constitution Avenue, N.W.
 Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
 U.S. Department of Labor
 200 Constitution Avenue, N.W.
 Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

EXHIBIT 6

RAILROAD INFORMATION

1. General Information

The proposed Project intersects CSX Transportation (CSXT) at the following locations:

- Site 1 – US 78/52 Bridge Replacement at CSX Railroad Milepost A-388.57 (industry track)
- Site 2 – US 78/52 Bridge Removal at CSX Railroad Milepost Milepost A-388.57 (industry track)
- Site 3 – New Flyover at CSX Railroad Milepost A-388.57 (industry track)
- Site 4 - US 78/52 Bridge Replacement at CSX Railroad Milepost ACN-391.26, USDOT Crossing 631994L
- Site 5 – US 78/52 Bridge Removal at CSX Railroad Milepost ACN-391.47, USDOT Crossing 631995T
- Site 6 – New Flyover at CSX Railroad Milepost ACN-391.6,
- Site 7 – New Bridge at CSX Railroad Milepost SH-418.3 (Cooper Yard)
- Site 8 – New Bridge at Stromboli Ave., CSX Railroad Milepost SH-417.8, USDOT Crossing 632172D

The proposed Project intersects Norfolk Southern (NS) Railroad at the following locations:

- SITE – 1 – REPLACEMENT OF EXISTING US78/52 OVERHEAD GRADE SEPARATION – RAILROAD MILEPOST SC-3.8 – DOT/AAR #721391M
- SITE – 2 – REMOVAL OF EXISTING US78/52 OVERHEAD GRADE SEPARATIONS - RAILROAD MILEPOST SC-3.6 – DOT/AAR #721392U
- SITE – 3 – CONSTRUCTION OF NEW FLYOVER OVERHEAD GRADE SEPARATIONS – RAILROAD MILEPOST SC – 3.4

The proposed Project intersects the railroad spur providing service to Albright & Wilson, Inc. (Solvay) and intersects the proposed Palmetto Railways track.

2. Railroad Coordination

The Contractor shall be responsible for all railroad coordination and for all conditions related to railroad impacts. The Contractor shall forward all railroad coordination materials through SCDOT.

The Contractor's attention is called to Attachment B which includes copies of CSXT's and NS's responses to SCDOT's Request for Railroad Engineering Requirements for Inclusion into Design-Build Project Bid Package and which includes the Palmetto Railways Concept Design. The Contractor shall comply with the requirements set forth in CSXT's and NS's responses, CSXT's follow-up email, and the Palmetto Railways Concept Design.

The Contractor shall coordinate with Albright & Wilson, Inc.'s (Solvay's) plant manager to determine the necessary requirements for railroad coordination along the railroad spur. The Contractor shall provide clearances in accordance with Exhibit 4b.