South Carolina Department of Transportation

REQUEST FOR PROPOSALS
(For Industry Review)

Interstate 85/385 Interchange Improvements

Federal Aid Project No. IM23(009)
File No. 23.038111

A Design-Build Project

Greenville County

South Carolina

January 24, 2014

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I. PURPOSE OF REQUEST FOR PROPOSALS

The South Carolina Department of Transportation (SCDOT) in cooperation with the Federal Highway Administration (FHWA) seeks to make improvements to the Interstate 85/Interstate 385 System Interchange, widen I-385 through the interchange area and rehabilitate portions of I-85 just north and south of the interchange area. The project will include all items detailed in Exhibit 3 (Scope of Work). The project will be procured and constructed using the Design-Build Procurement method. 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.

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 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.

II. OVERVIEW

Project Description

The purpose of this project is to improve the safety, operation, capacity, and condition of the interchange of Interstate 85 and Interstate 385 and the adjacent segments of interstate roadway.

SCDOT intends to enter into a contract, for services as detailed in Exhibit 3 (Scope of Work):

The PROPOSER shall be responsible for meeting all Project requirements, specifications, and other applicable criteria as set forth in "Attachments A and B". If modifications to the plans produced by the proposer are required by the PROPOSER, the PROPOSER shall be responsible for these modifications, any associated permit modifications, right-of-way, utility impacts, and cost thereof. All modifications must meet or exceed the Project requirements.

Project Information

A Project Information CD, containing electronic information applicable to the Project, will be supplied to PROPOSERS. 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 B".

PROPOSERS are encouraged to visit the project site and to make any additional subsurface explorations or soil tests 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.

Schedule and Liquidated Damages

It is the intent of SCDOT to complete the Project in a timely manner with minimum interference to normal traffic operations. Liquidated damages shall be assessed in accordance with Article IV of the Agreement.

SCDOT will establish two Notices to Proceed for the Project. The first notice to proceed shall be no later than 45 days from the effective date of the Agreement and will initiate all preconstruction and permitting activities in order to successfully secure all permits for the Project. The duration for these preconstruction and permitting activities has been established as 365 calendar days. SCDOT will only consider time extensions beyond this 365 calendar day timeframe subject to the provisions in Article IX of the Agreement. The second notice to proceed will initiate construction once the 404 permit secured. The second notice to proceed shall be issued no later than 45 days from the effective date of the 404 permit or 410 calendar days from the first notice to proceed, whichever comes first. The PROPOSER must identify the time required for the construction time of the Project on the Cost Proposal Bid Form.

Contract Time will begin when SCDOT issues Notice to Proceed #2 for the Project and will end with substantial work completion of the Project.

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 attached hereto as "Attachment A".

Disadvantaged Business Enterprises

The contract for this Project contains a DBE goal of nine percent (9.0%) of the contract price. PROPOSER shall submit a DBE Committal Sheet, as provided in Exhibit 7, with their response to this RFP in a separate sealed Cost Proposal packet. PROPOSER is required to calculate the percentage of its total goal/committal for this Project on the DBE Committal Sheet. Submission of the DBE committal sheet is a requirement of this RFP. Failure to submit the DBE committal sheet will deem the Proposal non-responsive and the Proposal shall be rejected.

On-The-Job Training Requirement

The Contract for this Project contains an On-The-Job Training Requirement. The number of persons to be trained under the On-the-Job Training Program during this Project is 11 for Bridge and 12 for Roadway. The PROPOSER shall comply with the requirements of Attachment A, Exhibit 7. The Proposer shall submit its plan for On-the-Job Training to SCDOT for written approval prior to commencing construction activities.

III. GENERAL INSTRUCTIONS

RFP for Industry Review

It is the intent of SCDOT to issue an RFP for industry review during the initial stages of this RFP process to allow industry review and comment. After completion of the written clarifications/comment stage as set forth below, a Final RFP will be issued. PROPOSER shall submit their responses to the Final RFP in accordance with the Milestone Schedule.

Questions and Clarifications

Once the RFP for industry review is issued, the PROPOSERS may submit questions or seek clarification relating to the RFP. Questions or requests for clarification shall be in writing and must be received by SCDOT in accordance with the Milestone Schedule. SCDOT reserves the right to accept or not accept questions received after the milestone deadlines. Changes made to the RFP for Industry Review as a result of the written questions will be tracked by highlighting the changes in the Final RFP. Verbal responses from SCDOT are for information only and not binding.

Questions or clarifications concerning the RFP or Project shall be directed to:

Mr. John D. Boylston, P.E.
SCDOT Point of Contact (POC)
South Carolina Department of Transportation
955 Park Street, Room 403
Post Office Box 191
Columbia, South Carolina 29202-0191
803-737-1598
BoylstonJD@scdot.org

Confidential One-On-One Meetings

Once the Final/Revised RFP is issued, SCDOT will schedule one-on-one meetings 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 addressed to John D. Boylston at the above address. The purpose of the confidential one-on-one meetings is to provide

the PROPOSER the opportunity to confidentially discuss the contents of his proposal with SCDOT personnel. Preliminary Concepts may be discussed during the Confidential One-on-One Meetings. SCDOT will determine if questions submitted to or asked at the one-on-one meetings are considered confidential. No additional time will be allowed to research answers. Nothing discussed at the one-on-one meetings shall change the requirements in the RFP. SCDOT will answer the questions at the meeting verbally if possible. Verbal responses are for information only and are not binding. If necessary, written responses that are determined to be of a non-confidential nature will be provided in an addendum to the RFP.

Alternative Technical Concepts

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 RFP 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.

1. Submittal of ATCs:

a. Preliminary Concepts: Preliminary concepts may be submitted that present a description adequate for SCDOT to assess the benefits of the concept. Preliminary concepts may be submitted by email from the Design Build Team Project Manager to the SCDOT Point of Contact and 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 prior to investment of time and resources by the Proposer. 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 email. If a preliminary concept receives a favorable response from SCDOT, Proposer can elect to submit a formal ATC in accordance with these procedures. 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. **A maximum number of twenty-five (25) Preliminary Concepts may be submitted to SCDOT by the PROPOSER for consideration.** PROPOSER shall be limited to two packages of Preliminary Concepts and the total number of Preliminary Concepts shall not exceed twenty (20). If more than one Preliminary Concept has been received on the same topic, SCDOT has the right to revise the RFP to include that concept as an addendum to the RFP.

b. ATC Identification: ATC will be submitted by the Proposer and evaluated by SCDOT as set forth in the RFP Milestone Schedule. All ATCs shall be

submitted in writing to the Project Manager identified in the RFP 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.

c. **A maximum number of ten (10) ATCs may be submitted to SCDOT by the PROPOSER for consideration.**

2. Contents of ATC Submittal:

Each ATC submittal shall include one (1) electronic and one (1) hard-copy and 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,

3. Review of ATCs:

a. Fourteen Day Review: SCDOT will review each ATC submitted within fourteen (14) calendar days of ATC receipt.

b. More information Needed: If within seven (7) calendar days of receipt of the ATC SCDOT needs more information to determine whether or not the ATC will be approved or not approved, SCDOT will 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: SCDOT may submit written questions to the PROPOSER within seven calendar (7) days of receipt of the ATC. PROPOSER has three (3) calendar days to remit answers. Within four (4) calendar days of receipt of the answers, SCDOT shall respond to the ATC.

ii. One-on-One Meetings: ATC meeting may be scheduled by SCDOT within seven (7) calendar days of receipt of the ATC. One-on-one 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), either in the Final RFP or 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 within fourteen (14) calendar days of SCDOT's receipt of the ATC, the ATC is deemed rejected by SCDOT, unless written notification to extend this period is given by SCDOT. No ATC shall be included in the proposal unless approved by SCDOT in writing prior to the proposal submission deadline.

d. Conditional Response by SCDOT: If SCDOT issues a conditional answer; an additional 14 days are added to the Fourteen Day Review

period. 7 days for PROPOSER to respond to the condition, and 7 days for SCDOT to submit its final response to the ATC.

4. 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 or in part;
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; or
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 basic configuration 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 the Department 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.

5. 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 Proposal.

Proposals with or without ATC's 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 guarantee 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 Proposal Price 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.

6. Value Engineering

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

7. 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 design and scope requirements at the awarded cost, and shall be responsible for any redesign costs.

8. 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 contact 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.

9. 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. Should SCDOT revise the RFP after a formal ATC has been approved, be solely responsible for reviewing the RFP and determining if the ATC deviates from the revised requirements. If required, the Proposer must submit a request for approval of all additional variances required within seven (7) calendar days of receipt of the revised RFP.

Stipends

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

A. 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.

B. PROPOSERS shall indicate on the Stipend Acknowledgement Form in Section XII to the RFP whether it elects to receive a stipend. The Stipend Acknowledgement Form shall be signed and returned with the unsealed Technical Proposal. The Stipend Acknowledgment Form will not count against the specified page limit.

C. If PROPOSER elects to receive a stipend, the Stipend Agreement shall be signed by PROPOSER and submitted as part of the unsealed Technical proposal. The Stipend Agreement will not count against the specified page limit.

Proposal Submittal

Proposals must be received by the time and date given in the Milestone Schedule. Deliver TEN (10) printed and bound copies and one (1) electronic PDF (CD) copy of the Technical Proposal and one (1) sealed, printed copy of the Cost Proposal to:

Jeff Elliott, P.E.
Contract Administration Engineer
South Carolina Department of Transportation
955 Park Street, Room 333
Post Office Box 191
Columbia, South Carolina 29202-0191

IV. PROJECT SCOPE

See Exhibit 3.

V. PROPOSAL DEVELOPMENT

Proposals must be submitted concurrently in two parts, a Technical Proposal and a Cost Proposal. The Technical Proposal shall contain no more than twenty-five (25) pages, excluding any plans and appendices. The Technical Proposal shall be single sided, with minimum twelve-point (12) font and double line spacing for text. The Cost Proposal shall be bound and sealed separately from the Technical Proposal. The Cost Proposal shall be clearly marked as "Confidential Proprietary Information" by the PROPOSER and shall include the completed Cost Proposal Bid Form. Responses should address all of the items listed below. 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. In order to meet the minimum requirements of this RFP, PROPOSER must provide responses to each of the items listed. **Beyond the minimum requirements**, a maximum of 100 quality credit points are available to the PROPOSER based on the commitments to the bolded items below. **Responses must be in the form of commitments in order to receive quality credit.** 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. Point values for each of the bolded items are shown at the end of each item.

PROPOSERS are advised that SCDOT reserves the right to conduct an independent investigation of any information, including prior experience, identified in the responses. PROPOSERS are responsible for affecting delivery by the deadline date. Late submissions will be rejected without opening. SCDOT accepts no responsibility for misdirected or lost proposals.

Technical Proposal

PROPOSERS must provide responses to the items below in order to provide SCDOT a general overview of the PROPOSER'S approach to the project. The 100 quality credit points will be based on the conceptual plans and commitments made in the responses to the items below:

In order that evaluation may be accomplished efficiently, the Technical Proposal shall be prepared in the following sequence:

1. 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. Plan and Profile sheets at a 1"=100' scale

2. Conceptual Bridge Plans which shall consist of:
   a. Title Sheet
   b. Plan and Profile
   c. Superstructure cross section showing pertinent structural elements
   d. Horizontal and vertical clearances.

3. Conceptual Maintenance of Traffic Plans depicting the number of construction stages and a staging narrative to include duration of each stage.

PROPOSERS must provide responses to the items below in order to provide SCDOT a general overview of the PROPOSER'S approach to the project. **The conceptual plans required above and the technical proposal narrative will be utilized to evaluate the responses below.** The 100 total quality credit points available will be based on the commitments in the responses to the items below:

4. **Describe the team's approach to minimization of traffic shifts, lane closures, and construction stages and describe any commitments to early completion of work items including but not limited to auxiliary lanes and re-surfacing on I-85. (40 points)**

5. **Describe the team's approach to minimizing third party impacts such as impacts to Right-of-Way, utilities and environmental. (40 points)**

6. **Identify commitments of materials, designs, and construction methods that would minimize maintenance costs in the future to the Department and benefit the project. (10 points)**

7. **Describe any additional improvements or tasks that will be included in the Project including but not limited to additional warranties, assumed project risk, and improving the existing conditions associated with documented design exceptions. (10 points)**

Note: Drawings and plans requested as part of the Technical Proposal shall not count against the page limit and can be included in the Appendix.

Cost Proposal

PROPOSERS shall complete the Cost Proposal Bid Form provided at the end of this document. The Cost Proposal Bid Form along with the DBE committal sheet shall be sealed in a separate envelope and delivered as part of the proposal.

Confidentiality of Proposals

PROPOSER shall specifically mark any elements that are deemed confidential, or proprietary. 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 determining whether to release documents, the SCDOT will rely on 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.

Noncollusion and Equal Employment Opportunity 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 Protection Opportunity (EEO) Performance Certification form 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.

VI. EVALUATION OF PROPOSALS

Proposal Review Committee

A Proposal Review Committee ("Committee") will be appointed by SCDOT to review the Proposals. The voting members will be comprised of SCDOT employees. In addition, SCDOT will assemble a group of non-voting resource members having expertise in the various disciplines required by the project including the Federal Highway Administration.

Proposal Review

The Committee will review the Proposals and determine whether each Proposal is responsive. Responsive Proposals will be accepted by the Committee for evaluation. Any non-responsive Proposal will be returned to the PROPOSER with a detailed explanation as to reasons for determining non-responsiveness. 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, failure to meet the contract goal or make good faith efforts to meet the contract goal, conflict of interests, conditional proposals, failure to provide complete and honest information, failure to complete the

Cost Proposal Bid Form correctly, failure to submit the EEO certification, and failure to provide a DBE committal sheet in the Cost Proposal Packet. Responsive Proposals will be evaluated and scored by the Committee. 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.

Technical Evaluation

All Proposals will be evaluated for technical merit prior to opening the cost proposals. The committee will determine responsiveness of the technical proposal based on responses to all items requested. Technical merit scores will computed to the half digit (i.e. 9.5) for purposes of calculating the quality points. For the items that have quality credit points associated with them, the Committee will utilize the table below entitled "Quality Credit Percentage for Technical Proposals" to assign a Quality Credit Percentage to each Proposal based on the Proposer's overall quality score. The maximum quality credit percentage for this project will be four percent (4%).

Quality Credit Percentage for Technical Proposals

Quality Points	Quality Credit (%)
100	4.0
90	3.6
80	3.2
70	2.8
60	2.4
50	2.0
40	1.6
30	1.2
20	0.8
10	0.4
0	0.0

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.

Clarifications

SCDOT, at its sole discretion, shall have the right to seek clarifications after receipt of the technical proposals 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.

Opening of Cost Proposals

All Technical Proposals will be evaluated for responsiveness based on those items requested in this RFP. Those Technical Proposals deemed non-responsive for any reason will be returned to the PROPOSER along with the PROPOSER's unopened Cost Proposal prior to the Opening of Cost Proposals. Those Technical Proposals deemed responsive will be scored according to the information provided in this RFP. Based upon that score, a Quality Credit percentage will be applied to the PROPOSER's Cost Proposal, in accordance with the table shown above. The Quality Credit percentage will be provided confidentially in a sealed envelope to each PROPOSER at the Opening of Cost Proposals meeting as shown on the Project Milestones – Section IX of this RFP.

Cost Proposals of PROPOSERS with responsive Technical Proposals will be opened at the meeting. The Total Bid amount shown on the Cost Proposal Bid Form and the Quality Credit Score for each respective PROPOSER will be entered into a spreadsheet and analyzed. Each Cost Proposal will be compared against the confidential SCDOT Engineer's Estimate.

If upon analysis, one or more of the Total Adjusted Bids is within an acceptable range of the Engineer's Estimate, all Total Bid Amounts (including A and B portions if applicable) and Quality Credit Scores for each PROPOSER will be read aloud and the proposals will be ranked based on the lowest Total Adjusted Bid.

If upon analysis, all of the Total Adjusted Bids exceed an acceptable range of the Engineer's Estimate, only the Total Bid Amounts (including the A and B portions if applicable) will be read and the Quality Credit Scores for each PROPOSER will remain confidential and be known only to each respective PROPOSER. The meeting will then adjourn so that 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.

In the event that SCDOT elects NOT to proceed with a Best and Final Offer (BAFO), then SCDOT will schedule a date and time to publicly reiterate all Total Bids Amounts and read all Technical Scores.

SCDOT intends to award the contract to the PROPOSER with the lowest Total Adjusted 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, proposals shall be returned to the PROPOSERS and a new solicitation must be conducted for the project.

Total Adjusted Bid Determination

The Adjusted Low Bid method will be utilized in determining the Total Bid to determine the lowest adjusted bid. Award of the Contract, if made, will be made to the responsible and

qualified Proposer who submits the lowest Total Adjusted Bid. In the event that two or more Proposers are determined to have the same lowest total adjusted bid, the award, if made, will be made to the Proposer with the highest quality credit score. The following formula will be used to evaluate the values given on the Cost Proposal Bid Form:

Total Adjusted Bid = A - [A x Quality Credit] + B:

A Guaranteed Maximum Cost to Complete all work to be performed under the contract

B is the Project Construction Time cost (B = b x dc)

b is the contract time to reach substantial work completion of the Project in calendar days after NTP #2 is issued.

Construction time (b) is defined as calendar days from Notice to Proceed #2 to substantial work completion of the project. Notice to Proceed #2 shall be no later than 45 days from the effective date of the 404 permit or 410 days from Notice to Proceed #1, whichever comes first.

dc is the daily cost associated with the Project as stipulated on the Cost Proposal Bid Form

Quality Credit is the assigned quality credit percentage as a result of the proposal's technical score; expressed as a decimal.

Example for Determining Total Adjusted Bid

Proposal	Quality Points	Quality Credit (%)	Cost Proposal (A)	Quality Value	Contract Time (b)	Total Adjusted Bid
A	100	4.0	$100,000,000	4,000,000	1000	121,000,000
B	85	3.4	105,000,000	3,570,000	750	120,180,000
C	75	3.0	110,000,000	3,300,000	800	126,700,000
D	80	3.2	107,000,000	3,424,000	850	124,826,000

Note: In this example, Proposal B was determined to be the lowest total adjusted bid

VII. 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 Adjusted Bid. 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 Adjusted Bid.*

The Design-Build Agreement will be executed for the Guaranteed Maximum Cost to Complete as shown in the cost envelope and the maximum Contract Time will be the Guaranteed

Maximum Number of Calendar Days from Notice to Proceed #1 to Substantial Work Completion of the Project. Contract time for the Project shall be established as shown on the Cost Proposal Bid Form.

VIII. GENERAL INFORMATION

1. SCDOT reserves the right to terminate evaluation of one or more of the proposals if it is determined to be in the best interest of the state to do so.

2. 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.

3. 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.

4. SCDOT assumes no liability and will not reimburse costs incurred by firms, whether selected or not, in developing proposals or in contract execution.

5. 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 mailed to all RFP holders.

6. 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 addendums 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**.

7. 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 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.

8. After award, if an unsuccessful PROPOSER would like to schedule a debriefing, PROPOSER shall submit a request within three (3) working 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) day period waives the opportunity for a debriefing.

9. All PROPOSERs must visibly mark as “CONFIDENTIAL” each part of their submission that they consider to contain proprietary information the release of which would constitute an unreasonable invasion of privacy. All unmarked pages will be subject to release in accordance with law. PROPOSER should be prepared, upon request, to provide justification of why such materials should not be disclosed under the South Carolina Freedom of Information Act, S.C. Code Section 30-4-10, et seq.

10. 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.

11. 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.

12. No proposal guaranty in the form of a Bid Bond is required for this procurement.

IX. MILESTONES (RFP for Industry Review)

Provide RFP for Industry Review to Selected Short-list PROPOSERS	Friday, January 24, 2014
Deadline Clarifications/Comments to be submitted by PROPOSERS	Friday, February 14, 2014
President's Day	Monday, February 17, 2014
Issue Final RFP	Friday, March 14, 2014
Preliminary ATC Concept Submittals (Start)	Friday, March 14, 2014
Confidential RFP and ATC Questions to be submitted by PROPOSERS	Friday, April 4, 2014
Confidential RFP and ATC One-on-One meetings with PROPOSERS	Tuesday, April 22, 2014
Begin Formal ATC Process	Tuesday, April 22, 2014
Confederate Memorial Day	Friday, May 9, 2014
All ATC's SHALL be submitted prior to	Wednesday, May 23, 2014
Memorial Day	Monday, May 26, 2014
Submittal of Proposals	Friday, June 27, 2014
Bid Opening(with team representatives present)	Wednesday, July 18, 2014
Award/Contract Execution	August 2014

X. COST PROPOSAL BID FORM

I-85/385 Interchange Improvements
Greenville County

CONTRACTOR:_____

ADDRESS:_____

Provide full project scope as described in Attachment A.

GUARANTEED MAXIMUM COST TO COMPLETE (A)= _____

dc (Daily Cost of Project) = $25,000

CONSTRUCTION TIME (b) IS DEFINED AS CALENDAR DAYS FROM NOTICE TO PROCEED #2 TO SUBSTANTIAL WORK COMPLETION OF THE PROJECT. NOTICE TO PROCEED #2 SHALL BE NO LATER THAN 45 DAYS FROM THE EFFECTIVE DATE OF THE 404 PERMIT OR 410 DAYS FROM NOTICE TO PROCEED #1, WHICHEVER COMES FIRST.

Construction Time (Calendar Days)(b)=_____

Total Project Time Cost (B) = _____

TOTAL BID (A+B) = _____

No conditional Bids will be accepted. SCDOT reserves the right to delete any or all conditions placed on the Guaranteed Maximum 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

XI. NON-COLLUSION AND EEO CERTIFICATIONS

NON-COLLUSION CERTIFICATION

Federal Project: IM23(009)

State Project: 23.038111

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 _____, 2011. Signed:_____
(Officer/Proposer)

_____
(Title)

_____
(Address)

_____

(COMPLETE THIS SECTION FOR FEDERAL PROJECTS ONLY)

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 41 C.F.R. §60-2;

(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)

_____

SEAL (Company)

_____

(Address)

XII. STIPEND ACKNOWLEDGEMENT FORM

Stipend Acknowledgement Form
Interstate 85 and Interstate 385 Interchange Improvements
Greenville 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
File No.: 23.038111
Project Description: Interstate 85 and Interstate 385 Interchange Improvements
Greenville 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) hall 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 submitting the successful proposal 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 TRANSPORATION

By: _____
Matthew R. Lifsey, P.E.
Regional Production Engineer

Recommended:

_____
John D. Boylston, P.E.
Program Manager

PROPOSER

_____
Name of PROPOSER

Witness:

_____

_____

By: _____

Its: _____

AGREEMENT

AGREEMENT
FOR THE DESIGN & CONSTRUCTION
of
Interstate 85 and Interstate 385 Interchange Improvements

Greenville County, South Carolina

A DESIGN-BUILD PROJECT

BETWEEN
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
AND

_____ day of _____, 2014

SC File No. 23.038111
Federal Aid Project No. IM23(009)

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10. Escrow Proposal Documents

WHEREAS, the South Carolina Department of Transportation, as an agency of the State of South Carolina, wishes to improve the safety and operation of the state highway system by improving the interchange between Interstates 85 and 385 in Greenville County (hereinafter referred to as "the Project"); and

WHEREAS, the South Carolina Department of Transportation, as a servant of the people of the State of South Carolina, wishes to see this strategic project completed; 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), 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 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, Special Provisions and Supplemental Specifications identified in the Agreement Exhibits, the order of precedence shall be (1) the Project Criteria; (2) Special Provisions, and (3) Supplemental Specifications and Forms.

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, 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 NPDES co-permittee agreements and these agreements 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, 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 (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 twenty-one (21) 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. If more than one package is submitted within a seven day period, an additional seven (7) 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 seven (7) days. SCDOT will then status CONTRACTOR's comments within seven (7) 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. Ensure the Transportation Management Plan and its components comply with the requirements of 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 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 and Federal Highway Administration (FHWA)

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 and FHWA 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 Plan (for entire project, in order to submit Notice of Intent (NOI))
5. Storm Water Pollutant Prevention Plan and Spill Prevention Plan
6. Traffic Management Plan

7. Crane Safety Plan
8. QC Plan
9. Public Relations Plan
10. Drainage Notebooks for the Project in accordance with SCDOT's Requirements for Hydraulic Design
11. CPM Schedule
12. EEO, DBE, and OJT Requirements, as specified in **EXHIBIT 7**
13. Right-of-Way documents per Article VIII
14. Shop Plans and working drawings
15. Preliminary & Final Geotechnical Reports
16. All final electronic design files for the Project, as specified in **EXHIBIT 4**
17. Escrow Proposal Documents
18. CONTRACTOR's Materials Certification
19. As-Built Plans
20. RR Agreement
21. HAZMAT surveys for bridges
22. Clearing and Grubbing Plan
23. Utility Coordination Reports and Utility Agreements
24. Right of Way Plats and Monuments (per Preconstruction Advisory Memorandum #8)

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 Project Scope of Work - **EXHIBIT 3**, and as identified in the Cost Proposal Bid Form – **EXHIBIT 1**.

B. Contract Price Adjustments

1. Allowable adjustments

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:

a) 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 hazardous materials as set forth in Article XI.

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 and profit will be considered for this item.

* Overhead: The operating expense of a business exclusive of direct cost labor and material.

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. 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 construction cost as shown in the Schedule of Values. Mobilization 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 because 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, 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 Complete within ____ calendar days from Notice to Proceed #1. Time is of the essence.

2. 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.

3. 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 the schedule in accordance with this agreement and the SCDOT Supplemental Specifications (**EXHIBIT 6**) 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 quality 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.

4. 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 hazardous materials as set forth in Article XI; or,

8. Discovery of archeological or paleontological remains not previously identified as set forth in Article X.

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 Twenty Five Thousand Dollars ($25,000.00) for each day for which construction is not substantially complete, as defined in Article IV.

CONTRACTOR shall pay liquidated damages to SCDOT in the amount of Two Thousand Five Hundred Dollars ($2,500.00) for each day that Final Completion, as defined in Article IV is not achieved.

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 Quality Control Plan that outlines how CONTRACTOR shall assure that the materials and work are in compliance with the drawings, plans, standard specifications, contract special provisions, SCDOT Construction Manual, Inspection Training Manuals, RFP and all attachments. The Quality Control Plan shall also include the specific portions of the Transportation Management Plan that address the work item. The initial plan shall be submitted to SCDOT for review and approval at least seven (7) days prior to any design or plan submittal or the beginning of any construction activity. The plan shall be updated as necessary prior to the start of any specific construction operation. The plan shall include a list of certified SCDOT 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. 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 certified or adequately trained and qualified as determined by SCDOT. Training, qualification, and/or certification shall include classroom training, written testing, documented demonstration of proper inspection, sampling and testing procedures, pre-employment training and an on-the-job training period. CONTRACTOR shall provide SCDOT with copies of each individual's training, qualifications, and/or certifications, in resume form, as required, for review and approval by SCDOT. Approved CONTRACTOR QC personnel shall be on the job at all times that the CONTRACTOR is on-site actively involved in work.

3. CONTRACTOR Testing: CONTRACTOR is required to conduct asphalt sampling and testing in accordance with QC/QA special provisions and supplemental specifications for asphalt included in **EXHIBITS 5** and **6** and the SCDOT Supplemental Technical Specifications. CONTRACTOR may elect to conduct other sampling and testing for its own benefit. 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**.

4. 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.

5. 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 seven (7) 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 fourteen (14) days prior to use.

6. Materials Certifications: CONTRACTOR shall submit all material certifications for approval by SCDOT prior to the CONTRACTOR incorporating the material and applying for payment for work in which the material was incorporated. Upon Completion of the project, CONTRACTOR shall submit to SCDOT a letter of certification stating that, based upon an analysis of all materials test results, all materials incorporated into the Project were found to be in substantial conformance with the requirements of the plans and specifications. A list of any exceptions and all failing test results will be provided, along with a record of disposition of the material represented by these tests.

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 is required to coordinate its 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 in 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 commencement of the work. 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 until at least 30 days prior written notice has been given to SCDOT. 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.

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 waste. 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 status 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 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 Three Million Dollars ($3,000,000) 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.

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).

2. CONTRACTOR shall also provide a warranty bond, acceptable to SCDOT, in the amount of Three Million Dollars ($3,000,000) to cover the warranty obligations of the contract.

VII. UTILITIES AND RAILROAD COORDINATION

A. 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 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.

B. 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.

C. The resolution of any conflicts between utility companies and the construction of the Project shall be the responsibility of CONTRACTOR. No additional compensation (time or dollars) will be allowed for any delays, inconveniences or damage sustained by CONTRACTOR or its subcontractors due to interference from utilities or the operation of relocating utilities.

D. CONTRACTOR shall meet with the Department's Utilities Office within seven (7) 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 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.

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.

In the event railroad property is impacted by this project, provisions K through S 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 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 will 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 of the Notice to Proceed. The CONTRACTOR will be required to 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 9 and additional information in Attachment B). 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.

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.

VIII. RIGHT OF WAY ACQUISITION

A. Right of Way Services

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 plan 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 title to such properties to SCDOT with Register of Deeds, and deliver all executed and recorded general warranty deeds to SCDOT. For all property purchased in conjunction with the Project, title will be acquired in fee simple (except that SCDOT may in its sole discretion direct the acquisition of a right-of-way easement or permissions, in lieu of fee simple title, with respect to any portion of the Rights of Way) and shall be conveyed to "The South Carolina Department of Transportation" by general warranty deed, free and clear of all liens and encumbrances except permitted encumbrances.

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 SCDOT practices to investigate. SCDOT shall be notified of the presence of such materials before an offer is made to acquire the property.

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. All 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. The CONTRACTOR shall submit permit applications to SCDOT. SCDOT will submit the permit application to the appropriate permitting agency indicating that CONTRACTOR is acting as an agent for SCDOT. If said regulatory agencies fail to issue permits in a timely manner, SCDOT may, on an individual basis, consider a time extension for permit approval delays when CONTRACTOR can demonstrate that the application was submitted in a timely manner, all reasonable efforts have been made to expedite the permit approval, and that the delay has a direct impact on the Critical Path. CONTRACTOR shall not be entitled to additional compensation for delays in permit approval.

B. All necessary permit modifications shall be the CONTRACTOR's responsibility. All work associated with permit modifications as a result of changes proposed by

CONTRACTOR shall be CONTRACTOR's responsibility. See Article II.B.4 regarding deductions for waived fees.

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. A copy of the environmental document is included in **Attachment B**. Environmental Commitments are included in **Exhibit 8**.

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 of any permits required by federal, state, or local laws or regulations; The CONTRACTOR is responsible for any mitigation required by permits; 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 Management 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.

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.

XI. HAZARDOUS MATERIALS

A. CONTRACTOR is responsible for obtaining any necessary survey(s) to determine the extent of and develop a remedial strategy of Hazardous materials, wastes, substances or chemicals on the Project. The cost of the surveys shall be included in the Contract Price. The CONTRACTOR shall anticipate that the structural steel components contain lead-based paints. The CONTRACTOR shall remove and dispose of the structural steel components containing lead-based paints 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, and worker health and safety. The cost the removal and disposal of components containing lead-based paints shall be included in the Contract Price. The CONTRACTOR is required to perform asbestos inspections on the existing structures. A copy of the lead and asbestos report and a notification of demolition or renovation forms must be submitted to the South Carolina Department of Health and Environmental Control 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 CONTRACTOR is responsible for required containment and disposal of the asbestos. The cost of removal and disposal of components containing asbestos shall be included in the Contract Price**.**

B. Except as noted in paragraph "A" above, CONTRACTOR is not responsible for handling, storage, remediation, or disposal of any materials, wastes, substances and chemicals deemed to be hazardous under applicable state or federal law, (hereinafter "Hazardous Conditions") encountered at the Site which were not introduced to the site by CONTRACTOR or

any of its agents. Upon encountering any Hazardous Conditions, CONTRACTOR shall stop Work immediately in the affected area and duly notify SCDOT and, if required by state or federal law, all government or quasi-government entities with jurisdiction over the Project or site.

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

D. CONTRACTOR shall resume Work at the affected area of the Project only after written notice from SCDOT that the (i) Hazardous Conditions have been removed or rendered harmless and (ii) all necessary approvals have been obtained from all government and quasi-government entities having jurisdiction over the Project.

E. CONTRACTOR's Contract Price and/or Contract Time shall be adjusted to the extent CONTRACTOR's cost and/or time of performance has been adversely impacted by the presence of Hazardous Conditions.

F. SCDOT is not responsible for Hazardous Conditions actually brought to the Project by CONTRACTOR, CONTRACTOR's design consultants, subcontractors 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, subcontractors and suppliers or anyone for whose acts they may be or are liable relating to Hazardous Conditions found at the site. CONTRACTOR shall indemnify, defend and hold harmless SCDOT and 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 Conditions actually brought to the Project or negligent or willful acts relating to Hazardous Conditions, or both by CONTRACTOR, CONTRACTOR's design consultants, subcontractors and suppliers or anyone for whose acts they may be or are liable.

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 Material 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/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.E, 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.E, 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 nine percent (9.0 %) of the Contract Price. CONTRACTOR shall comply with the requirements of the Instructions to Proposers - DBE Requirements and the Supplemental Specifications entitled “Disadvantaged Business Enterprises (DBE) – Federal Projects” attached hereto as **EXHIBIT 7**. CONTRACTOR shall be responsible for ensuring that the DBE’s listed on the committal sheet perform the items of work for which they are listed in accordance with the requirements of 49 CFR Part 26.

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 number of persons to be trained under the On-the-Job Training Program during this Project is eleven (11) for Bridge and twelve (12) for Road. The CONTRACTOR shall comply with the requirements of the Federal-Aid Project Supplemental Specifications attached hereto as **EXHIBIT 7**. The CONTRACTOR shall submit its plan for On-the-Job Training to SCDOT for written approval prior to commencing construction activities.

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 (substantially in the form of SCDOT's form 647, as revised 7/95);

3. 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.

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.

6. The final location 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

A. Scope and Purpose

The purpose of this article is to preserve the proposal documents of the successful proposer (CONTRACTOR) for use by the parties in any claims or litigation between SCDOT and CONTRACTOR arising out of this contract.

CONTRACTOR shall submit a legible copy of proposal documentation used to prepare the Technical and Cost Proposal for this contract to SCDOT. Such documentation shall be placed in escrow with a banking institution or other bonded document storage facility and preserved by that institution/facility as specified in the following sections of this specification.

B. Proposal Documentation

The term "proposal documentation" as used in this specification means all writings, working papers, computer print outs, charts, and all other data compilations which contain or reflect information, data, and calculations used by CONTRACTOR to prepare the technical and cost proposal in proposing for the Project. The term "proposal documentation" includes, but is not limited to, equipment rates, overhead rates, labor rates, efficiency or productivity factors, arithmetic extensions, and quotations from subcontractors and material suppliers to the extent that such rates and quotations were used by CONTRACTOR in preparing, formulating and determining the technical and cost proposal. The term "proposal documentation" also includes any manuals that are standard to the industry used by CONTRACTOR in determining the proposal for the Project. Such manuals may be included in the proposal documentation by reference. Such reference shall include the name and date of the Publication and the Publisher. The term does not include proposal documents provided by SCDOT for use by CONTRACTOR in proposing on the Project.

C. Submittal of Proposal Documentation

CONTRACTOR shall submit the proposal documentation to SCDOT, in a container suitable for sealing, no later than ten calendar days following award of the Contract by SCDOT. CONTRACTOR will not be allowed to begin work until the acceptable documentation has been received. The container shall be clearly marked "Proposal Documentation" and shall also show on the face of the container CONTRACTOR’s name, the date of submittal, the File Number, and the Project Name.

D. Alternative Delivery Method

CONTRACTOR may elect to use a delivery service to escrow the proposal documents directly with the escrow agent/facility as required under this Article. A delivery service with a tracking system such as FedEx, UPS, or DHL shall be used by the CONTRACTOR under this method of delivery. To affect delivery, CONTRACTOR is required to comply with the delivery procedures set forth under special provision entitled *Procedures to Escrow Bid Documentation by Delivery Service*, dated November 17, 2005, attached hereto as **EXHIBIT 10**. For purposes of this Agreement, the term bid documentation used in the special provision has the same meaning as proposal documentation in Section B above.

E. Affidavit

In addition to the proposal documentation, an affidavit, signed under oath by an individual authorized by CONTRACTOR to execute contracts shall be included. The affidavit shall list each proposal document with sufficient specificity so a comparison may be made between the list and the proposal documentation to ensure that all of the proposal documentation listed in the affidavit has been enclosed. The affidavit shall attest the following:

1. The affiant has personally examined the proposal documentation,

2. The affidavit lists all of the documents used by CONTRACTOR to determine the proposal for the Project, and

3. All such proposal documentation has been included.

F. Verification

Upon receipt of the proposal documentation, authorized representatives of SCDOT and CONTRACTOR will verify the accuracy and completeness of the proposal documentation compared to the affidavit. Should a discrepancy exist, CONTRACTOR shall immediately furnish SCDOT with any other needed proposal documentation. SCDOT, upon determining that the proposal documentation is complete, will, in the presence of CONTRACTOR's representative, immediately place the complete documentation and affidavit in the container and seal it. Both parties will deliver the sealed container to a banking institution or other bonded document storage facility selected by SCDOT for placement in a safety deposit box, vault or other secure accommodation.

G. Duration and Use

The proposal documentation and affidavit shall remain in escrow during the life of the Contract or until such time as CONTRACTOR files a claim or initiates litigation against SCDOT related to the contract. Receipt of CONTRACTOR's claim, or litigation against SCDOT, shall be sufficient evidence for SCDOT to obtain the release and custody of the proposal documentation. If no such claim is received or litigation initiated, the Final Estimate has been paid and the warranty period for the Contract has expired, SCDOT shall instruct the banking institution or other bonded document storage facility to release the sealed container to CONTRACTOR using the form provided in **EXHIBIT 10.**

CONTRACTOR agrees that the sealed container placed in escrow contains all of the proposal documentation used to determine the proposal and that no other proposal documentation shall be utilized by CONTRACTOR in litigation over claims brought by CONTRACTOR arising out of this contract.

H. Refusal or Failure to Provide Proposal Documentation

Refusal of CONTRACTOR to provide adequate documentation will be considered material breach of the Contract and CONTRACTOR will be declared in default of the

Contract. SCDOT may, at its option, terminate the contract for default. These remedies are not exclusive and SCDOT may take such other action as is available to it under the law.

I. Confidentiality of Bid Documentation

The proposal documentation and affidavit in escrow are, and will remain, the property of CONTRACTOR. SCDOT has no interest in, or right to, the proposal documentation and affidavit other than to verify the contents and legibility of the proposal documentation unless a claim is received or litigation ensues between SCDOT and CONTRACTOR. In the event of such claim or litigation, the proposal documentation and affidavit shall become the property of SCDOT.

J. Cost and Escrow Instructions

The cost of escrow will be borne by SCDOT. SCDOT will provide escrow instructions to the banking institution or other bonded document storage facility consistent with this article.

K. Escrow Agreement

CONTRACTOR agrees that it will sign an Escrow Agreement with SCDOT and the escrow agent consistent with this article. Should CONTRACTOR fail to sign the Escrow Agreement, when presented, CONTRACTOR may be declared in default of the Contract. The Escrow Agreement is attached in **EXHIBIT 10**.

L. Payment

There will be no separate payment for compilation of the data, container or cost of verification of the proposal documentation. All cost shall be included in the overall Contract Price.

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.

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:

SOUTH CAROLINA DEPARTMENT OF TRANSPORATION

_____

_____

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

Date: _____

Recommended:

_____

_____
Jeff Elliott, P.E.
Contract Administration Engineer

Witnesses:

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 PROPOSER certifies on behalf of the PROPOSER 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 PROPOSER'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 PROPOSER certifies PROPOSER and all PROPOSER'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.

PROPOSER:_____
(Signature)

EXHIBIT 1

COST PROPOSAL BID FORM

PROPOSED COST PROPOSAL BID FORM

FOR

INTERSTATE 85/385 INTERCHANGE IMPROVEMENTS

GREENVILLE 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

INTERSTATE 85/385 INTERCHANGE IMPROVEMENTS

GREENVILLE 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

General

The CONTRACTOR is to perform, at a minimum, all work necessary to complete the improvements to I-85, I-385, ramps and side roads as described within this Scope of Work, the Agreement, and the Request for Proposals (RFP). This work shall be performed in accordance with all contract requirements. In carrying out this work, the CONTRACTOR is responsible for all contract services including, but not limited to, project administration, design, demolition and construction services for roadway and bridge, maintenance of traffic, right-of-way acquisitions and acquisition services, utility coordination and relocation services, railroad coordination, contractor quality control, environmental permitting, and public/community relations. The project limits are shown in a .pdf file entitled "Figure 1 – Project Limits" included in Attachment B of the RFP.

As part of the design services, the CONTRACTOR shall complete the design throughout the project limits per the typical sections and criteria provided. The CONTRACTOR is fully responsible for compliance with the specifications and standards cited in all Contract Documents. Design submittals shall be provided in accordance with the Contract Agreement. Any deviation from the proposed design (whether necessary or desired by the CONTRACTOR) shall meet or exceed the contract requirements. If the project design necessitates a modification to any previously approved document (including but not limited to, the environmental document(s), environmental permit(s), Municipal Agreements, and Interchange Modification Report), the CONTRACTOR is responsible for the necessary studies and reports. Final review and approval lies with SCDOT and FHWA.

Acquisition and all costs associated with acquiring the necessary right-of-way shall be the responsibility of the CONTRACTOR. If additional right-of-way is required outside the NEPA footprint, it shall be the responsibility of the CONTRACTOR to provide a re-evaluation of the NEPA document and to revise any permits deemed necessary to reflect the proposed right-of-way.

As part of the construction services required, the CONTRACTOR shall thoroughly review all contract documents especially the project's Special Provisions contained in Exhibit 5. These Special Provisions provide detailed information on work to be included in this contract.

The Project shall include at a minimum design and construction activities necessary for all improvements associated with Contract Documents including but not limited to the following:

1. Erosion Control
2. Clearing and Grubbing
3. Grading
4. Drainage
5. Paving
6. Guardrail, End Treatments, Concrete Median Barrier, and Cable Median Barrier
7. Transportation Management Plan
8. Pavement Marking

9. Signing
10. ITS System
11. Foundation and Geotechnical Design
12. Bridge and Structures Design
13. Bridge and Structures Construction
14. Permitting services, including permit submittal, negotiation, and identifying and providing mitigation as necessary
15. Environmental monitoring and compliance.
16. Right-of-Way Acquisition and Services
17. As-Built Plans

The following items shall be included in the work:

1. Neither Cable Guide Rail nor any form of Guardrail shall be allowed to provide separation between Mainline and Collector/Distributor or Ramp travelways where narrow strips of grass would result between guardrails. See Exhibit 4a for requirements for determining where Concrete Median Barrier shall be used to provide the positive separation.

2. Proposed Concrete Median Barrier Walls: Concrete Barrier Walls used in the median of I-385 shall be 'Jersey Face' type barriers (SCDOT Concrete Barrier Walls Type 2 through Type 6 and Type 11A through Type 15). All other Concrete Barrier Walls used on this project shall be 'Single Slope' type barriers (SCDOT Concrete Barrier Wall Type 21 through Type 25).

3. Median Barrier Extension: Existing concrete median barrier along I-85 and I-385 which separates opposing traffic shall have concrete barrier extension provided except in areas on I-385 with existing landscaping between median barriers. Barrier extension shall be in accordance with SCDOT Specifications and Standard Drawings. Any existing glare shields on existing concrete median barrier shall be removed and replaced with concrete barrier extension.

4. Fill Slopes: New embankment slopes shall be as described in the Roadway Design Criteria – Attachment A, Exhibit 2A. Any deviation in slopes must be approved by SCDOT.

5. Guardrail: Replace all existing guardrail and end treatments within the project limits. New guardrail shall be added where necessary in order to meet the requirements of the RFP. Paving under guardrail is required on this project and shall be performed in accordance with FHWA Memorandum HAS-10/B64-B found online at http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/listing.cfm

6. Storm Drainage:

   - The CONTRACTOR shall provide complete storm drainage design and construction for the portion of the project within the limits of the interchange. No hydraulic design is required in the portions of the project beyond the limits of widening for interchange ramps or auxiliary lanes, however the existing pipes shall be cleaned, have debris removed, and video inspected prior to project completion.

- All driveway pipes located within the project area shall be replaced as part of the scope of services.
- Existing catch basins to be retained within the project area and right-of-way for I-85 and I-385 and their associated ramps which are outside the areas for normal pedestrian traffic shall be modified to include Type 12 Catch Basin Grates.
- The Department has determined some existing cross lines within the Project limits are structurally inadequate and are to be replaced or otherwise rehabilitated as detailed in Exhibit 4e.
- All other cross line drainage culverts and pipes may remain in place provided that the PROPOSER demonstrates to the Department's satisfaction that they provide the necessary hydraulic capacity. The hydraulic capacity shall be verified by a professional engineer registered in South Carolina.

7. Pavement:
   - The design for pavement shall be selected from the designs listed in Exhibit 4c.
   - Milled-in rumble strips shall be used on all interstate shoulders, both inside and outside, in accordance with SCDOT standard drawings and specifications.
   - The existing milled in rumble strip on the outside concrete paved shoulder along I-385 Northbound between the Butler Road on-ramp and the northern terminus of the existing concrete pavement shall be removed and replaced in order to accommodate the proposed lanes. This work shall be performed in accordance with Exhibits 4a and 4c.
   - The existing outside concrete paved shoulder along I-385 Southbound between the northern terminus of the existing concrete pavement and the Butler Road off-ramp shall be removed and replaced in order to accommodate the proposed lanes. This work shall be performed in accordance with Exhibits 4a and 4c.

8. Traffic:

   Pavement Markings - Provide durable pavement markings and surface mounted raised pavement markers throughout the limits of the project. Striping materials will be determined by the type of roadway surface as described in Exhibit 4c. Apply line widths and patterns in accordance with the Standard Drawings.

   Signs - Provide and install all permanent signing required within project limits as described in Exhibit 4d – Part 1 including the required advance signs for interchanges that may be located beyond the project limits. A signing strip map with approved destinations is included as a .pdf file named "Signing Strip Map" and included in Attachment B. The CONTRACTOR shall provide signing plans and sign layouts for SCDOT approval prior to ordering any materials. Traffic signing shall be provided throughout the project limits in accordance with MUTCD.

   ITS - At project completion, the ITS System shall be complete and operational.

   Traffic Signals – Re-construct existing traffic signals as necessary to complete the project.

9. Clear Zone: CONTRACTOR shall provide adequate clear zone throughout project as defined in Exhibit 4a, Section 10.

10. Maintenance of Traffic: The Project shall contain at a minimum the following items:

- Prepare and submit a Transportation Management Plan (TMP) and special provisions for SCDOT's acceptance prior to any construction activity. The TMP includes Temporary Traffic Control, Traffic Operations, and Public Involvement plans as detailed in The Rule on Work Zone Safety and Mobility.
- Provide all necessary Traffic Control as required by the Standard Specifications, Supplemental Specifications and Special Provisions.
- Temporary Traffic Control Plans shall be submitted to SCDOT for review prior to beginning any work in the area. Plans shall include a description of the sequenced steps to be followed in implementing the plans, and will be developed at a scale of 1"=50' unless otherwise agreed upon. Potential items for inclusion in a Temporary Traffic Control plan (TTC) will include but are not limited to lane closures, shoulder closures, road closures, traffic relocations, detours, traffic control devices, temporary pavement construction, temporary drainage provisions, temporary lane markings, construction signing and sequencing notes.
- Maintain the existing I-85 mainline and I-385 mainline lanes of traffic in each direction at all times in accordance with Exhibit 4d – Part 2. Ramp traffic must be maintained at all times.
- For all roadways, ramps, and loops, maintain the number of travel lanes and all traffic movements including but not limited to intersections and interchanges through, left and right turn movements and on-ramp and off-ramp movements, for the duration of the project in accordance with Exhibit 4d – Part 2.

11. Environmental: The CONTRACTOR shall give extra attention throughout project operations to minimize impacts to the environment. As a minimum the CONTRACTOR shall include the following in the Project:

- The CONTRACTOR shall provide all modifications or revisions to the environmental documents that result from deviations in the project design and environmental impacts as stated in the environmental documents.

- The CONTRACTOR shall provide an Environmental Plan for the Project. The plan shall be submitted to SCDOT for approval prior to any construction activity. The plan shall identify specific measures that the CONTRACTOR will implement to assure compliance with all environmental documents, permits, and other environmental commitments as may be detailed in the contract documents. The plan shall also designate specific personnel that are charged with carrying out monitoring and compliance activities included in the plan.

  The CONTRACTOR shall stake out and delineate the jurisdictional areas in accordance with the preliminary jurisdictional determination issued by the USACE and the project Special Provisions. The delineation of the jurisdictional areas and other environmentally sensitive areas such as the cemetery along Roper Mountain Road shall be in accordance with the Supplemental Specification of 'Temporary Barrier Fence for Environmental Boundary'. If it is determined that a Section 404 Permit or a Section 401 Water Quality Certification is required, it shall be the responsibility of the CONTRACTOR to obtain the permit.

Additionally, if a Section 404 permit is required; all mitigation expenses will be the responsibility of the CONTRACTOR.

- The CONTRACTOR will be responsible for the acquisition of all required environmental permits. The Department will provide applicable oversight and coordination to ensure compliance. The following are the assumed environmental permits required for the construction of the proposed project: a U.S. Army Corps of Engineers (USACE) permit, under Section 404 of the Clean Water Act; a 401 Water Quality Certification from the South Carolina Department of Health and Environmental Control (SCDHEC); a Land Disturbance permit under the SCDHEC National Pollutant Discharge Elimination System (NPDES) Stormwater Program for a construction site exceeding 1.0 acre. These efforts will require evaluation and implementation of various strategies to avoid, minimize, and mitigate the impacts to jurisdictional waters of the U.S.

12. Community Relations: The CONTRACTOR shall be responsible for community relations and shall implement a Community Relations Plan. The plan shall be submitted to SCDOT for approval prior to any construction activity. The Community Relations Plan shall actively promote good relationships with local elected officials and the community. All costs of community relations will be included in the Total Project Cost.

13. Utility and Railroad Coordination: The CONTRACTOR shall be responsible for coordination with all utilities on the Project and railroads. See Exhibit 9 – Railroad Information for requirements.

Detailed Scope of Work

The project consists of interchange improvements to the I-85/I-385 Interchange and associated work on I-85, I-385, adjacent interchanges and side roads. The following is a description of the minimum improvements to the interstates, ramps and side roads as depicted in the approved Environmental Assessment and Interchange Modification Report.

Roadway

A. I-85

1.) With the exception of the I-85 NB Collector-Distributor between the Woodruff Road exit and the entrance ramp from Woodruff Road, all new ramp construction along I-85 shall accommodate a future 8-Lane (four each direction) with the following typical section:

- 2.5’ Median Barrier
- 10’ Inside Shoulder in each direction
- 4-12’ Travel Lanes in each direction
- 12’ Outside Shoulder in each direction

I-85 NB Collector Distributor 2-lane exit may tie to the existing I-85 NB Collector Distributor. The I-85 NB Collector Distributor and Ramp 4A within the area of the Ramp 3 exit and the Ramp 2A bridge shall be offset to accommodate a future 8-lane (four in each direction) I-85 based on the dimensions provided above.

2.) Widen existing I-85 NB to provide a continuous 4th auxiliary lane connecting the entrance ramp from I-385 with the exit ramp to Pelham Road. Provide full depth outside paved shoulder as part of this widening. Provide a 2-lane exit at this location with the two lanes tying into the 3-lane ramp section.
3.) Widen existing I-85 SB to provide a continuous 4th auxiliary lane connecting the entrance ramp from Pelham Road with the exit ramp to I-385 / Woodruff Road. Provide full depth outside paved shoulder as part of this widening.
4.) Reconstruct and widen, where applicable, portion of I-85 NB exit to Pelham Road to provide a 2-lane parallel exit. The two-lane exit shall extend as a two lane ramp up to a point where it transitions to tie to the existing three-lane section on the existing ramp.
5.) Provide a combined three-lane exit to I-385 NB / SB and Woodruff Road from I-85 SB as shown in the approved IMR. Split ramp into two 2-lane ramps to provide access to I-385NB/Woodruff Road and I-385 SB as depicted in approved IMR.
6.) Provide a two-lane entrance onto I-85 SB from I-385 NB and SB as shown in the approved IMR.
7.) Provide a single lane entrance onto I-85 SB from Woodruff Road.
8.) Provide Collector-Distributor along I-85 NB servicing Woodruff Road via existing ramps and new I-385 Interchange ramps.
9.) Provide two-lane exit from I-85 NB to I-85 NB Collector-Distributor.
10.) Provide two-lane entrance from I-85 NB Collector-Distributor to I-85 NB for Woodruff Road traffic.
11.) Collect the I-385 NB and SB traffic to I-85 NB into a common ramp and enter onto I-85 NB via a three lane entrance.
12.) Perform additional rehabilitation work along I-85 Northbound beyond the limits of the interchange work to MP 47.3 to the South and to MP 56.4 to the North. See Exhibit 4c for paving requirements. In addition, replace all existing guardrail and end treatments and add new guardrail where necessary in order to meet the requirements of the RFP.

B. I-385

1.) Widen I-385 NB between MP 34.97 and MP 37.15 to provide a third through lane and tie to existing three-lane section at each end.
2.) Widen I-385 SB between MP 34.97 and MP 37.10 to provide a third through lane and tie to existing three-lane section at each end.

3.) Widen existing I-385 NB to provide a continuous 4th auxiliary lane between the entrance ramp from Butler Road and the exit ramp to Woodruff Road / I-385.
4.) Widen existing I-385 SB to provide a continuous 4th auxiliary lane between the entrance ramp from I-385 / Woodruff Road and the exit ramp to Butler Road.
5.) Provide a 3-lane exit from I-385 NB to Woodruff Road/I-385.
6.) Provide a single lane entrance from Woodruff Road to I-385 NB.
7.) Provide access from Woodruff Road at I-385 to I-85 NB and SB without merging ramp traffic from Woodruff Road onto I-385 NB.
8.) Provide a two-lane entrance on I-385 NB from I-85 SB.
9.) Provide a single lane entrance on I-385 NB from I-85 NB.
10.) Widen I-385 NB to provide a continuous 5th auxiliary lane between I-85 NB entrance ramp and Roper Mountain Road.
11.) Widen I-385 SB to provide a continuous 4th auxiliary lane between Roper Mountain Road and I-385 Exit Ramp to I-85.
12.) Provide 2-Lane exit from I-385 SB to I-85.
13.) Provide single lane exit from I-385 SB to Woodruff Road.
14.) Provide Collector-Distributor along I-385 SB which collects traffic from I-385 SB and I-85 NB / SB and provides access to Woodruff Road.
15.) Provide 3-lane entrance ramp onto I-385 SB from Woodruff Road and I-85 NB / SB.

C. Ramps

All interstate-to interstate movements shall be maintained and the following improvements are required:

1.) Realign I-385 SB to I-85 NB ramp to replace bridge over I-85.
2.) Replace I-385 NB to I-85 SB loop ramp with a flyover ramp.
3.) Replace I-85 SB to I-385 SB loop ramp with a flyover ramp.
4.) Realign I-85 NB to I-385 NB ramp to replace bridge over I-85.

All service level interchange ramps shall be maintained and the following improvements are required:

1.) Reconstruct Woodruff Road / I-85 ramps and ramp terminals on the north side of I-85 to accommodate new I-85/I-385 ramps.
    a. I-85 SB exit ramp to Woodruff Road shall be isolated (“braided”) from the ramps carrying traffic from I-385 to I-85 and provide a 4-lane throat at Woodruff Road (double right and double left).
    b. I-85 SB entrance ramp from Woodruff Road shall be relocated as necessary to accommodate the I-385 entrance ramp.
2.) Ramp from Woodruff Road to I-385 NB shall be isolated (“braided”) from ramp carrying traffic from I-385 NB and Woodruff Road to I-85.

Access from I-385 (both directions) to the I-85 SB Exit Ramp to Woodruff Road via the I-85/I-385 ramps shall not be allowed.

D. Side Roads

1.) Re-align Roper Mountain Road as required to replace bridge over I-85. Roadway section shall be a three-lane section with bike lanes in each direction in accordance with design criteria in Exhibit 4a. One lane of traffic in each direction shall be maintained at all times during construction.
2.) Remove portion of Chrome Drive to accommodate the new ramp construction and reconstruct Chrome Drive to maintain property access and provide a continuous connection between Roper Mountain Road and Garlington Road.
3.) Relocate Whispering Hollow Road as required due to I-85SB widening for ramp construction to maintain property access.
4.) Perform intersection improvements at the Woodruff Road Intersection with Garlington and Miller Roads as shown in File No. 23.037688A (included in Attachment B) and in accordance with Exhibit 4a.
5.) Perform intersection improvements at the Woodruff Road intersection with the I-85 ramps on the South side of I-85 as shown in File No. 23.037689A (included in Attachment B) and in accordance with Exhibit 4a.
6.) Coordination with Salters/Old Sulphur Springs Road Bridge Replacement.
7.) Maintain existing traffic patterns on all roads crossing and adjacent to I-85 and I-385 unless otherwise noted.

Structures

A. Bridges

1.) Construct new bridge(s) for I-385 NB C/D exit ramp to I-85 over railroad, Garlington Road and I-385 NB entrance ramp from Woodruff Road.
2.) Construct new bridge for I-385 NB entrance ramp from Woodruff Road over railroad and Garlington Road.
3.) Remove and dispose of portions of the I-385 SB Bridge over railroad and Garlington Road and perform widening as required to accommodate additional lane on I-385 and the new SB Collector-Distributor. Perform rehabilitation on portions of the bridge which are retained in accordance with Exhibit 4b.
4.) Construct new bridge for I-385 SB Collector-Distributor over railroad and Garlington Road.
5.) Remove and replace existing I-385 NB and SB Bridges over I-85 and ramps.

6.) Construct new flyover to carry traffic from I-385 NB to I-85 SB.
7.) Construct new flyover to carry traffic from I-85 SB to I-385 SB.
8.) Construct new bridge for I-385 SB exit to Woodruff Road.
9.) Remove and replace existing ramp bridge carrying traffic from I-85 NB to I-385 NB.
10.) Remove and replace existing ramp bridge carrying traffic from I-385 SB to I-85 NB.
11.) Remove and reconstruct Roper Mountain Road bridge over I-85 to accommodate new ramps and future widening of I-85
12.) Construct bridge(s) for ramps from I-385 to I-85 SB over Woodruff Road exit ramp from I-85 SB.
13.) Rehabilitate I-385 NB Bridge over railroad and Garlington Road in accordance with Exhibit 4b.

B. Culverts

1.) Culverts shall be extended/constructed as required based on the proposed design and other contract requirements including the modifications and revisions made by the CONTRACTOR to complete the design.
2.) All work associated with the design and construction of culverts must be in accordance with the Environmental Permits. All work associated with any permit modifications as a result of changes proposed by CONTRACTOR shall be CONTRACTOR's responsibility.
3.) Unless specifically identified for replacement in Exhibit 4e, existing pipe culverts may be retained and extended as necessary as determined by the hydraulic study. The existing pipes at the locations detailed in Exhibit 4e shall be removed or abandoned in place in accordance with the Standard Specifications and replaced with pipe culverts in accordance with this Scope of Work.
4.) Existing box culverts may be retained and extended as necessary as determined by the hydraulic study. See Exhibit 4e for repairs that are required in order to retain culverts.

C. Retaining Walls

1.) Provide roadside barrier adjacent to new auxiliary lanes beneath the existing Smith-Hines Road Bridge over I-385.
2.) Construct cut wall as close as practical to end bents of the existing Woodruff Road Bridge over I-385 to provide space for new ramps beneath the existing end spans. See Attachment B for design exception allowing for reduced shoulders in this area.
3.) Construct a retaining wall with roadside barrier along I-85 NB above and adjacent to the end of the quadruple box culvert such that culvert does not require extension and no fill is placed within the stream banks.
4.) Any additional retaining walls or modifications to existing retaining walls shall be constructed as required by the proposed design and other contract requirements including the modifications and revisions made by the CONTRACTOR to complete the design.

EXHIBIT 4

PROJECT DESIGN CRITERIA

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

Exhibit 4a. Roadway

Exhibit 4b. Structures

Exhibit 4c. Pavement

Exhibit 4d. Traffic

- Part 1 – Signing and Pavement Markings
- Part 2 – Work Zone Traffic Control
- Part 3 – Traffic Signals

Exhibit 4e. Hydraulic/Hydrology

DESIGN REFERENCES

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

Design standards shall be in accordance with the following design references as supplemented or amended by Sections 4a, 4b, 4c, 4d, 4e, and 4f of this Exhibit:

- 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 Roadside Design Guide, with 2006 Chapter 6 update, 3rd Edition
- AASHTO Standard Specifications for Highway Bridges, 17th Edition
- SCDOT Requirements for Hydraulic Design Studies, May 2009
- SCDOT Standard Drawings, effective as of the Final RFP release date
- SCDOT Engineering Directive Memorandums, 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, January 2009
- SCDOT Roadside Plants to Avoid/Trees with Limitations on R/W, June 2008
- 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, 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
- FHWA Manual on Uniform Traffic Control Devices, 2009
- SCDOT Supplement to the MUTCD
- The Rule on Work Zone Safety and Mobility
- SCDOT Traffic Signal design Guidelines, 2009 with updates
- Highway Capacity Manual, 2000
- SCDOT Traffic Engineering Guidelines
- SCDOT Preconstruction Advisory Memorandums, effective as of the Final RFP release date
- AASHTO “Highway Drainage Guidelines”
- SCDOT Bridge Design Manual, 2006
- SCDOT Bridge Design Memoranda, effective between July 1, 2006 and the Final RFP release date

- 2010 AASHTO LRFD Bridge Design Specifications, Fifth Edition (with 2010 Interim Revisions)
- SCDOT Geotechnical Design Manual, 2010 Edition (Version 1.1)
- SCDOT Seismic Design Specifications for Highway Bridges, 2008 (Version 2.0)
- SCDOT Bridge Design Drawings and Details, effective as of the Final RFP release date
- AASHTO/AWS D1.5M/D1.5:2010 Bridge Welding Code, with 2011 interims
- AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals", effective as of the Final RFP release date
- Road Design Reference Material for Consultant Prepared Plans, June 2010

Any variation in design from the included information shall require written approval from SCDOT.

See Attachment B for approved design exceptions.

DESIGN DELIVERABLES

The CONTRACTOR is solely responsible for the accuracy, completeness, and constructability of the submitted deliverables before and after review. The CONTRACTOR is reminded that the SCDOT reviews the working drawings and design calculations only to insure that the specifications have been addressed.

All submittals to SCDOT shall be subjected to a thorough QA/QC review by the CONTRACTOR prior to submittal and 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

ROADWAY DESIGN DELIVERABLES

Preliminary Plans

Eight (8) sets of preliminary plans shall include, at a minimum: roadway typical section, roadway plan and profile, cross sections, drainage features, proposed right-of-way, construction staging details, and preliminary geotechnical reports.

CONTRACTOR shall also provide any design calculations requested in writing by SCDOT.

Right of Way Plans

Eight (8) sets of Right of Way plans are not a required submittal. However, if right of way is required and the CONTRACTOR wishes to pursue right of way acquisition prior to Final Plan submittal, CONTRACTOR has the option to submit Right of Way Plans.

Right of Way plans shall include, at a minimum: Right of Way data, roadway typical section, roadway plan and profile, cross sections, drainage features, existing Right of Way, and proposed new Right of Way requirements.

Final Plans

Eight (8) sets of Final plans shall include, at a minimum: roadway typical section, roadway plan and profile, cross sections, drainage features, sediment and erosion control features, existing right-of-way, proposed right-of-way, construction staging details, proposed barrier locations, and final geotechnical reports. CONTRACTOR shall also provide any design calculations requested in writing by SCDOT.

As – Built Construction Plans shall adhere to Road Design Reference Material for Consultant Prepared Plans, latest edition and to the SCDOT Manual of Instructions for the Preparation of As-Built Construction Plans, latest edition.

HYDRAULIC DESIGN DELIVERABLES

Preliminary Hydraulic Design Submittal

The CONTRACTOR shall provide the Hydraulic Design Calculations to SCDOT with the Preliminary Plans. Hydraulic Design Calculation submittal shall include calculations for drainage structures and calculations for sediment and erosion control.

Final Hydraulic Design Submittal

The CONTRACTOR shall provide the following to the Department with the Final Plan submittal:

- Eight (8) signed, completed copy of the SCDHEC Notice of Intent (NOI),
- Eight (8) copies of the Final Drainage Report and Stormwater Management Report,
- Eight (8) complete “No-Rise” Certification, if applicable, and
- Eight (8) complete CLOMR and LOMR FEMA Packages, if applicable.

STRUCTURAL DESIGN DELIVERABLES

Preliminary Structural Design Plans

Preliminary structural plans shall include six (6) half size sets and, at a minimum, all documents and calculations 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. A Preliminary Geotechnical Report shall be submitted with the preliminary structural design plans. No final design shall begin until all comments are resolved and SCDOT acceptance is given.

Final Structural Design Plans

Final Structural Design Plans shall include six (6) half size sets and, at a minimum, all documents, reports, and calculations described in Chapter 3 of the SCDOT Bridge Design Manual. Three (3) copies of the final geotechnical report shall be included with the final plans submittal.

Final plan submittals to SCDOT shall be signed and sealed by the State of South Carolina licensed Professional Engineer of record. CONTRACTOR shall provide any design calculations requested in writing by SCDOT. No construction shall begin until all comments are resolved and SCDOT acceptance is given.

Release for Construction (RFC) Plans

For roadway and structural plans, CONTRACTOR shall provide two full size sets, six half size sets, and one electronic copy of RFC Plans to SCDOT. RFC Plans shall be inserted into plan folders as detailed in the SCDOT bridge design manual and the SCDOT plan and preparation guide.

Foundation Installation Plans

The CONTRACTOR shall prepare Drilled Foundation Installation Plans (DFIP) and/or Pile Installation Plans (PIP) in accordance with the Standard Specifications for Highway Construction. 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. Comments must be resolved by the CONTRACTOR's designer prior to re-submittal to SCDOT. The CONTRACTOR is reminded that the SCDOT reviews the DFIP and/or the PIP only to insure that the specifications have been addressed.

Shop Plans

Shop plans, as defined by the Standard Specifications for Highway Construction, shall be submitted to the CONTRACTOR's designer for review and approval. All approved shop plans shall be routed to SCDOT for review and distribution. Shop plan submittals shall 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. Comments shall be reviewed and approved by the CONTRACTOR's designer prior to the plans being resubmitted to the SCDOT for further review. Shop plans shall be stamped "approved" by the CONTRACTOR's designer prior to submittal to SCDOT and shall be stamped and distributed by the SCDOT prior to commencing fabrication and/or construction/erection. All design calculations and shop plans shall bear the legible seal, date, and signature of the responsible engineer registered as a Professional Engineer in the State of South Carolina.

Working Drawings

Working drawings and design calculations, as defined by the Standard Specifications for Highway Construction, shall be submitted to the CONTRACTOR's designer for review and approval. All approved working drawings and design calculations shall be routed to the SCDOT for review and distribution. Working drawings and design calculation submittals shall 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 written comments to the drawings. Comments shall be reviewed by the CONTRACTOR's designer prior to re-submittal to the SCDOT for further review. Working drawings and design calculations shall be stamped "approved" by the CONTRACTOR's designer prior to submittal to SCDOT and shall be stamped and distributed by the SCDOT prior to commencing construction/erection. All design calculations and working drawings shall bear the legible seal, date, and signature of the responsible engineer registered as a Professional Engineer in the State of South Carolina.

EXHIBIT 4a

ROADWAY DESIGN CRITERIA

Section 1

INTENT of DESIGN CRITERIA

The CONTRACTOR will be expected to design and construct the project according to these design requirements.

Design criteria were established based on design speed, character and composition of traffic and width of right of way. These criteria were derived directly from the South Carolina Department of Transportation (SCDOT) Highway Design Manual and supplemented with AASHTO "A Policy on Geometric Design of Highways and Streets", 2001 Edition.

Section 2

DESIGN SPEED & FUNCTIONAL CLASSIFICATION

INTERSTATE

I-85	65 mph (Functional Classification (FC) – Freeway)
I-385	65 mph (Beginning of I-385 work to Sta. 350+00) 60 mph (Sta. 350+00 to End of I-385 work) (FC – Freeway)

COLLECTOR/DISTRIBUTOR ROADS

I-85	60 mph (FC – Freeway)
I-385	50 mph (FC – Freeway)

SYSTEM INTERCHANGE RAMPS

RAMP	DESCRIPTION	DESIGN SPEED (mph)	Functional Classification to be used for design
1	I-85 SB to I-385 NB	50	Freeway Ramp
1A	I-85 SB to I-385 SB	45	Freeway Ramp
2	I-385 SB to I-85 SB	45	Freeway Ramp

2A	I-385 SB to I-85 NB	50	Freeway Ramp
3	I-85 NB to I-385 SB	45	Freeway Ramp
3A	I-85 NB to I-385 NB	35	Freeway Ramp
4	I-385 NB to I-85 NB	50	Freeway Ramp
4B	I-385 NB to I-85 SB	45	Freeway Ramp

SERVICE INTERCHANGE RAMPS

RAMP	DESCRIPTION	DESIGN SPEED (mph)	Functional Classification to be used for design
1B	I-85 SB to Woodruff Rd (I-85)	40	Freeway Ramp
5	Woodruff Rd (I-85) to I-85 SB	50	Freeway Ramp
R6	I-85 NBCD to Woodruff Rd (I-85)	N/A	Freeway Ramp
L6	Woodruff Rd SB (I-85) to I-85 NBCD	20	Freeway Ramp
7	Woodruff Rd NB (I-85) to I-85 NBCD	35	Freeway Ramp
2B	I-385 SB to I-385 SBCD	50	Freeway Ramp
	I-385 NB to Roper Mountain Rd	60	Freeway Ramp
4A	I-85 NBCD to I-85 NB	60	Freeway Ramp
8	Woodruff Rd (I-385) to I-385 NB	45	Freeway Ramp
8A	Woodruff Rd (I-385) to I-385 NBCD	45	Freeway Ramp
9	I-385 SBCD to Woodruff Rd (I-385)	40	Freeway Ramp
10	Woodruff Rd (I-385) to I-385 SBCD	45	Freeway Ramp
11	I-385 NBCD to Woodruff Rd (I-385)	45	Freeway Ramp

CROSSROADS

Rd S-548 (Roper Mountain Road)	45 mph (FC – Urban Collector)
Rd S-564 (Garlington Road/Miller Road)	45mph (FC – Urban Collector)
SC 146 (Woodruff Road)	45mph (FC – Urban Arterial)

FRONTAGE ROADS AND SIDE ROADS

I-85 SB Frontage Road (Whispering Hollow)	45mph (FC – Local Group 2)
Rd S-1112 (Chrome Drive)	25mph (FC – Local Group 2)
Rd S-1142 (Chrome Drive)	25mph (FC – Local Group 2)

Section 3

PAVEMENT, SHOULDER & MEDIAN WIDTH

GENERAL

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

INTERSTATE – I-85

Through Lanes	12 ft
Shoulder (Outside)	10 ft paved/12 ft total width
Shoulder (Inside/immediate)	4.75 ft total width paved (existing) (See I-85 Design Exception for clarification)
Shoulder (Inside/ultimate)	10 ft total width paved

Special Requirements for Inside Shoulder at large obstructions in median: The minimum inside shoulder width at a localized obstruction (bridge columns, sign supports, etc.) shall be 2.25 feet. In locations where the obstruction in the median results in a shoulder width less than this minimum, the I-85 travel lanes shall be shifted out towards the outside by 5.25 feet utilizing an appropriate taper (so that the lanes are in the "ultimate" location based on a theoretical 10-foot inside shoulder). In order to avoid multiple lane tapers over a short distance, once the lanes are shifted out, they may not be shifted back to the original location until such point where the lanes will not need to be offset again to achieve the minimum inside shoulder within the project limits. When the lanes are shifted in a normal crown section, the crown of the roadway shall be shifted accordingly such that two lanes and the inside shoulder are sloped towards the median.

INTERSTATE – I-385

Through Lanes	12 ft
Shoulder (Outside)	10 ft paved/12 ft total width
Shoulder (Inside)	10 ft total width paved

PAVING ALONG INTERSTATE SHOULDERS ADJACENT TO BARRIER

The areas along the mainlines between the edge of paved shoulder and the face of barrier shall be paved in accordance with Exhibit 4c. See Section 6 for barrier requirements along the interstate mainlines. In areas where the ramp is converging towards the mainline after the barrier has ended, this pavement structure shall continue between the end of the barrier and the gore where applicable.

COLLECTOR/DISTRIBUTOR ROADS

Lanes	16 ft single lane/12 ft double lanes
Shoulder (Outside)	10 ft paved/12 ft total
Shoulder (Inside)	4 ft paved/10 ft total

SYSTEM INTERCHANGE RAMPS

Travel Lane Width	16 ft single lane/12 ft multiple lanes
Outside Shoulder Width	10 ft paved/12 ft total
Inside Shoulder Width	4 ft paved/10 ft total

SERVICE INTERCHANGE RAMPS

Travel Lane Width	16 ft single lane/12 ft multiple lanes
Outside Shoulder Width	6 ft paved/10 ft total
Inside Shoulder Width	4 ft paved/10 ft total

CROSSROADS

<u>Rd S-548 (Roper Mountain Rd)</u>

Travel Lane Width	12 ft
Median	15 ft paved
Turning Lanes	11 ft
Bike Lane	4 ft
Shoulder Width	2 ft curb and gutter with 6 ft berm measured from back of curb

Rd S-564 (Garlington Rd/Miller Rd), SC 146 (Woodruff Rd)

Travel Lane Width	12 ft
Median	16 ft paved to accommodate 12 ft turn lane and 4 ft median due to truck traffic
Turning Lanes	12 ft
Shoulder Width	6-10 ft total widths/2 ft paved (Based on the SCDOT HDM (2003 with updates) functional class) or 2 ft curb and gutter with 6 ft berm measured from back of curb

FRONTAGE ROADS AND SIDE ROADS

I-85 SB Frontage Road (Whispering Hollow Road)

Travel Lane Width	10 ft
Shoulder Width	6 ft total width/2 ft paved

Rd S-1112 & Rd S-1142 Chrome Drive

Lanes	11 ft
ShoulderWidth	6 ft total widths/2 ft paved or 2 ft curb and gutter with 6 ft berm measured from back of curb

Section 4

HORIZONTAL CURVES

INTERSTATE

Minimum Radius (65mph)	1485 ft (Retain existing superelevation fo I-85, "e=Retain Existing")
Minimum Radius (60mph)	1205 ft
Superelevation	0.08 ft/ft

COLLECTOR/DISTRIBUTOR

Minimum Radius (50 mph)	760 ft
Minimum Radius (60 mph)	1205 ft
Superelevation	0.08 ft/ft

RAMPS

Minimum Radius (35 mph)	350 ft
Minimum Radius (45 mph)	600 ft
Minimum Radius (50 mph)	760 ft
Superelevation Maximum	0.08 ft/ft

CROSSROADS

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

FRONTAGE AND SIDE ROADS

Minimum Radius (35 mph)	380 ft
Minimum Radius (45 mph)	660 ft
Superelevation	0.06 ft/ft

Section 5

SIDE SLOPES

FILL SLOPES

Shoulder Section

Height of Fill

≤ 5 ft	6:1
5 ft - 10 ft	4:1
≥10 ft	2:1

*3.5 ft will be added to shoulder for guardrail

Curb & Gutter Section

6:1 to 2:1

CUT SLOPES/DITCH SECTIONS

Interstate, Collector/Distributors, and Ramps

Shoulder (paved)	24:1
Shoulder (unpaved)	12:1
Foreslope	6:1
Backslope	6:1 to 2:1

Crossroads

Shoulder (paved)	48:1 (2ft wide); 24:1 (4ft wide)
Shoulder (unpaved)	12:1
Foreslope	6:1 to 4:1
Backslope	4:1 to 2:1

Frontage Roads and Side Roads

Shoulder (paved)	48:1 (2ft wide); 24:1 (4ft wide)
Shoulder (unpaved)	12:1
Foreslope	6:1 to 4:1
Backslope	4:1 to 2:1

Curb and Gutter Section

2:1 or flatter in special cases

Section 6

BARRIER WALLS & GUARDRAILS

Barrier Types

Barrier in the median of I-85 and I-385 shall be shall be 'Jersey Face' type barriers (SCDOT Concrete Barrier Walls Type 2 through Type 6 and Type 11A through Type 15) in order to match the existing barrier. All other Concrete Barrier Walls used on this project shall be 'Straight Face' type barriers (SCDOT Concrete Barrier Wall Type 21 through Type 25).

Barrier Extension

Existing and proposed concrete median barrier along I-85 and I-385 which separates opposing traffic shall have concrete barrier extension provided except in areas on I-385 with existing landscaping between median barriers. Barrier extension shall be in accordance with SCDOT Specifications and Standard Drawings.

Guardrail and Barrier Usage

In order to eliminate narrow areas of grass between guardrails, barrier wall shall be utilized between the I-85 or I-385 (mainlines) and adjacent ramp or collector-distributor roadways in areas where the distance between the edge of the outermost mainline lane (through or auxiliary lane) and the edge of the innermost lane of the adjacent roadway is less than 45 feet. The barrier shall be placed to provide the appropriate inside shoulder for the adjacent roadway and allow for the future widening of the mainline (additional 12-foot lane on either I-85 or I-385 and 5.25' inside shoulder widening on I-85). The barrier may not be discontinued in areas where the offset between the mainline and adjacent roadway is greater than 45 feet due to a lane drop on the mainline. The barrier may end as the mainline and ramp alignments converge near the gore areas.

Section 7

GRADES

INTERSTATE

Desirable Maximum 4%

Allowable Maximum 5%

Allowable Minimum 0.3%

COLLECTOR/DISTRIBUTOR ROADS

Desirable Maximum 4%

Allowable Maximum 5%

Allowable Minimum 0.3%

INTERCHANGE RAMPS AND LOOPS

The SCDOT HDM (2003 with updates) and Figure 16.5C will be used to determine maximum grades according to the design speed. Downgrades should desirably be limited to 3 to 4 percent on ramps with sharp horizontal curvature and significant heavy truck or bus traffic.

CROSSROADS

Maximum 6%

Minimum 0.3%

FRONTAGE ROADS AND SIDE ROADS

Maximum 8%

Minimum 0.3%

Section 8

VERTICAL CURVES

The SCDOT HDM (2003 with updates) Chapter 12 will be used to determine length of curves. Grade adjusted K values should be considered where the grades are 3 percent or greater.

Section 9

SIGHT DISTANCE

The SCDOT HDM (2003 with updates) Chapter 10 will be used.

Section 10

CLEAR ZONE

MAINLINE INTERSTATE, COLLECTOR/DISTRIBUTOR ROADS, AND RAMPS

The SCDOT HDM (2003 with updates) Chapter 14 and the *Roadside Design Guide* (AASHTO) edition 2006 with Chapter 6 Update, 3rd Edition will be used based on traffic volumes, design speed and slopes. Clear Zones provided in Figure 14.3A in the SCDOT HDM (2003 with updates) shall not be limited to 30 feet as indicated as a possibility in the footnote for this figure.

SIDE ROAD & OTHER ROADS

The SCDOT HDM (2003 with updates) Chapter 14 and the *Roadside Design Guide* (AASHTO) edition 2011 will be used based on traffic volumes, design speed and slopes.

FACILITIES WITH CURBS

Clear zone for any facilities using curbs on this project will comply with the SCDOT HDM (2003 with updates) Chapter 14.

Section 11

BRIDGE CLEARANCES

VERTICAL CLEARANCE

All new bridges constructed shall have a minimum vertical clearance of 17ft from the bottom of the new structure to the proposed pavement surface (including ultimate 8-lane section of I-85 which includes a crown shift). Existing bridges which are retained or widened shall have a minimum vertical clearance of 16ft 6 in from the bottom of the structure to the proposed pavement surface (including ultimate 8-lane section of I-85 which includes a crown shift). All bridges over railroads shall have a minimum vertical clearance of 23ft from the bottom of the structure to the existing top of rail.

HORIZONTAL CLEARANCE

Unless noted otherwise in the Structures Design Criteria, all new bridge bents and abutments shall be located to provide the horizontal clearance required by Figure 13.5B in the SCDOT HDM (2003 with updates). In instances where this clearance does not satisfy the Clear Zone requirements in Figure 14.3A in the SCDOT HDM (2003 with updates), the bent or abutment shall be protected with barrier or guardrail in accordance with SCDOT Standard Drawings.

See bridge design criteria for horizontal clearance requirements for bridges over railroads.

Section 12

PEDESTRIAN & BICYCLE FACILITIES

Pedestrian facilities will be evaluated on a case-by-case basis along selected side roads and crossroads. Pedestrian accommodations shall comply with the *Guide for the Planning, Design, and Operation of Pedestrian Facilities* (AASHTO) edition 2004 as well as the SCDOT ADA Transition Plan. Bicycle accommodations shall be in accordance with the Engineering Directive No. 22 and the *Guide for the Development of Bicycle Facilities* (AASHTO) edition 2012.

Section 13

RIGHT-OF-WAY & CONTROL OF ACCESS

RIGHT OF WAY

Right of way widths will vary based on construction limits and NPDES requirements. Right of way concrete posts shall be installed along the right of way required for interstate, collector/distributers, ramps, and frontage roads as per Standard Drawing 809-105-00. Rebar cap markers shall be installed along all other roadways as per Standard Drawing 809-105-00.

CONTROL OF ACCESS

All right of way and control of access will follow the guidelines in the SCDOT HDM (2003 with updates), the Access & Roadside Management Standards (ARMS Manual 2008) and other SCDOT memorandums and bulletins.

Chain Link Fence shall be installed along the Control of Access in accordance with Standard Drawings 806-105-00 and 806-115-00. Location of gates shall be specified by SCDOT. Existing Control of Access within the interchange limits shall be removed and replaced.

Section 14

DESIGN EXCEPTIONS

Design exceptions have been secured for this project which document existing and proposed conditions; however these design exceptions do not preclude the design-build team from improving existing conditions as part of the final design. The intent of these design exceptions are to ensure that existing conditions are not worsened by this project and to document design exceptions that are anticipated as part of the project.

The design exceptions that have been secured are summarized below:

I-85 Vertical Curves: Two separate design exceptions which document the existing conditions along I-85 that are not anticipated to be improved as part of the project.

I-85 Shoulder Widths: Design exception documents the existing inside shoulder width along I-85 throughout the project as well as localized encroachments at anticipated bridge and sign support locations. Note that design exception allows for a minimum inside shoulder width of 2.25 feet along I-85 at localized encroachments.

I-385 Bridge/Shoulder Width: Design exception documents the existing shoulder widths on the I-385 NBL bridge over Garlington Road and GE Railroad which is to be retained as part of this project.

I-385 NB C-D Shoulder Widths: Design exception documents the anticipated conditions along the I-385 NB C-D in the vicinity of the existing Woodruff Road Bridge, which is to be retained.

I-385 SB C-D Shoulder Widths: Design exception documents the anticipated conditions along the I-385 SB C-D in the vicinity of the existing Woodruff Road Bridge, which is to be retained.

Interchange Ramps Shoulder Width: Design exception documents the anticipated conditions along the various ramps where localized encroachments into the shoulders are anticipated due to bridge and sign supports.

See the approved design exception requests in Attachment B.

Section 15

INTERSECTION IMPROVEMENTS ALONG WOODRUFF ROAD

Woodruff Road at Garlington Road/Miller Road Intersection – The work required along Woodruff Road from I-385 SB off-ramp and on-ramp westward to Market Point Drive through the Garlington/Miller intersection shall be as follows:

- Construct an additional 3rd westbound lane from the I-385 off-ramp up to the Garlington Road intersection. This lane shall be developed as a free flow right off of the I-385 off-ramp. This lane shall not be continuous through the Garlington intersection.
- Construct a 170ft storage tapered left from westbound Woodruff Road onto Miller Road.
- Construct an additional 3rd westbound lane from Garlington Road to Market Point Drive. This lane shall be developed as a free flow right off of Garlington Road.
- Construct a 120ft parallel left from westbound Woodruff onto Market Point Drive.
- Construct a 150ft dual left from eastbound Woodruff Road onto Garlington Road.
- Construct a 100ft long right turn lane from eastbound Woodruff Road onto Miller Road.
- Construct a 350ft dual left turn from Miller Road onto westbound Woodruff Road.
- Construct at a minimum a three lane section along Miller Road from Woodruff Road to the existing three lane section for the Park Woodruff intersection.
- Construct a 375ft free flow right turn lane from Garlington Road onto westbound Woodruff Road.
- Construct a 250ft left turn lane off of Garlington Road onto eastbound Woodruff Road.
- Construct 675ft of dual left receiving lanes on Garlington Road for the left turn off of eastbound Woodruff Road onto Garlington Road.
- Construct minimum of 4ft medians between left turn lanes and the opposing traffic.

Woodruff Road at I-85 Interchange – The work required along Woodruff Road from Market Point Drive to the NB I-85 CD off-ramp and on-ramp shall be as follows:

- Construct an additional 3rd westbound lane from Market Point Drive to the I-85 NB CD on-ramp.
- Retain the 60ft right turn lane into the Shops at Greenridge near the existing I-85 NB CD on-ramp in its current form. If improvements to Woodruff Road impact this configuration, then reconstruct as necessary to recreate the existing configuration with the 4ft concrete median separating the turn lane from Woodruff Road.
- Construct a right out at the existing right in only intersection near the existing I-85 NB CD on-ramp.

- Construct a dual left turn lane from westbound Woodruff Road to Carolina Point Parkway. The inside turn lane shall have 70ft of storage and the outside turn lane shall have 155ft of storage.
- Reconstruct the I-85 NB CD on ramp to tie to Woodruff Road west of the Carolina Point Parkway intersection. This on ramp shall be designed to be a 35mph free flow exit off of Woodruff Road.
- Widen the existing I-85 NB CD off-ramp to provide a dual right turn lane. The dual right turn lane shall be carried back from the edge of Woodruff Road approximately 150ft to the end of the ramp curve. The dual right turn lane addition shall be developed through the ramp curve.
- Construct a 3rd lane along eastbound Woodruff Road from the I-85 NB CD off ramp to Carolina Point Parkway.
- Construct 250ft of dual left turn lanes from eastbound Woodruff Road into the Shops at Greenridge at the Market Point Drive intersection.
- Construct a 160ft right turn lane from eastbound Woodruff Road onto Market Point Drive.
- Construct minimum of 4ft medians between left turn lanes and the opposing traffic.

EXHIBIT 4b

STRUCTURES DESIGN CRITERIA

1.0 GENERAL STRUCTURES CRITERIA

1.1 BARRIER PARAPETS

For bridges greater than 60 feet in length, the SCDOT 32-inch Concrete Bridge Barrier Parapet, 1'-6" in width, shall be used. The SCDOT Standard Barrier Parapet Transition shall be used at all barrier ends where a thrie beam guardrail bridge connector is required.

For bridges 60 feet or less in length, a reinforced concrete wall with a vertical face may be used as permitted by Section 17.6.1.2 of the SCDOT Bridge Design Manual. The top of the wall shall be 32" above the top surface of any asphalt overlay.

For bridges with sidewalks, the SCDOT 42" Concrete Wall shall be used in accordance with Section 17.6.1.2 of the SCDOT Bridge Design Manual and SCDOT Bridge Drawings and Details, Drawing No. 700-Misc.

1.2 BARRIER & MOMENT SLAB

When required, barrier and moment slab shall be provided and designed in accordance with the *AASHTO LRFD Bridge Design Specifications* and NCHRP Report 663. Barrier should be detailed independently of the MSE wall as shown on the SCDOT Standard Drawing 713-01d.

A moment slab is not required when the barrier is sufficiently connected to concrete pavement.

1.3 FINAL FINISH OF EXPOSED CONCRETE SURFACES

Final surface finish in accordance with Section 702.4.11 of the *Standard Specifications for Highway Construction* shall be provided to the following bridge areas: Entire surface of all barrier rails, parapet walls, approach slab curbs, concrete utility supports, wing walls, and outside vertical edges of bridge deck slabs and sidewalks.

Anti-Graffiti Coating shall be applied to exposed concrete surfaces of bridge abutments walls, including precast panels and coping of MSE Walls. A Special Provision for Anti-Graffiti

Coating is included in Exhibit 5.

1.4 STAY-IN-PLACE BRIDGE DECK FORMS

Permanent stay-in-place steel bridge deck forms for concrete deck slabs may be used at the CONTRACTOR's option. Fillers shall not be used in the flutes of the stay-in-place forms. Form flutes shall be filled with concrete as the deck slab is placed.

1.5 GROOVED SURFACE FINISH

A Grooved Surface Finish shall be applied to all concrete decks in accordance with Subsection 702.4.16 of the *Standard Specifications for Highway Construction*.

1.6 BRIDGE DECKS

Bridge decks supported by girders or beams shall be reinforced cast-in-place concrete with reinforcing steel.

Asphalt overlays will not be allowed on girder or beam supported bridges or flat slab bridges.

1.7 CONCRETE STRENGTHS

In prestressed concrete beams, concrete strengths up to 10,000 psi maximum may be used. In prestressed concrete piles, concrete strengths up to 8,000 psi maximum may be used. All cast-in-place concrete bridge components shall be constructed with concrete having a minimum compressive strength of 4000 psi. All precast concrete bridge components shall be constructed with concrete having a minimum compressive strength of 5000 psi.

1.8 BELOW STRENGTH CONCRETE

For purposes of applying the reduced payment and below strength provisions of Sections 701.2.12.4.1 and 701.2.12.4.2.4 of the *Standard Specifications*, a unit price of $750/CY will be used. When design analysis is required to verify the acceptance of below strength concrete, it shall be performed by the Engineer of Record and shall be submitted to the SCDOT for approval.

1.9 LIGHTWEIGHT CONCRETE

Lightweight Concrete will be permitted in bridge railings and bridge decks only.

1.10 POST-TENSIONING

External post-tensioning will not be permitted.

1.11 SUPERSTRUCTURE TYPES

For this project, Section 12.3.3 of the *SCDOT Bridge Design Manual* shall not be used. Allowable superstructure types are outlined in Sections 12.3.2.1, 12.3.2.3 and 12.3.2.4 of the *SCDOT Bridge Design Manual*.

If Prestressed concrete girders are used as outlined in Section 12.3.2.1 of *SCDOT Bridge Design Manual*, they shall be either I-beams or modified bulb-tee beams.

If structural steel girders or beams are used as outlined in Sections 12.3.2.3 or 12.3.2.4 of *SCDOT Bridge Design Manual*, they shall be "I" shaped.

All widenings and construction stages for girder bridges must consist of a minimum of two lines of girders.

1.12 SUBSTRUCTURES

Interior Bents shall consist of cast-in-place reinforced concrete bent caps and columns supported on cast-in-place reinforced concrete drilled shafts or pile footings.

End abutments shall be either vertical abutments or spill through type abutments (2:1 maximum slope). Vertical abutments shall be constructed of cast-in-place reinforced concrete or MSE walls. If MSE walls are used, the bridge ends shall be on a cast-in-place reinforced concrete cap 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.

The tops of footings shall be set in accordance with Section 19.5.5 of the SCDOT Bridge Design Manual. In cases where there is pavement immediately above the footing, the top of footing shall be a minimum of two feet below the pavement structure.

1.13 INTEGRAL INTERIOR BENT CAPS

If required on this Project, integral interior bent caps shall be constructed of cast-in-place concrete.

1.14 FOUNDATION DESIGN

Bridge spread footings will not be permitted. Deep foundations are required to extend below any compacted fill, including MSE wall backfill.

1.15 PILE SIZES AND TYPES

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

Pile Type	Minimum Size
Steel H-Piles	HP12x53
Steel Pipe Piles	16” Diameter (min. wall thickness equal to ½”)
Prestressed Concrete Piles	18” Square
Prestressed Concrete Pile Points	W8x58
*Timber Piles	8” Tip Diameter

*Timber Piles may only be used for ground improvement.

1.16 CROSS-HOLE SONIC LOGGING (CSL) TESTING

Cross-hole sonic logging (CSL) access tubes shall be installed in all drilled shafts in accordance with the *Standard Specifications for Highway Construction*. CSL testing will be conducted by SCDOT on all of the shafts.

1.17 DYNAMIC LOAD TESTING WITH PILE DRIVING ANALYZER AND STATIC LOAD TESTING

The CONTRACTOR will be responsible for dynamic and static load testing of all foundations if required by design. Load test reports shall bear the legible seal, date, and signature of the testing firm's engineer, who shall be registered as a Professional Engineer in the State of South Carolina. The CONTRACTOR'S designer shall review and approve all load test reports prior to submitting the reports with his written approval to SCDOT for review and acceptance. The CONTRACTOR shall submit three copies of each report to SCDOT. SCDOT will review the load test reports and provide either acceptance or comments. Comments must be reviewed by the CONTRACTOR'S designer prior to resubmittal to SCDOT.

1.18 SLOPE PROTECTION

Slope protection for bridge end fills shall be provided for all bridges. Concrete slope protection shall have a minimum thickness of 4". Use details and notes as applicable that are located on Drawing No. 804-1 of the *Bridge Design Drawings and Details* and the requirements of Section 804 of the *Standard Specifications for Highway Construction*.

1.19 APPROACH SLABS

Approach slabs will be required for all permanent bridges.

1.20 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 shall not be used for this project. Steel pipe piles shall be terminated at the bottom of the cap or footing and the piles must be connected to the bent cap using a reinforced concrete infill, with the reinforcing extending into the cap or footing.

2.0 RETAINING WALLS

2.1 MECHANICALLY STABILIZED EARTH (MSE) WALLS

See Supplemental Technical Specification SC-M-713 and SCDOT Bridge Drawings and Details, Drawing No. 713-01.

MSE wall facing shall be precast concrete panels with a fractured fin finish at bridge abutments. MSE wall block facing may be implemented along roadway sections, provided the wall face is not visible to interstate traffic.

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

Wall heights and lengths shall be designed to provide adequate cover for roadway and bridge drainage inlets and pipes in the roadway approaches and adequate slope transitions to maintain stable shoulders and slopes and design clearances and templates in accordance with the design criteria.

MSE wall heights greater than the maximum specified wall heights in the *Geotechnical Design* Manual shall be approved by the SCDOT.

A concrete paved drainage ditch shall be provided along the top of the wall as per MSE Wall Standard Drawings.

2.2 REINFORCED CONCRETE WALLS

Selection criteria for reinforced concrete walls shall be based on FHWA Publication FHWA NHI-07-071 entitled *Earth Retaining Structures*, 2008.

These walls shall be designed in accordance with the *2012 AASHTO LRFD Bridge Design Specifications, Sixth Edition (with 2013 Interim Revisions) and* FHWA Publication FHWA NHI-07-071 entitled *Earth Retaining Structures*, 2008.

For walls separating traffic with grade differentials less than 12 feet, Standard Median Barrier Types 11 through 15 may be used as shown in the *SCDOT Standard Drawings*. These standard concrete median barrier walls may be used provided that the foundation soils meet the foundation design requirements indicated on the *SCDOT Standard Drawings*.

Spread footings are permitted for concrete retaining walls that are not directly supporting bridges.

2.3 OTHER WALL TYPES

Other acceptable wall types include SCDOT Standard Brick walls, Precast Counterfort walls (which may be used in conjunction with traditional MSE walls in partial rock cuts), Tangent Pile/Secant Pile walls, Anchored walls, Sheet Pile walls, Soldier Pile and Lagging walls, and Soil-nailed walls.

SCDOT Standard Brick walls shall not be used at bridge abutments.

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

3.0 REINFORCED BOX CULVERTS

Culverts will not be allowed as a substitute for bridges specified in this project.

Culverts may be used on this project as a means of accommodating cross line drainage, if warranted by hydraulic design.

Culverts shall have four sides and shall be constructed of reinforced concrete.

Riprap is required at ends of box culverts and shall conform to details shown on the *SCDOT Standard Drawings.*

3.1 DESIGN SPECIFICATIONS

Culverts shall be designed in accordance with the requirements of the *2010 AASHTO LRFD Bridge Design Specifications, Fifth Edition (with 2010 Interim Revisions)*. The design live loading shall be HL-93.

Culverts that convey water shall be hydraulically designed in accordance with the requirements of the *SCDOT Requirements for Hydraulic Design Studies*.

Subsurface investigations for culverts shall comply with the requirements of the *SCDOT Geotechnical Design Manual*.

Seismic effects for culverts need not be considered, except when they are subject to foundation soils that may undergo shear strength loss during the design seismic event.

3.2 MATERIALS

Class 4000 concrete (minimum) shall be used for cast-in-place elements of culverts and Class 5000 concrete (minimum) shall be used for precast elements of culverts.

Reinforcing bars shall conform to the requirements of ASTM A 706, Grade 60. Welded Wire Fabric shall meet the requirements of AASHTO M 55 or AASHTO M 221. The wire for the welded wire fabric shall meet the requirements of AASHTO M 32 or M 225, Grade 65.

3.3 DESIGN AND DETAILING REQUIREMENTS

3.3.1 GENERAL

The length of the culvert shall be established so that, at the end of the culvert, the theoretical fill slope is 1 foot below the top of the top slab. Where practical, the culvert headwalls should be located outside of the adjusted clear zone (see *SCDOT Standard Drawing* No. 805-010-00) or the exposed portions of the structure should be appropriately shielded.

Weep holes and French drains shall be detailed in accordance with Section 702 of the *SCDOT Standard Specifications for Highway Construction*. The weep holes shall be located 12 inches above the normal water line.

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

The maximum allowable settlement for a culvert is 8 inches from the beginning of construction until the end of the 75-year design life of the culvert. The maximum allowable differential settlement along the length of a culvert is limited to 1 inch per 50 feet of culvert length. During a seismic event, the maximum allowable differential settlement along the length of a culvert is also 1 inch per 50 feet of culvert length. If deep foundations are used to limit the settlement of a culvert, the longitudinal differential settlement shall be checked for the adjacent embankment and shall not exceed the longitudinal embankment performance limits provided in the *SCDOT Geotechnical Design Manual*.

Additional reinforcing steel shall be detailed at openings in the top slab or side walls to meet or exceed the reinforcement shown on *SCDOT Standard Drawing* No. 722-105-02.

In situations where guardrail or rigid barrier must be provided for protection and the installation would require attachment to the culvert, a moment slab shall be designed and detailed to eliminate transfer of moment to the culvert barrel. The moment slab may be attached to the

culvert barrel for resistance to sliding forces; the connection must be designed and detailed to resist horizontal sliding forces only. Where site and culvert geometry permit, a 12'-6" long span nested guardrail shall be detailed to bypass the culvert as shown on *SCDOT Standard Drawing* No. 805-565-00.

All box culverts, whether cast-in-place or precast, shall be detailed with cast-in-place wing walls, head walls, aprons, and cut-off walls on both the inlet and outlet ends. Precast wing walls, head walls, aprons, cut-off walls, and footings are not permitted.

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. The wing walls shall be detailed so that the top of the wing wall is at least 12 inches above the finished ground line. The wing wall height should be designed and detailed 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. The wing wall may be terminated when the height is such that 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.

Wing walls may be supported by footings or aprons, but no support shall be assumed from the culvert barrel(s).

The thickness of wing walls shall be 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, a minimum of 5 inches of clearance shall be provided between the mats of reinforcing steel.

3.3.3 APRONS

For box culverts, aprons shall be detailed 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). The aprons may be designed to support the wing walls. The thickness of the aprons shall be 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, the apron thickness need not be greater than 12 inches unless required by design.

3.3.4 CUT-OFF WALLS

Cut-off walls shall be detailed with a minimum thickness of 10 inches. Cut-off walls shall be detailed to extend a minimum of 2 feet below the bottom of the bottom slab or apron or 2 feet below the 500 year scour line, whichever is greater. If cut-off walls are used as structural elements, appropriate reinforcement must be designed and detailed in the plans.

3.3.5 HEAD WALLS

Head walls shall be detailed with a minimum height of 12 inches above the finished ground line and a minimum thickness of 12 inches. Head walls shall extend the full width of the culvert barrel(s).

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

3.3.6 CONCRETE COVER

For cast-in-place box culverts, concrete cover to reinforcing shall be provided in accordance with the *AASHTO LRFD Bridge Design Specifications*. For W/C ratios that are less than or equal to 0.4, the concrete cover modification factor shall be taken as 1.0.

Precast box culverts shall have a clear cover as shown in ASTM C 1433 or ASTM C 1577 as appropriate.

3.4 CAST-IN-PLACE CONCRETE BOX CULVERTS

For culverts with skews greater than 30 degrees, the transverse reinforcing steel shall be designed and detailed perpendicular to the longitudinal reinforcing steel. For lesser skew angles, the transverse reinforcing steel may be designed and detailed parallel to the skew.

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

3.4.1 SLABS

Cast-in-place box culvert top and bottom slabs shall have a minimum thickness of 10 inches.

3.4.2 WALLS

Cast-in-place box culvert walls shall be vertical and shall have a minimum thickness of 8 inches. If the vertical opening dimension of the culvert is greater than 5 feet, a minimum of 5 inches of clearance shall be provided between mats of reinforcing in the walls.

3.4.3 CONSTRUCTION JOINTS

The maximum pouring length of cast-in-place culvert barrel sections shall be limited to 70 feet. Keyed transverse construction joints must be detailed in the barrel(s) as required to meet this limit. The longitudinal reinforcing steel shall be detailed continuous across the joint.

If the volume of cast-in-place concrete exceeds 225 yd^3 in any pour, provide a pouring sequence on the plans. All concrete pours must be completed in less than 5 hours. If a pouring rate greater than 45 yd^3/hr is needed, the plans shall indicate the required pouring rate.

A keyed construction joint shall be detailed 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, a keyed construction joint shall also be detailed between the walls and top slab.

The plans shall specify that cast-in-place concrete in a completed pour must reach a minimum compressive strength of 3 ksi prior to placing new concrete.

3.5 PRECAST CONCRETE BOX CULVERTS

Precast box culvert sections are not allowed 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 will be used for pedestrian traffic.

Monolithically cast box culvert sections shall be specified. Precast concrete split box culvert sections are not permitted.

3.5.1 DESIGN REQUIREMENTS

Precast box culvert sections shall be designed in accordance with ASTM C 1577. For precast culverts having design fill heights greater than 5 feet, the design fill height shall be rounded to the next higher 5 foot increment when using the tabulated design information from ASTM C 1577 or ASTM C 1433.

3.5.2 DETAILING REQUIREMENTS

Precast box culverts shall be detailed in accordance with *SCDOT Standard Drawing* No. 722-305-00 and Section 722 of the *SCDOT Standard Specifications for Highway Construction*. The plans shall require all precast box culverts to be placed on a prepared bed of aggregate (Coarse Aggregate No. 5, No. 56, or No. 57) having a minimum thickness of 6 inches. The aggregate bed must extend the entire width and length of the culvert plus 3 inches beyond the outer walls of the barrel(s).

The plans for precast box culverts shall include details for cast-in-place wing walls, head walls, aprons, cut-off walls, and footings. These cast-in-place elements shall comply with the requirements of the section above entitled “Design and Detailing Requirements” and shall be attached 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). These elements shall be designed to be self-supporting. The adhesive anchors are intended to control differential settlement only.

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.

3.6 PLANS PREPARATION

Culvert plans are typically included within a set of roadway plans and the sheets are numbered using an "S" prefix. The culvert plan sheets shall present the following information:

1. Title Blocks. The title blocks of the culvert sheets shall 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. Location Sketch. A location sketch shall be provided 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 shall be 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,
- top and bottom of footing elevations for floorless culverts,
- boring locations, and
- hydraulic data.

3. Design Information. The design specification and live load shall be indicated in the plans. If shop plans will be required, the plans must include the shop plans submittal information (mailing address and telephone number of designer).

4. Plan View. A plan view shall be provided 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.

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

6. Reinforcing Steel Schedule and Quantities. For each culvert, include a reinforcing steel schedule that lists the reinforcing steel required for the culvert. The schedule shall 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. All quantities required for construction of the culvert (e.g., reinforcing steel, concrete, piling,

temporary shoring, excavation, existing culvert removal, riprap, geotextile, etc.) shall be included. For projects requiring stage construction, reinforcing steel and quantities must be broken down by stage.

7. Boring Logs. Copies of the boring logs shall be included in the plans or proposal.

4.0 PIPE CULVERTS

Pipe culverts shall be designed and installed in accordance with Instructional Bulletin No. 2010-1.

5.0 GEOTECHNICAL DESIGN

All geotechnical design and testing shall comply with the requirements of the *SCDOT Geotechnical Design Manual*, latest version, and the following list of Special Provisions. Geotechnical information provided as part of this RFP is intended for the use in design in accordance with the *SCDOT Geotechnical Design Manual* (GDM). Additional geotechnical investigation by the CONTRACTOR may be necessary depending on final design.

6.0 SEISMIC DESIGN CRITERIA

All bridges shall be designed for seismic considerations in accordance with the SCDOT "Seismic Design Specifications for Highway Bridges", 2008 Edition, Version 2.0 and SCDOT Geotechnical Design Manual, 2010 Edition, Version 1.1. The Operational Classification of all interchange bridges shall be I, except for crossroad bridges, which shall be II. The Use SC Seismic Hazard Map Three-Point ADRS Curves provided in Figure 1. If longitudinal joint restrainers are used, they shall be considered secondary and minimum support lengths shall be provided in accordance with the *SCDOT Seismic Design Specifications for Highway Bridges.*

7.0 REMOVAL AND DISPOSAL OF EXISTING BRIDGES

Remove and dispose of existing bridges and appurtenances in accordance with the *Standard Specifications for Highway Construction* and all applicable laws and regulations. For existing bridges to be removed which have bents in the median or shoulders of I-85, columns and footings

shall be removed in their entirety to prevent conflicts with future construction. If a portion of an existing structure is to be removed while traffic is maintained on the bridge, the structural capacity must be verified for the traffic loading for which the bridge was originally designed.

8.0 BRIDGE DECK DRAINAGE

The bridge deck drainage shall be designed by a hydraulic engineer to ensure that 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.

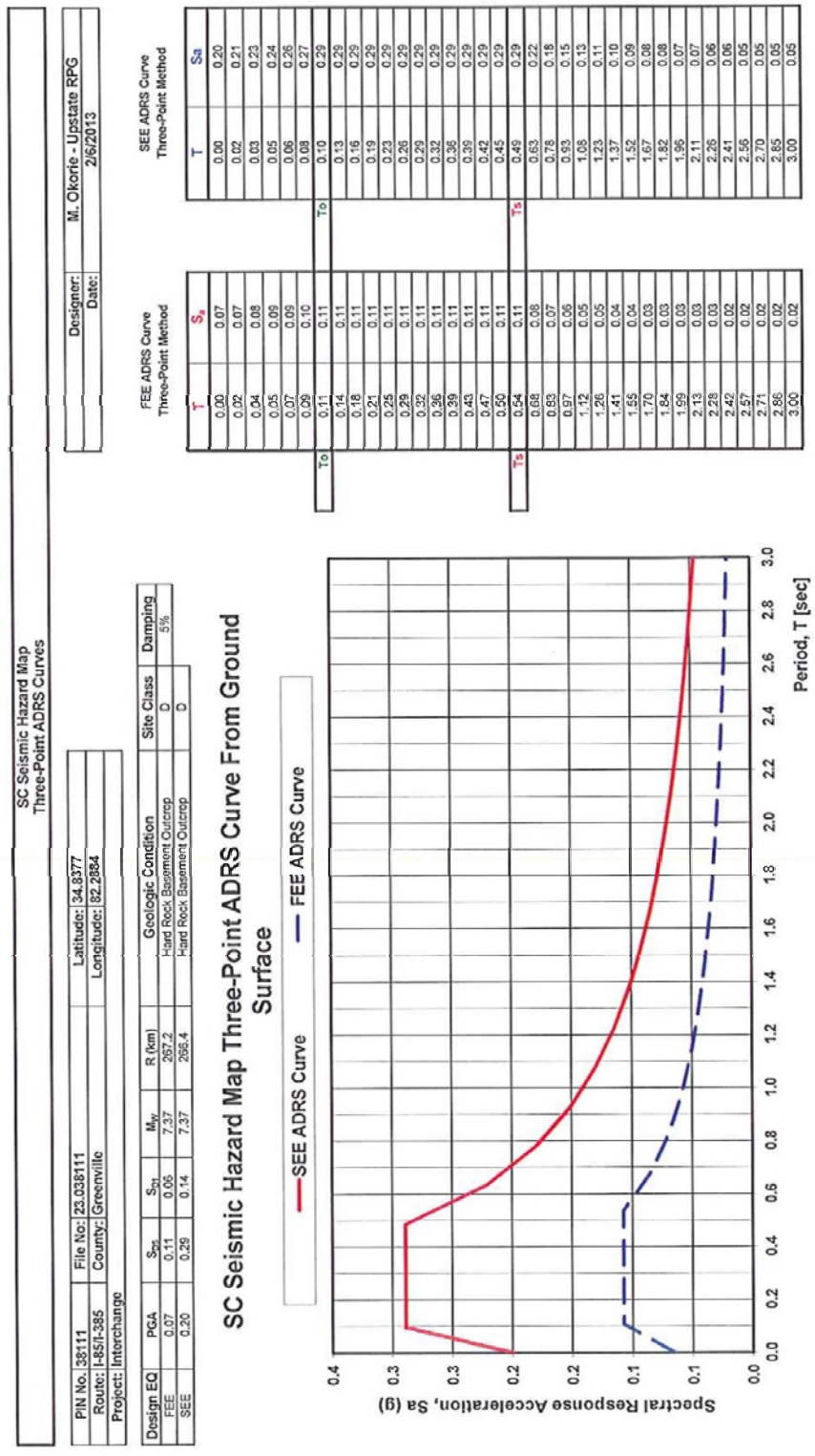

Figure 1: SC Seismic Hazard Map Three-Point ADRS Curves

9.0 BRIDGE LAYOUT

9.1 SPAN ARRANGEMENT

All new bridges constructed shall accommodate a future I-85 typical section, 8 lanes (4 in each direction) as shown in Figure 2.

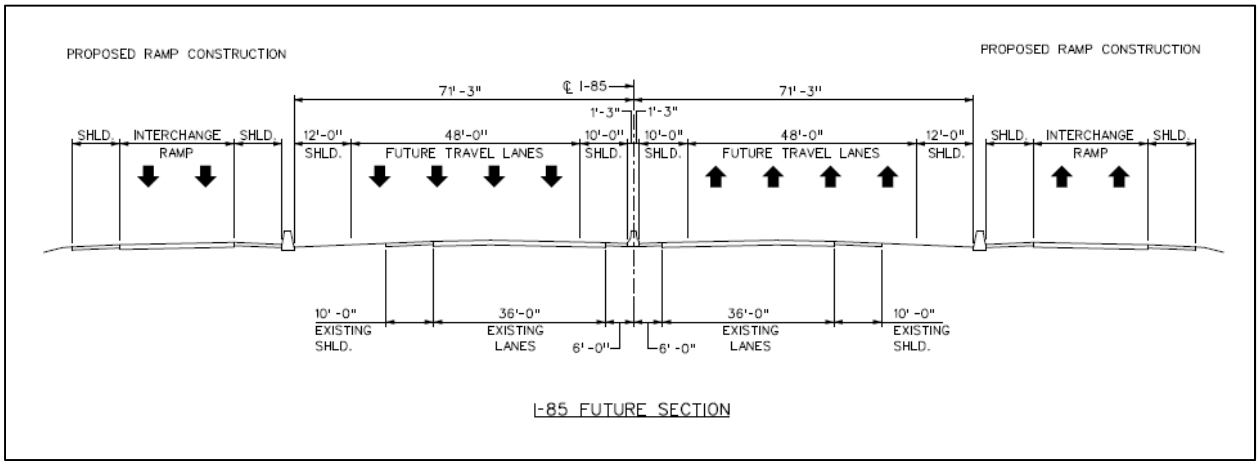

Figure 2: I-85 Future Typical Section

All new bridge bents, abutments, walls, or non-traversable fill slopes shall be located to provide the horizontal clearance required by Figure 13.5B in the *SCDOT Highway Design Manual* (HDM) unless indicated otherwise in this criteria. In instances where this clearance does not satisfy the Clear Zone requirements in Figure 14.3A in the SCDOT HDM, the obstruction shall be protected with barrier or guardrail in accordance with SCDOT Standard Drawings.

At locations where it is practical to place bridge bents or abutments that do not satisfy the SCDOT HDM clear zone requirements, new bridges may accommodate the typical section shown in Figure 3. A design exception has been approved for the reduced 4'-9" I-85 median shoulder width and shoulder width reductions at spot locations on I-85 and adjacent ramps.

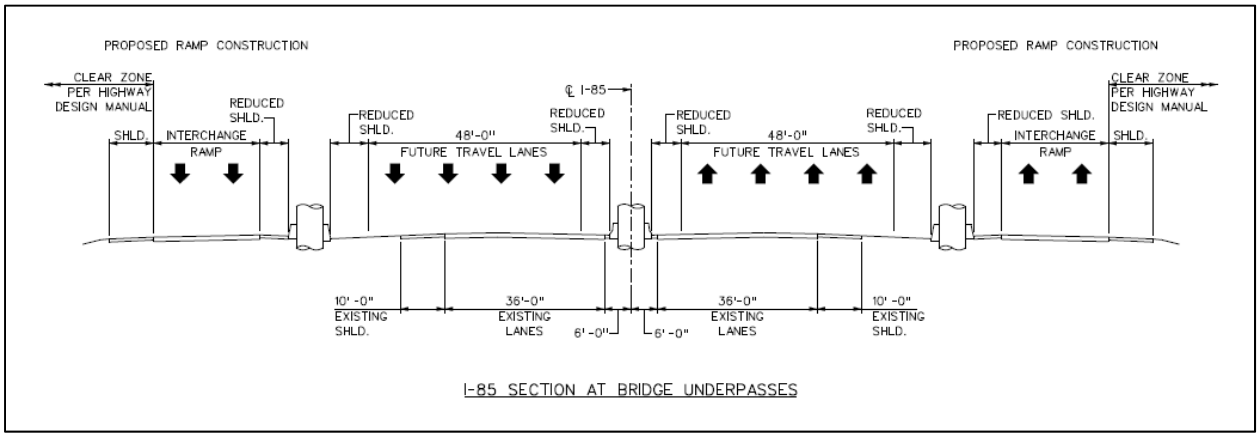

Figure 3: I-85 Future Typical Section at Bridge Underpasses

At the crossing of I-85 under Roper Mountain Road, the new bridge may accommodate the typical section shown in Figure 4.

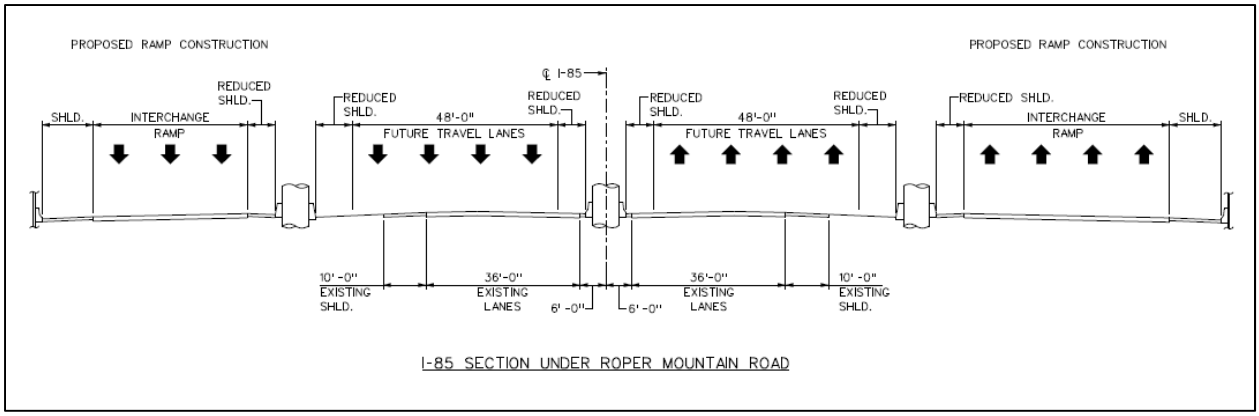

Figure 4: I-85 Future Typical Section under Roper Mountain Road

For bridges over the ramp from I-85 SB to Woodruff Road (I-85 crossing), the bridge length may be based on providing 10-foot minimum shoulders with barrier protection.

All new bridges shall be located to provide vertical clearances in accordance with Section 12.6.3.2 of the SCDOT BDM.

9.2 BRIDGE WIDTH

Unless noted otherwise, the minimum bridge width shall be set to provide the clear roadway width in accordance with SCDOT BDM Section 12.6.1.4 and Exhibit 4a, plus Two – 1'-6" Barrier Parapets and Two – 1 ½" Slab extensions (for Slip Forming the Barrier Parapets).

For the Roper Mountain Road bridge, provide the typical section shown in Figure 5.

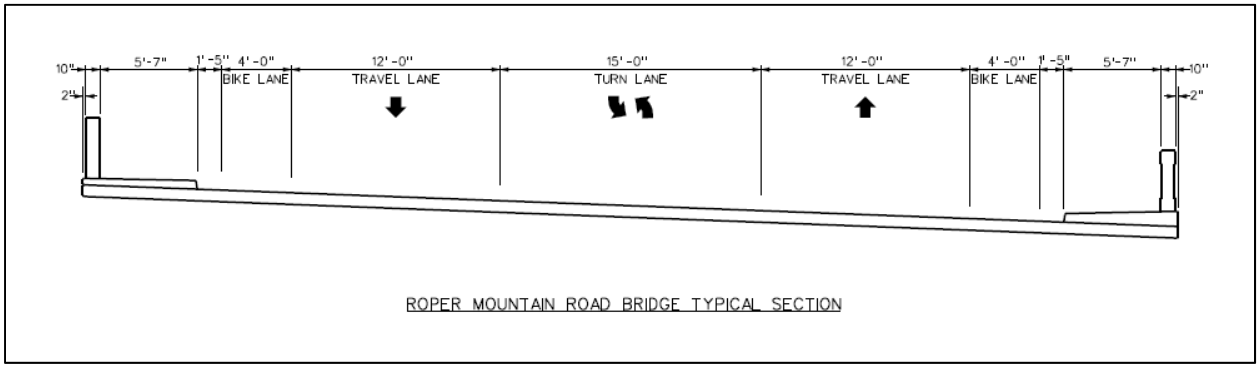

Figure 5: Roper Mountain Road Bridge Typical Section

10.0 BRIDGES OVER RAILROAD AND GARLINGTON ROAD

All bridges over the GE Railroad and Garlington Road shall be designed to satisfy the minimum horizontal and vertical clearance requirements of the SCDOT BDM and railroad requirements outlined in Exhibit 9. All such bridges shall also be designed to accommodate a future widening of Garlington Road. The required clear distance between bridge columns for this widening is 56'-0" per Figure 6.

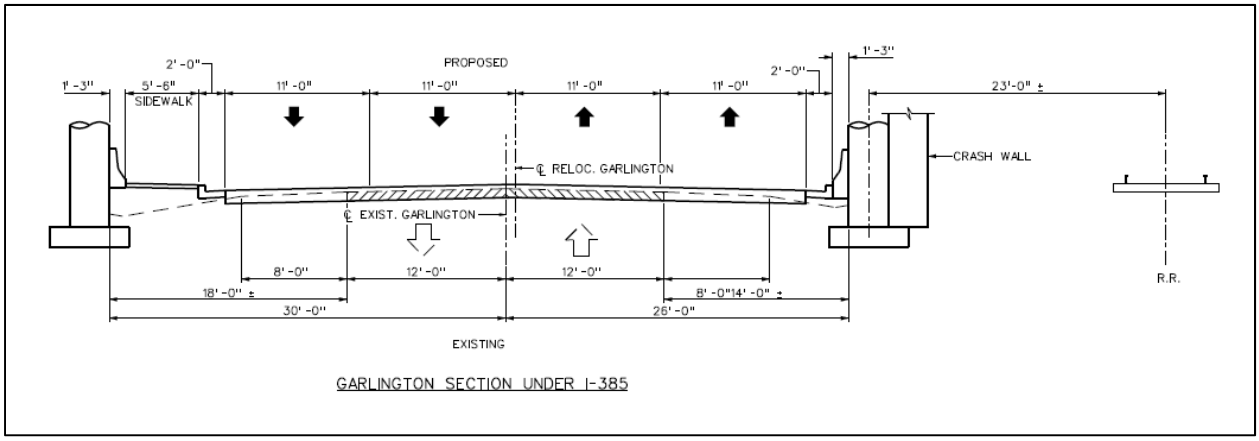

Figure 6: Future Garlington Road under I-385

11.0 WOODRUFF ROAD BRIDGE OVER I-385

It is anticipated that the alignment of the I-385 collector-distributor (CD) ramps will result in the retrofitting of the Woodruff Road bridge over I-385. The minimum section required for the I-385 NB and SB CDs under Woodruff Road is shown in Figure 7. A design exception has been approved for the CD ramp shoulder widths under Woodruff Road.

The CONTRACTOR shall verify the location of the existing piles prior to beginning work. The CONTRACTOR shall sufficiently demonstrate that the retrofitting will not adversely affect the bridge through design and plan submittals. Drilling holes through the deck will not be allowed.

All existing columns shall be protected per SCDOT Standard Drawing No. 805-825-00.

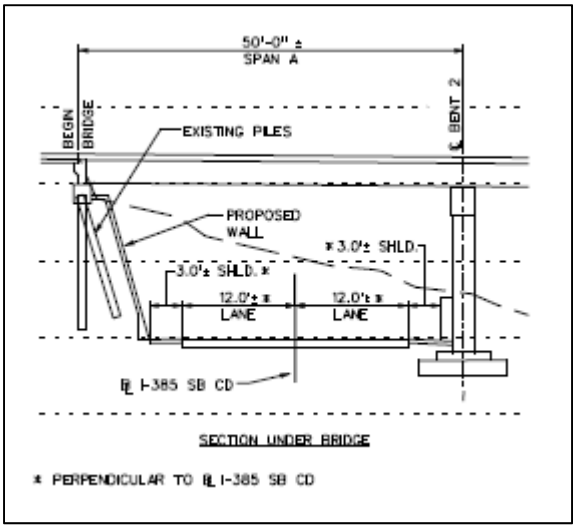

Figure 7: Minimum Section for I-385 SB CD under Woodruff Rd.

(Section for I-385 NB CD opposite hand)

12.0 RETROFIT AND REHABILITATION REQUIREMENTS

Both the I-385 Norhtbound (entire bridge) and Southbound (retained portion) bridges over the GE Railroad and Garlington Road will require rehabilitation.

12.1 BRIDGE DECK REHABILITATION/REPLACEMENT

The entire Northbound bridge deck and the portion of the Southbound bridge deck which is to be retained shall be rehabilitated using one of the two options below:

1. The existing bridge deck shall be rehabilitated by performing partial removal of the bridge deck concrete (minimum of 3.25 inches, maximum of 3.75 inches), retaining the existing top mat of reinforcing, and providing a latex modified concrete overlay. The rehabilitated deck thickness shall match the existing deck thickness. This work shall be performed in accordance with Section 726 of the Standard Specifications.
2. Completely remove the concrete bridge deck, retaining the existing reinforcing steel and provide an in-kind bridge deck replacement with Class 4000 concrete. New barrier parapet shall be reconstructed on the new bridge deck. This work shall be performed in accordance with section 702 of the Standard Specifications.

12.2 EXPANSION JOINT REPLACEMENT

Bridge expansion joints shall be replaced with a new expansion joint. Bridge joint type selection and design shall be in accordance with the SCDOT Bridge Design Manual and shall be constructed in accordance with applicable Standard Drawings and Standard Specifications. Joint replacement will require complete bridge deck replacement in the areas immediately adjacent to the joint.

12.1.3 BEARING REPLACEMENT

Replace the rocker bearings with elastomeric bearings. If traffic is on the bridge during the replacement, the bridge may be raised a maximum of ¼ inch to permit the removal of the existing bearings and installation of the new elastomeric bearings. Where the existing bridge is to be widened, perform bearing replacement prior to connecting the new and existing superstructures. Remove and discard existing bearing components and replace with steel bearing plates and elastomeric pads. The bearing replacement shall be designed and detailed to facilitate replacement while maintaining traffic. The elastomeric bearing shall be designed in accordance with the Bridge Design Manual.

12.1.4 REPAINTING OF EXISTING STEEL BEAMS

Existing steel beams shall be cleaned and repainted in accordance with Section 710 of the Standard Specifications.

12.1.5 SPALL REPAIR FOR EXISTING SUBSTRUCTURE

Concrete spalls on the existing substructures shall be repaired in accordance with Special Provision (XX).

13.0 MISCELLAENOUS CRITERIA

13.1 BRIDGE LOCATION AND TRAFFIC INFORMATION

The Design ADT and Truck % that is applicable to the roadway layout in the approved environmental documentation is shown in Table 1. The location of all bridges referred to in Table 1 is shown in Figure 8.

Bridge	Route Over	Route Under	Design ADT for Route Over	% Trucks
1	I-385 SB CD	Garlington Rd. and GE Co. Railroad	38,780	18%
2A	I-385 SB	Garlington Rd. and GE Co. Railroad	36,410	18%
2B	I-385 NB	Garlington Rd. and GE Co. Railroad	36,410	18%
3	I-385 NB CD	Garlington Rd. and GE Co. Railroad	28,765	18%
4	Ramp 8	Garlington Rd. and GE Co. Railroad	13,695	18%
5	Ramp 1A	I-85, I-385 and Interchange Ramps	16,185	18%
6	Ramp 4B	I-85, I-385 and Interchange Ramps	10,225	18%
7	Ramp 2B	I-85 and Interchange Ramps	10,650	18%
8	Ramp 3A	I-85 and Interchange Ramps	8,595	18%
9	Ramp 2A	I-85 and Interchange Ramps	20,800	18%
10A	Ramp 2	Ramp 1B	10,010	18%
10B	Ramp 4B	Ramp 1B	10,225	18%
11	Roper Mountain Rd.	I-85 and Interchange Ramps	19,000	0.7%
12A	I-385 SB	I-85 and Interchange Ramps	36,410	18%
12B	I-385 NB	I-85 and Interchange Ramps	49,240	18%
13	Woodruff Rd.	I-385 and I-385 NB &	48,380	15%

		SB CDs		

Table 1: Design ADT and % Trucks

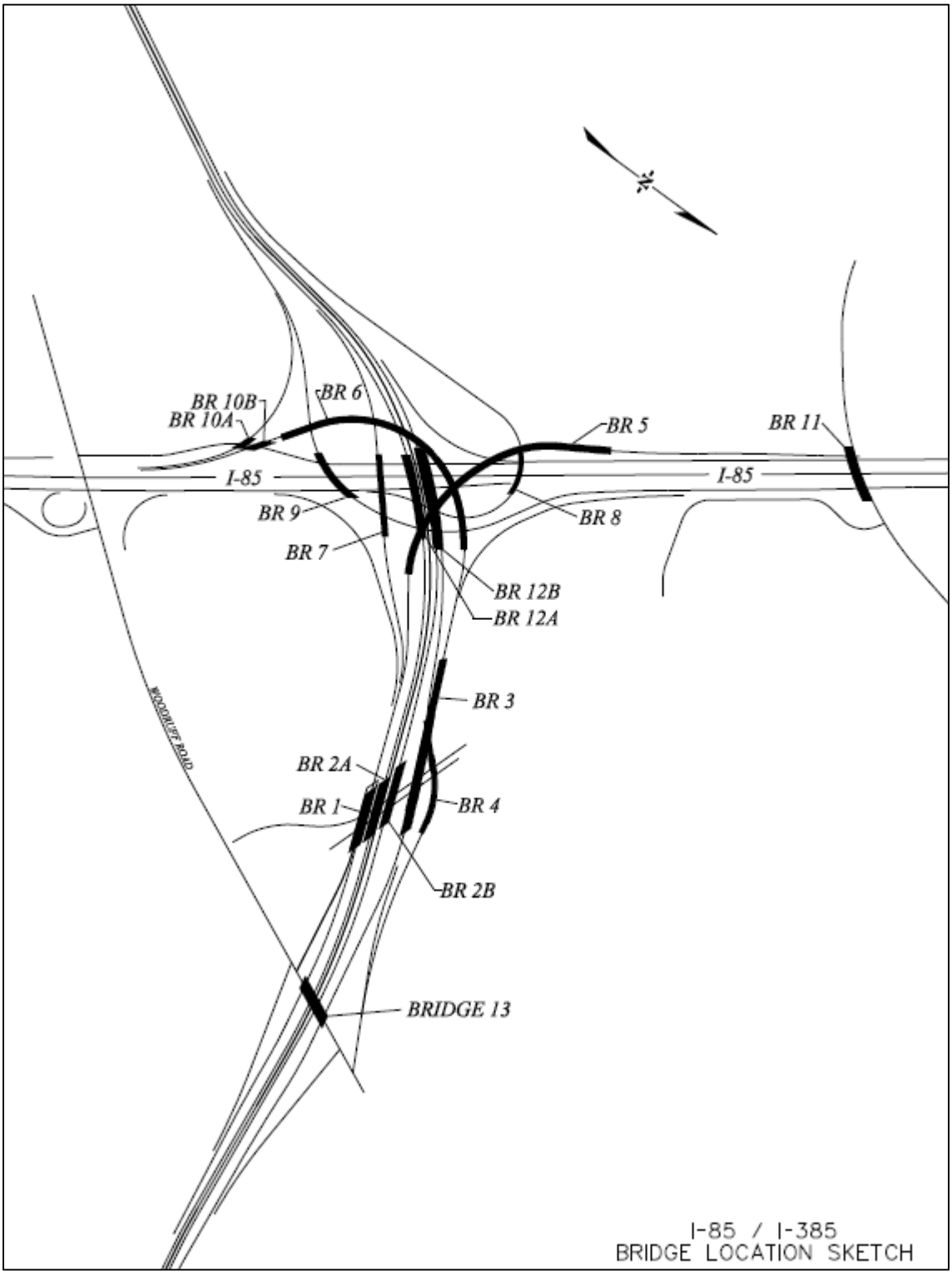

Figure 8: Bridge Location Sketch

EXHIBIT 4c

PAVEMENT DESIGN CRITERIA

I-385 South of I-85

Mainline Pavement: Construct a concrete pavement for the mainline travel lanes and shoulders. In all cases, construct a plain jointed concrete pavement with the following characteristics:

Thickness:	13”
Transverse Joint Spacing:	15’
Transverse Load Transfer:	1.5” dowels, 18” long, spaced 12” c-c, mainline only
Longitudinal Joint Spacing:	Maximum 15’
Longitudinal Reinforcement:	#5 tie bar, 30” long, 30” c-c
Surface Texture:	Mainline – Diamond Ground Shoulders – Heavy Broom or Turf Drag
Joint Sealant:	Silicone, 3/8” wide longitudinal and transverse
Nominal Compressive Strength:	4000 psi

Options for the pavement structure are as follows and may be alternated throughout the project as desired. However, under no circumstance shall the nominal thickness of the concrete pavement itself be varied transversely across the finished lanes. The intent of this requirement is to avoid construction of a “bathtub” section or otherwise trap water underneath the concrete pavement. For all options, construct an expansion joint of a design acceptable to the Department when abutting bridges or other structures.

Option 1: Mill the existing mainline pavement up to 3”. Perform 6” full-depth asphalt patching on areas that are visibly deformed. Where further grade change is desired, overlay with Asphalt Surface – Type C as necessary. Place concrete pavement as described above. The existing shoulders may be white-topped if not milled. However, if any milling is necessary in the shoulders, Option 2 is required for the base under the shoulder. The 4’ wide shoulder in the median of I-385 must be removed and replaced with Option 3 under all circumstances.

Option 2: Mill the existing mainline pavement from 3” to 6”. Reclaim the existing base to a depth of 10” in accordance with Section 306 of the Standard Specifications at a cement rate approved by the Resident Construction Engineer and overlay with 200 psy of Asphalt Surface Type C. Place concrete pavement as described above. Use this option for existing shoulders if any milling is required except for the 4’ wide shoulders in the median of I-385 as noted in Option 1.

Option 3: Remove existing pavement or grade new location as appropriate. Modify the existing subgrade to a depth of 6” to create Cement Modified Subbase. Place at least 6” Cement Stabilized Aggregate Base or 600 psy Asphalt Base Type A, overlay with 200 psy Asphalt Surface Type C, and concrete pavement as described above.

For new location related to tie-ins to asphalt pavement, use the following pavement structure. Modify the existing subgrade to a depth of 8” to create Cement Modified Subbase. Place 1350

psy Asphalt Base Type A, 200 psy Asphalt Intermediate Type B, 200 psy Asphalt Surface Type A and 140 psy Open Graded Friction Course as described under I-85 and I-385 North of I-85 new location pavement below. All lanes transversely must use the same pavement type; PCC pavement lanes may not be placed adjacent to asphalt pavement lanes such that a longitudinal joint that may be crossed by traffic is created.

Where flexible tie-ins to I-85 are needed, mill off the existing OGFC. Overlay the existing pavement with at least 200 psy Asphalt Intermediate Type B, 200 psy Asphalt Surface Type A, and 140 psy Open Graded Friction course as described below. To meet the existing asphalt pavement grade, perform two variable milling operations up to 3" in depth to smoothly tie in the intermediate course for the first operation and the surface and OGFC courses in the second.

A portion of the existing Northbound I-385 outside shoulder south of I-85 has recently been constructed 12' wide with concrete in order to accommodate the current project. Where the current 12' concrete shoulder will be utilized as a travel lane, remove the existing milled in rumble strip by diamond grinding the shoulder and adjacent travel lane a maximum depth of three quarters of one inch (3/4") in order to provide the correct cross slope and to remove the milled in rumble strips. The existing 10' southbound concrete shoulder on Southbound I-385 south of I-85 shall be removed where required by design in order to provide a 12' travel lane

Ramp Pavement: For new ramps, construct mainline concrete pavement for the full width of the ramp, including shoulders. Carry the concrete ramp pavement to the gore area. For retained asphalt ramp pavement, perform full-depth patching to a depth of at least 8" in the existing pavement in areas where the pavement is visibly distorted and/or has high severity cracking. Mill the existing pavement 2", then overlay with 400 psy Asphalt Intermediate Type B, 200 psy Asphalt Surface Type A and 140 psy Open Graded Friction Course as described below.

Temporary Pavement: Design of temporary pavement, including using the existing shoulder to carry the mainline traffic, is at the discretion of the Design-Build Team. If temporary pavement is to be incorporated in the final pavement structure, it must minimally meet the structural requirements given in the various options above. Additionally, the pavement must be free of cracks and distortion prior to whitetopping. 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 with the PCC pavement. Because of the fragility of the existing pavement, the use of the existing pavement for any traffic other than minimally necessary construction traffic after milling to any depth is not prohibited, but is strongly discouraged and undertaken at the Design-Build Team's risk.

I-85 and I-385 North of I-85

New Location Pavement: Any of the asphalt mainline and shoulder pavement structure alternatives shown on the following pages are acceptable for pavement on new location. Shoulder and mainline designs may be mixed between alternatives. However, mainline

pavement should have the same structure for the full width of the travel lanes unless otherwise approved by the Department. Ramp pavement should use a mainline structure alternative for the full width of the ramp, including shoulders.

In all alternatives, place 140psy of OGFC over all travel lanes and shoulders. Carry the OGFC to a width of 4 feet over shoulders that are 4 feet or greater in width and to the full width for shoulders less than 4 feet in width. For shoulders adjacent to barrier walls, carry the OGFC to the face of the drop inlets or 4 feet, whichever is less. For system interchange ramps with design speeds of 45 mph or greater and that do not lead to a stop or signal, carry the OGFC for the full length of the ramp. For ramps that do lead to a stop or signal, the OGFC may be terminated just beyond the gore in a neat, smooth transverse joint using variable milling.

Existing Pavement: For I-85 Southbound from Milepost (MP) 51.2 to MP 53.1 and I-85 Northbound from MP 47.3 to MP 56.4, mill 3 inches in areas with OGFC and 2 inches where there is no OGFC. Correct the cross slope with variable milling up to 1 inch and Asphalt Surface Type E for correction up to 2 inches and Asphalt Surface Type B for greater correction. Overlay with 200 psy Surface Type A and 140 psy OGFC as stated above. For I-85 Southbound between MP 51.2 and the southern termini of the project, micromill the existing OGFC and replace with 140 psy OGFC as stated above. For I-385 north of I-85, micromill any existing OGFC and overlay with 140 psy OGFC as stated above. Combined uniform and variable milling depths may be increased up to one additional inch in the vicinity of low clearances as necessary to maintain minimal clearances.

Where flexible tie-ins to I-385 north of the interchange are needed, mill off existing OGFC. Overlay the existing pavement with at least 200 psy Asphalt Intermediate Type B, 200 psy Asphalt Surface Type A, and 140 psy Open Graded Friction course. To meet the existing asphalt pavement grade, perform two variable milling operations up to 3” in depth to smoothly tie in the intermediate course for the first operation and the surface and OGFC courses in the second.

Paving Beyond Shoulder Adjacent to Barrier

In areas where pavement is required between the outside paved shoulder and barrier wall along I-85 or I-385 mainlines, construct pavement structure consisting of 150 PSY Asphalt Surface Type D and 6 inches of Graded Aggregate Base Course. See Exhibit 4a for information regarding areas where this additional pavement is required.

Roper Mountain Road/Chrome Drive (S-1112)

New Location: Construct new location with either of the pavement design alternatives shown. Use variable milling 0 to 2 inches over 200 feet to tie into existing pavement.
Existing Location: Where indicated, overlay the existing pavement with 200 psy Asphalt Intermediate Type B and 200 psy Asphalt Surface Type B. The existing pavement may be milled up to 2 inches prior to overlay at the contractor’s discretion.

Whispering Hollow Road (S-1123)

New Location: Construct new location using Asphalt Surface Triple Treatment Type 1 or 2 and 6 inches Graded Aggregate Base. Full depth patch and place surface treatment over existing pavement.

Woodruff Road (SC 146)

New Location: Construct new location using any of the pavement design alternatives shown.

Existing Location: Where indicated, mill the existing pavement 2 inches and replace the milled material with 200 psy Asphalt Surface Type B.

I-385/85 Mainline and Ramp Asphalt Pavement Design Alternatives

IM1	IM2	IM3	IM4
200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 1725 psy Asphalt Base Type A	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 1350 psy Asphalt Base Type A 8 inches Cement Modified Subbase	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 1250 psy Asphalt Base Type A 10 inches Cement Modified Subbase	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 1050 psy Asphalt Base Type A 12 inches Graded Aggregate Base

IM5	IM6	IM7	IM8
200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 1150 psy Asphalt Base Type A 10 inches Graded Aggregate Base	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 1275 psy Asphalt Base Type A 8 inches Graded Aggregate Base	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 675 psy Asphalt Base Type A 10 inches Cement Stabilized Aggregate	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 875 psy Asphalt Base Type A 8 inches Cement Stabilized Aggregate

IM9	IM10	IM11	IM12
200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 800 psy Asphalt Base Type A 10 inches Graded Aggregate Base 8 inches Cement Modified Subbase	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 900 psy Asphalt Base Type A 8 inches Graded Aggregate Base 8 inches Cement Modified Subbase	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 300 psy Asphalt Base Type A 10 inches Cement Stabilized Aggregate 8 inches Cement Modified Subbase	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 600 psy Asphalt Base Type A 8 inches Cement Stabilized Aggregate 6 inches Cement Modified Subbase

I-385/85 Shoulder Asphalt Pavement Design Alternatives

IS1	IS2	IS3	IS4
200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 950 psy Asphalt Base Type A	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 600 psy Asphalt Base Type A 8 inches Cement Modified Subbase	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 450 psy Asphalt Base Type A 10 inches Cement Modified Subbase	200 psy Asphalt Surface Type A 425 psy Asphalt Intermediate Type B 12 inches Graded Aggregate Base

IS5	IS6	IS7
200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 350 psy Asphalt Base Type A 10 inches Graded Aggregate Base	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 450 psy Asphalt Base Type A 8 inches Graded Aggregate Base	200 psy Asphalt Surface Type A 200 psy Asphalt Intermediate Type B 9 inches Cement Stabilized Aggregate

Roper Mountain Road over I-85/Chrome Drive

RM1	RM2
200 psy Asphalt Surface Type B 200 psy Asphalt Intermediate Type B 700 psy Asphalt Base Type A	200 psy Asphalt Surface Type B 200 psy Asphalt Intermediate Type B 7 inches Cement Stabilized Aggregate

Woodruff Road

W1	W2	W3
200 psy Asphalt Surface Type B 200 psy Asphalt Intermediate Type B 1050 psy Asphalt Base Type A	200 psy Asphalt Surface Type B 200 psy Asphalt Intermediate Type B 650 psy Asphalt Base Type A 8 inches Cement Modified Subbase	200 psy Asphalt Surface Type B 200 psy Asphalt Intermediate Type B 600 psy Asphalt Base Type A 10 inches Cement Modified Subbase

W4	W5	W6
200 psy Asphalt Surface Type B 200 psy Asphalt Intermediate Type B 450 psy Asphalt Base Type A 10 inches Graded Aggregate Base	200 psy Asphalt Surface Type B 200 psy Asphalt Intermediate Type B 600 psy Asphalt Base Type A 8 inches Graded Aggregate Base	200 psy Asphalt Surface Type B 200 psy Asphalt Intermediate Type B 10 inches Cement Stabilized Aggregate

EXHIBIT 4d - Part 1

SIGNING AND PAVEMENT MARKING DESIGN CRITERIA

GENERAL PROVISIONS FOR PERMANENT PAVEMENT MARKINGS

Pavement marking work on this project consists of preparing detailed pavement marking plans and applying appropriate markings for the length of the project. All I-85 and I-385 mainline edge lines and lane lines shall be to interstate standards as detailed in the Standard Drawings. Lane lines and edge lines shall be 6 inches in width. Exit and entrance gore markings shall be 12 inches in width. Markings on Roper Mountain Rd. shall be 4 inches as detailed in the Standard Drawings. 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 all concrete surfaces. Thermoplastic markings shall be used on all asphalt surfaces.

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 with be accepted based on manufacturer's certifications.

3. PREFORMED PATTERNED TAPE (T-1) PAVEMENT MARKINGS (CONCRETE SURFACES):
All preformed tape markings installed on the interstate mainline, crossing routes or any 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.

GENERAL PROVISIONS FOR PERMANENT SIGNING

Signing work on this project consists of preparing detailed signing plans; and fabricating, furnishing, and erecting new ground mounted and overhead mounted signs, breakaway posts, overhead sign structures with LED lighting, refurbish and modify existing overhead 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-85 from 2,200 ft. south of Old Sulphur Rd. to 400 ft. north of Pelham Rd. and along I-385 1,200 ft. south of Butler Rd. to 2,200 ft. north of Roper Mountain Rd. Note that this work is beyond the official project limits.

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 the SCDOT.

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.

3. SPECIAL INSTRUCTIONS TO THE CONTRACTOR:

Sheets showing the preliminary signing scheme for the mainline of I-85 and the I-385 mainline major guide signs are included in Attachment B of the RFP. These plans do not include the regulatory, warning and guide signs for the I-85 and I-385 ramps or Roper Mountain Rd.. However, these signs are to be included in this contract in accordance with the 2009 MUTCD and subject to review by SCDOT.

If there are discrepancies in the preliminary plans and the scheme described in these Provisions, the scheme as noted in these Provisions shall take precedence.

Any realignment modifications in roadway plans that would alter the signing scheme shown in these Provisions shall be submitted to the Director of Traffic Engineering for approval.

All extruded multiple panel signs (ground mounted and overhead mounted) on the interstate mainline, ramps and crossing routes shall have 16"/12" upper case/lower case Clearview 5W copy for installations requiring new supports or structures and 5WR where existing supports are to be retained, unless otherwise noted. The Contractor shall utilize SignCAD software to develop all sign layouts. A complete as built set of signing plans, including SignCAD copies of all layouts, should be submitted to the Director of Traffic Engineering at the conclusion of the project.

Maintenance walkways, as described in Section 657.1.2 of the Standard Specifications, shall be included in the design and construction of all overhead structures.

Guard rail should be included for all overhead uprights located within the clear zone, typically 46' from the edge of travel way.

Sign lighting systems shall be LED Luminaires. All references to mercury vapor of halide luminaire in the Sign Lighting Systems Supplemental Specifications shall be revised to LED Luminaires. See Special Provision entitled "Refurbishing Sign Lighting Systems" in Exhibit 5 for details and requirements for converting existing lighting systems on sign structures which are to be retained.

New overhead sign structures, overhead signs and ground mounted signs will be required on this project. A general plan view description of the overhead structures and signs and the extruded panel signs to be ground mounted on I-beam breakaway supports is included in Attachment B. All sign locations given are approximate.

EXHIBIT 4d - Part 2

WORK ZONE TRAFFIC CONTROL DESIGN CRITERIA

TRAFFIC CONTROL

The CONTRACTOR shall execute the item of Traffic Control as required by the following Design Criteria, the Standard Specifications, the plans, the Standard Drawings for Road Construction, the Special Provisions, all supplemental specifications, the MUTCD, and the Engineer.

GENERAL REGULATIONS

These criteria 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 design/staging 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 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 closures 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 mounted on portable sign 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.

LANE CLOSURE RESTRICTIONS

The lane closure restrictions stated below are project specific, for all other restrictions, see supplemental specification, “Restrictions”, dated January 3, 2013.

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.

On Interstates 85 and 385, the Department prohibits lane closures on northbound I-85 Monday through Thursday from 7:00 am to 7:00 pm, on Fridays from 7:00 am to 8:00 pm, on Saturdays from 9:00 am to 7:00 pm, and on Sundays from 10:00 am to 9:00 pm. The Department prohibits lane closures on southbound I-85 Monday through Wednesday from 7:00 am to 7:00 pm, on Thursdays from 7:00 am to 8:00 pm, on Fridays from 7:00 am to 9:00 pm, on Saturdays from 9:00 am to 7:00 pm, and on Sundays from 10:00 am to 9:00 pm.

HOURLY LANE CLOSURE PROHIBITIONS (NORTHBOUND)	**HOURLY LANE CLOSURE PROHIBITIONS** (SOUTHBOUND)
MON-THU: 7A-7P	**MON-WED: 7A-7P**

FRI: 7A-8P	**THU: 7A-8P**
SAT: 9A-7P	**FRI: 7A-9P**
SUN: 10A-9P	**SAT: 9A-7P**
	SUN: 10A-9P

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 the 15 to 30 foot clear zone based upon the roadway speed limit 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 "2007 Standard Specifications for Highway Construction" 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.

SHOULDER CLOSURE RESTRICTIONS

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.

On Interstates 85 and 385, 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 northbound I-85 Monday through Thursday from 7:00 am to 7:00 pm, on Fridays from 7:00 am to 8:00 pm, on Saturdays from 9:00 am to 7:00 pm, and on Sundays from 10:00 am to 9:00 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 southbound I-85 Monday through Wednesday from 7:00 am to 7:00 pm, on Thursdays from 7:00 am to 8:00 pm, on Fridays from 7:00 am to 9:00 pm, on Saturdays from 9:00 am to 7:00 pm, and on Sundays from 10:00 am to 9:00 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.

MOBILE OPERATIONS

A mobile operation moves continuously at all times at speeds 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.

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.

Scheme B	**N.B. I-85 and N.B. I-385**	**384 Square Feet**
	S.B. I-85 and N.B. I-385	**384 Square Feet**
Total		**768 Square Feet**

ADDENDUMS

(Addendums to the "2007 Standard Specifications for Highway Construction")

(A) 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 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 that the flagger does not stop traffic, cause traffic to change lanes, or affect traffic in any manner. The CONTRACTOR's vehicles may not disrupt the normal flow of 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 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 that these flaggers do not stop traffic, cause traffic to change lanes, or affect traffic in any manner. The CONTRACTOR's vehicles may not disrupt the normal flow of 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)

(B) 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.

(C) <u>Category I Traffic Control Devices</u> (Section 603)

****** (Effective on all projects let to contract after May 1, 2010) ******

<u>Sub-section 603.2.2 Oversized Traffic Cones (paragraph 6)</u>

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.

<u>Sub-section 603.2.3 Portable Plastic Drums (paragraph 3)</u>

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.

(D) Category II Traffic Control Devices (Section 604)

******** ***(Effective on all projects let to contract after May 1, 2012) ******

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.

(E) 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.

(F) 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.

(G) Truck-Mounted Attenuator (Sub-section 605.4.2.2)

Sub-section 605.4.2.2 Truck-Mounted Attenuators (paragraph 6)

Attach each truck-mounted attenuator to the rear of a truck with a minimum gross vehicular weight (GVW) of 15,000 pounds (actual weight). 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 and shall not protrude from the steel structure in any manner.

(H) Trailer-Mounted Changeable Message Signs (Sub-section 606.3.2)

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.

(I) 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.

Due to excessive wear resulting from high volume traffic and construction activities, replace and reapply all pavement markings on the I-85 and I-385 mainline travel lanes, on and off ramps and adjacent collector-distributor roadways at time intervals not greater than 90 days and as directed by the RCE.

When utilizing temporary fast dry waterborne paint, apply the paint at a wet film thickness not less than 15 mils. When applying a temporary fast dry waterborne paint to a newly

installed hot mix asphalt pavement course, reapply the temporary fast dry waterborne paint within 7 to 10 days after the initial application of the pavement markings unless otherwise directed by the RCE.

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.

(J) <u>Flagging Operations</u> (Sub-section 610.4.1)

<u>Sub-section 610.4.1.1 Flagging Operations (paragraph 1)</u>

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.

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.

(K) 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.

STAGING

TRAFFIC CONTROL RESTRICTIONS (Project Specific)

All construction and work vehicles over six tires shall enter and exit a right shoulder or median work area during the presence of lane closures. At no time will these vehicles be permitted to enter and exit these work areas without the presence of active lane closures. Shoulder closures are unacceptable and insufficient methods for control of traffic at ingress / egress areas for these vehicles.

The presence of acceptable grade elevation differences less or equal to 1" in milled areas or less than or equal to 2" in paved areas adjacent to a travel lane open to traffic are prohibited during weekends from 8:00 am Friday to 9:00 pm Sunday unless otherwise directed by the Engineer. When necessary, the weekend restriction may be extended due to the proximity of a holiday as directed by the Engineer.

The CONTRACTOR shall have no more than 72 hours to eliminate any grade elevation differences within or adjacent to the travel lanes of I-85. 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 CONTRACTOR may conduct these work activities under lane closures with lengths up to but not greater than 4 miles. The Contractor shall comply with the 3 mile length restriction for lane closures for all work activities other than the asphalt paving operations.

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 Engineer. 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.

All construction and work vehicles over six tires shall enter and exit a right shoulder or median work area during the presence of lane closures. At no time will these vehicles be permitted to enter and exit these work areas without the presence of active lane closures. Shoulder closures are unacceptable and insufficient methods for control of traffic at ingress / egress areas for these vehicles.

EXHIBIT 4d - Part 3

TRAFFIC SIGNAL DESIGN CRITERIA

S.C. FILE NO:	PROJECT NO:	COUNTY
23.038111	IM23(009)	Greenville

1. **LIST OF TRAFFIC SIGNALS WITHIN PROJECT**

Intersection No.	Intersection Name	Description of Signal Work
1	Woodruff Rd @ I-385 NB	Full signal rebuild - span wire
2	Woodruff Rd @ I-385 SB	Full signal rebuild - span wire
3	Woodruff Rd @ Garlington/Miller	Full signal rebuild - span wire
4	Woodruff Rd @ Market Place Dr	Full signal rebuild - mast arms
5	Woodruff Rd @ Carolina Point Pkwy	Full signal rebuild - mast arms
6	Woodruff Rd @ I-85 NB	Full signal rebuild - span wire
7	Woodruff Rd @ I-85 SB	Full signal rebuild - span wire
*	Woodruff Rd btwn I-85 SB and I-385 NB	Fiber Interconnect between all 7 signals
*	Woodruff Rd btwn Ketron Ct and SC 14	Synchro Green Traffic Adaptive Signal System installation

2. **PROJECT DESCRIPTION**
   a. This Project is a Design-Build construction project and involves the signal construction of ____ intersections along Woodruff Road (SC 146) in and around the city of Greenville, South Carolina. The intersections involved are shown on the above "List of Traffic Signals within Project".
   b. Specific Description of the signal work:

Signal Scope
Rebuild 7 traffic signals utilizing black powder coated (over galvanized) steel poles with span wire for existing span wire configurations and black powder coated (over galvanized) steel poles with mast arms for existing mast arm configurations, including new cabinet/controller, signal heads, signal cable, and overhead signs; Install pedestrian treatments in accordance with SCDOT policy. Fiber optic cable connecting traffic signals is existing. Signal design should include re-running fiber optic cable along section affected by construction project to reconnect all 17 traffic signals in signal system. Controller at Woodruff Rd & I-85 NB currently operates 2 intersections, NB ramp and Carolina Point Parkway. Signal design should separate out these 2 intersections with separate signal controllers.

Synchro Green Traffic Adaptive Signal System
Install Enterprise version of Synchro Green traffic adaptive software for the 17 signals in the Woodruff Road signal system, prior to and during construction of I-385/I-85 ramps. Temporary stop bar detection shall be utilized for the 7 signals affected by the construction project, for ease of varying detection zones during the various phases of traffic control Install permanent stop bar detection at each of the 17 signals; Two signals on Woodruff Rd @SC 14 and @Ketron Ct) shall have flush mounted detection on the mainline approaches in each lane, at the stop bar, in accordance with requirements below. Four signals (Woodruff Rd @I-385 NB, @I-385 SB, @I-85 NB, @I-85 SB) shall have flush mounted detection on both the mainline approaches and the side street approaches in each lane, at the stop bar, in accordance with requirements below. Detection at the other signals shall be designed to accommodate needed information for Synchro Green Adaptive Signal System, as indicated below.
• Stop bar detection – Stop bar detection is required on every lane on every approach where adaptive is installed. Each detector must have a separate input channel into the controller. The stop bar detectors are typically placed near the stop bar and are small enough to pick up gaps between vehicles. Typically an equivalent loop size of 6'x15' works well. Stop Bar Detection can consist of inductive loops, video detection, and flush mounted wireless detection.
• Advanced detection – Advanced detection is required on the mainline through lanes only. Each detector should be approximately 6'x6' and each detector should be placed on a separate input channel into the controller. The advanced detectors should be placed between 250'-500' upstream of the intersection stop bar. Where intersection spacing is less than 1000', advanced detection is not required. Advanced Detection can consist of inductive loops or flush mounted wireless detection.

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:

103.1 Mobilization

- ◯ Work Order Contract: Includes all necessary mobilization items for one work order and shall be paid one time per work order. Once work order includes work at one traffic signal. If installing fiber or other communications, one work order would not exceed 2500 linear feet of fiber.
- ◯ Design-Bid-Build Contract: Includes all work as a lump sum cost.

103.2 Mobilization of Material
675.1 Electrical Conduit
676.1 Fiber Optic Training
676.2 Fiber Optic Test Equipment
677.1 Electrical Cable
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
678.1 Detector Loop
680.1 Electric Service
680.2 Splice Box/Junction Box
682.1 Wood Pole
682.2 Back Guy
682.3 Steel Cable
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
688.1 Removal Salvage and Disposal of Equipment and Materials
688.2 Temporary Adjustment of Traffic Signal Equipment and Timings
688.3 Video Detection – Loop Emulation System
688.5 Steel Strain Pole and Foundation
688.6 Concrete Strain Pole
688.7 Controller and 332/336 Cabinet
688.8 Remote Splice/Flasher Cabinet
688.9 Solar Powered Flasher Assembly
689.2 System Integration and Testing
689.3 Traffic Signal System Training
690.1 Steel Pole with Mast-Arm

3. **QUANTITY LISTS**

This is a lump sum design build project. No quantities are provided in this contract.

4. **EQUIPMENT**

a. SCDOT Supplied Equipment - The Department will not furnish any signal equipment..

b. Contractor Supplied Equipment

i. The CONTRACTOR shall furnish all **new** equipment, including incidental items; used, refurbished equipment will not be accepted.

ii. Compatibility

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. 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.

iii. 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 below. 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.

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
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									

iv. 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.

v. 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.

vi. 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.

5. **GENERAL PROVISIONS -**

a. 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.

b. 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.

c. 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.

d. Any deviation from the Plans must be approved by the Engineer.

e. At Project completion all traffic signals/equipment shall be complete and operational, to the satisfaction of the Engineer.

f. The CONTRACTOR will install the traffic signal to provide a completely modern installation.

g. 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).

h. 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.

i. 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.

j. Maintenance during construction
The contractor shall be responsible for the maintenance and operation of all existing signals in the project, 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.*

6. **PERMITS, CODES, LICENSES, & ABILITIES –**

a. 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.

b. 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.

c. 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*****.**

d. 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.

e. 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.

7. **INSPECTION**

a. 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 ELECTRIAL 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.

b. 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.

c. 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.

8. **SIGNAL INTEGRATION**

The following entity will perform integration in accordance with 689.2 System Integration and Testing:

X__ Contractor
___ SCDOT – District ___
___ Other _____

9. **MAINTENANCE OF OPERATION**

a. 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.**

b. 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.

c. 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.

d. 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.

e. 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".

i. Restriction

The CONTRACTOR shall not change the phasing or other operation of a signalized intersection without Departmental approval.

ii. 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.

iii. New Signals

Signals installed by the CONTRACTOR shall be maintained by the CONTRACTOR until the Department formally accepts the work.

iv. 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.**

v. 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.

vi. Repair Time

The CONTRACTOR shall be ON-SITE of the malfunctioning signal for emergency service within the maximum time listed in the following schedule-

Weekdays or Saturday	Maximum Time
6 AM to 6 PM	1 hour
6 PM to 6 AM	4 hours
Sundays or Holidays	
Day or Night	4 hours

vii. 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.

viii. Time Changes (EST/DST)

As part of Maintenance, the CONTRACTOR shall reset all time clocks to local legal time.

ix. 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.

x. 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.

10. **CONTRACT SCHEDULE**

○ This is a "TURN-KEY" project where work is assigned using a work order system. Once work orders have been assigned to the **CONTRACTOR, he** shall furnish the Engineer with a **WEEKLY SCHEDULE** for all active traffic signal construction work orders, 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. This contract is for a __ month period with all work to be completed within __ months of the award. There may be substitutions or additions to this list of signals, due to increased funding or change in priorities.

Or

◉ 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.

11. **PAYMENT FOR MATERIALS ON HAND**

This is a lump sum project, therefore no payment will be made for materials on hand.

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.

13. **FINAL INSPECTION**

a. 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.

b. 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.

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. *For Traffic Signal projects, see the amendment to the Standard Specifications,* ***MAINTENANCE OF TRAFFIC – General Regulations*** *included.*

EXHIBIT 4e

HYDRAULIC DESIGN CRITERIA

1. Hydraulic Design, Stormwater Management, and Sediment and Erosion Control Design Services.

Full and complete Hydraulic, Stormwater Management and Sediment/Erosion Control Studies are required for the drainage structures pertaining to this project.

a) Design standards shall be in accordance with SCDOT's Requirements for Hydraulic Design, May 2009.

b) The CONTRACTOR will perform all aspects of the roadway drainage design and will follow all guidelines for roadway surface drainage and sediment and erosion control. The impacts to the existing hydrology due to the proposed project will be evaluated. Based on this evaluation, design alternatives to control flooding and manage the runoff associated with the project will be examined. Designs will be performed for roadside ditches, storm sewer systems, replacement of all existing drop inlet style median drainage structures, cross line culverts and energy dissipaters as necessary. See Item 2 below and additional information package for a listing of cross line drainage box culverts and pipe culverts that require repair or replacement.

c) Prepare an erosion and sediment control plan for inclusion in the roadway construction plans, outlining methods for the minimizing the amount of erosion and sedimentation during construction and for conformance to the NPDES General Permit. The plan will be detailed on the drainage sheets prepared for the project.

d) The design frequency for all routes shall be based on their classification. Interstate ramps shall be considered primary routes.

e) The drainage design and roadway profile shall take into account the backwater effects of any natural dams or other downstream controls.

f) Alternate pipe shall be specified for this project in accordance with Engineering Directive Memorandum No. 24 Selection of Drainage Pipe for Use in South Carolina, Instructional Bulletin 2009-4 Design and Implementation of Alternate Pipe, SC-M-714 Permanent Pipe Culvert, and SCDOT Standard Drawings. All pipe systems shall specify 13 psi rated joints. CONTRACTOR is only required to submit design calculations for the selected pipe material. All new pipe shall be cleaned of all debris and video inspected prior to acceptance of the project.

g) The CONTRACTOR shall include treatment at outfalls through vegetative practices where possible and utilize structural controls when vegetative practices are not applicable. Downstream water bodies will be evaluated to determine if the outfall discharges to outstanding resource waters, shellfish beds, trout streams or water bodies of significant importance prior to determining if controls are needed. Outfalls will be evaluated for post-construction treatment on a case specific basis against the Maximum Extent Practicable standard. Specific design criteria has been developed for some project outfalls as noted below:

Approximate Location – Left Station 367+00 (I-85)

Pre-versus Post-Construction Flows – No increase in pre-construction versus post-construction flows.

Outlet Velocity – Maximum 3.0 fps discharge velocity for the 10-year storm.

h) The CONTRACTOR shall identify the receiving stream(s) for this project. After this determination has been made, the stream(s) should be cross-checked with SC DHEC's most current 303(d) list (http://www.scdhec.gov/environment/water/tmdl/docs/tmdl_08-303d.pdf) and table for water bodies with approved TMDL's (http://www.scdhec.gov/environment/water/tmdl/docs/tmdl_08sites.pdf) to see if this receiving stream(s) has either an approved TMDL or a soon-to-be TMDL target date. If listed, the CONTRACTOR shall provide the necessary best management practices to bring the project in conformance with SC DHEC requirements. This process should also be updated prior to construction.

i) The CONTRACTOR shall minimize impacts to FEMA Special Flood Hazard Areas. Any impacts to Special Flood Hazard Areas shall be evaluated in accordance with the SCDOT Requirements for Hydraulic Design, May 2009. Impacts within floodplains designated as Zone AE Special Flood Hazard Areas shall be evaluated for the need for a Conditional Letter of Map Revision (CLOMR). If a CLOMR is required, the CONTRACTOR shall prepare the appropriate documentation and submit the completed application and Supporting Documentation to the SCDOT for submittal to FEMA. The CONTRACTOR shall coordinate as needed with FEMA during the review process.

j) The CONTRACTOR is responsible for the coordination and preparation of the Notice of Intent (NOI) with the Department of Health and Environmental Control (DHEC). Contract shall forward NOI and any Supporting Documentation to SCDOT for review, signature, and submittal to SCDHEC. Contractor shall coordinate with SCDHEC regarding review comments and revise construction plans as needed to obtain the permit.

k) All deliverables shall be in accordance with SCDOT's Requirements for Hydraulic Design, May 2009.

For sections where additional impervious areas are not constructed, a Sediment and Erosion Control Plan is required. In order to meet the requirements of National Pollution Discharge Elimination System (NPDES) regulations, the CONTRACTOR shall take necessary measures to insure all sediment is maintained on-site during construction. Best Management Practices (BMPs) implemented by the CONTRACTOR shall include, but not be limited to, the following:

a) At stream crossings, silt fence shall be placed beginning at the structure (bridge, culvert, or pipe) along the construction line on the shoulder to a minimum distance of 200 linear feet from the crossing. Silt fence shall be placed along both the inside and outside shoulders of the roadway.

b) Additional silt fence shall be placed in areas outside of stream crossings to prevent sediment from leaving the project site.
c) At stream crossings, median catch basins shall be protected by the appropriate inlet filter to prevent the entry of sediment into the pipe system.
d) In locations away from stream crossings, additional catch basins shall be protected by the appropriate inlet filter if there appears to be any potential for sediment to escape the site and to be deposited in adjacent drainage systems and/or outfalls.
e) Any fill or cut slopes greater than five feet shall be stabilized with a temporary erosion control blanket.
f) The CONTRACTOR may select suitable accepted alternates for protecting catch basins in lieu of wrapping with silt fence. Hay bales are not considered a suitable alternate.
g) All deliverables shall be in accordance with SCDOT's Requirements for Hydraulic Design, May 2009.

2. Pipe Culvert Replacement

SCDOT inspected pipe culverts within the project area. Please refer to the document, "I-85 / I-385 Interchange Improvements – Pipe Inspection Summary" for a summary of the inspection, inspection reports, and recommendations. See the following table for a summary of existing pipes requiring repair or replacement. Pipe and culvert locations are approximate. The Pipe Designation refers to the Pipe Inventory number provided in the Pipe Inspection Summary. CONTRACTOR is directed to the column headed "SCDOT Evaluation of Pipe" for direction regarding replacement or repair that is required. CONTRACTOR may elect to replace any pipe in lieu of repair and CONTRACTOR is responsible for any permits necessary to perform the replacement. CONTRACTOR is responsible for final hydrologic/hydraulic analysis of all pipes within the project area.

I-85 / I-385 Interchange Pipe Inventory Summary

Pipe No.	Alignment	Station	Size	SCDOT Evaluation of Pipe
A7	I-85 SB	229+05	15"	8' of existing pipe prior to outlet shall be replaced.
A8	I-85	231+00	4' x 6'	Culvert needs to be cleaned; any cracks and holes grouted.
A10	I-85 SB	241+50	18"	24' of existing pipe prior to outlet shall be replaced.
A13	I-85 SB	252+80	18"	Slip line existing pipe due to hole and joint deficiencies.
A14	I-85 SB	255+05	15"	8' of existing pipe prior to outlet shall be replaced.
A18	I-85 NBCD	264+00	18"	Remove or plug & abandon due to joint separations.
A19	I-85 NBCD	264+50	18"	Remove or plug & abandon due to joint deficiencies..

B2	I-85 SBCD	311+70	18"	Slip line existing pipe due to joint deficiencies.
B3	I-85 NB	317+90	18"	Remove or plug & abandon due to joint deficiencies.
B4	I-85 SB	318+40	18"	Slip line existing pipe due to hole and broken pipe.
B5	I-85 SB	322+00	18"	Slip line existing pipe due to joint separations.
B6	I-85 SB	322+00	18"	Slip line existing pipe due to joint deficiencies.
B10	I-85 NB	332+00	18"	15' of existing pipe prior to outlet shall be replaced.
B11	I-85 SB	337+00	18"	25' of existing pipe prior to outlet shall be replaced.
B14	I-85	342+40	24"	Remove obstruction at median catch basin and clean pipe.
B15	I-85 SB	350+20	15"	12' of existing pipe prior to outlet shall be replaced.
B17	I-85 NB	357+00	18"	Slip line existing pipe due to broken pipe.
B26	I-85	387+10	48"	Slip line existing pipe due to joint deficiencies.
B27	I-85 NB	388+50	15"	12' of existing pipe prior to outlet shall be replaced.
B31	I-85 SB	406+80	18"	Slip line existing pipe due to joint separations.
B36	I-85 SB	427+90	18"	Remove or plug & abandon due joint deficiencies and broken section
C2	I-385	335+10	30"	Slip line existing pipe due to joint offset and hole.
C3	I-385 SB	338+80	30"	47' of existing pipe prior to outlet shall be replaced.
C5	I-385	341+50	30"	Slip line existing pipe due to joint deficiencies.
C7	I-385	345+00	30"	Slip line existing pipe due to joint deficiencies.
C8	I-385	346+20	42"/36"	Remove or plug & abandon due to joint offsets and material change at 49' in the VPI.
C9	I-385 SB	346+70	18"	Remove or plug & abandon due to multiple deficiencies.
C10	I-385 NB	347+90	18"	Remove or plug & abandon due to joint offset deficiencies.
C15	I-385 NB	363+40	18"	Repair pipe sections located at 80' and 246' from the upstream inlet.
D2	I-385 NB	423+30	18"	Remove or plug & abandon due to deficiencies.
D3	I-385 NB	431+00	36"	Slip line existing pipe due to joint separations.
D4	I-385 SB	430+50	36"	Slip line existing pipe due to joint deficiencies.
D5	I-385 SB	435+00	15"	Slip line existing pipe due to joint offset and hole.
F40			18"	Broken / Crushed pipe under the pavement structure. Remove or plug & abandon due to joint deficiencies and material change.
I3A	I-85 SBCD	271+30	18"	Repair existing pipe section at approx. 73' from the median catch basin due to a guard rail post being driven into the pipe.

I5	I-85 NBCD	273+50	18"	Existing pipe can be retained for 92' from pipe outlet. 8' at the median shall be replaced. (Utilities through pipe and large hole in ceiling)
I6	I-85 SBCD / I-85 SB	278+50	18"	Slip line existing pipe due to a joint seperation and several broken sections.
I8	I-85 NBCD	279+80	18"	Remove or plug and abandon due to large joint separations and broken section.
I9	I-85 SBCD	281+00	36"	Slip line existing pipe due to joint separations.
I10	I-85 SBCD / I-85 SB	281+50	36"	Repair existing pipe at the downstream catch basin.
I12	I-85 NBCD	281+55	36”	Minor deficiencies. Okay to Retain. Recommend adding a junction box for the existing lateral line.
I15	I-85 SBCD	284+20	15"	Slip line existing pipe due to joint separations.
I17A	Ramp 3	57+50	36"	Slip line existing pipe due to joint deficiencies.
I20	I-385	403+00	30"	Slip line existing pipe due to joint deficiencies.
I21	I-385	405+50	30"	Slip line existing pipe due to joint deficiencies.
I23	I-385 SB	406+80	18"	Slip line existing pipe due to joint offset.
I24	I-385 NB	405+90	18"	Slip line existing pipe due to joint deficiencies.
I25	I-385	409+50	30"	Slip line existing pipe due to joint deficiencies.
I26	I-385 NB	411+10	30"	Retain 72' of existing pipe from the upstream catch basin. Replace remainder pipe due to pipe bend.
I28	I-385 NB	405+50	30"	Slip line existing pipe due to deficiencies.
I29	I-85 SBCD	293+70	18"	Repair broken joint at 3 feet from the upstream catch basin; retain the remainder of the pipe.
I30	I-85 SBCD	295+90	18"	Slip line existing pipe due to joint deficiencies and hole in pipe.
I32	I-85	297+00	18"	Remove or plug and abandon due to joint deficiencies and several holes.
I34	I-85 SBCD	301+60	15"	Slip line existing pipe due to joint deficiencies.
I37	I-85	304+10	18"	Retain 48' existing pipe from the downstream junction box and replace existing pipe from the bad joint to the end of I37
I39	I-385	380+80	54"	Slip line existing pipe due to multiple deficiencies.
I40	I-385	383+20	6' X 7' / 5' x 7'	Needs maintenance; repair culvert at all voids and exposed rebar.

For pipes not inspected by the SCDOT, the CONTRACTOR shall confirm the condition of the pipe prior to utilizing for proposed storm drainage systems. The CONTRACTOR shall provide video pipe inspection reports for any pipes which are to be retained and were not previously inspected as shown in the “I-85 / I-385 Interchange Improvements – Pipe Inspection Summary”.

3. Pipe Culverts or Box Culverts to be Retained

The CONTRACTOR may retain existing pipes provided the following conditions are met:

- For pipes and culverts listed in the table in section 2 above, the CONTRACTOR shall:
    1. Satisfactorily repair the pipe/culvert as indicated.
    2. Verify that the repaired pipe provides the necessary hydraulic capacity through an analysis performed by a professional engineer registered in South Carolina. If the pipe does not provide sufficient capacity as the result of the repair, the CONTRACTOR shall replace the pipe or perform improvements to the drainage system to provide the sufficient capacity.

- For pipes and culverts not listed in the table in section 2 above or listed below, the CONTRACTOR shall:
    1. Review provided inspection reports (if available) and/or conduct an inspection to verify structural and hydraulic adequacy.
    2. Perform any necessary repair/rehabilitation, if required.
    3. Verify that the pipe to be retained (including the effects of any repairs, if applicable) provides the necessary hydraulic capacity through an analysis performed by a professional engineer registered in South Carolina.

All retained pipe shall be cleaned of all debris and video inspected prior to acceptance of the project by the DEPARTMENT.

The following hydraulic crossings may be retained with no additional hydraulic capacity required provided that the Contractor's design does not result in flows in excess of those depicted in the Preliminary Stormwater Management Design Report (prepared by ICA Engineering, dated October 2013). Any necessary repairs discussed in section 2 above, shall be performed as noted. If the pipe has not been inspected, refer to Section 2 for project requirements.

Pipe No. A8, I-85 Station 231+00 - 4' x 6' RCBC
Pipe No. A10, I-85 Station 241+50 – 18" R.C. Pipe
Pipe No. B8, I-85 Station 328+60 – 5' x 5' RCBC
Pipe No. B14, I-85 Station 342+40 – 24" R.C. Pipe
Pipe No. B17, I-85 Station 357+00 – 18" R.C. Pipe
Pipe No. B26, I-85 Station 387+10 – 48" R.C. Pipe
Pipe No. B29, I-85 Station 433+00 – 48" R.C. Pipe
Pipe No. I40, I-385 Station 383+20 – 5' x 7' RCBC

4. Considerations for Future Widening

All drainage systems along barrier walls on the outside of the interstates shall be designed based on a shoulder width of 12 feet regardless of the shoulder that may be present at the completion of the project.

5. Pipes and Culverts Outside of Interchange Area

For areas along I-85 beyond the tie ins points of the new interchange ramps and/or auxiliary lanes which are required to be overlaid and/or rehabilitated, the Contractor will only be required to provide an Erosion Control Plan per section 1 and shall be responsible for cleaning pipe and clearing debris. No hydraulic analysis will be required.

EXHIBIT 5

SPECIAL PROVISIONS

TABLE OF CONTENTS

(1) DIVISION 100: ERRATA TO 2007 STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION:

The Supplemental Specification entitled "Errata to 2007 Standard Specifications for Highway Construction" dated **May 4, 2009** in **Exhibit 6** is hereby amended to include the following:

Division 100 is amended as follows:

Page 4, The table in **Subsection 101.2** is amended as follows:

SCDOT OFFICIALS AND OFFICES

DELETIONS		REPLACEMENTS	
~~SHE*~~	~~State Highway Engineer~~	DSE*	Deputy Secretary for Engineering

*Wherever it appears in the text, replace the deleted abbreviation with the new abbreviation.

(2) SECTION 101: STANDARD DRAWINGS:

The Bidders are hereby advised that this project shall be constructed using the 2011 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.shtml. 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.

(3) 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 **610-005-00**, revise the following information as noted below:

Add **(OPTIONAL)** underneath "TRUCK MOUNTED ATTENUATOR" adjacent to the illustration.

A chart, entitled "Truck Mounted Attenuator", displaying the minimum length of buffer space required when a truck mounted attenuator is not utilized.

The buffer area illustration has been update to illustrate the requirements necessary when a truck mounted attenuator is utilized and the requirements necessary when a truck mounted attenuator is not utilized.

Underneath the section entitled "PORTABLE TRUCK MOUNTED ATTENUATOR", update Note 4 to read as follows:

> A trailer mounted advance warning arrow panel may be utilized in advance of the work area when this traffic control setup is utilized for asphalt concrete placement operations.

On sheet **610-405-00**, revise the following information as noted below:
Add **(OPTIONAL)** underneath "LEAD VEHICLE" adjacent to the illustration.

The "WORK VEHICLE" signing requirements have been updated. When the "LEAD VEHICLE" is omitted, the first "WORK VEHICLE" in the work train will also include the signing requirements specified for the "LEAD VEHICLE" in addition to the standard signing requirements for the "WORK VEHICLE".

Note 2 of the "Operation Notes" has been updated to describe the requirements for the "WORK VEHICLE" when the "LEAD VEHICLE" is omitted from the work train.

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** section B 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 "Rirap (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).

(4) SECTION 105: CONSTRUCTION STAKES, LINES AND GRADES:
Section 105.8.2 applies to this project. Payment for this work shall be made according to the following schedule:

Percent Contract Complete	Percent of Stakes, Lines, and Grades bid amount to be paid
1 – 5	20
6 – 15	40
16 – 29	60
30 – 49	70
50 – 69	80
70 – 89	90
90 - 100	100

(5) SECTION 105: CLAIMS PROCEDURE:
See Supplemental Specification entitled "Claims Procedure" dated **February 12, 1997**, in **Exhibit 6.** For this project, the STANDING DISPUTE REVIEW BOARD is designated.

(6) SECTION 105: CROSS SLOPE VERIFICATION:

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/publications_Survey.aspx

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 +.0208 ft/ft or +2.08% for the 12 foot lane on the high side of superelevation.

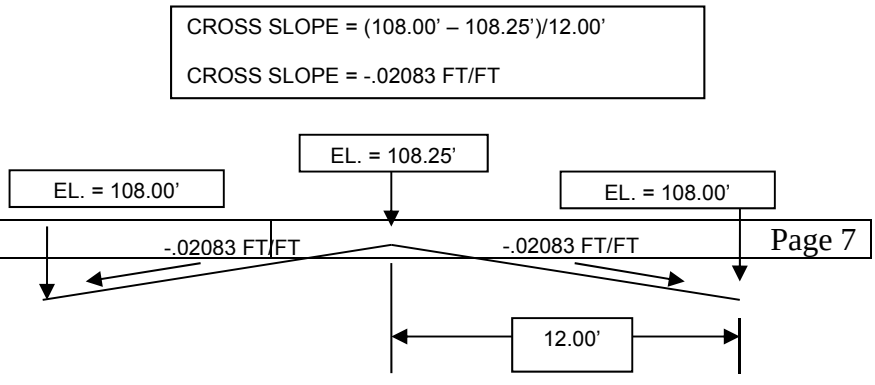

FIGURE 1
NORMAL CROWN

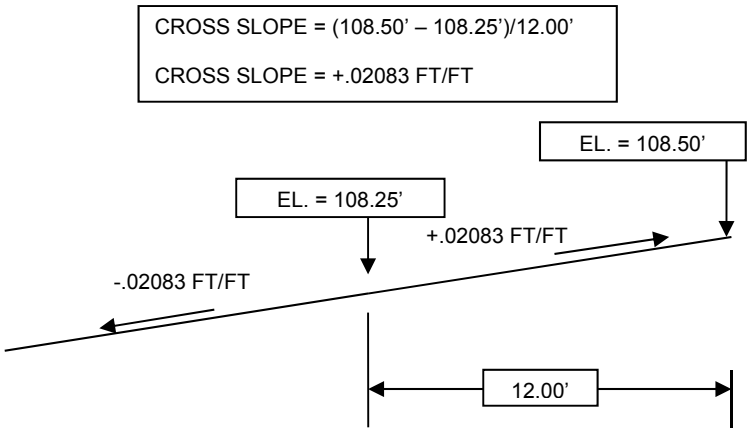

FIGURE 2
REMOVE CROWN

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

- Station
- Left Edge of Travel Lane Elevation (LETL) in ft
- Right Edge of Travel Lane Elevation (RETL) in ft
- Lane width in ft
- Calculated cross slope in ft/ft
- Plan cross slope in ft/ft
- Deviation between calculated cross slope and plan cross slope
- Tolerance Level (1, 2, or Out of tolerance)

Prior to placing uniform overlays of HMA and or concrete, 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 milling and/or build-up. 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 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 milling and buildup.

The RCE must approve the Initial Corrective Measures Plan prior to beginning corrective measures.

4.0 CONSTRUCTION PROCESS:

4.1 INITIAL CORRECTIVE MEASURES:

Perform all initial corrective measures prior to placing the first uniform overlay. 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:

- Completion of initial corrective measures (milling and/or build-up)
- After each uniform lift of pavement prior to the final surface overlay

Elevation data is to be collected at the edge of each travel lane perpendicular to the roadway centerline at the following locations:

- Minimum of one random location every 300 feet in tangent sections as determined by the Department
- Begin and end of superelevation, flat cross slopes within superelevation transition, remove crown, begin and end of maximum superelevation, PC's, and PT's
- 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

- Station
- Left Edge of Travel Lane Elevation (LETL) in ft
- Right Edge of Travel Lane Elevation (RETL) in ft
- Lane width in ft
- Calculated cross slope in ft/ft
- Plan cross slope in ft/ft
- Deviation between calculated cross slope and plan cross slope
- 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 course overlay (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:

- Even 100-foot stations in tangent sections and even 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, and PT's
- Cross slopes on begin and end of bridges

Submit to the RCE a summary of the progress 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

- Station
- Left Edge of Travel Lane Elevation (LETL) in ft
- Right Edge of Travel Lane Elevation (RETL) in ft
- Lane width in ft
- Calculated cross slope in ft/ft
- Plan cross slope in ft/ft
- Deviation between calculated cross slope and plan cross slope
- 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 HMA 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 HMA mixes.

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:

- Control points, horizontal alignment, and stationing used to construct the project.
- Superelevation with horizontal curve data
- Cross sections at even 100-foot stations in tangents and 50-foot stations in curves
- 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
- 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

(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: 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."

(9) SECTION 106: SOUTH CAROLINA MINING ACT:

See Attached Supplemental Specification Dated **March 20, 2003** in Exhibit 6. 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.

(10) 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:

For this project, a bulletin board shall be placed at the project location. Mount the project bulletin board in a permanent location within the project limits so that it is visible and accessible at all times. Notify the RCE and all subcontractors as to the location of the bulletin board.

(11) SECTION 107: CSX TRANSPORTATION SPECIAL PROVISIONS:
See Attached Supplemental Specification Dated **April 11, 2007** in **Exhibit 6.**

(12) SECTION 107: RAILROAD PROTECTIVE INSURANCE:
The cost of the portion of the structure within railroad right-of-way is estimated to be 15 % of the estimated entire contract cost of the bridge.

(13) SECTION 107: COORDINATION OF UTILITY RELOCATION WORK WITH HIGHWAY CONSTRUCTION:
It shall be the responsibility of the contractor to inspect the sites for potential utility conflicts. It is the responsibility of the contractor to call Palmetto Utility Protection Service (PUPS) at 811 or 1-888-721-7877 three (3) days prior to work so that existing utilities can be properly marked. All utilities may not be a member of PUPS.

(14) 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.

(15) SECTION 107: APPLICATION OF DAVIS-BACON AND RELATED ACTS TO INDEPENDENT TRUCK DRIVERS AND MISCELLANEOUS CONSTRUCTION ACTIVITIES:
See attached Supplemental Specification dated **June 13, 1990** in **Exhibit 7.**

(16) SECTION 107: DISADVANTAGED BUSINESS ENTERPRISES (DBE) GOALS AND REQUIREMENTS:
See attached Supplemental Specification entitled "Disadvantaged Business Enterprises (DBE) Supplemental Specification" dated **January 1, 2014** in Exhibit 7 for specific requirements that must be met. The DBE Goal for this project is 9%.

The CONTRACTOR's attention is directed to the electronic DBE BIN file found on the electronic bidding service website, *Bid Express*, containing data from the "Directory of Certified Disadvantaged Business Enterprises" approved for use in each particular letting. It specifies the amount (percentage) that the contractor may count toward its appropriate DBE Goals of expenditure for materials and supplies obtained from DBE Suppliers and Manufacturers.

For this project, the Contractor shall use the "Directory of Certified Disadvantaged Business Enterprises" to determine appropriate DBE involvement.

(17) SECTION 107: LATE DISCOVERY OF ARCHAEOLOGICAL/HISTORICAL REMAINS ON FEDERAL AID PROJECTS AND APPROVAL OF DESIGNATED BORROW PITS:
See attached Supplemental Specification dated **August 7, 1991** in **Exhibit 7.**

(18) SECTION 107: REQUIREMENTS FOR FEDERAL AID CONTRACTS WHICH AFFECT SUBCONTRACTORS, DBE HAULERS, MATERIAL SUPPLIERS AND VENDORS:
See attached Supplemental Specification dated **March 1, 2010** in **Exhibit 7.**

(19) SECTION 107: SPECIFIC EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITY TRAINING SPECIAL PROVISIONS:
See attached Supplemental Specification entitled "Specific Equal Employment Opportunity Responsibilities Training Special Provisions" dated **August 20, 1975,** revised **April 1, 2004** in **Exhibit 7**.

The Supplemental Specification states "…the contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program." The Contractor is advised that the Department will not accept bids with any unit price other than $0.80/Hr for the item: ON-THE JOB TRAINEE. Bids that are submitted with any other unit price will be corrected by the Department to $0.80/Hr, and the Grand Total bid amount adjusted accordingly.

(20) 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).

(21) SECTION 107: CRANE SAFETY:

See attached Supplemental Specification in **Exhibit 6** dated **August 1, 2013**.

(22) SECTION 107: REQUIRED MEDIA NOTIFICATION FOR CONSTRUCTION PROJECTS:
CONTRACTORS are encouraged to co-operate with the news media since all projects are constructed with public funds. Because the scope of this project will cause disruption of normal traffic flow, the CONTRACTOR is required to notify the public, in a timely manner, of disruptive activities such as lane closures.

The CONTRACTOR is required to utilize area media to accomplish public notification of traffic disruptions.

The CONTRACTOR is required to deal directly with the news media and all reasonable efforts should be made to co-operate with the media. However, the safety, security and construction schedule on site should not be disrupted in order to accomplish this. The CONTRACTOR may co-ordinate these activities with and receive guidance from the SCDOT Public Affairs Office.

(23) SECTION 107: PERMITS:

All permits necessary for completion of this project shall be procured by the CONTRACTOR. Failure to adequately comply with the provisions of permits or any other requirements from the permitting agencies will result in the stoppage of contract operations until corrective actions have been taken.

Fines assessed by permitting agencies to the Department as the result of the CONTRACTOR's non-compliance or violation of said permit provisions will be paid by the Department and subsequently deducted from the CONTRACTOR's monthly pay estimate.

(24) SECTION 107: ON-THE JOB TRAINEE:
See Supplemental Specification entitled "Specific Equal Employment Opportunity Responsibilities Training Special Provisions" dated **August 20, 1975** and revised **April 1, 2004,** in **Exhibit 7.**

The Supplemental Specification states "…the contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program." The Contractor is advised that the Department will not accept bids with any unit price other than $0.80/Hr for the item: ON-THE JOB TRAINEE. Bids that are submitted with any other unit price will be corrected by the Department to $0.80/Hr, and the Grand Total bid amount adjusted accordingly.

(25) 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.

(26) SECTION 108: CRITICAL PATH METHOD CONSTRUCTION SCHEDULES:
See attached Supplemental Specification dated **November 4, 2013** in **Exhibit 6.**

(27) SECTION 108: FAILURE TO COMPLETE THE WORK ON TIME

Paragraph 1 of **Section 108.9** is hereby replaced with the following:

If the CONTRACTOR fails to substantially complete the work by the contract completion date, the CONTRACTOR is liable for liquidated damages. Liquidated damages will be assessed for each day beyond the contract completion date that work items are not completed. This includes the application of thermoplastic, raised pavement markers and grassing. Days to be charged for liquidated damages will not stop due to seasonal restrictions. The daily liquidated damages rate is determined from the following schedule. The date of substantial completion is determined by the RCE.

(28) SECTION 109: PAYMENT SCHEDULE

Subsection 109.7 of the SCDOT 2007 Standard Specifications for Highway Construction is replaced as follows:

Pursuant to the **Critical Path Method Construction Schedules** Supplemental Specification dated March 1, 2007, submit the Critical Path Method (CPM) schedule within 30 days of award. Once accepted by SCDOT, the project's initial baseline cost loaded CPM will be used for SCDOT budget purposes and the contractor will not be paid in excess of the cumulative amount shown on the schedule through each payment date; regardless of what subsequent monthly updates indicate. For example, see chart below:

Pay period ending	12/16/11	1/16/12	2/16/12	3/16/12	4/16/12	5/16/12
Baseline CPM Planned Payout in Millions (Cumulative to Date)	2.0 (2.0)	3.0 (5.0)	3.0 (8.0)	4.0 (12.0)	4.0 (16.0)	3.0 (19.0)
Actual work performed (Cumulative to Date)	1.5 (1.5)	2.0 (3.5)	3.5 (7.0)	6.0 (13.0)	3.0 (16.0)	4.0 (20.0)
Payout by SCDOT (Cumulative to Date)	1.5 (1.5)	2.0 (3.5)	3.5 (7.0)	5.0 (12.0)	4.0 (16.0)	3.0 (19.0)

Partial payment estimates will be generated in SiteManager (computerized construction management system) based on actual quantities installed. If actual quantities installed exceed the cumulative schedule amount to date, a negative adjustment will be made in SiteManager to adjust the pay as necessary. For previous work exceeding the schedule amount, payments will be released as work progresses and payouts fall below the scheduled cumulative amount, never to exceed the cumulative scheduled amount through that pay period.

If significant contract changes are necessary, and upon approval by the SCDOT, a re-baseline to the initial CPM will be allowed per the CPM schedule specification and the payout schedule may be adjusted accordingly.

All subcontractors must be paid in accordance with the Prompt Payment Clause (Supplemental Specification dated January 5, 2012) for the quantities used to generate the

partial payment estimates. In instances where a payout by SCDOT is less than the actual work installed under a given estimate, the Prompt Payment Clause is hereby amended to require full payment to all subcontractors, for work complete, within 7 days of receipt of said SCDOT payout

Partial Payments will be made no more than once each month as the work progresses. The monthly partial payment periods end at the end of the day on the following dates for the respective Engineering Districts:

- Engineering District Nos. 2, 3, and 5 – Last day of each month.
- Engineering District Nos. 1, 4, 6, and 7 – 16th day of each month.

(29) 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 CONTRACTOR s schedule of values shall provide sufficient detail to compare work progress to the contractor's schedule and determine appropriate periodic payments.

(30) SECTION 109: RETAINAGE
If the CONTRACTOR's progress is judged to be delinquent or portions of the work are defective, the Department reserves the right to withhold retainage. The total amount retained will be sufficient to cover anticipated liquidated damages and the cost to correct defective work.

(31) SECTION 109: PROMPT PAYMENT CLAUSE:
See attached Supplemental Specification dated **January 5, 2012** in **Exhibit 6.**

(32) SECTION 109: FUEL ADJUSTMENT:
No fuel adjustment will be made on this Project.

(33) SECTION 202: RECLAIMING EXISTING ROADWAY:
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.

Materials:
None

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.

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.

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.

(34) SECTION 202: STAGED REMOVAL OF EXISTING BRIDGES:
For existing bridges that will be removed in stages, maintain stability of the existing structure at all times while traffic is on the bridge. At a minimum, replace tie rods after removal of any slab sections and maintain bracing on the existing piles at all times while traffic is on the bridge.

(35) SECTION 202: REMOVAL OF EXISTING GUARDRAIL:
Section 202.4.4.3 applies on this project.

(36) SECTION 202: REMOVAL OF STRUCTURES AND OBSTRUCTIONS:
Section 202 is amended as follows:

Page 92 **Subsection 202.5**, item 5, second bullet:
Change the words "brick sidewalk" to "concrete, brick or stone sidewalks".

(37) SECTION 202: REMOVAL AND DISPOSAL OF STRUCTURES CONTAINING STRUCTURAL COMPONENTS WITH LEAD-BASED PAINT:

The existing structures shall be removed and disposed of by the Contractor in accordance with Subsection 202.4.2 of the Standard Specifications except as amended herein, or by accompanying Special Provisions.

The Contractor's attention is called to the fact that this project may require removal and disposal of structural components containing lead-based paints. Removal and disposal of structural components containing lead-based paints shall comply with all applicable Federal (EPA, OSHA & DOT) and State requirements for lead as waste, lead in air, lead in water, lead in soil, and worker health and safety. The requirements include but are not limited to the following:

1. Federal Resource Conservation and Recovery Act (RCRA) – Regulates when lead is present in a solid waste.

2. National Ambient Air Quality Standard (NAAQS) – EPA regulates airborne lead as a "criterion" pollutant. OSHA regulates the amount of lead in the air that workers breathe.
3. Clean Water Act (CWA) – Specifies the regulations for lead in water.
4. OSHA Lead Exposure in Construction, 29 CFR 1926.62.

(38) SECTION 203: BORROW PITS ON LARGE PROJECTS:

Borrow materials for this project shall not be obtained from wetlands, streams, or rivers.

(39) SECTION 204: TEMPORARY SHORING WALL:

Subsection 204.4.5.2 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."

(40) SECTION 208: FINE GRADING:

Section 208 is amended as follows:

Page 131, **Subsection 208.5**, Paragraph 1, first sentence:
Insert the word "paved" before the word "shoulders".

(41) 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.

(42) SECTION 401: PRICE ADJUSTMENT FOR LIQUID ASPHALT BINDER:
No price adjustment for liquid asphalt binder will be made on this Project.

(43) 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.

(44) 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.

(45) SECTION 401: TRANSPORTATION AND DELIVERY OF MIXES:
See attached Supplemental Specification dated **July 1, 2010** in **Exhibit 6.**

(46) SECTION 401: FULL DEPTH ASPHALT PAVEMENT PATCHING:

Description: The Contractor shall patch existing asphalt pavement at locations of high severity fatigue cracking and failed utility patches on the bridge approaches as directed by SCDOT. This work shall consist of the removal of deteriorated pavement and replacing with a full depth asphalt plant mix patch.

Construction Process: The deteriorated pavement shall be removed to the width and length indicated by the RCE, with the face of the cut being straight and vertical. The pavement shall be removed to a depth of six inches on I-85 and eight inches on other roads. In the event unstable material is encountered at this point, then such additional material shall be removed as directed by the RCE. The volume of material removed below the patch shall be backfilled with crushed stone and thoroughly compacted in 4-inch layers with vibratory compactors. Prior to placing the asphalt patch material in the hole, the sides of the existing asphalt pavement shall be thoroughly tacked. The patch material shall then be placed in layers not exceeding 3 inches with each layer being thoroughly compacted with a vibratory compactor and pneumatic roller. The patch material shall be an approved SCDOT Asphalt Concrete Binder Course Mix. Patches shall be opened and filled in the same day. Asphalt mixture shall not be applied when the existing surface is wet or frozen. If the roadway is open to traffic, Contractor shall maintain one lane of traffic in each direction at all times. Traffic control shall be in accordance with the requirements of the Special Provision for Traffic Control. The finished patch shall be smooth riding. The patches are to be no less than six feet by six feet in size and should be spaced at not less than 25 feet between patches.

The quantity of full depth asphalt pavement patching to be paid for will be the actual number of square yards of existing asphalt pavement which has been patched and accepted. The work includes cleaning, removing, and disposing of debris from the patching work, furnishing and placement of crushed stone and asphalt patching material, and all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to fulfill the requirements of this item of work.

The Contractor's bid shall include 6500 square yards of 6" full depth asphalt pavement patching, 2000 square yards of 8" full depth patching and 1500 square yards of 12" full depth

patching. If more than 10,000 square yards of patching are required by SCDOT, the Contractor will be paid a unit price of $40.00 per square yard for the patching. If less than 9000 square yards of full depth patching are required, the Contractor shall reimburse SCDOT, at a unit price of $40.00 per square yard, for the quantity of full depth patching that was not needed.

(47) DIVISION 600: MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES:
The CONTRACTOR is hereby advised that the Department has adopted the MUTCD 2009 – Manual on Uniform Traffic Control Devices for use on all projects. All references to the South Carolina Manual on Uniform Traffic Control Devices (SCMUTCD) are hereby revised to read "MUTCD – 2009 Edition".

(48) DIVISION 600: RULE ON WORK ZONE SAFETY AND MOBILITY:
The CONTRACTOR is responsible for complying with the Rule on Work Zone Safety and Mobility. This Project is classified as "**Significant**". The Contractor shall submit a Traffic Management Plan in compliance with the Rule on Work Zone Safety and Mobility. See "Rule on Work Zone Safety and Mobility" in the Project Information section.

(49) DIVISION 600, Etal.: ADHESIVELY BONDED ANCHORS AND DOWELS:
See attached Supplemental Specification dated **September 1, 2008** in **Exhibit 6.**
This Supplemental Specification applies when Adhesively Bonded Anchors or Dowels are called for in the Plans or Detailed Drawings.

The following Standard Drawings have been identified as showing Adhesively Bonded Anchors or Dowels:

605-205-03	Temporary Concrete Barrier
605-210-04	Temporary Concrete Barrier
605-310-01	Temporary Concrete Barrier
605-315-00	Temporary Concrete Barrier
605-320-00	Temporary Concrete Barrier
605-325-00	Temporary Concrete Barrier
605-330-00	Temporary Concrete Barrier
651-105-00	Barrier Mounted Sign Post
657-100-00	Overhead Sign Support Roadway Bridges
722-105-01	Box Culvert (Used to connect headwall, wingwalls, and for extensions)
805-120-00	Guardrail (W Beam) Base Plate Connection
805-405-03	Guardrail (Tubular Beam) Bridge Railing
805-405-04	Guardrail (Tubular Beam) Bridge Railing
806-505-00	Fence (Ornamental Steel Picket)

It is the contractor's responsibility to determine if Adhesively Bonded Anchors or Dowels are a part of the project, and to comply with the provisions of the Supplemental Specification.

(50) 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)

White	Yellow
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)

White	Yellow
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.

(51) DIVISION 600: WORK ZONE TRAFFIC CONTROL TRAINING REQUIREMENTS FOR CONTRACTORS / SUBCONTRACTORS:

See attached Supplemental Specification dated **September 1, 2013** in **Exhibit 6**.

(52) SECTION 601: PENALTY FOR VIOLATING LANE CLOSURE RESTRICTIONS:

The Contractor is advised that the Lane Closure Restrictions for the Project outlined in the Work Zone Traffic Control Requirements 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 **$1,250.00 (One Thousand Two Hundred Fifty 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 **$2,500.00 (Two Thousand Five Hundred Dollars)** for each 1/4 hour interval (or any portion thereof).

See attached Supplemental Specification dated **January 3, 2013** in **Exhibit 6**.

(53) 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.

(54) SECTION 609: HIGH PRESSURE WATER METHOD FOR REMOVAL OF PAVEMENT MARKINGS:
See attached Supplemental Specification dated **July 2, 2009,** in **Exhibit 6.**

(55) DIVISION 700: DYNAMIC LOAD TESTING WITH PILE DRIVING ANALYZER AND STATIC LOAD TESTING:
The CONTRACTOR will be responsible for dynamic and static load testing of all foundations if required by design. See **Exhibit 4b**, "Project Criteria – Structures," for additional information.

(56) SECTION 701: CONCRETE BATCHING AND MIXING:
See attached Supplemental Specification dated **April 5, 2010** in **Exhibit 6.**

(57) 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 per cubic yard will be used.

(58) SECTION 709: ELASTOMERIC CONCRETE FOR EXPANSION JOINT HEADERS:
See attached Supplemental Specification dated **June 1, 2010** in **Exhibit 6.**

(59) SECTION 711: PILE AND DRIVING EQUIPMENT DATA FORM:
Pile and Driving Equipment Data Form is included in **Exhibit 6.**

(60) SECTION 712: DRILLED SHAFTS:
Drilled Shaft Forms are included in **Exhibit 6.**

(61) SECTION 713: MSE WALLS:
Section 713 of the 2007 Standard Specifications for Highway Construction is deleted and replaced with the following heading and sections.

SECTION 713
MECHANICALLY STABILIZED EARTH WALL
(MSE Wall)

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MECHANICALLY STABILIZED EARTH WALL (MSE WALL)

713.01 Description. This work shall consist of designing, furnishing materials, and constructing temporary or permanent Mechanically Stabilized Earth (MSE) walls in accordance with these specifications and the MSE wall system supplier's recommendations, and in conformance with the lines, grades, designs, and dimensions shown on the plans or established by the RCE. MSE wall exposed facings shall either be precast concrete panels, modular concrete blocks, or other facings as specified in the plans or specifications. Design details for MSE wall structures such as type of wall facing (i.e. precast concrete panel, modular concrete block facing, etc.); loading conditions; leveling pad requirements; temporary surcharge retaining walls; and details for appurtenances shall be as shown on the plans or as specified herein. MSE wall design shall include supplying engineering calculations and design drawings (shop drawings). Furnishing materials includes all MSE wall components such as facing elements, leveling pad, soil reinforcement and attachment devices, MSE wall backfill, wall coping, and any other project specific requirements such as, structural frames or other methods to design around obstructions in walls, drainage features, etc. MSE wall construction shall include structural excavation for the MSE wall, constructing the concrete leveling pad, erecting the wall facing, placing and compacting reinforced backfill, installing soil reinforcements, installing a drainage system, installing coping, and installing other project specific items as required in the plans.

713.02 MSE Wall Submittals. The Contractor shall submit 8 sets of design calculations and 8 sets of Shop Plans/Working Drawings to the SCDOT for review in accordance with the requirements provided herein. Send Shop Plans for projects designed for the Department by a design consultant directly to the consultant. For Shop Plans sent to the SCDOT, 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. Submit the design calculations and Shop Plans/Working Drawings a minimum of ten (10) days before the proposed date to begin work.

Acceptance of the MSE wall design will be based on a review of the design calculations and the design drawings for conformance with the plans, specifications, and SCDOT standard design practices. All calculations and design drawings shall bear the legible seal, date, and signature of the responsible civil engineer registered as a Professional Engineer in the State of South Carolina. The Designer is solely responsible for the accuracy, completeness, and constructability of the submitted design before and after review. Fabrication of the MSE wall components shall not begin until written acceptance of the design and design drawings has been provided. The Regional Production Group (RPG) Structural Engineer will notify the Contractor in writing when the review process is complete and transmit the reviewed and accepted design drawings (shop drawings).

The MSE wall Certification Package is required to document the ultimate and nominal tensile load of extensible (geosynthetic) soil reinforcement, modular concrete block facing/soil reinforcement connection load (T_{al}), and soil reinforcement pullout coefficients (F^*, α). The Contractor shall submit the Certification Package to the RCE after the design calculations and design drawings have been reviewed and accepted. At the completion of the review, the RCE will forward the reviewed and accepted Certification Package of the MSE wall structure to the Contractor. The MSE wall structural components (i.e. facing elements, soil reinforcement, etc) shall not be delivered to the site without prior written approval of the MSE wall system supplier's Certification Package.

If the Contractor or the Contractor’s wall supplier is required to supplement or revise the submittal in order to obtain acceptance of the MSE wall design or the MSE wall Certification Package, the time allowances provided above may increase. No additional contract time will be given for any subsequent loss of construction time due to time delays caused by revisions, modifications, clarifications, or re-submittal of calculations, design drawings, or MSE wall Certification documentation that is not in conformance with the plans and specifications.

MSE wall construction shall not begin until the MSE wall Certification Package (when required), MSE wall material certifications, and MSE wall reinforced backfill material tests have been reviewed and accepted.

713.03 MSE Wall Design

(a) Design Scope: MSE wall structures shall be considered gravity walls and shall be designed for external and internal stability of the reinforced soil mass. The design shall consist of determining the required soil reinforcement length and strength, facing/soil reinforcement connection strength, facing stability, global stability for deep-seated failures, sliding stability, overturning, settlement analysis, and bearing capacity in accordance with the plans and this specification. The Contractor will be responsible for evaluating the external stability of permanent MSE wall structures, which shall consist of checking the global stability for deep-seated failures, sliding stability, overturning, settlement analysis, and bearing capacity.

The Contractor's MSE wall system supplier shall be responsible for the internal stability design of permanent and temporary MSE wall structures. The Contractor's supplier shall also be responsible for the design of permanent and temporary MSE wall facings and facing connections required during either standard MSE wall construction or during two-stage MSE wall construction, or other project specific requirements (such as wall drainage systems, designs that allow obstructions within the reinforced soil mass, etc.) that is required to build the MSE wall structure. The project specific design criteria provided in the plans shall be used by the Contractor's supplier in developing the MSE wall design. If design criteria are not shown in the plans, the design criteria listed in Section 713.03 (b) shall be used. The external stability of the MSE wall structure, with appropriate resistance factors, is satisfied with the minimum base width required, B_{Req}, that is specified in the plans. The MSE wall bearing pressures shall not exceed the bearing pressures provided in the plans. The design drawings shall be prepared using the MSE Wall Details provided in the plans as a guide of the SCDOT standard design practice. The design by the Contractor's supplier shall also specify the minimum required wall face batter to limit the amount of horizontal movements resulting from the outward rotation of the wall as a result of the development of internal equilibrium between the loads applied to the wall and the internal structure of the wall. At no time will a negative batter (i.e. walls leans outward past the vertical) be acceptable.

(b) Design Methodology: Temporary and permanent MSE walls and any miscellaneous structures or systems associated with the MSE walls (i.e. structural frames for obstructions, wall drainage, joints, Two-Stage MSE wall construction, etc.) shall be in accordance with the following references listed in order of precedence:

1. Design criteria/requirements provided in the Plans
2. SCDOT Special Provisions
3. SCDOT Geotechnical Design Manual (GDM): The SCDOT GDM provides LRFD Limit State requirements in Section 8.10.3, Internal Stability requirements in Section 9.8, Deformation Limits in Section 10.6, and Performance Limits in Section 10.9. Seismic design criteria for MSE walls are governed by the SCDOT GDM Chapter 13 and 14.
4. FHWA-NHI-10-024, "Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Volume I", 2009
5. FHWANHI-10-025, "Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Volume II", 2009
6. FHWA-NHI-09-087, "Corrosion/Degradation of Soil Reinforcements for Mechanically Stabilized Earth Walls and Reinforced Slopes", 2009
7. AASHTO LRFD Specifications for Highway Bridges, Fourth Edition with 2008 and 2009 Interims

In instances of conflict between specifications and references the order of precedence provided above shall govern. The Department will not accept designs based on methodology other than required by this special provision.

The MSE wall design criteria shown in the plans and the following specific design requirements must be met.

1. If specific design criteria are not shown in the plans, the following design criteria and the SCDOT Geotechnical Design Manual shall be used.

Table 1 – MSE Wall Design Life

Design Life	MSE Wall Application
100 Years	Permanent MSE walls at bridge abutments and the first 150 feet of wall parallel to the roadway as measured from the abutment.
75 Years	Permanent MSE walls along roadway embankments that are located greater than 150 feet from a bridge abutment.
75 Years	Temporary MSE walls that will be in service for more than 5 years.
5 Years	Temporary MSE that will be in service for 5 years or less

Table 2 – MSE Wall Reinforced Backfill Properties

Material Property	Granular Backfill [713.06 (a)]	Stone Backfill [713.06 (b)]	Borrow Materials or Onsite Soils [713.06 (f)]
Internal Friction Angle (Degrees)	32	36	28
Total Unit Weight (lbs./cubic foot)	120	110	115

(1) Use critical unit weight based on type of calculations.

2. Alternate types of reinforced backfill materials may be used if specified in the plans and contract documents in conjunction with this Special Provision. In addition to the material requirements specified in the plans and contract documents, alternate backfill materials shall meet the soil property requirements and testing frequency indicated in Section 713.06 of this Special Provision. Unless indicated otherwise in the plans, alternate reinforced backfill materials shall require pullout resistance factors F* and α to be determined from experimental laboratory pullout testing using approved project specific borrow materials.

3. The MSE walls shall be designed for the effects of hydrostatic pressure and saturated backfills. This may be accomplished by installing drainage systems even if not shown in the plans.

4. The MSE wall shall be designed to limit the detrimental effects of differential and total settlement on the wall. This may be accomplished by placing slip joints along the wall, adjusting joint spacing between panels, or initially attaching a temporary facing and then placing the permanent facing after wall settlements have been reduced to acceptable movements.

5. Internal stability calculations shall use the full value of the average peak ground accelerations, k_{avg}, due to wave scattering provided that the MSE wall heights are greater than 20 feet. MSE walls with heights of 20 feet or less the Peak Ground Acceleration (PGA) shall be used. Maximum wall acceleration, A_m, (Mononobe-Okabe Analysis) for internal stability calculations shall not be reduced for external

stability permissible displacement allowed for external stability calculations. It is the responsibility of the Contractor's MSE wall designer to insure that the internal stability and performance of the MSE wall meets the performance criteria for both design earthquakes indicated in the following Table:

Table 2 – MSE Wall Seismic Performance Criteria

Earthquake	Performance Criteria
Functional Evaluation Earthquake (FEE)	Designed so that the structure has limited damage and that any damage that does occur is accessible and readily repairable.
Safety Evaluation Earthquake (SEE)	Designed so that the structure does not collapse under the design earthquake.

6. The maximum reinforcement load, T_{Max}, shall be computed using the Simplified Method approach as described in AASHTO LRFD. Other design methods will not be allowed.

7. A reinforcement coverage ratio of 1.0 shall be required for all continuous reinforcement layers such as sheet type reinforcement (i.e. geogrids).

8. All reinforcement layers within a design section shall be of constant length to form a uniform reinforced soil mass.

9. The static and seismic external stability (sliding, overturning, and bearing capacity) shall be checked by the Contractor's MSE wall system supplier using the final MSE wall configuration and design criteria provided. Based on these computations, the minimum base width required, B_{Req}, shown in the plans may be increased. No reductions in minimum base width required, B_{Req}, from those shown in the plans will be allowed based on the external stability computations. Bearing capacities may be adjusted based on any increases in minimum base width required, B_{Req}. Any increases in soil reinforcement lengths beyond those minimum requirements provided in the plans will not be considered a change in condition and shall be adjusted as needed without any additional compensation. The minimum base width required, B_{Req}, for MSE walls with modular concrete block facings shall be measured from the front of the facing element to the end of the soil reinforcement. When MSE walls with precast concrete panel facings are used, the minimum base width required, B_{Req}, shall be measured from the back of the facing element to the end of the soil reinforcement.

10. Any temporary MSE walls used for staging, retaining surcharges, or that interfaces with the reinforced backfill of a permanent MSE wall shall conform to this specification and shall be designed and detailed by the same manufacturer responsible for the design of the permanent MSE wall. The temporary facing shall be designed to the same structural requirements as the other components of the temporary MSE wall. Temporary facing with a welded wire form and geosynthetic wrap or other approved temporary facing method shall be designed in a manner which prevents the occurrence of bulging in excess of 2 inches when backfill behind the facing elements is compressed due to compaction stresses or self-weight of the backfill. Bulging shall be measured as the maximum displacement from the theoretical vertical or sloped face of the temporary MSE wall that extends over a section of 1 foot or more along the theoretical wall face. The design of temporary MSE walls shall also include a method to prevent reflective cracking at the top of the embankment that may occur at the interface between the two construction phases. This may be accomplished by constructing horizontal layers of soil reinforcement that crosses the interface between both construction phases at various elevations along temporary MSE wall with welded wire form facing and geosynthetic wrap.

(c) Design Calculations: The Contractor shall supply the Department with a complete set of the MSE wall system supplier's design calculations in accordance with this specification. The determination of all loading conditions and assumptions shall be fully documented with all design

calculations. Submitted calculations (including computer runs) shall include all load cases that exist during construction and at the end of construction for any surcharges, hydraulic conditions, live loads, combinations, and obstructions within the reinforced backfill. Computer generated designs shall require verification that the computer program's design methodology meets the requirements provided herein; this shall be accomplished by either:

Providing complete, legible, calculations that show the design procedure step-by-step for the most critical geometry and loading condition that will govern each design section of the MSE wall structure. Calculations may be computer generated provided that all input, equations, and assumptions used are shown clearly.

Any special designs where computer runs do not adequately model the structure will require hand calculations. Design calculations must include a summary of the design computations that shall include design section identification, location, wall geometry (height, backslope, etc.), loadings (traffic loading, hydrostatic, seismic, traffic barrier, etc), governing design resistance factors and level where they occur, and any other pertinent information.

713.04 Design Drawings: The design drawings (shop drawings) shall include the horizontal and vertical alignment of the walls as well as the existing and proposed ground lines shown in the contract plans. The vertical bearing pressure exerted by the MSE wall structure, relative to changes in wall height and soil reinforcement length, shall be shown clearly on the plans. The design drawings (shop drawings) shall be furnished on size A (22 inches x 36 inches) plan sheets. The design drawings shall also reflect all information needed to fabricate and erect the walls including:

(1) An elevation sheet or sheets for each wall;

(2) Existing ground elevations that have been verified by the Contractor for each location;

(3) MSE wall profile elevation showing top of the leveling pad elevations, maximum bearing loads, top of wall elevation at a minimum interval of 50 feet, etc.;

(4) Typical cross-section or cross-sections showing the elevation relationship between ground conditions and proposed grades;

(5) General notes pertaining to design criteria and wall construction;

(6) Details of slip joints if required to prevent stresses due to anticipated settlement shown on the plans or at interfaces with other walls;

(7) Details of all joints indicating type, size, and manufacturer;

(8) Details of wall batter;

(9) Shape, dimensions, and any structural design details of MSE wall facings;

(10) Details of the architectural or finish treatment supplied.

(11) Details of facing/reinforcement connections;

(12) The number, size, type, length, and details of the soil reinforcing elements in each design section;

(13) Details showing location and installation of geotextile fabric;

(14) Details of the leveling pad showing dimensions;

(15) Finishing details at the top of wall (i.e. cap block, panel coping, barrier, pavements)

(16) Details at miscellaneous obstructions (i.e. drainage structures, utility conduits, pipes) located within the reinforced backfill.

(17) Details at bridge foundation obstructions (including foundations to be installed with the current project);

(18) Dimensions of reinforced backfill required.

(19) Any additional details pertaining to coping, railing, temporary facing, and internal drainage, as required by the contract plans.

(a) Design Drawing Notes: Notes shown in the design drawings (shop drawings) shall not conflict with SCDOT specifications and standard practice unless the notes are more stringent.

(b) Top of Wall: Written approval by the BCE will be required to lower the top of wall elevations shown on the plans. When the top of the MSE wall with modular concrete block facing is stepped and covered with cap blocks, the top of wall elevation may be adjusted by increasing the top of the wall by a maximum of 8 inches. These adjustments in wall heights at stepped locations of MSE wall with modular concrete block facing shall be made without increases in wall quantity or additional compensation. The top of the wall elevations shall be such as to allow for proper interfacing with barriers, copings, surface ditches, bridge abutments, etc. as shown in the plans.

(c) Leveling Pad: Written approval by the BCE will be required to raise the leveling pad elevations shown on the plans. Leveling pad embedment dimensions shown in the plans may be increased a maximum of 20 inches of embedment without written approval provided that no obstructions are encountered. The leveling pad elevations shall be such as to allow for the transverse and longitudinal drainage structures shown on the plans. Unless otherwise indicated on the plans, all MSE walls shall be embedded a minimum of 2 feet below the finished grade at the wall face or 2 feet below the design scour elevation for streams adjacent to the wall face or 2 feet below the bottom of any drainage features adjacent to the wall face. If scour potential is mitigated, the leveling pad must be placed a minimum of 2 feet below the finished grade at the wall face. If utilities, ditches, or other structures are located adjacent to the wall, the leveling pad shall be embedded a minimum of 1 foot below the bottom of these structures.

(d) Wall Interface and Vertical Joint Details: Should conditions arise within the project where an MSE wall interfaces with another wall (MSE wall, concrete barrier wall, wing wall, etc.), the design drawings shall contain slip joint details, special facing element details, and details on how to end this wall or walls and how to compact the embankment at these locations. The wall ends shall not be placed over any foundations. All vertical joint lines shall be considered slip joints and must be detailed in a manner that the vertical joint is not wider than 1 inch and that the vertical joint remains covered for the life of the structure to insure that the reinforced backfill does not migrate outside of the MSE wall system. At locations where an MSE wall makes a 90 degree turn, the designer shall use corner panels or corner blocks to make the turns and cover the vertical joints at these locations. A detailed soil reinforcement layout shall be shown where walls intersect (i.e. permanent MSE wall intersects a temporary MSE wall at 90 degrees or less).

(e) Earth Surcharges: Should the plans indicate an earth surcharge is to be placed over the reinforced zone, the surcharge may be retained by using a temporary MSE wall structure. If a two-stage wall construction method is being used, the surcharge shall be constructed as part of the permanent wall and adjusted as indicated in the plans or directed by the Engineer.

(f) Precast Concrete Panel Facing Layout: MSE walls with segmental or full-height precast concrete panel facing shall require a numbered panel layout drawing for fabrication and erection purposes.

713.05 MSE Wall Facings: The Contractor shall make arrangements to purchase or manufacture all applicable materials such as facing panel, facing block, connectors, facing aggregate, block fill, welded wire mesh baskets, and all other necessary components. Written approval from the Director of Construction (DOC) shall be required to use materials or sources of materials not conforming to the specifications nor listed in the contract documents.

(a) MSE Wall With Precast Concrete Panel Facings:

(1) Precast Concrete Panel Facing: Concrete panel facing covered by this specification consists of either segmental precast concrete panels or full-height concrete panels.

Precast concrete panels shall be fabricated in accordance with Section 5 of AASHTO LRFD Bridge Design Specifications, with the following exceptions and additions.

a. Size: Precast concrete panels shall have a maximum width (w) to height (h) ratio, (w/h) ≤ 1.20. Precast concrete panels shall have a maximum height (h) to width (w) ratio, (h/w) ≤ 1.20. The panels shall have a maximum surface area of 30 square feet.

Full-Height concrete panels shall width (w) between 8 to 10 feet and a maximum height of 32 feet unless approved by the Department.

b. Reinforcing Steel: Unless noted otherwise in the plans, reinforcing steel shall be Grade 60 and shall meet the requirements of Section 703. Fabrication and placement of reinforcing steel shall conform to Section 703.

c. Concrete: Concrete and admixtures shall meet the requirements of Section 701, except that a certified plant will not be required. The concrete shall conform to the requirements of Class 4000P with a minimum 28 day compressive strength of 4000 psi.

d. Casting: The Structural Materials Engineer (SME) shall be notified 14 days prior to the production of precast concrete panels. The panels shall be cast on a flat surface, with the front face of the panel facing downward and the back face of the panel facing upward. Tie strip guide or other galvanized devices shall not be in contact with or be attached to the face panel reinforcement steel.

The concrete in each panel shall be placed without interruption and shall be consolidated by the use of an approved vibrator, supplemented by such hand tamping as may be necessary to force the concrete into the corners of the form. The units shall be fully supported until the concrete reaches a minimum compressive strength of 1000 psi. The panels shall be cured with burlap for 36 hours or steam cured. Forms shall remain in place until they can be removed without damage to the panel. The panels may be shipped 3 days after casting and attainment of the required concrete strength of 4,000 psi.

e. Compressive Strength: Acceptance of the precast concrete panels with respect to compressive strength will be determined on a lot basis. A lot is defined as either 40 panels or a single day's production, whichever is less. The lot will be randomly sampled for compressive strength testing in accordance with ASTM C 172 and tested in accordance with ASTM C 39. Strength testing and acceptance shall be in accordance with Section 701. Panels represented by test cylinders that do not reach the above requirements will be rejected.

f. Markings: The date of manufacture, the production lot number, and the panel identification number shall be clearly scribed on the rear face of each panel.

g. Finish: Unless otherwise indicated on the plans or directed by the RCE, the concrete surfacing for the front face shall have a natural gray stone block (Ashlar) wall finish. All concrete finishes shall conform to Section 702. The rear face shall have a uniform surface finish. The rear face of the panel shall be roughly screeded to eliminate open pockets of aggregate and surface distortions in excess of 1/4 inch.

h. Tolerances: Precast concrete panels shall be manufactured within the following tolerances:

1. Panel Dimensions: Position panel connection devices shall be within 1 inch of the specified dimension. All other dimensions shall be within 3/16 inch of the specified dimension.

2. Panel Squareness: Squareness as determined by the difference between the two diagonals shall not exceed 1/2 inch.

3. Panel Surface Finish: Surface defects on smooth formed surfaces measured over a length of 5 feet shall not exceed 1/8 inch. Surface defects on the textured-finish surfaces measured over a length of 5 feet shall not exceed 5/16 inch.

i. Rejection: Panels shall be rejected because of failure to meet any of the requirements specified above. In addition, any or all of the following defects shall be sufficient cause for rejection.

(1) Defects that indicate imperfect molding.

(2) Defects indicating honeycomb or open texture concrete.

(3) Cracked or severely chipped panels.

(4) Color variation on front face of panel due to excess form oil or other reasons.

(5) Defective or damaged reinforcement connection devices.

j. Handling, Storage and Shipping: Panels shall be handled, stored, and shipped in such a manner as to eliminate the dangers of chipping, discoloration, cracks, fractures, and excessive bending stresses. Panels in storage shall be supported on firm blocking located immediately adjacent to tie strips to avoid bending the tie strips.

(2) Joint Material: Joint material shall be installed to the dimensions and thickness shown in the plans, or the approved design drawings.

a. Vertical Joints: Filler for vertical joints between panels shall be flexible foam strips.

b. Horizontal Joints: Filler for horizontal joints between panels shall be preformed Ethylene Propylene Dimonomer (EPDM) rubber pads. The Contractor shall supply a manufacturer's certification to the RCE that the material conforms to ASTM D 2000 for 4AA, 812 rubbers, neoprene elastomeric pads having a Durometer Hardness of 55 $\pm$5, or high density polythylene pads with a minimum density of 0.946 g/cm^3 in accordance with ASTM D 1505.

(3) Panel Coping: Panel coping shall be required unless shown otherwise in the plans. The panel coping shall be a cast-in-place or precast concrete cap that is placed over the upper most level of the precast concrete panels as detailed in the plans. The concrete shall be Class 4000 concrete conforming to Section 701. If precast coping is used, concrete shall be Class 4000P. Level up concrete may be necessary at the top row of MSE wall precast concrete panel facings prior to placing panel coping. The stepped joint line between the level up concrete and the top row of blocks shall not be exposed. A lip shall be constructed to produce a joint line parallel to the finished grade. The level up concrete for precast coping shall be Class 3000 concrete conforming to Section 701. Unless noted otherwise in the plans, reinforcing steel shall be Grade 60 and shall meet the requirements of Section 703. Fabrication and placement of reinforcing steel shall conform to Section 703.

(b) MSE Wall With Cast-In-Place Full-Height Concrete Panel Facing:

(1) Cast-In-Place Full-Height Concrete Panel Facing: Concrete panel facing covered by this specification consists of cast-in-place full-height concrete panels. Precast concrete panels shall be fabricated in accordance with Section 5 of AASHTO LRFD Bridge Design Specifications, with the following exceptions and additions.

a. Reinforcing Steel: Unless noted otherwise in the plans, reinforcing steel shall be Grade 60 and shall meet the requirements of Section 703. Fabrication and placement of reinforcing steel shall conform to Section 703.

b. Concrete: Concrete and admixtures shall meet the requirements of Section 701. The concrete shall conform to the requirements of Class 4000 with a minimum 28 day compressive strength of 4000 psi.

c. Casting: Concrete construction shall meet the requirements of Section 702. Tie strip guide or other galvanized devices shall not be in contact with or be attached to the face panel reinforcement steel. The concrete in each panel shall be placed without interruption and shall be consolidated by the use of an approved vibrator, supplemented by such hand tamping as may be necessary to force the concrete into the corners of the form. Form liners shall be approved by the Engineer by preparing a sample with minimum dimensions of 2 feet by 2 feet. Forms shall remain in place until they can be removed without damage to the panel.

(2) Panel Coping: Panel coping shall be required unless shown otherwise in the plans. The panel coping shall be a cast-in-place or precast concrete cap that is placed over the upper most level of the precast concrete panels as detailed in the plans. The concrete shall be Class 4000 concrete conforming to Section 701. If precast coping is used, concrete shall be Class 4000P. Level up concrete may be necessary at the top row of MSE wall precast concrete panel facings prior to placing panel coping. The stepped joint line between the level up concrete and the top row of blocks shall not be exposed. A lip shall be constructed to produce a joint line parallel to the finished grade. The level up concrete for precast coping shall be Class 3000 concrete conforming to Section 701. Unless noted otherwise in the plans, reinforcing steel shall be Grade 60 and shall meet the requirements of Section 703. Fabrication and placement of reinforcing steel shall conform to Section 703.

(c) MSE Wall With Modular Concrete Block Facings

(1) Modular Concrete Block Facing: The Contractor shall supply a manufacturer's certification to the RCE that the modular concrete blocks for each lot shipped are in conformance with the following specifications. The certification for each shipment shall list for each particular lot shipped the date manufactured, type of block, the average compressive strength, and the water absorption.

a. Concrete: The concrete shall be Portland Cement Concrete with a minimum 28 day compressive strength of 4000 psi. Maximum water absorption limit shall be 6% in accordance with ASTM C 140. Admixtures shall conform to Section 701.

b. Casting: The modular concrete blocks shall be cast in steel molds and in a manner that will assure the production of uniform modular concrete blocks. The concrete in each block shall be placed without interruption and shall be consolidated. The blocks shall be steam cured for a minimum of 24 hours. The blocks shall reach a minimum compressive strength of 4,000 psi prior to being shipped.

c. Compressive Strength: Acceptance of the modular concrete blocks with respect to compressive strength will be determined on a per lot basis. The maximum number of blocks in each lot shall be 10,000. The lots shall be clearly marked until acceptance of testing results. The lot will be randomly sampled in accordance with ASTM C 140. The manufacturer shall perform compressive strength tests, on test specimens prepared by the manufacturer. Compressive strength test specimens shall conform to the saw-cut coupon provisions of Section 5.2.4 of ASTM C 140. Block lots will be approved when the average compressive strength is 4000 psi of 3 test coupons and with no individual test having a compressive strength less than 3500 psi. Block lots not reaching the above requirements shall be rejected.

d. Markings: The date of manufacture, lot number, and type of block in accordance with the approved MSE wall design drawings shall be clearly marked on each lot.

e. Finish: Unless indicated otherwise on the plans, the concrete surfacing for the front face of the block shall be natural gray with tri-planar fractured rock face finish.

f. Tolerances: Modular concrete blocks shall be manufactured within the following tolerances:

(1) The length and width of each individual block shall be within 1/8 inch of the specified dimension. Hollow units shall have a minimum wall thickness of 1¼ inch.

(2) The height of each individual block shall be within 1/16 inch of the specified dimension.

(3) Required Broken Face: When a broken or fractured face is required, the dimension of the front face shall be within 1 inch of the theoretical dimension shown on the plans.

g. Rejection: Modular concrete blocks shall be rejected because of failure to meet any of the requirements specified above. In addition, any or all of the following defects shall be sufficient cause for rejection.

1. Defects that indicate imperfect molding.
2. Defects indicating honeycomb or open texture concrete.
3. Cracks greater than 0.02 inches and longer than 25% of the height of the block.
4. Severely chipped or broken blocks.
5. Color variation on front face of block due to excess form oil or other reasons.
6. Defective or damaged reinforcement connection devices built into the modular concrete block.

h. Handling, Storage and Shipping: Modular concrete blocks shall be handled, stored, and shipped in such a manner as to eliminate the dangers of chipping, discoloration, cracks, or fractures.

(2) Block Fill: Block fill shall be furnished when modular concrete blocks require a block fill for connection strength or when vertical void spaces exist within the modular concrete block.

(3) Free Draining Aggregate: A 12-inch thick free draining aggregate with a geotextile fabric shall be required when a granular backfill is used with modular concrete block facings. In addition to the 12-inch aggregate layer, any void spaces along the backside of the modular concrete blocks shall also be filled with aggregate.

(4) Cap Blocks: Cap blocks shall be required unless shown otherwise in the plans. The cap blocks shall be a precast concrete cap that is placed over the uppermost level of blocks. Cap blocks shall be secured with Type S or Type M mortar that meets the requirements of Subsection 718.2.5 and 718.4.1.

(5) Block Coping: If required in the plans, a cast-in-place concrete coping shall be placed over the upper most level of modular concrete blocks as indicated in the plans or as shown on the accepted design drawings. Cast-in-place concrete coping shall be Class 4000 conforming to Section 701. Unless noted otherwise in the plans, reinforcing steel shall be Grade 60 and shall meet the requirements of Section 703. Fabrication and placement of reinforcing steel shall conform to Section 703.

(d) Temporary MSE Wall Facing:

(1) Welded Wire Mesh Facing: Reinforcing mesh shall be shop-fabricated of cold drawn steel wire. The Contractor shall supply a manufacturer's certification that the materials conform to the minimum requirements of ASTM A 82 (AASHTO M-55) and galvanization (when required) shall conform to the minimum requirements of ASTM A 123 (AASHTO M-111). Galvanization shall be applied after the mesh is fabricated.

(2) Temporary Facing Aggregate: The temporary facing aggregate shall be crushed stone or crushed gravel with the same gradation as the stone backfill referenced in the reinforced backfill materials section of this specification unless indicated otherwise in the plans.

713.06 Reinforced Backfill Material. The reinforced backfill material for permanent MSE walls shall be either granular or stone backfill, unless indicated otherwise in the plans or contract documents. Other types of reinforced backfill materials specified in the plans or contract documents shall be designated as alternate reinforced backfill materials in this specification. The granular and stone backfills shall conform to Section 205 with the following engineering properties and material requirements.

(a) Granular Backfill: The internal friction angle (Φ) for the reinforced granular backfill shall not be less than 32 degrees. A total unit weight of 120 pcf and a friction angle of 32 degrees shall be used for design, unless indicated otherwise in the MSE wall design criteria shown in the plans. A maximum internal friction angle of 34 degrees shall be used for design of the MSE wall regardless of project specific testing. The granular backfill material shall have the gradation in accordance with Table 3.

Table 3 - Reinforced Granular Backfill Gradation

Sieve Size (AASHTO T-27)	Percent Passing
Extensible Reinforcement (geosynthetic) = ¾", Inextensible Reinforcement (steel) = 1 ½"	100
No. 40	0 – 60
No. 100	0 – 30
No. 200	0 – 15

(b) Stone Backfill: The internal friction angle (φ) for the reinforced stone backfill shall not be less than 36 degrees. A total unit weight of 110 pcf and a friction angle of 36 degrees shall be used for design, unless indicated otherwise in the MSE wall design criteria shown in the plans. A maximum internal friction angle of 38 degrees shall be used for design of the MSE wall regardless of project specific testing. The stone backfill material shall be a coarse aggregate in accordance with Table 4 obtained from an SCDOT approved source.

Table 4 - Reinforced Stone Backfill

Soil Reinforcement Type	Coarse Aggregate No. (SCDOT Standard Specifications for Highway Construction, latest Edition)
Extensible Reinforcement (geosynthetic)	#67, #6M
Inextensible Reinforcement (steel)	#5, #57, #67, #6M

(c) Alternate Backfill: Alternate types of reinforced backfill specified in the plans and contract documents shall meet the material requirements specified. In addition, the Alternate types of reinforced backfill shall also meet the soil property requirements specified in this special provision Section 713.06 (f).

(d) Block Fill: The block fill material shall be a coarse aggregate #67 or #6M obtained from an SCDOT approved source.

(e) Free Draining Aggregate: Free draining aggregate shall be a coarse aggregate #67 or #6M obtained from an SCDOT approved source.

(f) Soil Property Requirements For Backfill: All reinforced backfill (granular or stone), block fill, and free draining aggregate shall have the following soil properties:

1. pH values shall range between 4.5 and 9.0 (AASHTO T-289 for granular backfill). For stone backfill, sample shall be prepared as follows: Obtain approximately 2-1/2 pounds of representative material. The sample shall be transferred into a 1 gallon wide mouth plastic jug. Add an equal weight of deionized or distilled water to the sample and let the mixture sit for approximately 30 minutes. At the end of this period, place a lid on the container and vigorously agitate the mixture for 3 minutes. Repeat agitation at 2 and 4-hour intervals. Allow the sample to sit for approximately 20 hours after the 4-hour agitation to allow for any solids to settle out. At this time remove a sufficient amount of the solution and filter through a coarse paper (such as Fisher Q8) to obtain the supernate to be analyzed. The supernate shall be analyzed according to ASTM D-1293 (Standard Test Methods for pH of Water)

and ASTM D-1125 (Standard Test Methods for Electrical Conductivity and Resistivity of Water).

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. Internal frictional angle testing of backfills is not required where 80% or more of the particles sizes are ¾" or larger.

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. Written approval from the DOC will be required to use soils with a coefficient of uniformity, C_u, less than 4.

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.

6. If steel soil reinforcements are used, the reinforced backfill and block fill shall have the following electrochemical properties:

a) The resistivity shall be greater than 3000 ohm-cm AASHTO T-288.
b) The chloride content shall be less than 100 ppm AASHTO T-291.
c) The sulfate content shall be less than 200 ppm AASHTO T-290.
d) The chloride and sulfate testing is waived if the resistivity is greater than or equal to 5000 ohm-cm.

(g) Temporary MSE Wall Reinforced Backfill: Reinforced backfill for temporary MSE walls may be granular backfill meeting section 713.06 (a) or stone backfill meeting section 713.06 (b).

Borrow materials or on-site soils may be used provided that the plasticity index, PI, (AASHTO T-90) is less than or equal to 15 and the liquid limit, LL, (AASHTO T-90) is less than or equal to 30, and it has a gradation (AASHTO T-27) of 100% passing the ¾" sieve and less than 30% passing the no. 200 sieve. The pH values of the backfill shall range between 4.5 and 9.0 (AASHTO T-289). The coefficient of uniformity, C_u, shall be 4 or greater. Written approval from the DOC will be required to use soils with a coefficient of uniformity, C_u, less than 4. The 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. Typically these soils will classify as A-1-a, A-1-b, A-3, and A-2-4. The internal friction angle (φ) for these soils shall not be less than 28 degrees. A total unit weight of 115 pcf and a friction angle of 28 degrees must be used for design, unless indicated otherwise in the plans. A maximum internal friction angle of 30 degrees shall be used for design of the MSE wall regardless of project specific testing.

Any temporary MSE wall that interfaces with the reinforced backfill of a permanent MSE wall shall use the same type of reinforced backfill that is used in the permanent MSE wall.

(h) 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 and pH. Reinforced backfill 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. If the coefficient of uniformity, Cu, of the reinforced backfill for permanent MSE walls is less than 4 then 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.

713.07 Soil Reinforcements and Attachment Devices: The Contractor shall make arrangements to purchase or manufacture all applicable materials such as soil reinforcements, attachment devices, and all other necessary components. Written approval from the DOC shall be required to use materials or sources of materials not conforming to the specifications nor listed in the contract documents.

(a) Inextensible Soil Reinforcement: All reinforcing shall conform to the required shape and dimensions and shall be free of defects that may impair their strength and durability. The Contractor shall supply a mill test report to the RCE with each shipment. Reinforcing will be sampled and tested from each heat number.

(1) Reinforcing Steel Strips: Reinforcing strips shall be hot rolled from bars to the required shape and dimensions. Their physical and mechanical properties shall conform to ASTM A 572 Grade 65 (AASHTO M-223) or equal. Galvanization shall conform to the minimum requirements of ASTM A-123 (AASHTO M- 111).

(2) Reinforcing Mesh: Reinforcing mesh shall be shop-fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A-82 (AASHTO M-55). Galvanization shall be applied after the mesh is fabricated and shall conform to the minimum requirements of ASTM A-123 (AASHTO M- 111).

(3) Bar Mats: Bar mats shall be fabricated from A-36 steel as shown on the plans. Galvanization shall conform to ASTM A-123 (AASHTO M-111). Galvanization shall be applied after the bar mats and connector pins have been welded as shown on the plans and shall conform to the minimum requirements of ASTM A-123 (AASHTO M-111).

(4) Galvanization Damage: Any damage done to the galvanization prior to the soil reinforcement installation shall be repaired with a cold galvanizing repair compound to provide a galvanized coating comparable to that provided by ASTM A 123 (AASHTO M- 111).

(b) Extensible Soil Reinforcement: All reinforcing shall conform to the required shape and dimensions and shall be free of defects that may impair their strength and durability.

(1) Geosynthetic Soil Reinforcement: Geosynthetic design requirements shall be as shown in the plans and specified in the design drawings. Geotextile reinforcement shall be a woven geotextile consisting only of long chain polymeric filaments or yarns formed into a stable network. Geogrid reinforcements shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil. The structure of geosynthetic 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.

(2) Delivery, Storage, and Handling of Geosynthetic Materials: The Contractor shall check the geosynthetic soil reinforcement upon delivery to ensure that the proper material has been received. Geosynthetic rolls shall be labeled per ASTM D 4837, Guide for Identification,

Storage, and Handling of Geosynthetic Rolls. During all periods of shipment and storage, the geosynthetic materials 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 geosynthetic materials 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 geotextile fabric or geosynthetic reinforcement damaged during storage or installation.

(3) 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. Conformance testing of ultimate tensile strength, T_{ult}, in accordance with Section 713.08(a) and applicable index testing shown on Table 11 of Section 713.08 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.

(c) Reinforcement Attachment Devices: All reinforcing and attachment devices shall conform to the required shape and dimensions and shall be free of defects that may impair their strength, durability, functionality, and design. The Contractor shall supply a manufacturer's certification to the RCE that the materials are in conformance with this specification.

(1) Tie Strips: The tie strips shall be shop-fabricated of a hot rolled steel conforming to the minimum requirements of ASTM A 1011, Grade 50 or equal. Galvanization shall conform to the minimum requirements of ASTM A 123 (AASHTO M-111).

(2) Fasteners: Fasteners shall consist of hexagonal cap screw bolts and nuts, which are galvanized and conform to the requirements of ASTM A 325 (AASHTO M-164), ASTM A 449, or equal, and galvanized in accordance with ASTM A 153 or ASTM F 2329 as applicable.

(3) Connector Pins: Connector pins shall be fabricated from A-36 steel and welded to the soil reinforcement mats as shown on the plans. Galvanization shall conform to ASTM A 123 (AASHTO M-111). Connector bars shall be fabricated of cold drawn steel wire conforming to the requirements of ASTM A 82 (AASHTO M-32) and galvanized in accordance with ASTM A 123 (AASHTO M-111).

713.08 MSE Wall Certification Package: When geosynthetic soil reinforcements are used for construction of MSE walls with modular concrete block facing or precast concrete panel facing the Contractor shall submit to the RCE a MSE wall Certification Package prepared by the MSE wall component manufacturer. The MSE wall Certification shall state that the furnished geosynthetic and the connection between the geosynthetic and the wall facing meets the design requirements as stated on the approved design drawings. 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. The MSE wall Certification Package shall include a Certificate of Compliance that certifies the following (as applicable to the MSE wall system):

1. The nominal tensile load, T_{al}, for geosynthetics soil reinforcements.

2. The ultimate tensile strength, T_{ULT}, (MARV) for geosynthetic soil reinforcements.

3. The strength reduction factors CR_{CR} and RF_D for the long-term connection strength between geosynthetic soil reinforcement and modular block facing.

4. The strength reduction factors RF_{ID} , RF_{CR} and RF_D, for the long-term geosynthetic soil reinforcement tensile strength.

5. The geosynthetic's pullout coefficients (F*, α) meet or exceed the MSE wall's required design pullout coefficients.

The certified values for the items above shall be documented to meet the minimum requirements outlined in AASHTO LRFD Bridge Design Specifications 11.10.

When alternate backfill materials are used the pullout resistance factors F* and α shall be determined from experimental laboratory pullout testing in accordance with FHWA NHI-10-025, Appendix B.2, "Experimental Procedures to Determination F* and α." All pullout resistance factors shall be evaluated using pullout test in accordance with ASTM D 6706 test procedure using the controlled strain rate method. Only borrow materials that have been approved by the Engineer shall be used as alternate backfill material for the project shall be used to conduct the pullout test. Borrow materials to be used for pullout testing shall be independently tested by an AASHTO certified geotechnical testing laboratory for the tests required in this specification. A report shall be submitted with geotechnical testing results, pullout testing results, and proposed pullout resistance factors.

713.09 Miscellaneous Construction Materials

(a) Leveling Pad: An unreinforced concrete leveling pad shall be constructed as shown in the design drawings. The leveling pad shall be Class 3000 concrete conforming to Section 701.

When full-height concrete panels are used, the leveling pad shall be reinforced concrete designed to support the full-height of the panel using Class 4000 concrete conforming to Section 701 and Grade 60 steel conforming to Section 703.

(b) Geotextile: The geotextile shall have the requirements shown in Table 5. The Contractor shall supply to the RCE a manufacturer's certification that the materials are in conformance with Table 5 of this specification. The fabric shall be resistant to chemical, biological, and insect attack.

Table 5 – Geotextile Properties

Property	Test Method	LIMIT
AOS (Sieve Opening, mm)	ASTM D 4751	0.300 maximum opening 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

(c) Geomembrane: If required in the plans, a single-layer continuous polymeric sheet shall be placed as indicated in the plans. The geomembrane shall be manufactured from a virgin polymeric resin. The geomembrane shall conform to the requirements shown in Table 6. The

Contractor shall supply to the RCE a manufacturer's certification that the materials are in conformance with Table 6 of this specification.

Table 6 – Geomembrane Properties

Property	Test Method	Minimum Requirements
Thickness, mills	ASTM D 5199	40
Tensile, lb/in.	ASTM D 882, 1 in. strip	70
Tear, lb.	ASTM D 1004, Die C	20
Puncture, lb.	ASTM D 4833 modified	40
Impact, ft.-lb.	ASTM D 1424 modified	25

713.10 Construction

(a) Wall Excavation and Foundation Preparation: Wall excavation and foundation preparation shall be in accordance with Section 204, Structure Excavation. In addition to the requirements of Section 204 the area where the MSE wall will be constructed shall be proof rolled with a minimum of 5 passes by pneumatic tire equipment weighing a minimum of 8 tons.

(b) Leveling Pad Construction: At each MSE wall foundation level, a precast reinforced or cast-in-place unreinforced concrete leveling pad of the type shown on the plans shall be provided. The leveling pad shall be cured a minimum of 12 hours before placement of wall blocks. If the permanent MSE wall facing is to be installed in front of a temporary MSE wall facing, the leveling pad shall be installed just prior to construction of the permanent MSE wall facing.

(c) MSE Wall System Supplier's Assistance: The Contractor's MSE wall system supplier/designer shall provide qualified and experienced advisory personnel at the start of the wall construction and until such time that the RCE feels the SCDOT inspectors and the Contractor's personnel are adequately acquainted with the MSE wall construction procedures and no longer require technical assistance. The representative shall also be available on an as needed basis, as requested by the RCE, during construction of the MSE wall structures. Three MSE wall field installation manuals, specific to the MSE wall type being constructed, shall be given to the RCE. If the MSE wall will be reinforced with geosynthetics, the RCE will be supplied with two sets of samples (approx. 1 square foot each) of each geosynthetic soil reinforcements that will be used. Each sample will have a durable tag attached to it, stating the geosynthetic manufacturer and type/model.

(d) Internal Drainage System: If required in the plans, an internal drainage system shall be installed behind the wall as indicated in the plans or as shown on the approved design drawings. Outlet pipes shall be placed at sags in the flow line, at the low end of the collector pipe, and at other locations shown or specified. Location and elevation of the internal drainage system shall be determined by the Contractor and submitted to the RCE for review.

(e) Geotextile: MSE wall with precast concrete panel facings shall have a geotextile fabric covering all joints between panels on the back side of the wall. The geotextile fabric shall have a minimum width of 12 inches and shall overlap adjacent geotextile fabrics a minimum of 4 inches. Geotextile fabric shall be adhered to panels by applying adhesive to the back of the panel on each side of the joint. Adhesive shall not be applied directly on the geotextile fabric or within 2 inches of the panel joint edge.

MSE walls with modular concrete block facings and granular reinforced backfill shall have a geotextile placed between the free draining aggregate and the reinforced backfill. If a stone reinforced backfill is used, the geotextile will be required at the limits of reinforced backfill and the retained backfill as shown in the plans.

If required in the plans, geotextile fabric shall be placed between the natural ground and the reinforced backfill. The subgrade to receive the geotextile fabric shall be free of loose or extraneous material and sharp objects that may damage the geotextile fabric during installation.

The geotextile fabric shall be stretched, aligned, and placed in a wrinkle-free manner with intimate contact with the soil. Adjacent geotextile fabric edges shall be overlapped a minimum of 1.5 feet.

At the direction of the RCE, torn or punctured sections of the geotextile fabric shall be repaired or replaced. Geotextile fabric damaged during installation by tearing or puncturing shall be cut out and replaced completely or repaired by placing a piece of fabric that is large enough to cover the damaged area and provide a sufficient overlap minimum 1.5 feet on all sides to secure the damaged geotextile fabric area.

(f) Wall Erection: Precast concrete panels and modular concrete block facings shall be placed so that their final position is vertical or battered as shown on the plans. Precast concrete panels and modular concrete block facings shall be placed in successive horizontal lifts. The MSE wall structure shall be constructed using a predetermined backward batter corresponding to the anticipated outward wall deflection due to the active soil pressures. This backward (positive) batter shall be determined by the Contractor's MSE wall system supplier and may be adjusted during construction as needed to build the wall to the required construction tolerances. At no time will a negative (outward) batter be acceptable.

MSE walls with precast concrete panels shall be handled by a lifting device set into the upper edge of the panels or as indicated in the design (shop) drawings. The first level of precast concrete panels shall be placed directly on the concrete leveling pad. Horizontal joint material or wooden shims shall not be permitted between the first course of panels and the leveling pad. As backfill material is placed behind a panel, the panel shall be maintained in position by means of temporary wooden wedges or bracing in accordance with the Contractor's MSE wall system supplier's recommendations. The wooden wedges shall be removed as soon as the panel above the wedged panel is completely erected and backfilled. External bracing shall be required for the first lift of precast concrete panels.

(g) Reinforced Backfill Placement: Backfill placement shall closely follow the erection of each lift of facing elements. At each level of soil reinforcement, the backfill material shall be roughly leveled to an elevation approximately 1 inch above the level of the connection at the facing before placing the soil reinforcement. Backfill shall be placed in such a manner as to avoid any damage or disturbance of the wall materials. Any wall materials, which become damaged during backfill placement, shall be removed and replaced at the Contractor's expense. Backfill placement methods near the facing shall assure that no voids exist directly beneath the reinforcing elements.

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. 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 wall at bridge abutments (including the first 150 feet of wall parallel to the roadway) and every 100 feet of wall along roadways (more than 150 feet away from bridge abutments). Stone backfill material shall be compacted with a minimum of 4 passes with a smooth heavy roller (approximately 15 tons). Compaction testing will not be required for stone backfill material. Sheepsfoot or grid-type rollers shall not be used for compacting backfill within the reinforced backfill.

Compaction within 3 feet of the back face of the wall shall be achieved by at least three passes of a lightweight walk behind vibratory plate or roller. In order to determine the number of passes needed to compact the area within 3 feet of the back face of the wall to 95 percent of the maximum dry density, the Contractor shall establish a test strip area measuring a minimum of 3 feet by 5 feet within the reinforced backfill and compact it with lightweight walk behind vibratory plate or roller. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Stone backfill placed within 3 feet of the back face of the wall shall be compacted by at least four passes of a lightweight walk behind vibratory plate or roller placed in 6 inch maximum lifts.

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 and shall closely follow the MSE wall facing erection. Stone backfill shall be placed in 6-inch to 12-inch lift thickness (loose). 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 wall face. In addition, the Contractor shall not allow surface runoff from adjacent areas to enter the wall 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.

(h) Soil Reinforcement Placement: The soil reinforcement shall be installed in accordance with the manufacturer's recommendations and these specifications. The soil reinforcement shall be placed within the layers of the compacted backfill material at the locations shown on the plans. The Contractor shall only place that amount of soil reinforcement required for immediately pending work to prevent undue damage. Soil reinforcement shall be placed with the strongest direction of soil reinforcement perpendicular to the wall face, unless shown otherwise in the plans. The soil reinforcement shall be connected to the MSE wall facing in accordance with the Contractor’s MSE wall system supplier's recommendations. The soil reinforcement shall then be laid flat and uniformly tensioned to remove any slack in the connection or soil reinforcement material.

(i) Construction Tolerances: The vertical alignment construction tolerances for temporary and permanent MSE walls shall not exceed 3/4 inch when measured along a 10 feet straight edge. The horizontal alignment construction tolerances for temporary and permanent MSE walls shall not exceed 3/4 inch when measured along a 10 feet straight edge for straight wall sections and along 3 feet straight edge for curved wall sections. The wall tolerance (plumbness from top to bottom) for temporary and permanent MSE walls shall not exceed 1/2 inch per 10 feet of wall height. The wall tolerance shall be determined from the net measurements after allowance is given for the offset batter of the MSE wall facing. A negative slope or batter (sloping outward from the face) shall not be acceptable regardless of the wall tolerance achieved.

The maximum allowable offset in the joint between panels shall be 3/4 inches. Horizontal and vertical joint widths between panels shall not be less than 1/2 inch nor more than 1 inch.

Temporary MSE wall facing constructed with welded wire form and geosynthetic wrap or other approved temporary facing method shall not bulge in excess of 2 inches when backfill behind the facing elements is compressed due to compaction stresses or self-weight of the backfill. Bulging shall be measured as the maximum displacement from the theoretical vertical or sloped face of the temporary MSE wall that extends over a section of 1 foot or more along the theoretical wall face.

(j) Surcharge: Should the contract indicate an earth surcharge to be placed over the reinforced zone, the surcharge shall be retained by using a temporary wall. The temporary wall may be built with a temporary MSE wall or other approved method. The face of the temporary MSE surcharge wall shall be placed 1 foot from the permanent wall face. The top surface of the surcharge shall allow the surface water to drain away from the wall. A plastic membrane shall be placed over the reinforced zone prior to placing the surcharge material. Materials and the

placement and removal of the temporary wall shall be included in the cost of the wall unless indicated otherwise on the plans.

(k) Abutment Piling: If abutments piles are to be placed within the reinforced zone, and the plans or Contractor's Pile Installation Plan indicate piles are to be cased through the reinforced backfill, the following requirements and sequence shall be adhered to unless indicated otherwise in the plans.

1. Drive all piles within the reinforced zone prior to installation. Encase each pile in a Smooth Wall or Corrugated Galvanized Steel (SWCGS) pipe of sufficient thickness to prevent buckling or distortion during placement and compaction of wall backfill. Payment to be included in the cost of the wall.
3. Externally stabilize the SWCGS pipe to prevent the pipe from coming in contact with the pile during backfilling of the wall.
4. Extend the SWCGS pipe from the bottom of the backfill to the bottom of the bridge abutment cap.
5. After positioning, seal the top of the SWCGS pipe to prevent debris accumulation during placement of wall backfill, and keep the pipe sealed until filled with granular material.
6. Fill the SWCGS pipe loosely with granular material after completion of wall construction to the satisfaction of the RCE.

713.11 Method of Measurement.

(a) MSE Wall: Temporary and permanent MSE wall quantity will be measured in square feet and shall be measured vertically from the top of the leveling pad (or bottom of temporary MSE wall) to the top of the wall as shown in plans on the MSE wall profile. There will be no separate measurements for precast concrete panels or modular concrete blocks, galvanized steel reinforcing and tie strips or galvanized steel mesh and mesh connectors or geosynthetic reinforcement, geotextile fabric, leveling pad, perforated pipe, drain pipe, or other incidental items required for construction of the MSE wall. If no revisions are made to the length and/or height of the MSE wall from the specified dimensions in the plans, no field measurement will be required and measurements shall be the quantity shown on the plans.

(b) Reinforced Backfill Material: Reinforced backfill material for temporary or permanent MSE walls will be measured in cubic yards and shall be the volume actually placed and measured as follows: The depth shall be measured between the finished grade and the elevation of the top of the leveling pad. The width shall be measured between the vertical planes located along the back of the MSE wall facing and 1 foot outside and parallel to the back end of the soil reinforcement as shown on the accepted design drawings. The length shall be from beginning to end of wall as measured along the MSE wall stationing. There will be no separate measurement of reinforced backfill material for temporary MSE walls.

(c) Coping: Roadway and bridge coping (cast-in-place or precast) for permanent MSE walls will be measured in linear feet of coping placed along the length of the top of the wall. There will be no separate measurements for level up concrete, dowels, grout, concrete, steel reinforcement, or other incidental items required for construction of the coping. If no revisions are made to the length of the MSE wall from the specified dimensions in the plans, no field measurement will be required and measurements shall be the quantity shown in the plans.

(d) Structure Excavation: Structure excavation when indicated in the plans for temporary or permanent MSE walls will be measured in cubic yards, and shall be the volume actually removed measured as follows: the depth shall be measured between the elevation of the original ground surface and the elevation of the top of the leveling pad. The width shall be measured between vertical planes located 2 feet outside of and parallel to the front facing of the MSE wall located at

the leveling pad and 3 feet outside and parallel to the back end of the soil reinforcement as shown on the accepted design drawings. The length shall be from beginning to end of wall as measured along the MSE wall stationing.

Basis of Payment.
(a) MSE Wall: The temporary or permanent MSE wall quantity measured above in Subsection 713.11 (a) will be paid for at the contract unit price for Mechanical Stabilized Earth Retaining Wall (MSE wall) that includes furnishing all materials, labor, equipment, and other incidentals required to complete this item of work. Payment will include, but shall not be limited to the following items: precast concrete panels or modular concrete blocks, galvanized steel reinforcing and tie strips or galvanized steel mesh and mesh connectors or geosynthetic reinforcement, geotextile fabric, leveling pad, drainage systems (even when not shown on the plans), material testing, and or other incidental items required for construction of the MSE wall. When changes in the work are ordered by the RCE, which vary the square foot wall quantity shown on the plans, the additional MSE wall quantity shall be paid for at the contract unit price.
(b) Reinforced Backfill Material: The temporay or permanent MSE wall reinforced backfill material quantity measured above in Subsection 713.11 (b) will be paid for at the contract unit price for MSE Wall Backfill. Payment will include furnishing all materials, labor, equipment, and other incidentals required to complete this item of work that shall include, but not be limited to furnishing, placing, and compacting the reinforced backfill material.
(c) Coping: The permanent MSE wall coping quantity measured above in Subsection 713.11 (c) will be paid for at the contract unit price for Coping for MSE Wall that includes furnishing all materials, labor, equipment, and other incidentals required to complete this item of work.
(d) Structure Excavation: The quantity of structure excavation for temporary or permanent MSE walls measured above in Subsection 713.11 (d) will be paid for in accordance with the Section 204 at the contract unit price for Structure Excavation for Retaining Walls.

Payment for each item will include all direct and indirect costs and expenses necessary to complete the work.

Payment will be made under:

Item No.	**Pay Item**	**Pay Unit**
7137005	MSE WALL BACKFILL	Cubic Yard
7137006	MSE WALL BACKFILL (GRANULAR)	Cubic Yard
7137007	MSE WALL BACKFILL (STONE)	Cubic Yard
7137008	MSE WALL BACKFILL (TEMPORARY)	Cubic Yard
7137105	MSE WALL (TEMPORARY) ROADWAY	Square Foot
7137110	MSE WALL (ROADWAY)	Square Foot
7137120	MSE WALL (BLOCK FACING) ROADWAY	Square Foot
7137130	MSE WALL (PANEL FACING) ROADWAY	Square Foot
7137205	MSE WALL (TEMPORARY) BRIDGE	Square Foot
7137210	MSE WALL (BRIDGE)	Square Foot
7137220	MSE WALL (BLOCK FACING) BRIDGE	Square Foot
7137230	MSE WALL (PANEL FACING) BRIDGE	Square Foot
7137190	COPING FOR MSE WALL (ROADWAY)	Linear Foot
7137290	COPING FOR MSE WALL (BRIDGE)	Linear Foot

(62) 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.

(63) SECTION 714: LINE EXISTING PIPE:

Description.
Rehabilitate drainage pipe by installing a pipe liner in accordance with the requirements of this Section. The plans will indicate the location of the pipe to be rehabilitated, the material composition and the alternate liner types that may be used to rehabilitate the pipe, and the method of liner installation.

Pre-installation Requirements.
Prior to installing the pipe liner, inspect the host pipe and ensure that it is clean, dry and stable. Inspect the host pipe by means of closed circuit television. Furnish all equipment necessary to inspect, remove silt and other debris, and dewater the host pipe to the satisfaction of the Engineer. Place flowable fill and make spot repairs as directed by the Engineer to maintain the stability of the host pipe.

Installation Methods.

General: Install the liner using one of, or a combination of, the following methods: slip lining, inverting, pulling/pushing, spiral winding, coating, or bursting. Seal or grout the annular space

between the interior of the host pipe and the exterior of the liner according to the liner manufacturer's written instructions.

A. Slip Lining: Use either high density polyethylene or aluminum pipe liner. Install the liner by joining discrete lengths, panels or segments of the pipe liner in a manhole or other access point and inserting the liner into the host pipe.

Pulling/Pushing: Install the liner in accordance with the manufacturer's written instructions. Protect the pipe liner end using a device that uniformly distributes the applied load around the perimeter of the liner. Continuously monitor the applied load, and do not stretch the liner by more than 1% of its original length. For liner lengths of 100 feet or less, the end protection device may be omitted, with written permission from the Engineer. Do not seal the liner ends or begin grouting prior to 24 hours after liner installation.

High density polyethylene: Install high density polyethylene pipe liner in accordance with ASTM F 585. The manufacturer's written instructions may be substituted for ASTM F 585 with written permission from the Engineer.

Aluminum: Install aluminum pipe liner in accordance with the manufacturer's written instructions.

B. Cured in Place: Install a resin impregnated felt tube pipe liner into the host pipe, and cure in place, in accordance with ASTM F 1216.

C. Spiral Winding: Install the pipe liner in accordance with ASTM F 1698.

D. Spray-On Coating: Use materials and install the pipe liner in accordance with the manufacturer's written instructions.

E. Pipe Bursting: Install the pipe liner in accordance with the manufacturer's written instructions. Limit bursting to concrete crossdrain or sidedrain pipe having no lateral connections or risers. Further limit bursting to locations where no part of the host pipe passes within 5 feet of any buried utility or pavement base material.

Acceptance.
Inspect the complete rehabilitation by means of closed circuit television Provide the Engineer with videos of all preliminary and final inspections.

Method of Measurement.
The quantity of pipe liner to be paid for will be the length, per foot, of pipe liner installed and accepted, measured along the centerline of the pipe, from end to end.

Basis of Payment.
Price and payment for pipe liner will be full compensation for furnishing and installing the pipe liner in accordance with the requirements of this Section, including all materials, labor and incidentals required for sealing cracks and joints in the existing pipe, and sealing and grouting the annular space between the liner and interior of the host pipe.

Price and payment for pipe liner will also be full compensation for all equipment, materials and labor required for inspections, and for furnishing videos of the inspections to the Engineer.

Item No.	Pay Item	Pay Unit
7149971	LINE EXISTING 12" PIPE	LF
7149972	LINE EXISTING 15" PIPE	LF
7149973	LINE EXISTING 18" PIPE	LF
7149974	LINE EXISTING 24" PIPE	LF

7149975	LINE EXISTING 30" PIPE	LF
7149976	LINE EXISTING 36" PIPE	LF
7149977	LINE EXISTING 42" PIPE	LF
7149978	LINE EXISTING 48" PIPE	LF
7149979	LINE EXISTING 54" PIPE	LF
7149980	LINE EXISTING 60" PIPE	LF
7149981	LINE EXISTING 66" PIPE	LF
7149982	LINE EXISTING 72" PIPE	LF
7149983	LINE EXISTING 78" PIPE	LF
7149984	LINE EXISTING 84" PIPE	LF

(64) 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

(65) SECTION 720: DETECTABLE WARNING SURFACE:

Description:

Detectable warnings are an Americans with Disabilities Act (ADA) requirement for the purpose of detecting the boundary between the sidewalk and the street. The detectable warning surface is a feature built in or applied to walking surfaces to warn visually impaired people where to stop. Generally, they are used where the sidewalk crosses or adjoins a vehicular way and the two surfaces are not separated by a curb, rail or other element excluding un-signalized driveway crossings. Truncated domes are the only detectable warning surface allowed along with a visually contrasting surface.

Materials:

The detectable warning surface consists of raised truncated domes with a base diameter of nominal 0.9 –1.4 inch, a height of nominal 0.2 inch and a center-to-center spacing of nominal 1.6 –2.4 inches. The pattern for the domes is a square pattern arranged in a parallel alignment. Minimum space between the domes at their base is 0.65 inch measured along any line of domes uniform over the entire detectable warning surface. See Standard Drawing 720-905-01 for details. Detectable warning surfaces must be listed on the Department's Approval Sheet prior to installation.

Detectable warning surfaces visually contrast with the adjoining surfaces. The SCDOT has selected the color "safety yellow" (Federal Number 33538) to meet this requirement. If a specific project requires another color other than safety yellow, the color selected will contrast either light-on-dark or dark-on-light.

Construction:

Cast detectable warnings into the newly poured concrete ramps. If existing ramps are retrofitted, use the surface mount type of detectable warning. See Standard Drawing 720-905-02, 720-910-01 thru 04 for details.

Follow the manufacturer's instructions for the proper installation of detectable warning surfaces. Provide copies of the manufacturer's literature to the Engineer to verify material and construction procedure compliance.

Method of Measurement:

The Engineer will measure detectable warnings by the square foot.

Basis of Payment:

Payment includes all costs for labor, materials, and incidentals to construct the detectable warnings in accordance with this Special Provision, Standard Drawings, and the manufacture's requirements. The bid item, description, and unit are as follows:

Item number	Description	Unit
7204900	DETECTABLE WARNING SURFACE	SF

(66) SECTION 726: POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM

DESCRIPTION: This Special Provision shall govern the furnishing of materials and the installation of polymer modified asphalt expansion joint systems of the size, type and at the locations shown in the project plans as directed by the Engineer. A 5-year manufacturer warranty against surface cracks, and infiltration of moisture and water in the joint is also required.

SUBMITTALS: The CONTRACTOR shall submit the following to the RCE.

a) Manufacturer's installation instructions and Product Data which indicates compliance with this specification.

b) The CONTRACTOR shall transfer the joint manufacturer's 5-year warranty against surface cracks, infiltration of moisture and water, from the time the bridge is opened to the traffic to SCDOT. This written manufacturer's warranty should contain SCDOT file number, estimated date the bridge will be opened to traffic and the following language:

"In the event surface cracks occur, before the warranty expires, the joint manufacturer will be responsible for repairing or replacing the joint at no cost. If the joint needs to be repaired or replaced by the manufacturer before the warranty expires, SCDOT will provide traffic control for a time interval specified by the joint manufacturer with 2 weeks notice"

MATERIALS: Materials used in the construction of the polymer modified asphalt joint system shall comply with the manufacturer's recommendations, modifications of this Special Provision and as directed by the RCE.

a) Backer Road: The backer rod shall be of circular cross section and consist of closed-cell polyethylene foam expansion joint filler capable of withstanding the elevated temperature of the polymer modified asphalt. The diameter required will be 1.5 times the joint width as a minimum.

b) Binder Coat: The binder coat shall be applied hot and be a type that is suitable for the intended use and be in accordance with the manufacturer's recommendations.

c) Bridging Plate: The metal used for bridging the joint opening shall comply with AASHTO M 270 Grade 36 (ASTM A 709 Grade 36). The use of aluminum for plates is strictly prohibited.

d) Polymer Modified Asphalt Binder: The polymer modified asphalt binder system may be from the manufacturer listed below, or an approved equal.

Linear Dynamics, Inc.	The D.S. Brown Co	Watson Bowman
RR2 Box 311	PO 158 – 300 E. Cherry St	95 Pineview Dr
Muncy, Pa 17756	N. Baltimore, Ohio 45872	Amherst, NY 14228
Contact Sherry Willard	Contact Kyle Robinson	Contact Ron Poleon
Phone (1-570-547-1621)	Phone# (770) 998-4511	Phone# (770) 592-9021

CONSTRUCTION PROCEDURES: The following construction procedures shall be used in construction of joints. A manufacturer's representative shall be present during all phases of

the joint preparation and installation to ensure adherence to the manufacturer's recommendations and procedures.

a) Sawing and Surface Preparation: After paving operations are completed, the asphalt overlay is to be saw cut full depth, for the width shown in the plans, and the overlay material between the saw cuts removed down to the top of slab concrete. The exposed concrete surface shall be cleaned and dried as recommended by the joint manufacturer or as directed by the Engineer. The prepared and dried joint surface shall be inspected and approved before proceeding with additional operations.

b) Backer Rod Installation: A proper sized backer rod shall be installed into the joint opening to a proper depth as directed by the manufacturer's representative.

c) Sealing Joint: Hot binder material shall be poured into the joint opening as directed by the manufacturer's representative to seal joint.

d) Bridging Plate: A proper size bridging plate shall be placed for the full length of joint.

e) Binder-Coat Placement: A hot poured binder coat shall be applied to cover all exposed surfaces (both vertical and horizontal) of the joint and bridging plate as directed by the manufacturer's representative.

f) Aggregate Binder Matrix Placement: The binder material shall be placed in layers as directed by the manufacturer's representative. The finished joint surface shall match the finished roadway surface.

METHOD OF MEASUREMENT: Measurement of Polymer Modified Asphalt Expansion Joint will be taken along the centerline of joint from gutter line to gutter line. Payment for the measured length will be full compensation for any additional extension required to terminate the joint beyond the gutter lines.

BASIS OF PAYMENT: Payment for the joint will be at the linear foot price bid for the item "Polymer Modified Asphalt Expansion Joint", which payment will include the cost of furnishing and installing the joint system and all labor, materials, tools, hardware, equipment, furnishing manufacturer's technical representative, cost for maintenance of traffic for a time interval as specified by the manufacturer for curing of the joint material and all incidentals necessary to complete the work.

Payment will be made under:

ITEM NO.	PAY ITEM	PAY UNIT
7261210	Polymer Modified Asphalt Expansion Joint	L.F.

(67) 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.

(68) SECTION 805: GUARDRAIL END TERMINAL - TYPE T:
The CONTRACTOR's attention is directed to the plans which call for Guardrail End Terminal Type T. These end treatments shall meet the requirements of NCHRP 350. The CONTRACTOR shall select a terminal listed on the Qualified Products List for "End Terminal - Type T". This list is maintained by the Materials and Research Engineer. Currently, the following two terminals are listed on the Qualified Products List:

ET - PLUS
SKT - 350

The CONTRACTOR shall construct the end terminal in accordance with the manufacturer's specifications for a four tube system. End Terminals are to be supplemented with a W18-1R-30 or W18-1L-30 sign as appropriate. The sign is to be fabricated from Type III sheeting with a high tack adhesive and attached directly to the end terminal without the aluminum blank. All costs for the sign and installation are to be included in the price bid for Guardrail End Terminal Type T.

Note: The Melt does not meet the NCHRP 350 criteria.

(69) SECTION 805: QUADTREND™ (ATTACHMENT TO STRUCTURES):

In all cases QUADTREND™ installation is to be in accordance with manufacturer recommendations. The Engineer may require that installation procedures be demonstrated or monitored by the manufacturer.

(70) SECTION 805: QUADTREND™ (APPLICATION OF WARNING SIGN):

All QUADTREND™ systems are to be supplemented with a W18-1R-30 or W18-1L-30 sign as appropriate. The sign is to be fabricated from Type III sheeting with a high tack adhesive and attached directly to the QUADTREND™ system without the aluminum blank. All costs for the sign and installation are to be included in the price bid for the QUADTREND™.

(71) SECTION 805: GEOCOMPOSITE WALL DRAIN DATED 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	ASTM D 4355	70

exposure)		

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 cuspations, 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.

(72) SECTION 805: GEOTEXTILE FOR DRAINAGE FILTRATION:
See attached Supplemental Specification dated **April 1, 2004** in **Exhibit 6.**

(73) SECTION 805: COLD APPLIED WATERPROOFING DATED MAY 29, 2003:

1.0 DESCRIPTION

A cold applied waterproofing system may be used in lieu of the “Second Method” waterproofing. The cold applied waterproofing shall be placed along construction joints and contraction joints that are adjacent to soil. The cold applied waterproofing shall be placed continuously along the joints in 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 cold applied waterproofing system 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. Acceptance will be based on the material test results meeting the 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. The waterproofing shall not be installed until the material certification is received and approved by the Research and Materials Engineer.

3.0 MATERIAL

The cold applied waterproofing system shall be a self-adhering membrane of rubberized asphalt integrally bonded to polyethylene sheeting. The material shall conform to the properties given in the table below.

COLD APPLIED WATERPROOFING SYSTEM PROPERTIES		
TEST	**METHOD**	**LIMIT**
Application Temperature Range (°F)	N/A	40 °F to 120 °F
Minimum Thickness (mils)	N/A	60
Pliability (180 bend over ¼" mandrel @ -25 °F)	ASTM D 146	No Effect
Minimum Tensile Strength – Film (psi)	ASTM D 412 (Die C) Modified	4000
Minimum Elongation – Ultimate Failure of Rubberized Asphalt, (%)	ASTM D 412 (Die C) Modified	300
Minimum Puncture Strength – Membrane (Stretches by blunt object) (lbs.)	ASTM E 154	40
Minimum Puncture Strength – Film (in ounce tear) (lbs.)	ASTM D 781	250
Maximum Permeance – Perms (Grains/sq. ft./hr./in.Hg)	ASTM E 96 (Method B)	0.1
Maximum Water Absorption (% by weight)	ASTM D 570	0.2
Minimum Tensile Strength – Membrane (psi)	ASTM D 412 (Die C) Modified	250

4.0 CONSTRUCTION REQUIREMENTS - GENERAL

The CONTRACTOR shall check the cold applied waterproofing system upon delivery to ensure that the proper material has been received. All materials shall be delivered to the site in the original containers, plainly marked with the manufacturer's brand or label. The waterproofing materials shall be stored in a dry protected place. Manufacturer's recommendations for shipping and storage at the construction site shall be followed.

The waterproofing materials will be rejected at the time of installation if it has defects, tears, punctures, flaws, or damage incurred during manufacture, shipment, or storage. Any waterproofing materials damaged during manufacture, shipment, or storage shall be replaced by the Contractor at no additional cost.

The cold applied waterproofing shall be installed in accordance with the manufacturer's recommendations at the locations shown on the plans or as directed by the engineer. If at any time the Engineer determines that the method of installation does not produce a satisfactory waterproofing, the Contractor shall alter his method and/or equipment as necessary to comply with this specification.

5.0 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Cold applied waterproofing shall not be measured for payment. The cost of the cold applied waterproofing shall be included in the cost of the retaining wall or wall system where the waterproofing is being installed.

(74) SECTION 809: RIGHT OF WAY PLAT:

Description:

The CONTRACTOR by the "Substantial Work Complete" date shall prepare a right of way plat signed and sealed by a Professional Land Surveyor (PLS) licensed to practice in the state of South Carolina. The right of way plat shall be in accordance with the requirements

of Section 49-460-A "General Property Survey" as outlined in the South Carolina "Standards of Practice Manual" for land surveyors. A copy of the plat will be recorded, by the contractor, in the Register Mesne Conveyance (RMC) office of the county or counties in which the project resides. The CONTRACTOR will provide one copy of the plat on a full sized plan sheet(s) (22" X 36") and submit to the resident construction engineer to be included in the as-built plans.

Materials: Rebar Cap R/W Marker
Materials used shall comply with those listed on SCDOT Standard Drawing No. 809-105-00.

Construction Requirements:
The PLS shall set right of way markers along all new right of way lines as well as along any present right of way being retained by the Department at intervals listed on the SCDOT Standard Drawings. Right of way markers shall not be placed at points common to side property lines and/or corners. In the event that the plan reflects a break in the right of way along a side property line the right of way marker will not be set without the side property line being retraced and established by way of survey. The PLS shall prepare a plat documenting the location of all right of way markers set and reflecting the as-built station and offset from the plan alignment. The plat shall show the entire project corridor as an enclosed strip or parcel of land to include the mainline and all side roads as defined on the project plan.

Measurement and Basis of Payment:
The item Right of Way Plat is paid on a lump sum (LS) basis; and therefore, there is no specific measurement for this item. The unit price bid for Right of Way Plat shall include all costs for labor, materials, equipment, services of a PLS and any related fees or costs associated with producing a plat, recording the plat at the RMC office, and all required copies. Each marker placed in accordance with the Standard Drawing complete and accepted will be measured and paid at the unit price bid.

Item No.	Description	Unit
8091000	RIGHT OF WAY MARKER (REINFORCED CONCRETE)	EA
8091010	RIGHT OF WAY MARKER (REBAR AND CAP)	EA
8091050	RIGHT OF WAY PLAT	LS

(75) SECTION 810: SEEDING:
Section 810.2.2.3 is hereby amended by adding the following note to the table:

[2] The use of Annual Sudan Grass for temporary vegetation shall be prohibited statewide.

The first paragraph of Section 810.4.3 is amended to read as follows:

Before acceptance of the seeding performed for the establishment of permanent vegetation, the Contractor will be required to produce a satisfactory stand of perennial grass sufficient to control erosion. It will not be necessary for the grass to re-establish after dry periods or winter weather for acceptance and payment to be made.

(76) SECTION 815: EROSION CONTROL MEASURES:
See attached Supplemental Specification dated **January 1, 2009**, in **Exhibit 6.**

(77) SECTION 815: EROSION CONTROL:
See attached Supplemental Specification Dated **July 1, 2011**, in **Exhibit 6.**

(78) 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.

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.

(79) SAFETY FENCE:

Safety Fence

Description
This work consists of furnishing materials, installing, and maintaining safety fence to mark all jurisdictional boundaries within a project corridor. Additionally where appropriate the contractor should hang highly visible flagging to outline the jurisdictional boundaries. The fence and flagging shall be installed prior to any land disturbing activities.

Materials
Polyethylene or polypropylene fence shall be an orange prefabricated safety fence approved by the Engineer. The fence shall be furnished with an ultraviolent coating and protected against moisture and extended ultra-violent exposure prior to placement. Either wood or

steel posts may be used. Install safety fence using wooden stakes (1 inch x 1 inch) or steel posts (1.25 lbs/ linear foot) a minimum of five (5) feet in length.

Construction
No additional clearing and grubbing is anticipated for the installation of the safety fence. The fence shall be erected along and around the existing ground contour and vegetation.

Place survey stakes with high visibility flagging on 25' feet maximum intervals along the jurisdictional boundary. With the boundary established, install the orange safety fencing parallel to and offset 10 feet from the outside perimeter of all jurisdictional boundaries. The safety fence may be installed on a tangent that runs parallel to the buffer but must not encroach on the buffer at any location. Post shall be set on a maximum of 10 feet spacing.

Wetland flagging tape should be placed on adjacent vegetation to assist contractors in recognizing the jurisdictional boundaries.

The contractor shall maintain the safety fence in satisfactory condition for the duration of the project as determined by the RCE.

(80) DIVISION 200: SETTLEMENT PLATES:

1.0 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.

1.1 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.

1.2 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.

1.3 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 sbugrade. 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

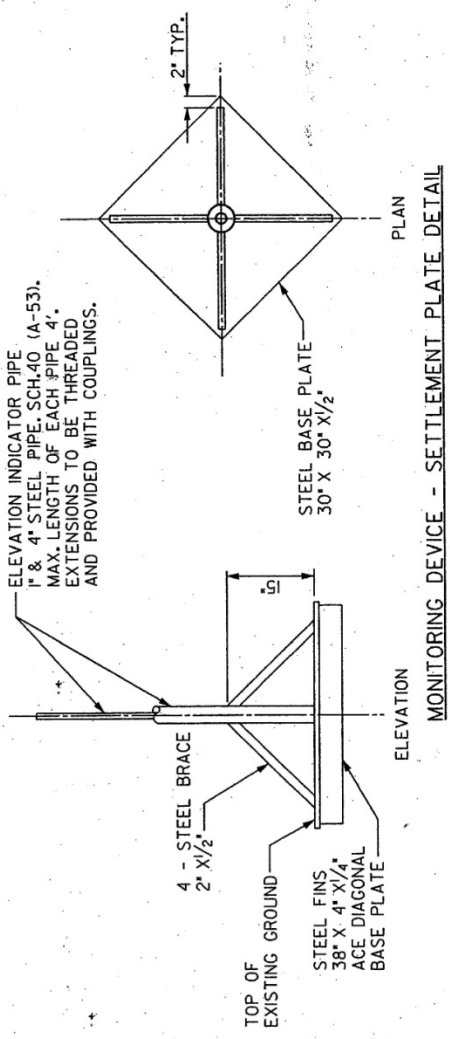
The number of settlement plates, as provided in the plans, will be paid for at the contract unit price bid for "Monitoring Device - Settlement Plates" which shall include all equipment, including but not limited to the settlement plates; mobilization; labor; surveys; materials; incidentals and abandonment 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

(81) NONWOVEN GEOTEXTILE INTERLAYER FABRIC FOR CONCRETE PAVEMENT:

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 $1x10^{-4}$ meters per second ($3.3x10^{-4}$ feet per second) when tested in accordance with modified ASTM D 4491 at 20 kPa (2.9 psi).

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 $5x10^{-4}$ meters per second ($1.6x10^{-3}$ 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 $2x10^{-4}$ meters per second ($6.6x10^{-4}$ feet per second) when tested in accordance with modified ASTM D 4716 at 200 kPa (29 psi)..

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 overlapping, 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.

(82) DIVISION 200: GROUND MODIFICATION – COMPACTION GROUTING COLUMNS

August 1, 2005

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 other wise 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^{o} 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/yd^3. 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 (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:

Item No.	Pay Item	Pay Unit
8990353	Ground modification – Compaction Grouting Columns	Linear ft

(83) DIVISION 200: 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**	**Nonwoven**	**Woven**	**Nonwoven**
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 REQUIREMENTS[1]

	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

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:

Pay Item	**Pay Unit**
Geotextile, Separation/Stabilization	Square Yard

(84) DIVISION 200: BRIDGE LIFT MATERIALS

Division 200 is expanded as follows.

1.0 DESCRIPTION

The requirements of this specification shall consist of furnishing all necessary submittals and materials for providing bridge lift materials in accordance with the details shown on the plans and the requirements of the Supplemental Specifications. The bridge lift materials shall be installed at locations show on the plans, unless otherwise directed by the Department.

2.0 MATERIALS

The materials provided for under this specification shall be used for bridge lifts. Bridge lift materials shall consist of two general types, first materials that can be placed through water and those materials that are placed over soft exposed subgrades without water being present. The materials placed through water shall consist of either stone or coarse granular materials. The materials placed on soft exposed subgrades may consist of borrow excavation, stone or coarse granular materials.

2.1 Stone Materials: The stone materials shall meet the specification requirements of No. 57 or No. 67 Coarse Aggregate (stone) as described in the current edition of the SCDOT Standard Specifications for Highway Construction. The stone shall consist of durable particles that are comprised of naturally occurring materials including marine limestone or man-made materials. The man-made materials are limited to light weight materials that meet the gradation requirements previously indicated and have a unit weight of at least 65 pounds per cubic foot. The natural materials shall have a dry unit weight of at least 105 pounds per cubic foot. Recycled materials may not be used.

2.2 Granular Materials: The granular materials shall meet the specification requirements for an A-1-a (AASHTO M-145) as indicated in the following table.

Sieve Analysis	Percent Passing
No. 10	50 max.
No. 40	30 max.
No. 200	15 max.
Plasticity Index	6 max.
Organics	1 max.

The granular materials shall consist of durable, naturally occurring particles. The granular materials shall have a dry unit weight of at least 110 pounds per cubic foot. Recycled materials may not be used.

2.3 Borrow Excavation Materials: Borrow excavation materials used as a bridge lift shall be limited to A-1, A-2 and A-3 materials (AASHTO M-145). The borrow excavation materials shall meet the requirements as described in the current edition of the SCDOT Standard Specifications for Highway Construction.

2.4 Submittals: The contractor is required to submit copies of gradation testing to the Department prior to delivery of the material to the site and at the discretion of the RCE as placement proceeds, if in the opinion of the RCE additional verification of the gradation is required.

3.0 METHOD OF MEASUREMENT

Stone bridge lift materials shall be measured by the ton (TON) when included in the Contract. Granular bridge lift materials shall be measured by the cubic yard (CY) when included in the Contract. The quantity of granular bridge lift material includes the material acceptably excavated and is measured in its original position and determined from cross-sections by the method of average-end-areas, complete and

accepted. Borrow excavation bridge lift materials shall be measured and included the total borrow material required for the project.

4.0 BASIS OF PAYMENT

Unless otherwise specified, payment for the accepted quantity of material, as specified herein, measured in accordance with this specification, is determined using the contract unit bid price for the applicable pay item. Payment is full compensation for obtaining, hauling and placing the material and all other materials, labor, equipment, tools, supplies and incidentals necessary to satisfactorily complete the work as required in the Plans, Project Specifications and other terms in the Contract.

Where the Contractor is required to furnish the borrow pits for granular bridge lift material, payment for the granular bridge lift material includes the cost of the borrow pit, clearing and grubbing of pits, necessary haul roads, hauling of the borrow material to the designated location on the project and for all other pertinent stipulations stated above.

Payment of borrow excavation bridge lift material shall be included in the quantity of borrow excavation used on the project.

Payments shall be made under:

Item No.	Pay Item	Pay Unit
2052010	Stone Bridge Lift Material	TON
2052020	Granular Bridge Lift Material	CY

(85) DIVISION 200: DEEP SOIL MIXING

September 21, 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 <u>Wet Method (DSM-SCC):</u>

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 <u>Dry Method (DSM-LCC):</u>

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 <u>DSM Construction Plan:</u> 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 <u>three DSM projects</u> 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:

o. 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.
p. Grout injection pressure and volume
q. Estimate of spoil volume
r. Target and actual cement factors and grout specific gravity measurements per DSM-SCC column.
s. Date, time, plan location, and elevation and other details of all soil-cement wet grab samples and any other samples taken during work shift.
t. 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:

o. Installation air pressure at tip and top of the lime-cement column.
p. Target and actual binder dosage mixed per DSM-LCC column.
q. 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 <u>Shop Plan/Working Drawing:</u> 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 effective 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-prodution 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 redrilling 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 redrilled 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 <u>Coring and Sampling:</u>

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 consists 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

(86) DIVISION 200: GEOGRID SOIL REINFORCEMENT

June 17, 2010

Division 200 is expanded as follows:

1.0 Description. This work shall consist of furnishing primary geogrid soil reinforcement in accordance with these specifications.

2.0 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.

3.0 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
Allowable Long-term Tension Load, T_{al} [1] [2] (lb/ft)	FHWA NHI-00-043	450	800	1450	2300	3000	3600	4000

[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 $\mathbf{T_{al}} = \frac{\mathbf{T_{ult}}}{\mathbf{RF}}$ 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] b. Ultimate Tensile Strength, T_{ult} (lb/ft) c. Allowable Long-Term Strength, T_{al} (lb/ft)	 ASTM D 4595 ASTM D 4595 FHWA NHI-00-043	 800 1400 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 Design Engineer (GDE) 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 GDE 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 GDE, 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_l, 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-00-43, *"Mechanically Stabilized Earth Walls and Reinforced Soil Slopes*" - Appendix "B". 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_l. 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, *"CorrosionIDegradation 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 ranging from 2 to 10 psi. 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	$\leq$ 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

(87) DIVISION 200: GROUND MODIFICATION – VIRBRO STONE COLUMN

(VIBRO DISPLACEMENT)

January 9, 2013

Division 200 is expanded as follows.

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 ration (A_r) achieved at any depth by the vibro-displacement stone columns shall be that which is equivalent to 36-inch diameter stone columns spaced 8 ft. center-to-center (c-c) on a triangular pattern.

The area replacement ratio shall be defined by the following relationships:

$$Ar = \frac{\text{Stone Column Area}}{\text{Tributary Area}} \times 100\%$$

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

(88) DIVISION 200: LIGHTWEIGHT AGGREGATES

1.0 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.

2.0 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/ft^3.
- In-place density: (ASTM D4253, and D4254): The in-place compacted dry unit weight must be between 55 and 60 lbs/ft^3. 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.

3.0 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.

4.0 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.

5.0 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

(89) DIVISION 200: HIGH-STRENGTH GEOTEXTILE FOR EMBANKMENT REINFORCEMENT

June 17, 2010

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 selvedges (edges) during shipping, handling, placement, and in service. Use geotextile free from defects or tears.

E. **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.
F. **Apparent Opening Size:** Values for Apparent Opening Size (AOS) represent maximum average roll values. Acceptance will be based on ASTM D 4759.
G. **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 to 2.0)$D_{85(soil)}$
Permeability	ASTM D4491	$\geq 10k_{soil}$
Default Pullout Friction Factor, F*	ASTM D6706	0.6Tan Φ
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 geotexile 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:

4. The ultimate tensile strength, T_{ULT}, (MARV) for geogrid soil reinforcements, MD/XD
5. The tensile strength at 5% strain, MD
6. The creep reduced tensile strength, MD
7. 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:

$$\mathbf{T_{al} = \frac{T_{ult}}{RF}}$$

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:

$$\mathbf{RF = RF_{ID} \times RF_{CR} \times RF_{D} \geq 3.0}$$

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_l, 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_l. 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, *"CorrosionIDegradation 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_{al} provided above where,

F* = Minimum pullout friction factor = C_i Tan Φ,
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 ranging from 2 to 10 psi. 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 goetextile. 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

(90) SECTION 203: MUCK EXCAVATION

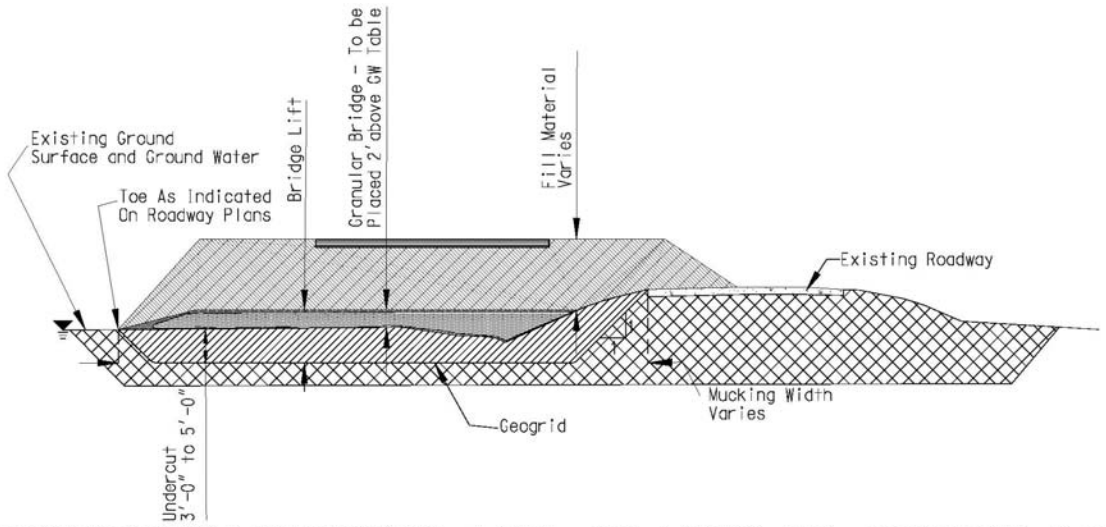
September 19, 2011

Section 203.2.1.3 is amended as follows:

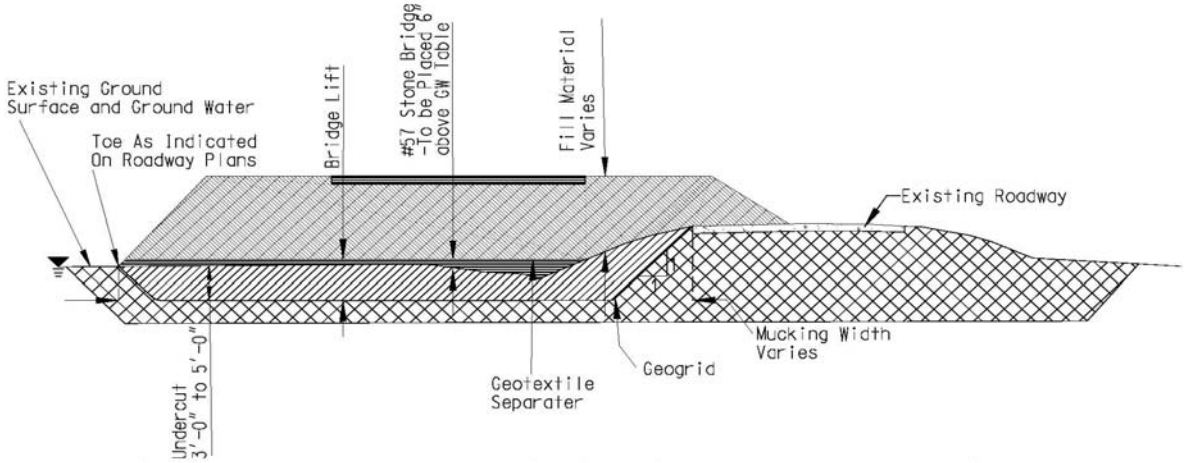
Any areas identified on the plans and any additional areas defined by the RCE that are discovered to deflect or settle may require corrective action by the Contractor. This may include undercutting, placing granular aggregate, placing stone aggregate that is separated from other fine aggregate materials 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.



UNDERCUT, GEOGRID, AND GRANULAR BRIDGE LIFT



UNDERCUT, GEOGRID, AND STONE BRIDGE LIFT

(91) DIVISION 200: PREFABRICATED EARTHQUAKE DRAIN WITH FILTER FABRIC

January 24, 2012

Division 200 is expanded as follows:

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

ASTM D4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

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: (ASTM D4491)	0.01 in/sec (K-value)
Minimum Water Permittivity, fabric: (ASTM D4491)	0.1 sec^{-1}
Minimum Tear Strength, fabric: (ASTM D4533)	50 lb
Minimum Tensile Strength, fabric: (ASTM 4632)	90 lb
Minimum Elongation at break: (ASTM D4632)	60 percent
Minimum Puncture Strength, fabric: (ASTM 4833)	35 lb
Minimum Mullen Burst, fabric: (ASTM D3786)	150 psi

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.

f) 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 MEASURMENT

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

(92) DIVISION 200: 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 of 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:

b) The Contractor shall immediately notify the Department prior to completing the drain and prior to installing other drains.

c) 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 MEASURMENT

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, an 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, an 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

(93) DIVISION 200: 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 then 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 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 Owner 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

(94) DIVISION 200: MONITORING DEVICES - PIEZOMETER

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."

(95) DIVISION 200: SETTLEMENT SENSORS

1.0 General

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.

2.0 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.

2.1 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.

2.2 Existing Soil Conditions:

The subsurface conditions encountered at the site are presented in the Contract Plans and documents.

3.0 PRODUCTS

3.1 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.

3.2 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.

3.3 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.

3.4 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.

4.0 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).

5.0 EXECUTION

5.1 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.

5.2 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.

5.3 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.

5.4 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.

5.5 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.

6.0 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.

7.0 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

(96) DIVISION 200: TOTAL PRESSURE CELLS

1.0 Description. This work includes furnishing all supervision, materials, equipment, labor, and related services necessary for installing pressure monitoring instrumentation consisting of a vibrating wire (VW) total (earth) pressure cell 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 total pressure 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:

3. Confirm estimates of load transfer to the stone columns beneath the column supported embankment;
4. Confirm that the soil located between the stone columns does not carry excessive loads that could induce consolidation settlement, thus affecting the performance of the bridge foundations.

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 Pressure Instrumentation. VW total (earth) pressure cell shall consist of 2 steel plates welded at the edges with an incompressible fluid filled void located between the plates. The void between the plates shall be hermetically sealed. The incompressible fluid shall be in contact with a pressure transducer that converts the pressure into an electronic signal that is recorded by the data collection unit outside of the embankment. The pressure cell shall be able to measure up to 50 psi and shall be designed to withstand point loads induced by stone of the stone columns and the load transfer platform on both sides. The aspect ratio (D/t – D - diameter of cell; t – thickness of cell) of the cell shall be greater than 15. The pressures cells shall have an accuracy ±0.1 percent with a thermal affect of <0.05 percent for a temperature range of -4°F to 176°F. 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 requirments of Schedule 80 materials. Provide enough conduit to enclose all lengths of buried cable from the pressure cells to the VW-DCC. All connections in the conduit and in the cable between the pressure cell and VW-DCC shall be water proof.

3.0 Submittals. Within 30 calendar days before installing the total pressure cells, the Contractor shall submit to the Department for review the qualifications of the personnel installing the instrumentation as well as the installation plan. The submittals shall contain as a minimum the following information.

3.1 <u>Qualifications:</u> The Contractor shall identify the licensed surveyor who shall be responsible for providing survey services during the installation of the total pressure cell. The Contractor shall also identify the geotechnical engineer that will be responsible for installing the total pressure cell in accordance with the Department's Geotechnical Instrumentation Monitoring Plan. The geotechnical engineer's experience in providing instrumentation services using a total pressure cell and remote 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 total pressure cell and VW datalogging 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 total pressure cells 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 total pressure cells or from the Department concerning the data being collected.

3.2 Installation Plan: The proposed total pressure cell installation plan shall include as a minimum the following information:

1. The Contractor shall submit the Specification sheet for the proposed total pressure cell system prior to purchase for review and approval of the Engineer.
2. Submit locations where the total pressure cells will be installed for approval. The location should indicate the number of the stone column that the total pressure cell will be located on or the numbers of the surrounding stone columns for the total pressure cell located between stone columns.
3. Proposed installation method of total pressure cell.
4. Proposed method to protect total pressure cell and cable during construction from construction equipment and vandalism.

3.3 Submittal Reviews: Approval of the personnel qualifications and installation plan by the Department shall not relieve the Contractor of its responsibility to successfully install the total pressure cells in accordance with the plans and specifications. Approval by the Department of the total pressure cell installation and instrumentation plan shall be contingent upon satisfactory demonstration that the instrumentation is meeting the objectives of the Department's Geotechnical Instrumentation Monitoring Plan. If, at any time, the Department or the Engineer considers that the method of installation or monitoring 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 Geotechnical Instrumentation Monitoring Plan. The Department will be the sole judge in determining the adequacy of the Contractor's installation and monitoring results and whether monitoring can be discontinued.

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 total pressure cells, 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 Total Pressure Cell Installation. Upon receipt of the total pressure cell, 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 pressure cell for inspection by the Engineer.

The Contractor shall notify the Engineer at least fourteen (14) days prior to the installation of total pressure cells. Total pressure cells 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 total pressure cells in the field and ensuring that no conflicts exist between total pressure cells 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 total pressure cells locations.

Total pressure cells shall be installed prior to construction of the load transfer platform and embankment construction and following installation of the stone columns. 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 total pressure cells.

Total pressure cell installation shall be in accordance with the manufacturer's recommendations as presented in their instruction and installation manual. The total pressure cell will be connected to the VW-DCC in accordance with the plans, contract documents, and manufacturer's recommendations.

The Contractor shall accurately locate all total pressure cells in accordance with plans. Total pressure cells 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 total pressure cell, which includes the instrumentation identification as provided in the plans, station/alignment, offset, and elevation of the total pressure cell. The total pressure cell shall be located to an accuracy of 0.01 ft (both vertically and horizontally).

The Contractor shall protect total pressure cell locations from damage and vandalism for the duration of the Contract and repair or replace damaged or inoperative total pressure cells at no cost to the Department.

6.0 Abandonment of Total Pressure Cells. Once the Engineer has determined that the total pressure cells have served their purpose and are no longer needed, the total pressure cells shall be abandoned in-place. The Contractor shall remove recoverable portions of the total pressure cell. 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 total pressure cells, as provided in the plans, will be paid for at the contract unit price bid for "Monitoring Device – Total Pressure Cells" which shall include all equipment, including but not limited to the total pressure cell, water proof casing; mobilization; labor; surveys; materials; incidentals and abandonment required by these Specifications along with total pressure cell data as outlined in the Geotechnical Instrumentation and Monitoring Plan. Payment will not be made for total pressure cells 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 Total Pressure Cell, including the total pressure cell, the waterproof casing, surveys, data as outlined in the Geotechnical Instrumentation and Monitoring Plan, and incidental items based on the acceptance of the Total Pressure Cell installation by the Engineer.

Payments shall be made under:

Item No.	Pay Item	Pay Unit
2038108	MON. DEVICE – TOTAL PRESSURE CELL	EA

(97) DIVISION 200: VIBRATING WIRE DATA COLLECTION CENTERS

February 23, 2012

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 and piezometers 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 instrumentation of the embankments being constructed.

2.0 Vibrating Wire Data Collection Center. The Vibrating Wire Data Collection Centers (VW-DCC) is an automated centralized vibrating wire data collection center. The VW-DCC will be used to collect vibrating wire rod extensometer (VWRE) and piezometer (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 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 rod extensometer and piezometer instrumentation. In addition, the VW-DCC shall have the following features:
Data logging system with sufficient capacity to read and save instrumentation readings.
The data logging system shall have the reserve capacity to add additional instrumentation if needed.
Powered by on-site AC current
Battery power back-up with surge suppression
Telephone/cellular access for transmitting data through the internet
Dedicated server for storing and running viewing software.
On-line instrumentation software for reviewing/downloading instrumentation data
Enclosure that protects the equipment from damage during construction, vandalism, and weather.

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 rod extensometers and piezometers 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:
The Contractor shall submit the Specification sheet for the proposed VW-DCC system for review and approval by the Engineer.
Submit locations where VW-DCC will be installed.
Proposed installation method.
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 rod extensometers and

VW piezometers 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. 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, 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

(98) DIVISION 200: VIBRATING WIRE ROD EXTENSOMETER

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:

5. The Contractor shall submit the Specification sheet for the proposed VWRE system for review and approval by the Engineer.
6. Submit locations where VWRE will be installed if different from the location shown on the plans.
7. Proposed installation method.
8. 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 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 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

(99) DIVISION 700: AXIAL O-CELL LOAD TESTING OF DRILLED SHAFTS

1. **DESCRIPTION**

This work shall consist of furnishing all materials, equipment, labor, and incidentals necessary for conducting axial load testing of one drilled shaft. Axial load tests shall be performed as shown on the plans.

The axial testing shall be performed using two levels of Osterberg-Cells. The Contractor will be required to supply material and labor as necessary to prepare for and perform the load test and to restore the site once the load test is completed. The drilled shaft used for the load test program will be instrumented by LOADTEST, Inc. (the Osterberg Cell supplier). The Contractor shall subcontract with LOADTEST, Inc. to supply the Osterberg-Cells and other necessary equipment and instrumentation, perform the test, and analyze the results of one axial load test on one test shaft. Immediately prior to the placement of the reinforcement cage, the shaft dimensions and verticality shall be determined using a soniCaliper system, as provided and operated by LOADTEST, Inc.

The Osterberg cell equipment shall have sufficient capacity to fully mobilize the test shafts' ultimate capacity. The applied load shall at least be equivalent to the test shaft load specified in the plans.

2. **ORDER OF ACTIVITIES**

For the test shaft, proposed instrumentation location shall be provided to the Department a minimum of 7 days prior to the fabrication of the shaft reinforcement cage. The Department will provide comments for the final instrumentation locations within 3 days after receiving this information.

Strain and pressure gage instrumentation, displacement transducers, CSL access tubes, O-cells and any other materials and equipment required by LOADTEST, Inc. shall be installed on the reinforcing cage.

Immediately prior to placement of the reinforcement cage, the dimensions and verticality of the drilled shaft excavation shall be determined by LOADTEST, Inc. using the soniCaliper system.

CSL testing will be performed by the Department personnel or a Department designated representative in accordance with Section 727 of the Standard Specifications. CSL logging will be performed between a minimum of 3 days and a maximum of 7 days after concrete placement provided the concrete has attained a compressive strength of at least 3,000 psi during this period.

The axial Osterberg-Cell (O-cell) testing shall not begin until at least 4 days after CSL testing and until the concrete has attained a compressive strength of 4,000 psi. With approval of the Engineer, high early strength concrete may be used to obtain this strength at an earlier time to prevent testing delays.

The Contractor shall cooperate with the Department's personnel whom shall be granted access to all facilities necessary for observation of the test and the viewing of the test results.

3. **SUBMITTALS**

The Contractor shall submit to the Department for approval three (3) sets of shop drawings, erection plans, test calculations and details associated with the axial O-cell testing within 21 days following

the Notice to Proceed. The submittal shall include details with respect to the reinforcement cage fabrication, instrumentation plans, reference beams and movement measuring systems. All details, drawings, calculations, and procedures shall be submitted to the Department for review a minimum of 21 days prior to beginning the axial load test. Approval of this submittal by the Department shall not relieve the Contractor from making subsequent changes that may become necessary to carry out the test.

4. **MATERIALS**

The Contractor shall supply all materials required to install the Osterberg cell, conduct the load test, and remove the load test apparatus as required.

The Contractor shall furnish two (2) Osterberg Cell assemblies as required for the test shaft, to be supplied by:

LOADTEST, Inc. 2631-D NW 41st Street Gainesville, FL 32606
Phone: **(800) 368-1138,** (352) 378-3717, Fax: (352) 378-3934

The Osterberg cell assemblies to be provided shall have a capacity that fully mobilizes the test shafts' ultimate capacity and shall be equipped with all necessary hydraulic lines, fittings, pressure source, pressure gage and telltale devices.

Additional materials required include, but are not limited to, the following:

- Fresh, clean, potable water from an approved source to be used as hydraulic fluid to pressurize the Osterberg Cell(s).
- Materials sufficient to construct and shade a stable reference beam system for monitoring movements of the shaft during testing. The system shall be supported at a minimum distance of 3 shaft diameters from the center of the test shaft to minimize disturbance of the reference system. A tripod shall be provided to support an automated digital survey level used to monitor movement of the reference system during testing. Alternatively, two survey levels located in excess of three shaft diameters may be used to monitor the top of shaft displacement in lieu of the beam. In this case, two tripods and weather protection (Quikshade) shall be provided.
- Materials sufficient to construct a protected work area (including provisions such as a tent or shed for protection from inclement weather for the load test equipment and personnel) of size and type required by the Engineer and LOADTEST, Inc. In the case of cold weather, the protected work area shall be maintained at a temperature above 40° F in order to insure proper operation of the load testing equipment.
- Stable electric power source, as required for lights, welding, instruments, etc.
- Materials such as angle or channel iron, steel bearing plates and/or other devices needed to attach O-cell assembly to rebar cage or carrying frame, as required.

Materials supplied which do not become a part of the finished structure become the property of the Contractor at the conclusion of the load test and shall be removed from the job site.

5. **EQUIPMENT**

The Contractor shall supply equipment required to install the Osterberg cells, conduct the load tests, and remove the load test apparatus as required. Equipment required includes but is not limited to:

- Welding equipment and certified welding personnel, as required, to assemble the test equipment under the supervision of LOADTEST, Inc. attach hydraulic fittings and telltales to the Osterberg cells, and prepare the work area.

- Equipment and labor to construct the reinforcing steel cage and/or placement frame required for the test shaft, including steel bearing plates as required.
- Equipment and operators for handling the Osterberg cells and instrumentation and placement frame or reinforcing steel cage during the installation of the Osterberg cells and during the conduct of the test, including but not limited to a crane or other lifting device for Osterberg cells and instrumentation, manual labor, and hand tools as required by LOADTEST, Inc.
- Equipment and labor sufficient to erect the protected work area and monitoring reference beam system, to be constructed to the requirements of the Engineer and LOADTEST, Inc.
- Air compressor (minimum 150 cfm) for pump operation during load testing.
- Strain Gauges – the Contractor shall supply the number of strain gauges as required at each level. The number of strain gauges will be determined by the Contractor after consultation with Loadtest, inc., and as approved by the Department. All cost for supplying strain gauges will be included in the price bid for Axial Load Test with Osterberg Load Cell, and no additional payment will be made for this equipment.

6. **PROCEDURE**

The Contractor shall perform the drilled shaft excavation in accordance with Section 712 of the Standard Specifications.

The Osterberg Cells, hydraulic supply lines and other instruments will be assembled and made ready for installation under the direction of LOADTEST, Inc. and the Department, in a suitable area, adjacent to the test shaft, to be provided by the Contractor. The Osterberg Cell assemblies shall be welded to the rebar cage or carrying frame. The plane of the bottom plate(s) of the O-cell(s) shall be set at right angles to the long axis of the cage. The Contractor shall use the utmost care in handling the test assembly so as not to damage the instrumentation during installation. The contractor shall limit the deflection of the cage to two (2) feet between pick points while lifting the cage from the horizontal position to vertical. The maximum spacing between pick points shall be 25 feet. The contractor shall provide support bracing, strong backs, etc. to maintain the deflection within the specified tolerance. The O-cell assemblies must remain perpendicular to the long axis of the reinforcing cage throughout the lifting and installation process.

When the test shaft excavation has been completed, inspected, callipered using the soniCaliper equipment and accepted by the Department, the O-cell assembly and the reinforcing steel may be installed. A seating layer of concrete shall be placed in the base of the shaft to provide a level base and reaction for the lower O-cell assembly. The seating layer shall be placed using a pump line or tremie pipe extending through the O-cell assemblies to the base of the shaft. After seating the Osterberg cell assembly, the remainder of the drilled shaft shall be concreted in a manner similar to that specified for production shafts. At least four (4) concrete test cylinders, in addition to those specified elsewhere, shall be made from the concrete used in the test shaft, to be tested at the direction of LOADTEST, Inc. At least one of these test cylinders shall be tested prior to the load test and at least two cylinders shall be tested on the day of the load test.

During the load test, no casings may be vibrated into place in the foundation area, within a 100 ft radious of the load test. Drilling may not continue within a 100-foot radius of the test shaft. If test apparatus shows any interference due to construction activities outside of this perimeter, such activities shall cease immediately.

After the completion of the load test, and at the direction of the Department, the Contractor shall remove any equipment, material, waste, etc. which are not to be a part of the finished structure.

7. **LOAD TESTING AND REPORTING**

The load testing shall be performed by a qualified geotechnical engineer approved in advance by the Department. The geotechnical engineer must have a demonstrated knowledge of load testing procedures, and have performed at least 10 Osterberg cell load tests within the past two years. The load testing shall be performed in general compliance with *ASTM D 1143 Standard Test Method for Piles Under Static Axial Load* using the Quick Load Test Method for Individual Piles.

Initially the loads shall be applied in increments equaling 5 to 10% of the anticipated ultimate capacity of the test shaft. The magnitude of the load increments may be increased or decreased depending on the project requirements but should not be changed during the test. Direct movement indicator measurements should be made of the following: O-cell expansion either directly or with telltales (minimum. of 3 indicators required), upward top-of-shaft displacement (minimum of 2 indicators required) and shaft compression above O-cell (minimum. of 2 indicators required). Loads shall be applied in three stages by: 1) pressurizing the lower O-cell while the upper assembly remains closed, 2) pressurizing the upper O-cell while the lower O-cell is allowed to freely drain and 3) pressurizing the upper O-Cell while the hydraulics are closed on the lower O-cell. Loads shall be applied at the prescribed intervals until the ultimate capacity of the shaft is reached in either end bearing or side shear, until the maximum capacity or maximum stroke of an O-cell is reached, or unless otherwise directed by the Department. At each load increment, or decrement movement indicators shall be read at 1, 2, 4 and 8-minute intervals while the load is held constant. During unloading cycles the load decrement shall be such that at least 4 data points are acquired for the load versus movement curve. Additional cycles of loading and unloading using similar procedures may be required by the Department following the completion of the initial test cycle. Displacement sensors used to measure O-cell expansion and top-of-shaft displacement should have a minimum travel of 4 inches and be capable of being read to the nearest 0.001 inch division. When O-cell expansion is measured directly, LVWDTs capable of measuring the full stroke of the Osterberg Cell will be used (typically 6 inches). Displacement sensors used to measure shaft compression should have a minimum travel of 1 inch and be capable of being read to the nearest 0.001 inch division.

Unless otherwise specified by the Department, the Contractor will supply four (4) paper copies of a report of each load test, as prepared by LOADTEST, Inc. and a PDF electronic copy. An initial data report containing the load-movement curves and data tables will be provided to the Department within 3 working days of the completion of load testing, to allow evaluation of the test results. A final report on the load testing shall be submitted to the Department within 7 working days after completion of the load testing.

8. **METHOD OF PAYMENT**

The Axial Drilled Shaft Load Tests shall be considered as any material, labor, equipment, load cells, etc. required above the requirements of production drilled shaft installation necessary to install, conduct, and remove the drilled shaft load test at the direction of the Department and LOADTEST Inc. representative. All costs of the axial load test including subcontracting to LOADTEST Inc. will also be included in the price bid for this work.

All costs associated with the normal production of the drilled shaft are measured and paid for elsewhere in the contract documents.

9. **DISPOSITION OF TEST SHAFT**

After completion of all testing and the submittal of the required reports, the test shaft shall be cut-off at a depth of 1 ft below the ground surface. The cut-off portion of the shaft shall be properly disposed of by the contractor and the resulting hole shall be backfilled with soil in accordance with Section 205 of the Standard Specifications. The test area shall be graded smooth.

10. **BASIS OF PAYMENT**

The complete and accepted "Drilled Shaft Osterberg Cell Load Tests" shall be paid for at the contract lump sum price for each. This shall constitute full compensation for all costs incurred during the procurement, installation, conducting of the test, and subsequent removal of test apparatus and appurtenances.

11. **PAYMENT**

Payments shall be made under SCDOT Pay Item No. 8990181, Axial Load Test with Osterberg Cell Load".

(100) DIVISION 700: APPLE LOAD TESTING

April 18, 2013

1.0 GENERAL

This work shall consist of performing high-strain dynamic testing using the APPLE dynamic loading system on a test shaft for the purpose of determining and/or verifying the ultimate bearing capacity of the production shafts. Production shaft lengths may be adjusted after results of the test shaft have been analyzed. No materials shall be ordered until shaft lengths are approved by the Department. The test shaft depth, diameter, and location shall be as specified in the plans. The testing specified in the project documents shall be conducted in general accordance with ASTM D4945 and this Special Provision.

The APPLE Load Testing equipment shall have sufficient capacity to fully mobilize the test shafts' ultimate capacity. The applied load shall at least be equivalent to the test shaft load specified in the plans.

The location of the test shaft (non-production) shall be as indicated in the plans. The test shaft shall maintain a minimum distance of 25 feet from any foundation element of any future bent. The Contractor shall submit the proposed location to the Department for approval.

Load testing of the test shaft shall not begin until the concrete has attained a compressive strength of no less than 4,000 psi and had a curing time of no less than 7 days. High early strength concrete may be used to obtain the required strength at an earlier time to prevent testing delays, upon the approval of the Department.

The Contractor will be required to furnish and include all costs in the bid item for all materials, personnel, and equipment as described in the plans and Special Provisions and as required by the Contractor to adequately perform the APPLE Load Test. The Contractor shall engage the services of an approved APPLE supplier for instrumenting, performing, and reporting of the load test. The Contractor must provide a minimum of 45 days notice to the APPLE supplier before the load testing. An approved APPLE supplier may be contacted at:

GRL Engineers, Inc., 9912 Colvard Circle,Charlotte, NC 28269
Phone: (704) 593-0992, Fax: (704) 593-0993

The Contractor shall submit to the Department for approval 3 sets of shop drawings, erection plans, and test calculations and details. The Contractor should include details with respect to the movement measuring system and the method for measuring the applied load. The Contractor shall also submit details and shop drawings of the proposed set up for review by the Department 2 weeks prior to beginning construction of the testing arrangements (including the test shaft). All details, drawing calculations, and procedures shall be submitted to the Department for review a minimum of 2 weeks prior to beginning the APPLE Load Test. Approval of these submittals by the Department shall not relieve the Contractor from making subsequent changes that may become necessary to carry out the test.

The Contractor, in cooperation with the APPLE supplier will supply and supervise the mobilization, assembly, and operation of the APPLE Load Test equipment. APPLE supplier will provide and install the required instrumentation for the test shaft, acquire the test data during testing, and culminate the APPLE data into a report. The report will be presented to the

Contractor and the Department for evaluation. Interpretation of the test data with regard to foundation recommendations will be performed by the Department.

2.0 MATERIALS & EQUIPMENT

The APPLE supplier will supply all materials, personnel and equipment as described below and as required by the Contractor and the APPLE supplier to adequately perform the APPLE Load Test. Such materials and equipment are:

1. APPLE dynamic loading system and all items specifically incidental to the APPLE test system.
2. Means to insure flat, level (axial to test shaft), and solid concrete shaft top.
3. A drop weight of no less than 20 tons. The impacting surface of the drop weight should have an area between 70 and 130 percent of the test shaft top area. The cross-sectional shape of the drop weight shall be as regular as possible (square, round, hexagonal, etc.).
4. A guiding frame allowing variable drop heights typically between 3 and 7 feet, or as determined by the APPLE Testing Engineer (described herein at Testing Engineer) in consultation with the Department.
5. A top cushion consisting of new sheets of plywood with a total thickness of 2 to 6 inches, or as determined by the Testing Engineer in consultation with the Department.
6. A surveyor's transit, laser light or equivalent for measurements of test shaft set under each drop weight impact.
7. Dynamic testing shall be performed and/or supervised by a Licensed Professional Engineer in South Carolina with at least two years of dynamic testing experience.
8. Final Report of APPLE Load Testing no later than 14 days after all APPLE Load Testing is completed and accepted by the Department. Field results of the APPLE Load Test will be provided within 72 hours of test completion.

The Contractor shall supply any additional equipment and personnel to assemble, perform, disassemble, and move to next test site (if applicable). This equipment includes, but not be limited to, the following:

1. Unloading and loading of the APPLE trucks during mobilization and demobilization.
2. Any necessary on-site mobilization of test equipment.
3. A level and firm surface surrounding the test shaft to support the APPLE testing system.
4. A level and smooth shaft top. The top of the test shaft shall incorporate permanent casing length as indicated in the plans and have a minimum ½-inch wall thickness. There shall be at least 6 inches between the top of the test shaft and the top of the casing left in place.
5. A crane, rigging and operator capable of lifting, unloading, assembling, disassembling, and packing all APPLE equipment. The crane and rigging should be of sufficient size and strength to handle the required APPLE equipment.
6. Power source adequate for electronic equipment.
7. <u>For over water tests only</u>, welding equipment and welder for falsework platform.

3.0 PREPARATION FOR TESTING

Notification of the requirement for an APPLE Load Test shall be provided by the Contractor to the

Department at least 45 days in advance of the test. The Contractor shall perform site and foundation preparation. Foundation preparation includes the cutting and cleaning of the surface of the test shaft down to test elevation. The top of the test shaft shall be smooth and level. The area around the test shaft, on land, should be leveled and compacted within a 15 foot radius. The top of shaft should be approximately 6 feet above grade for axial testing. For over water or elevated work areas, the area provided must be level and at the test elevation. The support falsework platform shall be assembled and installed by the Contractor at the test location.

Prior to performing the load test, the Testing Engineer must be provided with soil boring logs, test shaft installation records, concrete properties (strength, etc.) and details regarding the anticipated dynamic loading equipment. The Testing Engineer is required to perform wave equation analyses (using GRLWEAP or equivalent) to determine the suitability of the proposed dynamic load testing equipment and an acceptable range of drop weight heights so as not to cause damage in the test shaft during the test.

4.0 PROCEDURE FOR APPLE LOAD TESTING

The Contractor shall assist the Testing Engineer as necessary during all aspects of the APPLE Load Test. The following steps shall be taken in the performance of the APPLE Load Test.

1. Preparation for testing as described in Section 3.0.

2. Prior to testing, the Contractor shall make the upper 6 feet of the test shaft completely accessible to the Testing Engineer.

3. Four “windows” (approximate size of 6 by 6 inches) diametrically opposite of each other shall be located and removed from the casing, if appropriate, or an entire band of the casing removed to expose a smooth concrete surface for attachment of the sensors. Sensors are typically attached at least one diameter below the shaft top. Sensor locations will be determined by the Testing Engineer.

4. In areas where casing is not present, the Testing Engineer, or Contractor under the direction of the Testing Engineer, shall smooth (by grinding) areas around the test shaft circumference such that proper sensor attachment can be accomplished.

5. Sensors shall be attached by the Testing Engineer or under the direction of the Testing Engineer to the exposed concrete in a secure manner as to prevent slippage under impact.

6. Shaft top should be examined to insure having a smooth level surface.

7. Survey and record the shaft top elevation to a bench mark.

8. Apply plywood cushion and striker plate to the shaft top.

9. Two to four hammer impacts with varying drop heights should be applied to the top of the shaft. The first drop height should be minimal to allow the Testing Engineer to assess the testing equipment, the driving system and stresses on the shaft. Subsequent impacts can then be applied by utilizing sequentially higher drop heights until either stresses in the shaft are excessive or the shaft permanent set for the applied impact exceeds 0.1 inch.

5.0 INSTRUMENTATION

The intent of the load test instrumentation is to measure the test load and its distribution between side friction and end bearing, load versus deflection, to provide information for design calculations and estimates, and to provide information for final design. The Contractor shall provide

assistance when requested by the Testing Engineer during installation of any instrumentation supplied through this contract.

The cost of all instrumentation, to be installed as directed by the APPLE supplier, shall be included in the cost for APPLE Load Testing. Instrumentation pertaining to the APPLE testing, and listed below, shall be provided by the APPLE supplier in addition to any instrumentation outlined in ASTM D 4945.

1. Pile Driving Analyzer® (PDA) manufactured by Pile Dynamics, Inc., model PAK, PAX or PAL or equivalent.

2. Four calibrated strain transducers.

3. Four calibrated accelerometers.

6.0 REPORTING OF RESULTS

It is the APPLE supplier's responsibility to submit a Final Report of APPLE Load Testing no later than 14 days after all APPLE load testing is completed and accepted by the Department. Field results of the APPLE Load Test shall be provided within 72 hours of test completion. In addition to the field results, results from a CAPWAP® analysis or equivalent shall be submitted. A CAPWAP® analysis shall be completed for each hammer impact in the field and shall be performed by an Engineer that has achieved Advanced Level or better on the Foundation QC High Strain Dynamic Pile Testing Examination. The report must also provide the following:

1. Wave Equation analysis results obtained prior to testing.

2. CAPWAP® (or equivalent) analysis results.

3. The maximum measured force, maximum calculated tension force, transferred energy to the sensor location, corresponding stresses, and the Case Method bearing capacity for each impact.

4. Assessment of the test results both with respect to pile capacity and integrity.

7.0 METHOD OF MEASUREMENT

The quantity of the pay item "Drilled Shaft Axial Load Test is measured by each (EA) APPLE Load Test completed and accepted by the Department. A completed APPLE Load Test shall be one test conducted on a shaft using the APPLE dynamic loading system and meeting +/-15% of, or exceeding the target APPLE test peak load as specified in the plans and Special Provisions.

The APPLE Load Test shall be considered as any material, labor, equipment, instrumentation, etc. required above. This item should include everything necessary to assemble, install, perform, collect data, and remove the APPLE Load Test equipment; under the direction of the APPLE supplier and others.

8.0 DISPOSITION OF TEST SHAFT

After all testing and data collection has been completed, the test shaft shall be cut off to a minimum depth of 5 feet below the ground surface. It shall be the Contractor's responsibility to dispose of the cut off section of the test shaft.

9.0 BASIS OF PAYMENT

APPLE Load Testing will be paid for at the contract bid price per each accepted test. The price

and payment shall be considered full compensation for furnishing all materials, providing all tools, equipment, labor and incidentals, providing assistance to the production of the test shaft, performing the APPLE Load Test, and disposing of the test shaft as described in Section 8.0 above.

10.0 PAYMENT

Payment shall be made under SCDOT Pay Item No. 7120166, “Drilled Shaft Axial Load Test”.

(101) DIVISION 700: STATNAMIC LOAD TESTING

1.0 GENERAL

This work shall consist of performing a Statnamic axial compression load test on a test shaft for the purpose of determining and/or verifying the ultimate bearing capacity of the production shafts. Production shaft lengths may be adjusted after results of the test shaft have been analyzed. No materials shall be ordered until shaft lengths are approved by the Department. The test shaft depth, diameter, and location shall be as specified in the plans. The testing specified in the project documents shall be conducted in general accordance with ASTM D7383-08 and this Special Provision.

The Statnamic Load Testing equipment shall have sufficient capacity to fully mobilize the test shafts’ ultimate capacity. The Statnamic load shall at least be equivalent to the test shaft load specified in the plans.

The location of the test shaft (non-production) shall be as indicated in the plans. The test shaft shall maintain a minimum distance of 25 feet from any foundation element of any future bent. The Contractor shall submit the proposed location to the Department for approval.

Load testing of the test shaft shall not begin until the concrete has attained a compressive strength of no less than 4,000 psi and had a curing time of no less than 7 days. High early strength concrete may be used to obtain the required strength at an earlier time to prevent testing delays, upon the approval of the Department.

The Contractor will be required to furnish and include all costs in the bid item for all materials, personnel, and equipment as described in the plans and Special Provisions and as required by the Contractor to adequately perform the Statnamic load test. The Contractor shall engage the services of an approved Statnamic supplier for instrumenting, performing, and reporting of the load test. The Contractor must provide a minimum of 45 days notice to the Statnamic supplier before the Statnamic testing. If strain instrumentation is utilized, a minimum of 45 days notice shall be given to the Statnamic supplier before the test shaft construction to allow for instrumentation installation. An approved Statnamic supplier may be contacted at:

Applied Foundation Testing, Inc. 4035 J. Louis Street, Green Cove Springs, FL 32043
Phone: (904) 284-1337, Fax: (904) 284-1339

The Contractor shall submit to the Department for approval 3 sets of shop drawings, erection plans, and test calculations and details. The Contractor should include details with respect to the movement measuring system, the piston support system, and the method for measuring the applied load. The Contractor shall also submit details and shop drawings of the proposed set up for review by the Department 2 weeks prior to beginning construction of the testing arrangements (including the test shaft). All details, drawing calculations, and procedures shall be submitted to the Department for review a minimum of 2 weeks prior to beginning the Statnamic load test. Approval of these submittals by the Department shall not relieve the Contractor from making subsequent changes that may become necessary to carry out the test.

The Contractor, in cooperation with the Statnamic supplier will supply and supervise the mobilization, assembly, and operation of the Statnamic load test equipment. Statnamic supplier will provide and install the required instrumentation for the test shaft, acquire the test data during testing, and culminate the Statnamic data into a report. The report will be presented to the Contractor and the Department for evaluation. Interpretation of the test data with regard to foundation recommendations will be performed by the Department. Statnamic testing is non-destructive and entails no greater danger of shaft damage than static load testing.

2.0 MATERIALS

The Statnamic supplier will supply all materials, personnel and equipment as described below and as required by the Contractor and the Statnamic supplier to adequately perform the Statnamic load test. Such materials and equipment are:

1. Statnamic apparatus, including pressure chamber and cylinder, reaction masses, exhaust silencer, gravel structure, gravel structure base frame, and all items specifically incidental to the Statnamic test system.
2. Foundation top plate (and follower assembly, if needed), adequate to distribute the applied Statnamic test load to the test shaft.
3. Statnamic load, acceleration transducers, and data acquisition system pertaining directly to the Statnamic device. All required electronic equipment for the recording, processing, and storage of the Statnamic test will be operated by the Statnamic supplier.
4. Resistance based strain gages and sufficient cabling (if required).
5. One Geotechnical Engineer and one technician experienced in the implementation of the Statnamic test methods who will direct the test setup, perform the testing, direct the disassembly of the test apparatus, provide load test submittals, provide assistance as needed with pertinent Statnamic issues, and provide a written report.
6. Final Report of Statnamic Load Testing no later than 14 days after all Statnamic load testing is completed and accepted by the Department. Field results of the Statnamic load test will be provided within 72 hours of test completion.

Additional materials required for the Statnamic load test shall be supplied by the Contractor as specified by the Statnamic supplier and include, but are not limited to, the following:

1. Support piles for falsework platform. A falsework platform is not required for land based testing. However, materials such as crane mats and plywood may be necessary to provide a level and firm surface to assemble the Statnamic device on land based testing.
2. ¾ inch (19 mm) clear gravel with less than 5 percent fines, 105 cubic yards (81 cubic meters) per test. The gravel material must be approved by the Department. (Note that #67 Stone has been used successfully in the past.)
3. Statnamic load, acceleration transducers, and data acquisition system pertaining directly to the Statnamic device. All required electronic equipment for the recording, processing, and storage of the Statnamic test will be operated by the Statnamic supplier.

3.0 EQUIPMENT

The Contractor shall supply any additional equipment and personnel to assemble, perform, disassemble, and move to next test site (if applicable). This equipment includes, but not be limited to, the following:

1. Unloading and loading of the Statnamic trucks during mobilization and demobilization.

2. Any necessary on-site mobilization of test equipment.
3. A level and firm surface surrounding the test shaft to support the Statnamic device.
4. A level and smooth shaft top. The top of the test shaft shall incorporate permanent casing length as indicated in the plans and have a minimum ½-inch wall thickness. There shall be at least 6 inches between the top of the test shaft and the top of casing left in place.
5. A crane, rigging and operator capable of lifting, unloading, assembling, disassembling, and packing all Statnamic equipment. The crane and rigging should be of sufficient size and strength to handle the required Statnamic equipment.
6. Power source adequate for electronic equipment.
7. For over water tests only, welding equipment and welder for falsework platform.

4.0 PREPARATION FOR TESTING

Notification of the requirement for a Statnamic load test shall be provided by the Contractor to the Department at least 45 days in advance of the test. The Contractor shall perform site and foundation preparation. Foundation preparation includes the cutting and cleaning of the surface of the test shaft down to design or test elevation. The top of the test shaft shall be smooth and level. The area around the test shaft, on land, should be leveled and compacted within a 15 foot radius. The top of shaft should be approximately 2 feet above grade for axial testing. For over water or elevated work areas, the area provided must be level and at the test elevation. The support falsework platform shall be assembled and installed by the Contractor at the test location.

5.0 PROCEDURE FOR AXIAL STATNAMIC LOAD TESTING

The Contractor shall assist the Statnamic supplier as necessary during all aspects of the Statnamic Load Test. The following steps shall be taken in the performance of the Statnamic Load Test.

1. Preparation for testing as described in Section 4.0.
2. Place the piston mounting plate on the center of the test shaft, level the plate and secure with anchor bolts or welding.
3. Survey and record the shaft top elevation to a bench mark.
4. Bolt the piston assembly to the piston mounting plate.
5. Set the base frame for the gravel containment structure.
6. Connect load cell cable, ignition cable, and accelerometers to piston.
7. Connect all instrumentation to the data acquisition system.
8. Install the predetermined propellant fuel charge. Check the ignition initiating circuit for the correct resistance.
9. Install vent pin with new seal. Grease piston and cylinder. Place cylinder over piston.
10. Place reaction masses. Secure the masses to the cylinder assembly.
11. Place the gravel containment structure and secure into position.
12. Fill the annular space between the gravel containment structure and the Statnamic apparatus using gravel.

13. Check the assembled device to ensure there is no physical interference of the load or acceleration monitoring systems.

14. Clear the test work area of personnel.

15. Perform final check of instrumentation and recording equipment.

16. Perform the test.

17. Back up test data on hard drive or jump drive.

6.0 INSTRUMENTATION

The intent of the load test instrumentation is to measure the test load and its distribution between side friction and end bearing, load versus deflection, to provide information for design calculations and estimates, and to provide information for final design. The Contractor shall provide assistance when requested by Statnamic supplier during installation of any instrumentation supplied through this contract. The Contractor should be aware that lead times are required for ordering instrumentation. The Contractor shall take the lead times into account when planning the work. The instrumentation shall be installed prior to the construction or installation of the test shaft. A minimum of 45 days notice shall be given by the Contractor to the Statnamic supplier prior to test shaft construction to schedule the installation of the instrumentation.

The cost of all instrumentation, to be installed as directed by the Statnamic supplier, shall be included in the cost for Statnamic Load Testing. Instrumentation pertaining to the Statnamic testing, and listed below, shall be provided by the Statnamic supplier.

1. Electronic Resistance Based Strain Gages – A total of 20 resistance based strain gages shall be provided, 5 vertical levels with 4 gages per level. Lead wire should be unspliced.

2. Accelerometers – A total of 3 accelerometers shall be arranged across the top of the test shaft approximately 120 degrees apart during Statnamic testing.

3. Data Acquisition System – The resistance strain gages will require specialized equipment capable of digitizing at very fast rates. The Statnamic supplier shall supply the necessary equipment and record the test data.

7.0 METHOD OF PAYMENT

The quantity of the pay item “Drilled Shaft Axial Load Test” is measured by each (EA) Statnamic load test completed and accepted by the Department. A completed Statnamic load test shall be one test conducted on a shaft using the Statnamic method and meeting +/-15% of, or exceeding the target Statnamic test peak load as specified in the plans and Special Provisions.

The Statnamic load test shall be considered as any material, labor, equipment, instrumentation, etc. required above and including the requirements of test shaft installation. This item should include everything necessary to assemble, install, perform, collect data, and remove the Statnamic load test equipment; under the direction of the Statnamic supplier and others.

8.0 DISPOSITION OF TEST SHAFT

After all testing and data collection has been completed, the test shaft shall be cut off to a minimum depth of 5 feet below the ground surface. It shall be the Contractor’s responsibility to dispose of the cut off section of the test shaft.

9.0 BASIS OF PAYMENT

Statnamic load testing will be paid for at the contract bid price per each accepted test. The price and payment shall be considered full compensation for furnishing all materials, providing all tools, equipment, labor and incidentals, providing assistance to the production of the test shaft, performing the Statnamic load test, and disposing of the test shaft as described in Section 8.0 above.

10.0 PAYMENT

Payment shall be made under SCDOT Pay Item No. 7120166, “Drilled Shaft Axial Load Test”.

(102) DIVISION 702: CONCRETE STRUCTURES – PREFORMED JOINT FILLER

Delete Subsection 702.2.2.1 of the Standard Specifications in its entirety and replace it with the following:

702.2.2.1 Preformed Joint Filler

Use preformed joint material that meets AASHTO M 153 or AASHTO M 213 with the following exceptions:

1. Use only materials manufactured from rubber.
2. Use materials that require a load of not less than 340 kPa or greater than 5200 kPa to compress to 50% of its thickness when tested in accordance with AASHTO T 42.
3. Use materials that have a recovery of at least 70% when tested in accordance with AASHTO T 42.

Use preformed joint material that is listed on QPL 81.

Provide a manufacturer’s certification that states that the material conforms to SCDOT specifications.

(103) DIVISION 200: VIBRO COMPACTION

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

(104) SECTION 203: BORROW EXCAVATION

March 6, 2013

Section 203.2.1.8 of the Standard Specifications is amended as follows:

Ensure that all borrow material placed on embankments meet or exceed the requirements for total and effective internal friction angle, cohesion, and total moist unit weight as specified by the geotechnical design engineer of record. These requirements shall be determined by the following tests:

- Internal friction angle determined from either direct shear (AASHTO T236) or triaxial (AASHTO T297) testing on remolded specimens performed by the Contractor.
- Cohesion determined by triaxial (AASHTO T297) testing on remolded specimens performed by the Contractor.
- Total moist unit weight determined by standard proctor test (AASHTO T99) on remolded specimens performed by the Contractor.

Remold all samples to 95 percent of the maximum dry density as determined by the Standard Proctor test (AASHTO T99) and test at normal/consolidation stresses specified by the 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 normal embankment and borrow sampling and testing requirements for classification and compaction in accordance with Section 205 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.

(105) DIVISION 700: MONITORING OF CONSTRUCTION-RELATED EARTHBORNE VIBRATIONS

Division 100 is expanded as follows:

1.0 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 Transportion-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.

2.0 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.

3.0 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.

4.0 VIBRATION MONITORING DURING CONSTRUCTION:

A. Procedure - The Contractor shall monitor vibrations at no less than four locations 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.

5.0 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.

6.0 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

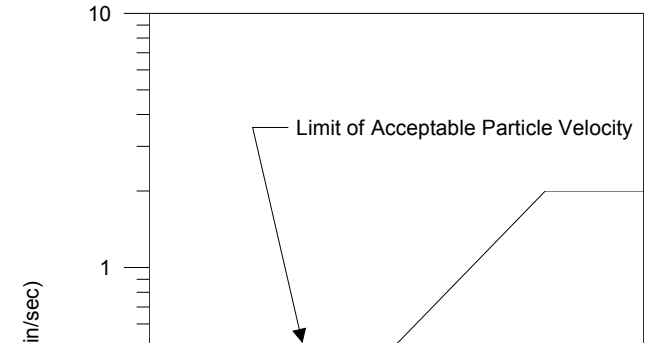


Figure 1. Vibration Criteria (adapted from AASHTO R8-96)

(106) ANTI-GRAFFITI COATING:

ANTI-GRAFFITI COATING

1. GENERAL

This special provision describes the application of an anti-graffiti coating for the purposes of enhanced appearance. Apply anti-graffiti coating system to the areas shown or described in the plans.

Anti-graffiti coatings intended for use under this provision shall be of a composition capable of preventing the adhesion of graffiti and/or facilitating the removal of graffiti. All anti-graffiti coatings must possess the physical and handling characteristics that are compatible with the requirements of this provision.

Use clear, non-sacrificial anti-graffiti coating for all applications.

2. MATERIALS

Provide clear, non-sacrificial anti-graffiti coating system manufactured by TEX-COTE or approved equal. Ensure that the anti-graffiti coating is compatible with any other Final Finish it is used in conjunction with, as specified in the plans, special provisions, or Section 702.4.11 of the SCDOT Standard Specifications.

Anti-graffiti coatings shall contain less than 5.0 lb/gal volatile organic compounds (VOC) as defined by 40 CFR Park 59, Subpart D.

Submit the following manufacturer provided information to the RCE for approval 60 days prior to application:

a. Cleaning instruction and materials, as applicable. Surfaces must be cleanable with nonproprietary cleaners as defined in ASTM D 6578.
b. Recommended base coat, as applicable.
c. Identification of coating system and type, as applicable.
d. Clear coats 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 certification that the coating meets the following laboratory performance requirements to the RCE for approval at least 60 days prior to application:

Laboratory Performance 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

Failure to meet the performance limits of any tests shall be suitable grounds to reject the proposed anti-graffiti coating.

3. APPLICATION

Apply an anti-graffiti coating or coating system in accordance with manufacturer's recommendation and as specified herein, when the ambient temperature is between 40°F and 90°F and when the surface temperature is between 50°F 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. If conditions are such that material is dispersed to areas where vehicles or other property may be damaged, suspend operation until conditions improve enough to permit work without damage.

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 per manufacturer's recommendations. Use all necessary precautions to prevent materials from cleaning and anti-graffiti coating operations being dispersed outside the work site.

5. SURFACE PREPARATION

Prepare all surfaces to be coated in accordance with the manufacturer's recommendations.

6. SAMPLE APPLICATION

Conduct a mock-up sample application on site to demonstrate performance, method of application, compatibility with any other coatings, and graffiti removal procedure. Do not apply anti-graffiti coating to the finished structure until receiving written acceptance from the RCE.

7. CORRECTION OF DEFICIENCIES

Remove all coating identified by the RCE as damaged or not meeting these provisions, 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.

Remove all graffiti from areas that received the anti-graffiti coating prior to final acceptance.

8. BASIS OF PAYMENT

Include all costs associated with materials, submittals, equipment, and workmanship for placement of the anti-graffiti coating in the unit price bid for:

Item No.	Pay Item	Pay Unit
8990443	Anti-Graffiti Coating	SF

(107) MICROMILLING OF ASPHALT PAVEMENT:

1. GENERAL
   1.1. Description: This Special Provision describes the material and construction requirements for the surfacing planing of existing asphaltic concrete pavement by micro-milling to remove wheel ruts and other surface irregularities, restore proper grade and/or transverse slope of pavement as indicated in the Plans or as instructed by the RCE. Ensure that the planed surface provides a texture suitable for use as a temporary riding surface or an overlay with OGFC with no further treatment or overlays. Do not use the planed surface as a temporary riding surface for more than ten days if no corrective action is required and no more than 21 days if corrective action is required unless otherwise instructed by the RCE, Plans, or Special Provisions.

2. REFERENCED DOCUMENTS

   2.1. SCDOT Standard Specifications, Edition of 2007

   2.2. SC-M-502, Rideability of PCC Pavement

3. EQUIPMENT
   3.1. Provide power-driven, self-propelled micro-milling equipment that is the size and shape that allows traffic to pass safely through areas adjacent to the work. Also, use equipment with the following characteristics.

      3.1.1. Ensure that the equipment is equipped with a cutting mandrel with carbide-tipped cutting teeth designed for micro-milling HMA and bituminous treated pavement to close tolerances.

3.1.2. Ensure that the equipment is equipped with grade and slope controls operating from a stringline or ski and based on mechanical or sonic operation.

3.1.3. Ensure that the equipment is capable of removing pavement to an accuracy of 0.0625 inches.

3.1.4. Ensure that the equipment is furnished with a lighting system for night work, as necessary.

3.1.5. Ensure that the equipment is provided with conveyors capable of transferring the milled material from the roadway to a truck located to the side, rear, or front while minimizing airborne dust and debris.

4. CONSTRUCTION REQUIREMENTS

4.1. Follow the Plans to micro-mill the designated areas and depths, including bridge decks, shoulder, and ramps, as required. Ensure that the following requirements are met.

4.1.1. Prior to commencement of the Work, construct a test section that is 1156 feet in length with a uniformly textured surface and cross section on the road to be treated as approved by the RCE. Ensure that the final pavement surface has a transverse pattern of 0.2 inches center to center of each strike area and the difference between the ridge and valley of the mat surface in the test section does not exceed 0.0625 inches.

4.1.2. Milling depth may range up to 2 inches as necessary to fully remove existing OGFC surface, which has a typical nominal depth of one inch, as well as lesser depths on shoulders to provide a planar surface that allows appropriate drainage prior to placement of new OGFC. While milling depths over one inch are anticipated to ensure OGFC removal in low spots as well as to meet rideability requirements, milling depth should be minimized when possible to avoid excessive removal of the pavement structure while still removing all existing OGFC.

4.1.3. Because of the longitudinal texture created by the process, the Department will test the test section for rideability following Subsection 6 of SC-M-502 for diamond ground and textured existing concrete pavement, except that the maximum acceptable rideability is 90 inches per mile for each 0.1 mile segment. SC-M-502 will apply even though the pavement is HMA. The first and last 50 feet of the test section will not be included in the two 0.1 mile segments. Provide the RCE with at least three business days of notice prior to need of rideability testing.

4.2. If any of the requirements of Section 4.1 are not met, do no further work and provide a written plan of action to the RCE detailing what steps will be taken to improve operations. The RCE may require corrective action to the test section prior to acceptance or accept the test section as is. Once the plan has been approved by the RCE, construct a second test section at a different location from the first. If the second test section meets the requirements of Section 4.1 and is approved by the RCE, continuous milling may commence. If the second test section fails to meet the requirements of Section 4.1, continue to construct test 1156 foot sections until satisfactory results are achieved.

4.3. Once continuous operations commence, continue to produce a uniform finished surface and maintain a constant cross slope between extremities in each lane.

4.4. Provide positive drainage to prevent water accumulation on the micro-milled pavement as shown on the Plans or as directed by the RCE.

4.5. Bevel back the longitudinal vertical edges greater than 2 inches that are produced by the removal process and left exposed to traffic. Bevel back at least 3 inches for each 2 inches of material removed. Use an attached mold board or other approved method.

4.6. At other areas such as bridge approach slabs, drainage structures, and utility appurtenances greater than 0.5 inch that are left open to traversing vehicles, protect with a temporary asphalt concrete tie-in (paper joint). Place the temporary tie-in at a taper rate of at least 6 to 1 horizontal to vertical distance.

4.7. When removing material at ramp areas and ends of milled sections, the transverse edges may be temporarily tapered 10 feet to avoid creating a traffic hazard and to produce a smooth surface, or a paper joint as described above may be used. However, ensure that a neat transverse joint is created prior to the placement of the OGFC; do not terminate OGFC by "pinching" the OGFC over a tapered area.

4.8. Remove dust, residue, and loose milled material from the micro-milled surface. Do not allow traffic on the milled surface and do not place overlying layers on the milled surface until removal is complete.

5. ACCEPTANCE

5.1. Ensure that the micro-milling operation produces a uniform pavement texture that is true to line, grade, and cross section.

5.2. The Department will test and accept the milled surface for rideability as given in Subsections 6.2 through 6.4 of SC-M-502. The Adjusted Schedule of Payment given in Table 2 of Subsection 6 of SC-M-502 will apply to the contract unit price for the micro-milling as given in Subsection 6 of this special provision. Although testing will be conducted by the Department as soon as practically possible, allow up to 72 hours for testing and reporting of rideability.

5.3. Micro-milled pavement surfaces are also subject to visual and straightedge inspections. Keep a 10-foot straightedge near the micro-milling operation to measure surface irregularities of the milled surface. Repair any areas exceeding 0.125 inches between the ridge and valley of the mat surface to the satisfaction of the RCE at no additional cost to the Department. Provide a written plan of action to the RCE for approval prior to performing any corrective action on the basis of rideability, grade, or surface texture.

6. MEASUREMENT AND PAYMENT

6.1. Measurement: The quantity measured for payment under this special provision is the number of square yards of micro-milled surface in place and accepted.

6.2. Basis of Payment: The quantity, as measured above, will be paid for at the contract unit price subject to the adjustments given herein, for which price and payment is full compensation for furnishing all materials, equipment, tools, labor, hauling, stockpiling, temporary asphalt, and any other incidentals necessary to satisfactorily complete the work. All reclaimed asphaltic pavement (RAP) becomes the property of the Contractor unless otherwise specified. No adjustment in the unit price for this item or other items will be considered for variations in the amount of RAP actually recovered.

Payment includes all direct and indirect costs and expenses required to complete the work. Payment will be made under:

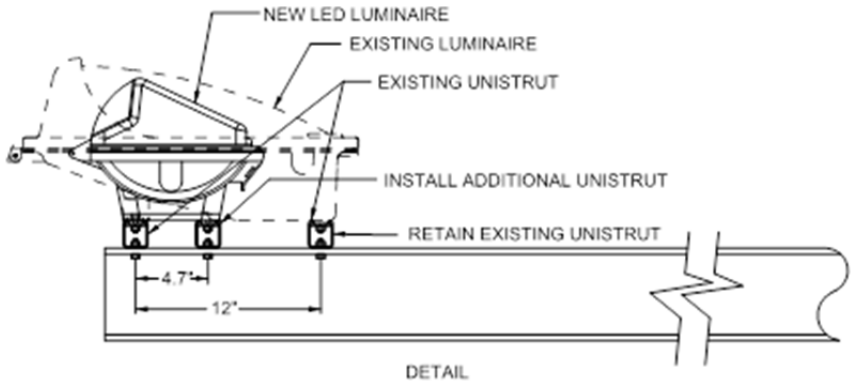
Item No.	Pay Item	Unit
4013099	Surface Plane Asphalt Pavement, Variable	Square Yard

(108) REFURBISHING SIGN LIGHTING SYSTEMS:

Overhead sign structures along I-85 and crossing routes have existing sign lighting systems. The contractor will refurbish and upgrade the existing systems by replacing existing sign lighting luminaires and repairing damaged or missing components on the systems. Existing mercury vapor or metal halide sign luminaires will be replaced with new LED luminaires of the same voltage. Rusted conduits, fittings, conduit straps, switch boxes, etc. located on the structures will be cleaned and painted with zinc-rich paint or replaced as necessary to the satisfaction of the engineer.

Existing equipment at service points should be inspected to determine needed repairs and any items found to be defective should be repaired to ensure that the sign lighting systems are operational. Underground conduits and conductors between the service point and the overhead structures will be retained.

LED sign lighting luminaires will be either two or three array fixtures with internal refractors. The contractor will determine the wattage of the existing luminaires (250 or 400 watt) prior to procuring the LED luminaires. 250 watt luminaires will be replaced with two array fixtures and 400 watt luminaires will be replaced with three array fixtures. Sign luminaires will be Holophane SVLED25K7XXSSVSGDFXX (XX = voltage) to replace 250 watt luminaires and SVLED35K1XXSSVSGDFXX (XX=voltage) for 400 watt luminaires. Luminaires will be attached to the structure by attaching to one existing unistrut and a new unistrut to be installed 4.7” from the existing as shown in the detail below.



DETAIL

The contractor will be required to drill new mounting holes in walkway supports to mount the additional unistrut and drill out the knockouts on the bottom of the new luminaires to accept the mounting bolts. The luminaire will be direct-bolted onto the unistrut using appropriate sized hardware.

Payment for refurbishing overhead sign lighting systems will include all materials, labor, tools and incidentals necessary to complete the work and ensure that all sign lighting luminaires are operational upon completion. Price and payment will be included in item number **6573106 – REFURBISH OVERHEAD SIGN STRUCTURE NO ( ).**

(109) SPECIFICATIONS FOR THE REPLACEMENT OR NEW INSTALLATION OF TRAFFIC COUNTING, CLASSIFICATION OR WEIGH-IN-MOTION SYSTEMS:

This work shall consist of furnishing and installing a Control Box with lightning suppression, Loop Wires, Piezo Film Sensors, Weigh-In-Motion sensors, lead-in wires, pull boxes, conduit and interconnections necessary to replace and upgrade the existing traffic counting, classification or Weigh-In-Motion devices which will be removed by the construction project. Should project conditions make it necessary to replace portions of the traffic counting, classification or Weigh-In-Motion system not mentioned above, a Supplemental Agreement would be negotiated to include the costs of those additional items. New installations shall consist of furnishing and installing a Control Box with lightning suppression, Loop Wires, Piezo Film Sensors, Weigh-In-Motion Sensors, lead-in wires, conduit, pull boxes, conduit and interconnections necessary for the installation. All equipment will be provided by the contractor, such as Traffic Counter, Modem, Solar 12V battery, Solar Panel and bracket, wood or metal pole or concrete pedestal for cabinet mounting. All work shall be performed in a satisfactory manner as determined by the SCDOT Engineer, and in accord with:

A. Applicable drawings, maps and plans.

B. SCDOT Standard Specifications for Highway Construction, latest edition with Special Provisions.

C. National Electrical Code, latest edition.

D. Uniform Traffic Control Manual.

E. South Carolina Manual on Uniform Traffic Control Devices for Streets and Highways, latest edition.

The plans, drawings, and maps indicate the extent and general arrangement of the installations and are for guidance. Any omission shown or implied shall not be cause for deviating from the intent of the plans or specifications. If the Contractor deems any modifications of the plans or specifications necessary, details of such modifications and the reasons therefore, shall be submitted in writing to the Engineer for written approval prior to beginning such modified work.

Prospective bidders are urged and cautioned to visit the traffic counting and classification site and apprise themselves of all conditions, which will affect the performance of the work called for or reasonably implied by the contract. Submission of a bid shall constitute sufficient evidence of this compliance and no allowance will be made for unreported conditions, which a prudent bidder would recognize as affecting the performance of the work called for in these specifications.

The Research and Materials Engineer shall approve all materials prior to being utilized. The Contractor shall submit for approval five (5) copies of descriptive literature, drawings and any requested design data for the materials proposed to be used. After approval, no substitutions for any approved materials may be made without the written approval of the Engineer.

A. Loop Wire: The loop wire shall be splice free lengths in flexible tubing (IMSA SPEC. 51-5-1984), which shall be No. 14 AWG, stranded, single-conductor, type THHN, encased in a ¼ inch flexible tubing sheath or approved equal.

B. Lead-in Cable: This shall be splice free lengths of IMSA SPEC. 50-2-1984, which shall be PVC sheathed, two conductor polyethylene insulated, No. 14 AWG, stranded cables; with an aluminum-polyester shield, and a stranded tinned copper drain wire. All lead-in cables for loops and piezo sensors that are installed on roadways are to be pulled to the nearest shoulder pull box and bored and jacked to a pull box near the control cabinet. No lead-in wires are to be cut across lanes unless prior approval is granted.

C. Sealant: The loop sealant used to fill the saw cuts and other gaps, shall be of a type intended for traffic loop embedding. The cured sealant shall be semi-flexible, and be capable of adhering

securely to concrete and asphalt. It shall be unaffected by freeze-thaw cycling, salts, gasoline, oil, sewerage and corrosive chemicals. It shall be proportioned and mixed per the manufacturer's instructions. Known suppliers include, but are not limited to, the following:

1. Preco, Gold-Label Flex

2. Detector Loop Sealant

D. Waterproofing Splice Material: Splices shall be made using the materials listed below:

1. Cable Splice Kit: Commercially available, low voltage, waterproof splice-kit; to be Rusco 974 Sealant, Plymouth "PLYFLEX", or 3-M "SCOTCH-LOK", Unipak #3570, Resin 400 or approved equal. To be installed per manufacturer's instructions.

2. Vinyl plastic electrical tape (use where required). Cold and weather resistant, ¾ inch wide, 7 mil thickness (Scotch 33+ or approved equal).

3. Liquid electrical coating (use where required). Fast-drying sealant compatible with vinyl tape, brush applied (3M, Scotchkote or approved equal).

4. Underwater Splicing Kit: In very wet areas, where it may be required, an underwater splicing kit shall be used. This splicing kit shall consist of either Rusco 974 sealant application or a two-piece mold-body, with pourable resin sealing compound, funnels and end sealing strips (3M, Scotchcast 82-A1 or approved equal).

E. Wire Crimps: The preferred splicing method shall use a commercial/industrial grade, copper-alloy, CRIMP-ON, with one end closed, of a size proper for the gauge of wires to be spliced, and the number of conductors. It shall be installed with the proper calibrated, ratchet type, crimping tool, intended for the purpose (NOT regular pliers). Note that wire nuts are not acceptable.

F. Solder: The alternate method of splicing is to use solder, which shall be electronic-grade, rosin-core, 60 lead/40 tin. Acid-core solder is not acceptable, nor are acid type soldering pastes.

G. Conduit: Conduit shall be as indicated on the sketches, but shall be at a minimum:

1. One inch schedule 80 PVC for all underground runs and from the road edge to boxes.

2. 3/4 inch schedule 80 PVC on poles above ground.

3. On replacement sites, existing conduits are to be removed and new conduit are to be installed as specified in original contract unless prior approval is granted.

H. Junction Boxes and Pull Boxes: Junction Boxes and pull boxes shall be of sufficient size to accommodate the necessary wires and other accessories for proper splicing of the loop wires. The boxes shall be either metal or plastic and shall be weatherproof. The number and configuration of the boxes will be determined by the installation site geometry and conditions.

*On replacement sites, existing junction boxes and pull boxes are to be removed and new boxes are to be installed as specified in original contract unless prior approval is granted.

I. Piezo Film Sensor: Piezo film axle sensors shall be furnished and installed as needed to enable the system to operate as indicated in these Special Provisions. Materials and installation for the axle detectors, necessary lead wires and all connections shall be of the high quality needed for the sustained, long-term operation of the field station. Piezo film sensors shall operate within specification in both asphalt and Portland cement pavements constructed on all commonly encountered sub-base materials and soil types. AMP Roadtrax BL Class I (Wim) or II

(Classification-Speed) piezo film sensors shall be used depending on type of installation. The sensor design must have been proven reliable in conditions similar to those in the United States. These sensors should at a minimum meet the requirements for class II piezoelectric sensors as outlined in FHWA report No. DP-88-76-006. See Attachment

The sensors should include all mounting hardware and installation grout. The supplied installation grout must be suitable for installation in both asphalt and portland cement pavements. The grout must have a short curing time to prevent unnecessary lane closure time. The grout should be of sufficient consistency to prevent "running" when being applied on road surfaces with a drainage cross-slope. Particulate matter within the grout must not separate or settle, nor must the grout shrink during the curing process.

Class I piezo film sensors must be Twelve (12) feet long or width of lane. Class II sensors must be six (6) feet in length and must be placed in the wheel path of the vehicle. The sensor must be active along the entire length. The sensors will be provided with a shielded lead in cable, which is at least 300 feet long, with no splices. Piezo film axle sensors shall be tested prior to and after installation.

J. Control Cabinets: This specification sets forth the requirements for cabinets for housing and terminal strips, modems (where used), batteries and wiring for the vehicle loops and/or piezo cable sensors. The cabinets shall also be of sufficient size to contain the necessary meter(s). Cabinets are to be mounted on either posts or concrete bases, unless otherwise stipulated in the contract documents.
See Attachments

1. Physical and Mechanical Requirements

   a. Materials

      (1) Cabinets shall be constructed of sheet aluminum alloy of 5052, with a minimum thickness of 0.125 inches (ASTM B209).
      (2) The cabinet surface shall have a smooth natural aluminum finish.
      (3) All exposed edges shall be free of burrs and pit marks.
      (4) All welds shall be neatly formed and free of cracks, blowholes, and other irregularities.
      (5) The Department may approve special design cabinets utilizing other special material combinations and gauges when such special designs are proposed by the Contractor.

   b. Doors and Locks

      (1) All cabinets shall be provided with a hinged, rain tight and dust tight main door which shall encompass at least 80 percent of the full area of the cabinet front.
      (2) The main cabinet door shall be supplied with a Standard No. 2 Lock and the handle shall be capable of accommodating a pad-lock with a minimum 3/8" diameter shank.
      (3) The main cabinet door shall be NEMA Type with a neoprene gasket in the door. **See Figure 1**
      (4) Hinges shall be made of 14 gauge stainless steel and shall be attached by welding, riveting or tamper proof bolts.
      (5) Larger cabinets shall be furnished with a three-point lock system for the main door. Larger cabinets shall be furnished with a minimum of a two-position doorstop. The doorstop shall hold the door open at 90 degrees and at the full open position (minimum of 120 degrees). The doorstop

shall be designed to lock into position and withstand the force of a 30-mph wind.

c. Ventilation: Cabinets shall be adequately vented by an approved watertight method.

d. Shelf Requirements: All cabinets shall have at least one shelf. Larger cabinets shall have two adjustable shelves. The range of adjustability shall be the full height of the cabinet in maximum increments of two inches. The bottom shelf will be at least 12 inches deep and the top of the shelf will be at least one inch less in depth. Other equipment shall not interfere with the adjustability of shelves.

e. Mounting Requirements

(1) Pole mounting hardware shall be furnished with cabinets as a standard; however, if the contract documents stipulate a pedestal or other method of mounting; then the necessary hardware to accomplish the mounting shall be furnished. **See Figure 2**

Angle arms shall be aluminum alloy 5052 minimum of ¼ inch thickness and a minimum width of 3 inch by 3 inch.

Galvanized anchor bolts, nuts, lock, washers, and flat washers in accordance with ASTM standard A153 shall be furnished with the cabinet. The anchor bolts shall be .750 inch in diameter and of sufficient length to support cabinet and equipment.

Each base mounted cabinet shall be furnished with a template for setting the anchor bolts in the footing.

Where base mounted control cabinets are specified, the reinforced concrete base, formwork and subgrade preparation shall be included in the price of the installation. Concrete for the base shall be class B, minimum compressive strength of 2500 psi.

(2) Manufacturer identification: The manufacturer's name shall not appear on the outside of the cabinet, but shall appear on the inside of the cabinet door, with the year and month of manufacture. This can be done by a plate welded to the door or by a moisture resistant label (or other approved methods).

2. Ground Bussbar

a. A copper ground bussbar shall be mounted on the side of the cabinet wall for the connection of AC neutral wires and chassis ground wires.

b. If more that 1 ground bussbar is used in a cabinet, a minimum of a AWG No. 10 copper wire shall be used to interconnect them.

c. The bussbar shall have at least two positions where an AWG No. 6 stranded copper wire can be attached. **See Figure 2A**

3. Documentation: Each cabinet shall be furnished with three copies of the cabinet wiring diagram and field wiring diagram unless otherwise stipulated in the contract documents.

K. Solar Panel:

1. General – The solar panel system shall consist of the solar panel (collector), voltage regulator and one or more rechargeable batteries. The power system shall be of sufficient capacity and design to enable it to operate without fault and within the full range of climatological conditions within South Carolina. The power system's reserve capacity shall enable it to operate the equipment for 14 consecutive days of heavily overcast weather without the battery voltage nearing the point where power is too low to maintain the integrity of the equipment at the designed power level.

   Each module shall be framed with bronze anodized extruded aluminum and shall be compatible with the mounting hardware. A weatherproof connection box shall be mounted on the back of the solar panel for connection of the output cable to the solar panel cable. This connection box shall have a fitting to accommodate the required conduit as indicated in Figure 3. **See Figure 3**

   All cell modules shall be factory tested and labeled with the actual peak power and voltage output and peak current. All modules shall be approved by Factory Mutual Research for application in NEC Class 1, Division 2, Group D hazardous location.

2. Reliability and Environmental – All modules shall conform to the Federal Department of Energy's Jet Propulsion Lab block V test criteria, and the following tests with no performance degradation.
   - Temperature coefficient of current 0.50 Ma/°C
   - Approximate effect of temperature on power .37°/°C
   - Temperature coefficient of voltage -72.0 mv/°C
   - NOT C 45.0°C

3. Mechanical characteristics – solar panels shall conform to the following mechanical characteristics:

Weight:	Max 3.5 Pounds
Dimensions:	Max 18 inches x 12 inches x 1.75 inches
Output Cable:	15 feet long AWG 18-2 polyethylene jacketed

4. Miscellaneous – The manufacturer shall provide a warranty for the solar equipment for a period of not less than 2 years.

   Mounting hardware shall be designed to support the solar equipment. Design shall be of such to accommodate a variety of attachment methods and mounting surfaces. All brackets and hardware shall be formed from high strength, corrosion resistance materials. All mounting hardware shall be adjustable to accommodate the directional requirements set forth by the solar cell manufacturer.

L. Modems: The cabinet at each designated station shall contain a modem designed for communication with the data and the transfer of data to and from a modem at the central location. The modems shall depend upon the telephone line voltage for power. The Contractor shall furnish and install the field modems which shall be capable of transmitting data at variable rates with a minimum of 99.8% throughput of data when tested for six (6) consecutive hours and be compatible with the central modem. As a minimum transmission rates will include 1200 and 24020 baud. **See Attachment**

M. Automatic Traffic Recorder: **See Figures 18 & 18A**

INSTALLATION PROCEDURES

A. Saw Cuts: The location and size of each loop shall conform to the specifications. Loops shall be centered in the lane. The loop shall be six feet by six feet with the sides parallel and perpendicular to the direction of traffic. **See Figures 4 & Figures 5-7H.**

**Note: Figure 4 applies to all projects. The appropriate Figure 5-7H (lane layout) should be used for the roadway. If none of the layouts apply to the project, a special lane layout will be drawn and supplied to the contractor. If there is question as to which layout to use, please contact Van B. Forrest, Jr. at 803-960-6709.

Prior to cutting, the intended saw cut should be carefully marked on the pavement and approved by the Engineer.

The Contractor shall use a diamond or abrasive rotary power saw. The saw shall be a power driven walk-along model, not a hand tool.

Slots for loop wires and lead-in wires should be ¼" wide and cut so that the top wire is a minimum of one inch below the surface in concrete pavement and three inches in asphalt. **See Figure 8**

All saw cuts shall be washed out, blown dry, and be free of dust, grit, oil, and moisture before the placement of the wire. High pressure oil free compressed air shall be used to blow dry.

Pavement joints should also be avoided. However, when it is necessary to traverse a joint, a two (2) inch diameter hole about three (3) inches deep should be drilled, and enough slack provided in the loop wire to allow for expansion and contraction. **See Figure 9**

B. Loop Wire: Each loop wire shall be continuous and splice free. Further, any wire with cuts, breaks, or nicks in the insulation shall not be accepted. All loops shall be wired in the counter-clockwise direction and shall have four turns of the wire.

See Figure 10

Each loop detector shall be formed by installing in a separate cut, one (1) continuous length of single conductor wire, from the nearest approved pullbox, around the loop the specified number of turns, then back to the pullbox.

The loop wire shall be pressed to the bottom of the saw cut slot. A roller or blunt stick (similar to a paint stirrer) shall be used to seat the wire. In no case shall a sharp tool or screwdriver be used for this purpose.

The wire shall be laid in the slot so that there are no kinks or curls and no straining or stretching of the insulation around the corner of the slot, or at the junction.

After placing the wire in the slot, it shall be rechecked for slack, raised portions and tightness. The wire shall be depressed to the bottom of the slot and pressed against one another. One-inch lengths of one-half (1/2) inch closed cell backer rod may be used at two-foot spacings to help hold the wire down in the slot. Alternatively, a bead of loop sealant may be placed in the bottom of the saw slot, the wires installed and then the remaining sealant installed. The loop wires should be fully encapsulated in the sealant.

The loop wire shall be enclosed in the conduit from the roadway edge to the pullbox. Galvanized steel conduit should be used under curbs, driveways, or shoulders. **See Figure 11**

Each loop shall be tested before and after sealing. The inductance shall be in the range of 50 to 800 micro-Henrys. The insulation resistance measured to earth ground should be greater than 100 megohms at 500 volts DC. A meggar tester shall be provided to the Department at the end of the contract.

Note: The Megger test required before and after sealing shall be submitted to the Engineer in writing.

C. Loop lead in wire: shall be extended splice-free to the pullbox. If the splices are required, every effort should be made to locate them in a pullbox. Each pair of lead in wires, exclusive of shielded cable, shall be twisted with three to five turns per foot before placement into saw slot, conduit or pullbox. Twisting of different loop pairs of wires together shall not be permitted.

Sufficient slack shall be left in both the lead in cable and the loop wire, so that the splice may be moved three (3) feet from the front of the pullbox. The slack shall be neatly coiled and nylon tied after completion of the splice. **See Figure 12**

Each roadway loop shall have a separate two conductor lead in at the terminal strip. In the controller cabinet the lead in cable shall be uniquely identified by an insulated, preprinted sleeve, slipped over the wire before the attachment of a spade-lug connector. A spade-lug connector shall be soldered onto each loop lead-in wire. In the controller cabinet, the ground wire from each lead in cable shall not be connected. Rather it shall be cut off at the cable sheath, and left floating. **See Figure 13**

D. Piezo Film Sensors: Piezo film axle sensors shall be furnished and installed as needed to enable the system to operate as indicated. Materials and installation for axle detectors, necessary lead wires and all connections shall be of high quality needed for the sustained, long-term operation of the field station. Piezo film sensors are for use in the classification of vehicles. Piezo film sensors shall operate within specification in both asphalt and Portland cement pavements constructed on all commonly encountered sub-base materials and soil types. Axle detectors shall be installed and connected in accordance with the attached recommendations of the manufacturer.

Piezo film axle sensors shall be furnished and installed in a slot cut in the pavement and shall have an active length of six (6) feet. The depth of pavement cut for piezo film sensors shall be ¾ inches. The width of the cut shall be ¾ inches. The cable channel shall be installed flush with the pavement surface in accordance with manufacturer's specifications.

*Piezo film sensors shall be tested prior to and after installation.

A pull box shall be installed on the shoulder on the end of the conduit if any splices are required and/or if the control box is not located near the edge of the road. At least 12 inches of slack wire should be left in the pullbox for future maintenance. Any required splices should be located in the pullbox with at least 12 inches of slack wire before and after the splice.

The pullbox shall be like the control box in size and materials and waterproof. It shall be located below the surface and have a removable panel located on the top side to allow for future access to wires. Once the wiring is pulled through and completed, the remaining hole with the wire lead-ins coming through it should also be waterproofed by filling it with flexible, removable waterproof compound or sealant.

E. Conduit: Rigid conduit encasement shall be provided for all conductors run to the

junction boxes, pullboxes and/or control cabinets. All conduit installations shall conform to the provisions of the National Electrical Code, except where directed otherwise. Bonded slip joints will be permitted for joining rigid conduit to boxes. Where a standard coupling cannot be used, an approved threaded union coupling shall be used. All conduit ends shall be reamed to remove burrs and sharp edges. Damaged portions of galvanized surfaces and untreated threads resulting from field cuts shall be painted with a rust inhibitive paint. Conduit bends shall have a radius of not less than 12 times the nominal diameter of the conduit, unless otherwise provided.

Conduit which will be subject to regular pressure from traffic shall be laid to a depth of not less than 12 inches. On transverse crossing under shoulders, the conduit shall be placed at a depth of not less than 12 inches below grade. After the conduit has been installed and before the backfilling is started, the conduit installation shall be inspected and approved by the Engineer.

In backfilling trenches, the backfill material shall be placed and compacted in lifts of 6 inches or less. Any area disturbed as a result of the contractor's operations shall be restored to the satisfaction of the Engineer. Conduits, junction boxes, and metal poles throughout the system shall be bonded together and bonded to all ground rods by using grounding brushings on the conduit ends.

F. Control Box:

1. General – The boxes shall be located as indicated in the Site Sketches.

   The control box shall be mounted on a post at least 30 feet from the roadway within the guidelines of the Roadside Design Guide concerning
   clearances of obstacles. Control boxes shall be a minimum of two feet behind guardrail sections. Treated wood support posts will be used whenever possible: elsewhere, galvanized steel channel posts shall be used. Where the shoulder is bordered by a concrete barrier, the conduit shall be carried to the outside of the barrier and the control box anchored to the far side of the barrier post. Conduit cannot be attached to the traffic side of a barrier unless it is mounted flush with or below the surface of the barrier surface. In some cases pedestal mounted boxes may be necessary.
   See Figure 14

2. Terminal and Wiring – Terminal strips with a minimum of ten terminals each will be mounted inside each control box in order to connect the loop wires to the leads of the 9-pin connectors. At least 10 inches of slack lead-in wire shall be left in the control box before connecting the lead-ins to the terminal strip. Wires connected to the terminal strips will have insulated, solderless, spade-tongue terminals of the correct wire and/or stud size. Wires connected to the 9-pin connectors will be 18 gauge stranded conductors with PVC insulation. The wires will be a minimum of 10 inches long and twisted in pairs to match the loop lead-in wires. The terminal strips and 18-gauge wire are to be supplied by the contractor as part of the control box. **See Figures 15, 16 & 17**

   All wiring for loops and piezo sensors shall be as recommended for connection to and compatible with the Department's existing equipment.

   All connections are made via the terminal strip using the spade tongue connectors. At least 10 inches of slack lead-in wire should be left in the box before connecting each lead-in wire to the terminal strip.

   The electrical lead-in can run in the same (if space is available) or different conduit as the loop lead-ins from the edge of the roadway to the box. If separate conduits are run for the lead-in wires, a pullbox shall be installed for each.

G. Pullbox: A pullbox shall be installed in the shoulder on the end of the conduit if any splices are required and/or if the control box is not located on a guardrail, barrier, etc. near the edge of the road. At least 12 inches of slack lead-in wire should be left in the pullbox after pulling the wire through to the control box. Any required splices should be located in the pullbox with at least 12 inches of slack wire before and after the splice. Do not coil the loop lead-in wire. They should be laid in the box folded and loosely tied if necessary.

The pullbox shall be located below the surface, and have a removable panel located on the topside to allow future access to the wires. Once the wiring is pulled through and completed, the remaining hole with the wire lead-ins coming through it should also be waterproofed by filling it with a flexible, removable waterproof compound or sealant.

A sign for each site shall be provided by the Department indicating underground conduit and pullbox proximity. The signs shall be approximately 4" X 6" panels which say:

UNDERGROUND INSTALLATION
PLEASE CALL 1-803-737-2232
BEFORE DIGGING
SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION
OFFICE OF DATA SERVICES

The signs shall be mounted on galvanized metal channel posts.

The Engineer will designate where to install the signs.

The price of the signs shall be included in the price of the sites.

H. Transient Protection:

1. Vehicle Loop Detector Inputs – Loop detector lead-ins shall be protected by a transient protection device or circuit to reduce the effect of transient voltages applied to the lead-in circuits. The protection device or circuit shall have the following minimum ratings:

   a. Recurrent peak A.C. voltage greater than 15 volts.

   b. Energy rating of 20 joules.

   c. Average power dissipation of 1 watt.

   d. Peak current rating of 500 amperes for pulses less than 6 microseconds.

   e. Standby current less than 1 millampere.

2. Field Wiring Terminals – The field wiring signal head output terminals shall be protected by a transient protection device or circuit to reduce the effect of transient voltages applied to the output terminal circuits. The protection device or circuit shall have the following minimum ratings:

   a. Recurrent peak A.C. voltage of 212 volts.

   b. Energy rating of 20 joules.

c. Average power dissipation of .85 watt.

d. Peak current rating of 2000 amperes for pulses less than 6 microseconds.

e. Standby current less than 1 millampere.

3. Other Circuits: Other circuits shall have transient protection devices or circuits when called for in the contract documents. This would include surge on modems.

MEASUREMENT AND BASIS OF PAYMENT

General: Upon completion of all construction as defined in these Special Provisions at a location, the site will be placed in permanent operation and a 60-day observation period will begin. The purpose of this observation period is to assess the adequacy of the installation and operation of the equipment. During this 60-day observation period the contractor shall repair any defects in the installation work performed and make any adjustments deemed necessary by the Engineer. Should any failures occur during this observation period, the contractor shall begin to make necessary repairs within forty-eight hours of notification. Should necessary repairs not be completed within seventy-two hours of notification, the observation period shall stop and resume only after such repairs and replacement of materials have been made, inspected and approved. During this observation period, the contractor shall repair or replace any material and equipment furnished by him that becomes defective, lost, or damaged. If the equipment does not operate according to the specifications during the operation period, the State shall have the option of returning the equipment at the vendor's cost.

FINAL ACCEPTANCE: Completion and final acceptance of the Traffic Counting and Classification or Weigh in Motion System shall be contingent upon successful completion of the 60-day observation period. The 60-day observation period shall be considered to be part of the work required to be completed by the final completion date specified for this project. Warranties and/or guaranties with respect to materials, parts, workmanship or performance shall not begin in force until final acceptance of the project. Payment for the system shall not be made until after the observation period has been successfully completed.

Payment will be made under:

Item	Unit
Traffic Monitoring Site Configuration	**Site**

Configuration Types: A, B & D

****Note: Configuration Type is dependent on the number of lanes and equipment/sensors installed.**

Typical Cabinet Door Seals

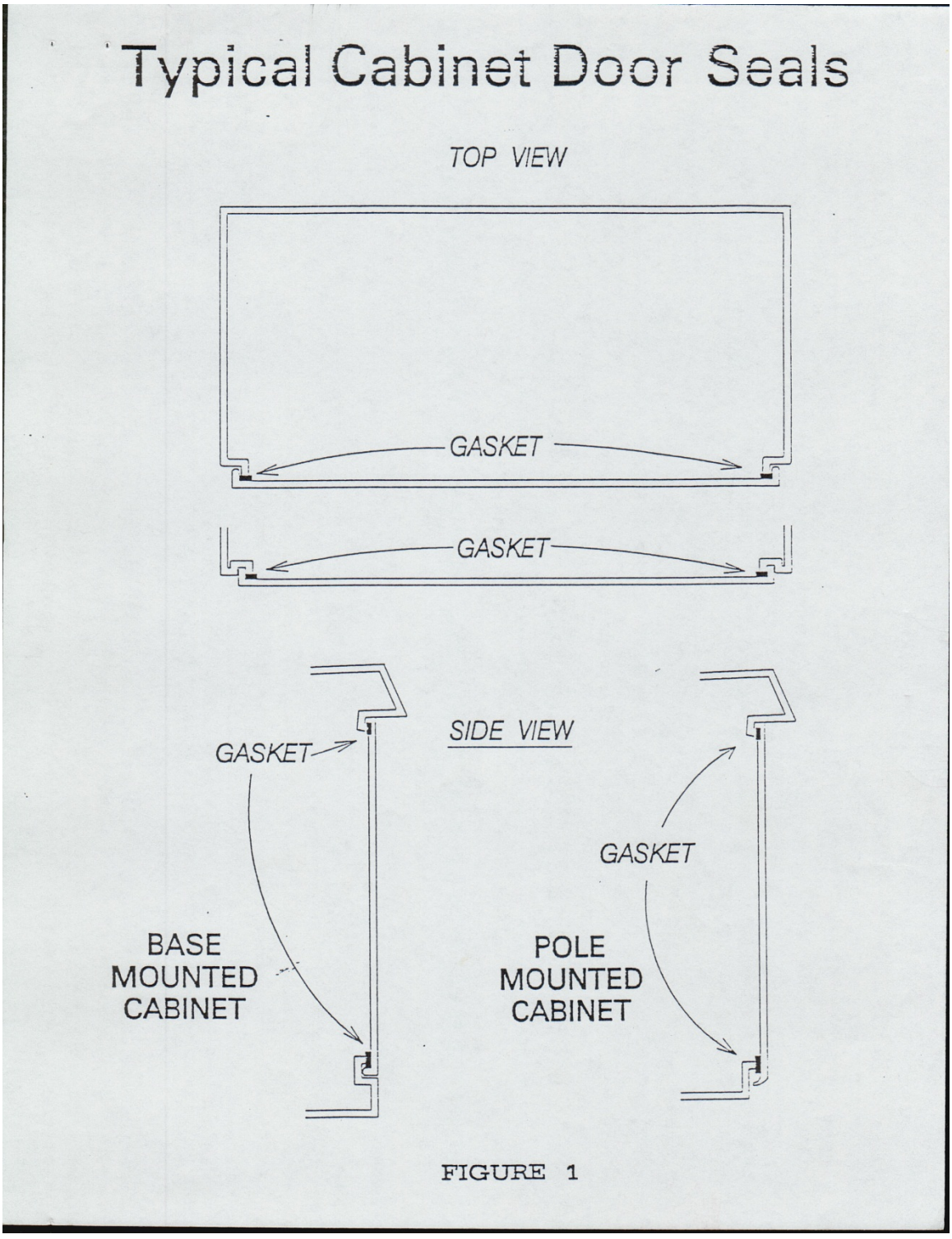
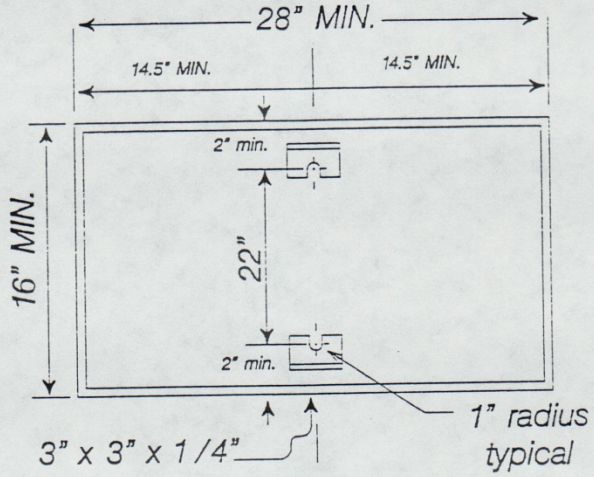


FIGURE 1

Typical
and Minimum Cabinet Dimensions
(underside views – mounting brackets)



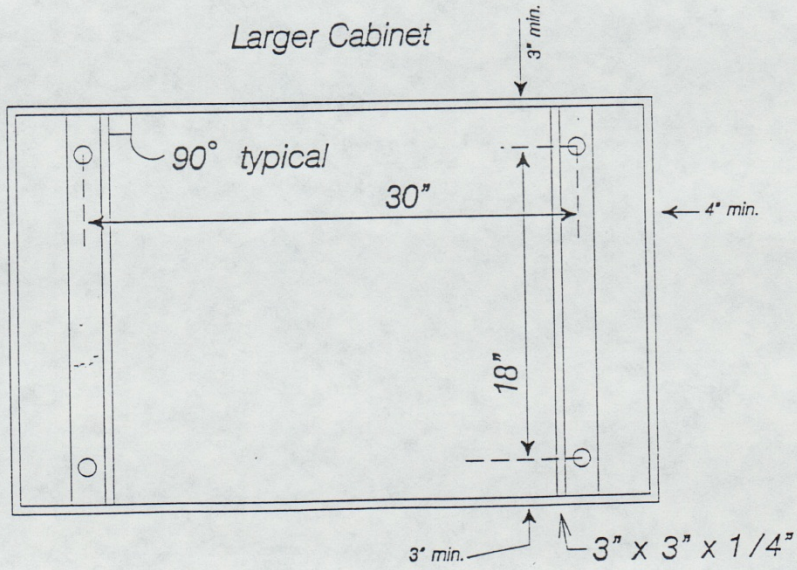


FIGURE 2

Typical Cabinet Detail

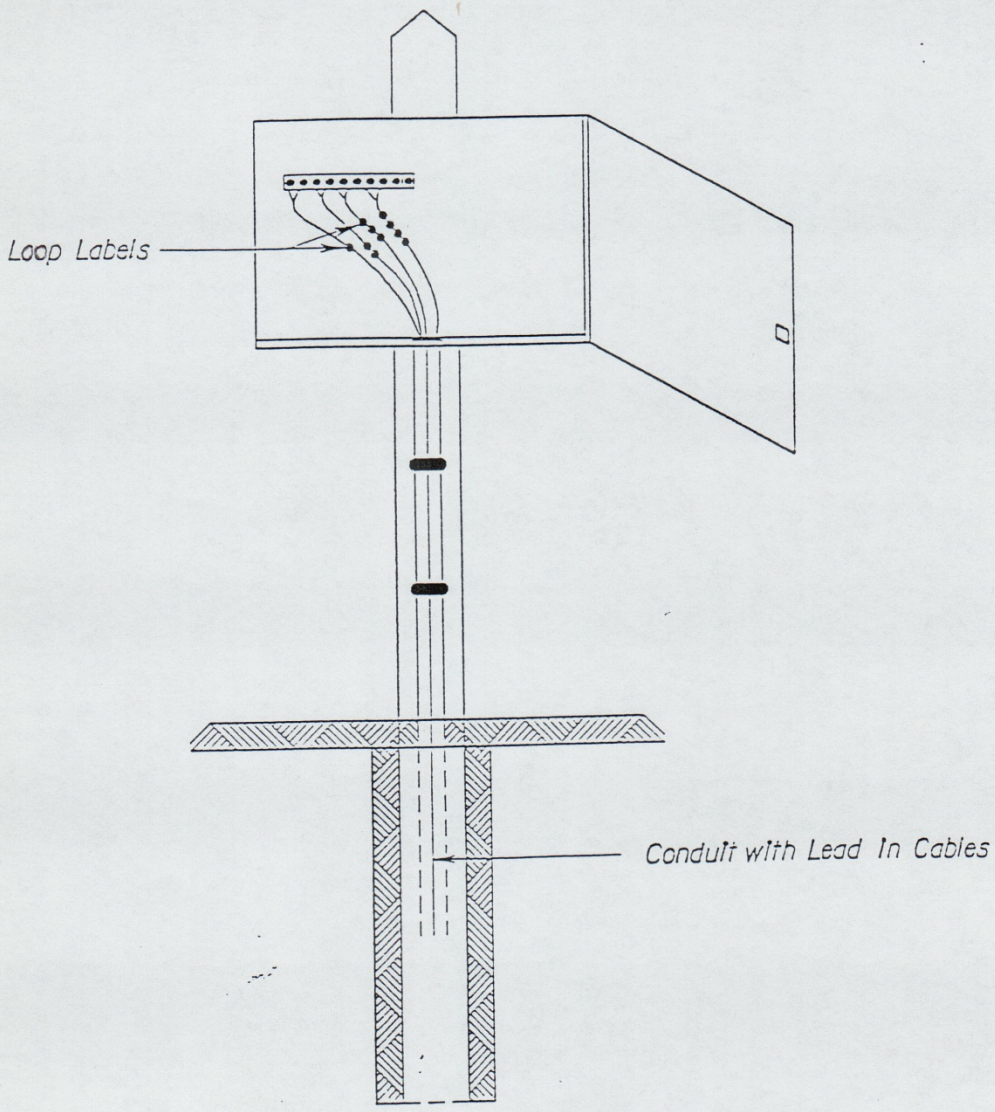


FIGURE 2A

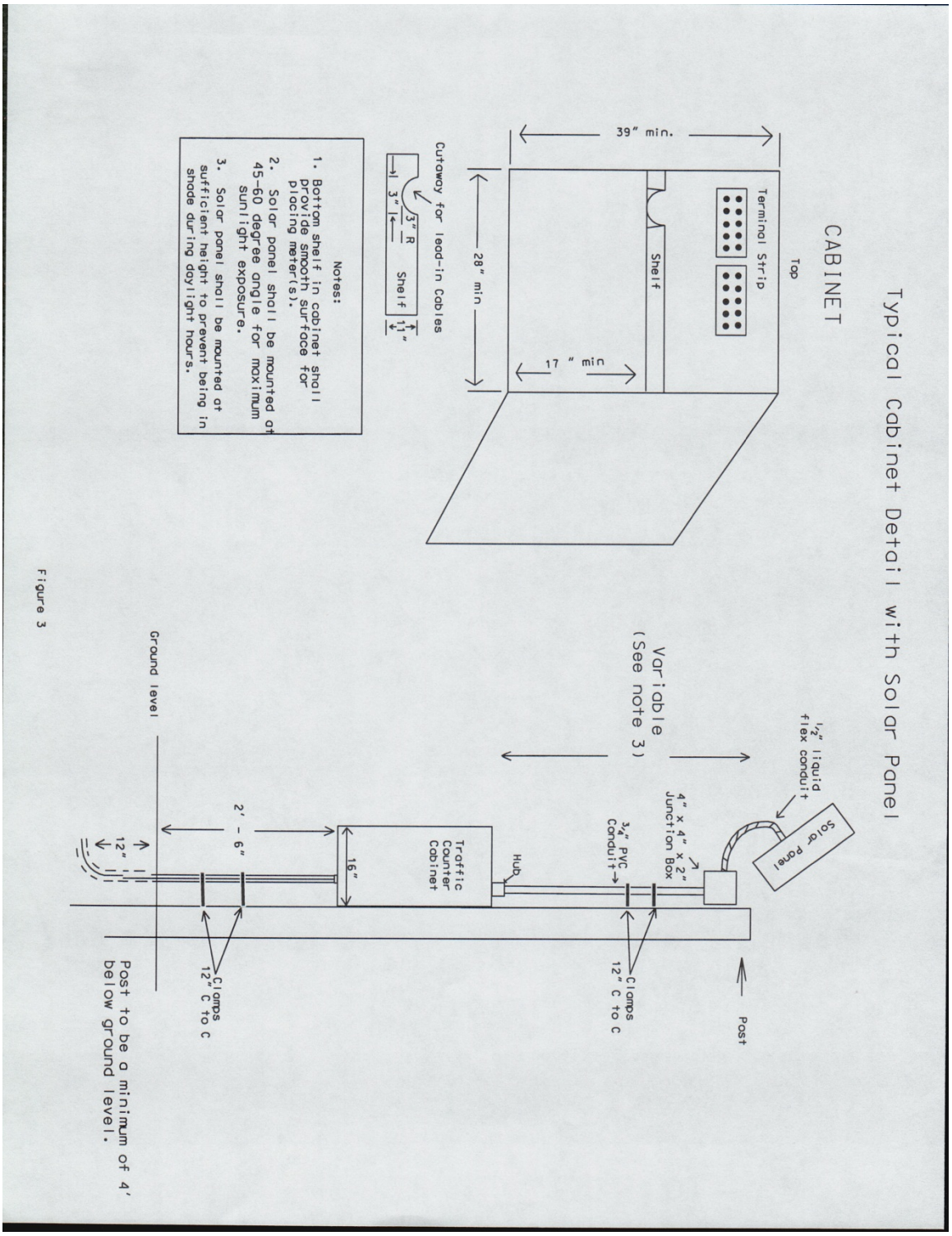

Typical Cabinet Detail with Solar Panel
CABINET
Top
Terminal Strip
Shelf
39" min.
17" min.
28" min
Cutaway for lead-in Cables
3" R
Shelf
1 1/2"
Notes:
1. Bottom shelf in cabinet shall provide smooth surface for placing meter(s).
2. Solar panel shall be mounted at 45-60 degree angle for maximum sunlight exposure.
3. Solar panel shall be mounted at sufficient height to prevent being in shade during daylight hours.
Variable
(See note 3)
1/2" liquid flex conduit
Solar Panel
4" x 4" x 2" Junction Box
3/4" PVC Conduit
Hub
Traffic Counter Cabinet
16"
2' - 6"
12"
Ground level
Clamps 12" C to C
Clamps 12" C to C
Post
Post to be a minimum of 4' below ground level.

Figure 3

LOOP INSTALLATION IN EXISTING ROADWAYS

FIGURE 4

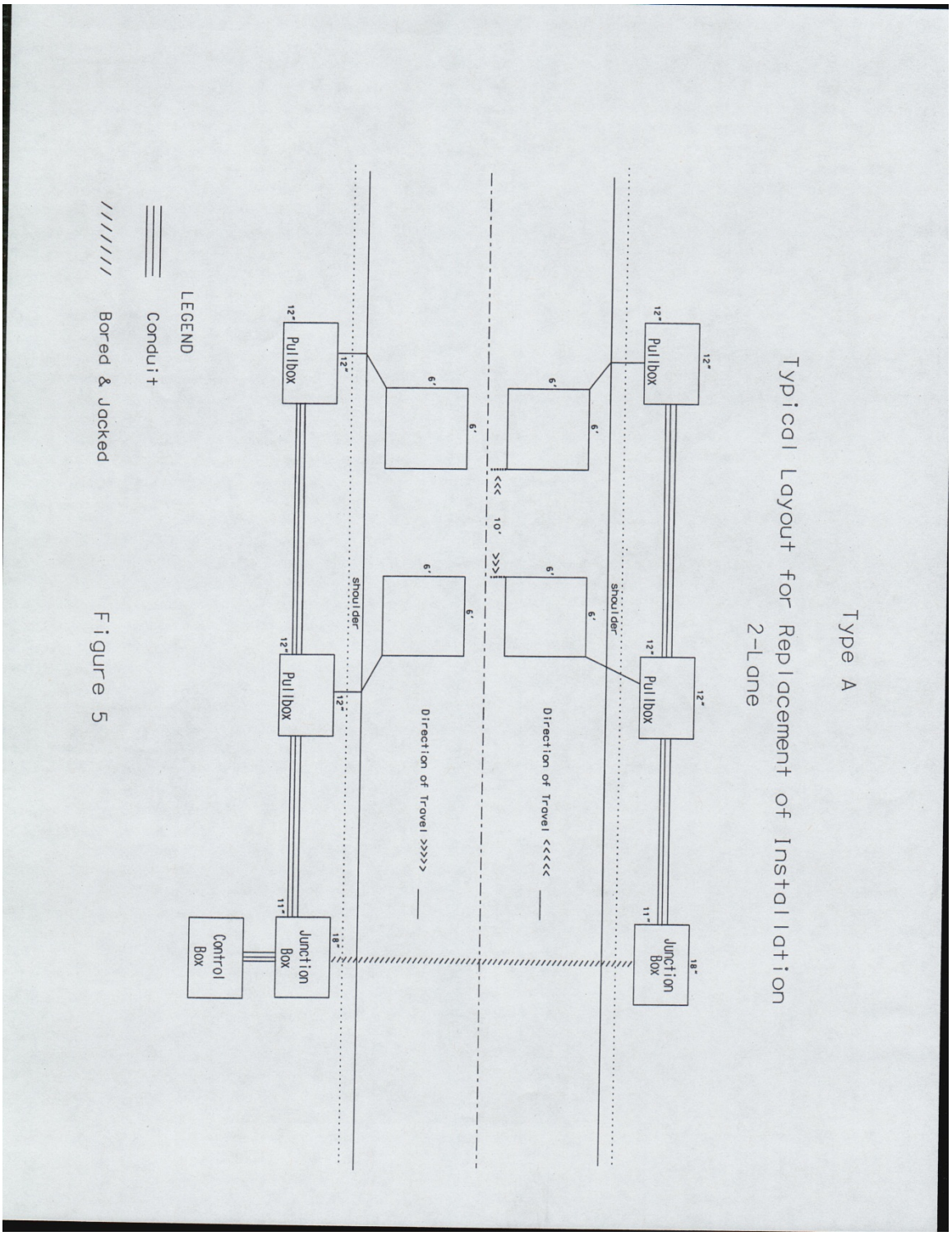

Type A
Typical Layout for Replacement of Installation
2-Lane
Pullbox
Junction Box
Control Box
shoulder
Direction of Travel <<<<<
Direction of Travel >>>>>
10'
6'
12"
18"
LEGEND
Conduit
Bored & Jacked

Figure 5

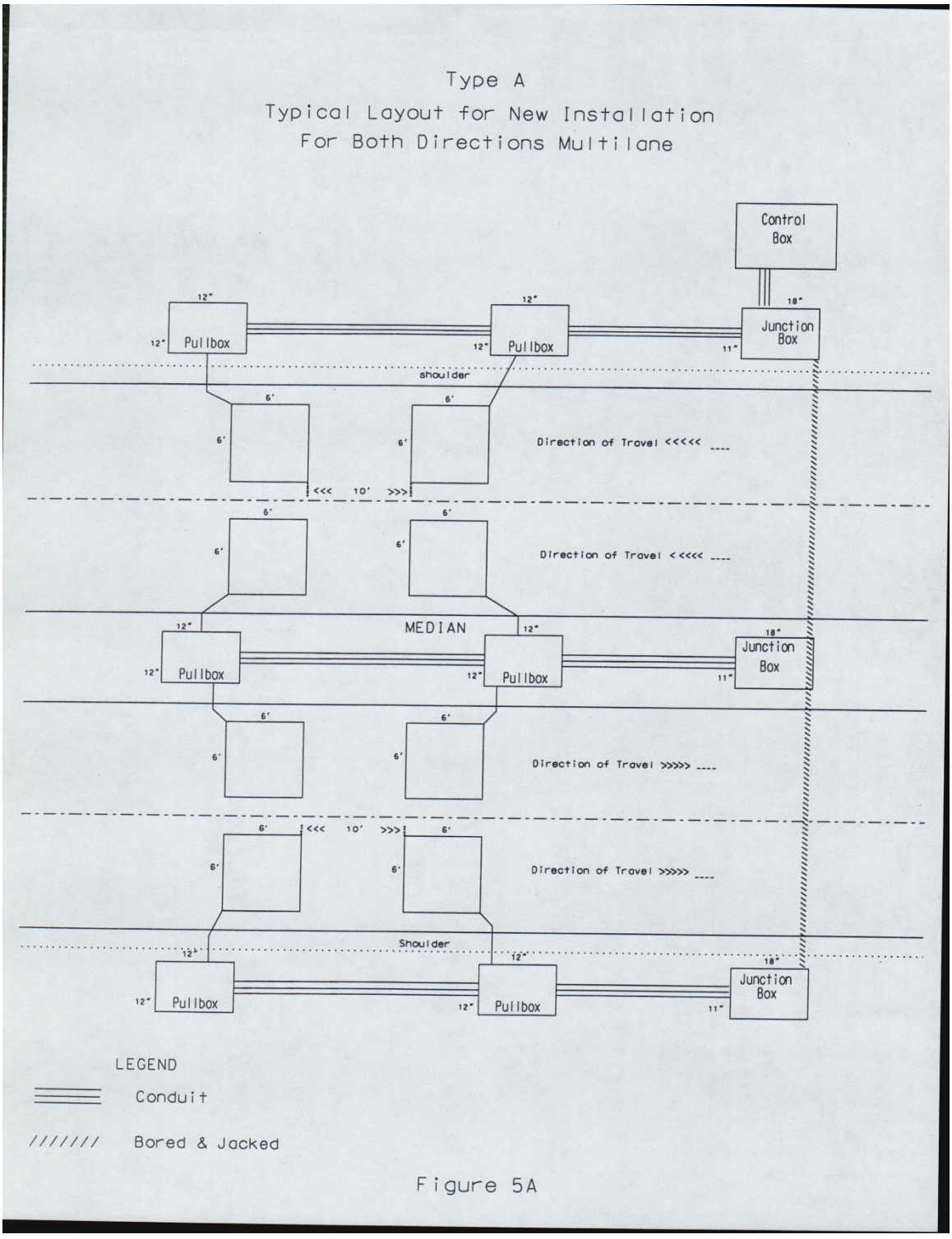

Type A
Typical Layout for New Installation
For Both Directions Multilane
Control Box
Pullbox
Junction Box
shoulder
Direction of Travel <<<<<
10'
MEDIAN
Direction of Travel >>>>>
Shoulder
LEGEND
Conduit
Bored & Jacked

Figure 5A

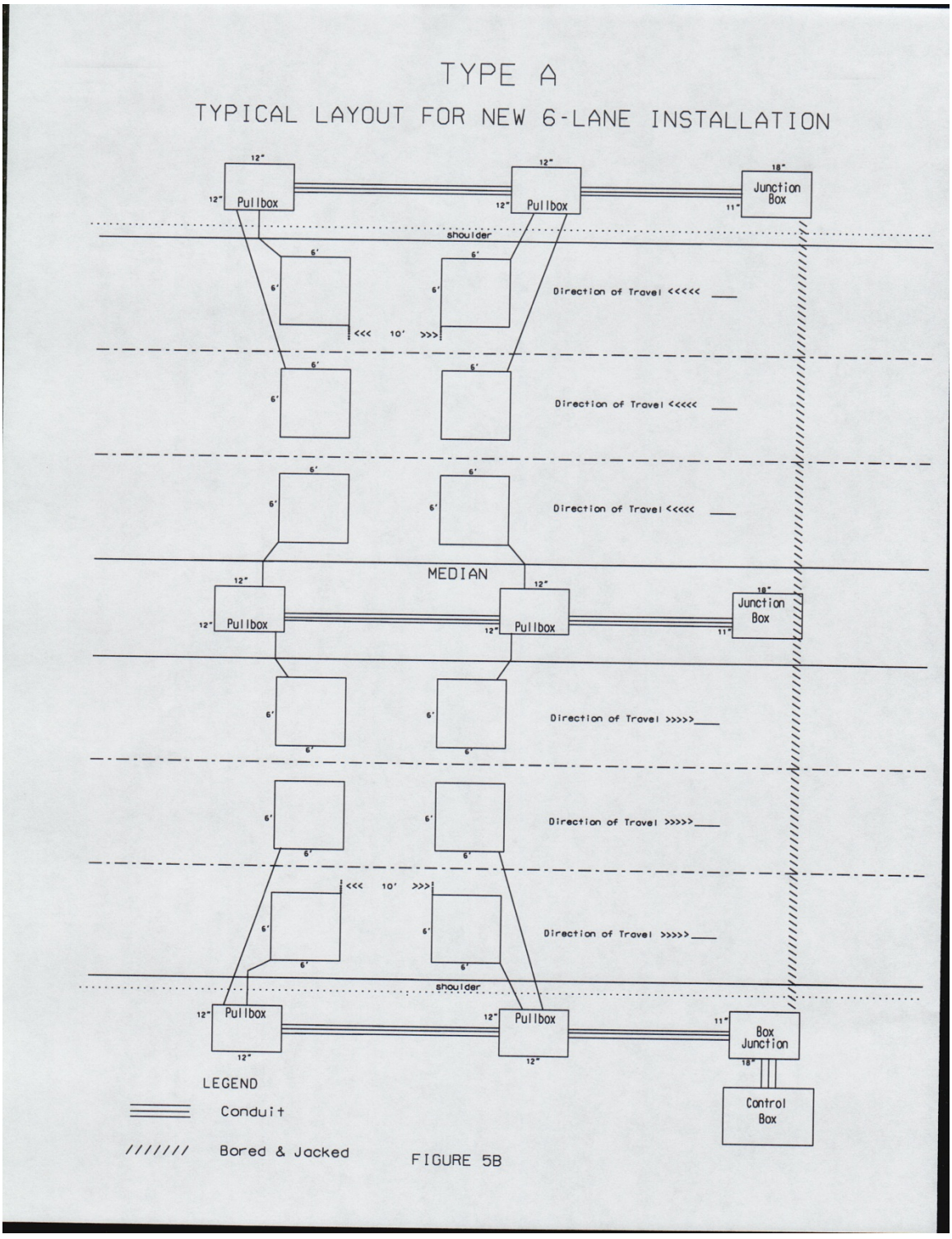

TYPE A
TYPICAL LAYOUT FOR NEW 6-LANE INSTALLATION
Pullbox
Junction Box
shoulder
Direction of Travel <<<<<
10'
MEDIAN
Direction of Travel >>>>>
Box Junction
Control Box
LEGEND
Conduit
Bored & Jacked

FIGURE 5B

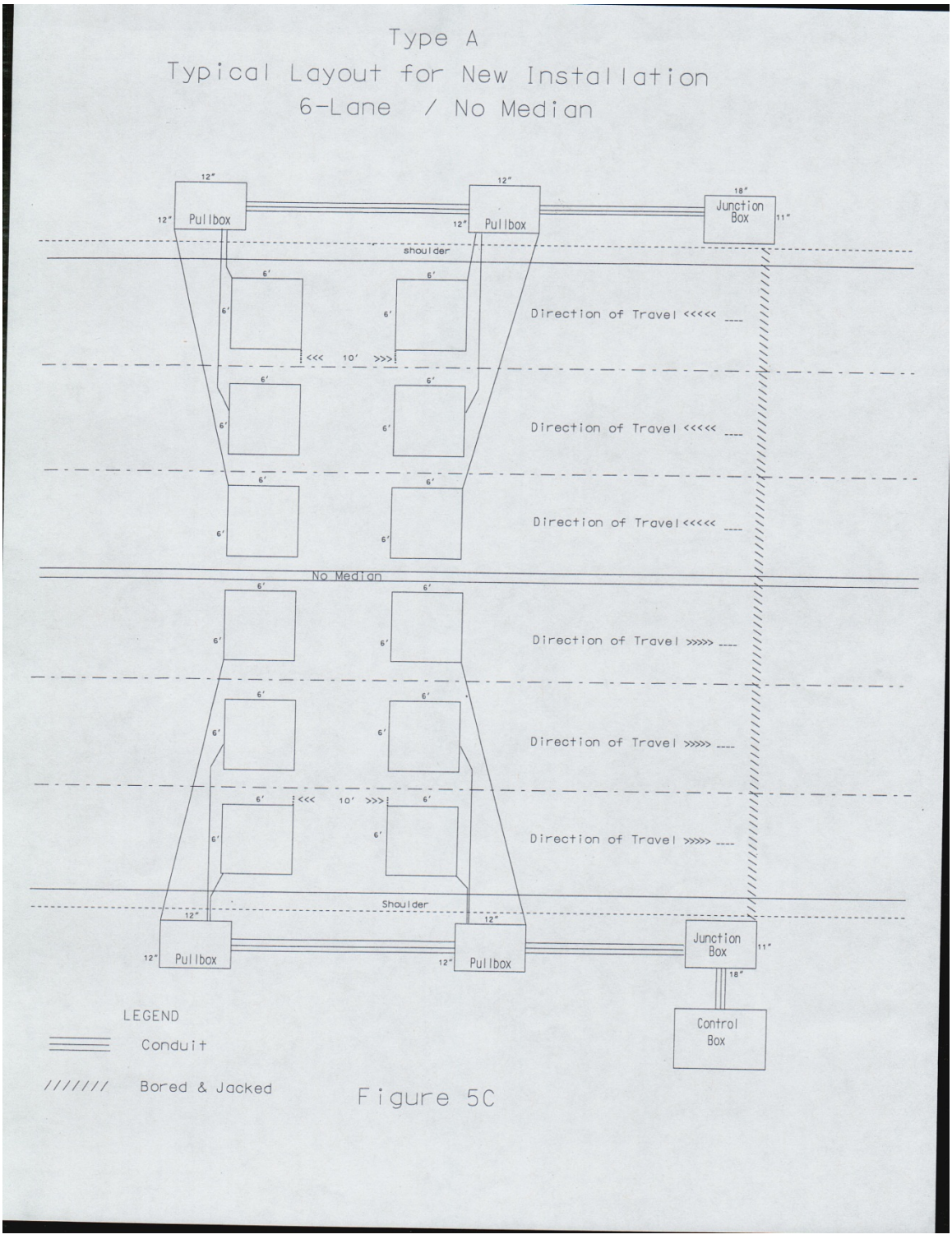

Type A
Typical Layout for New Installation
6-Lane / No Median
Pullbox
Pullbox
Junction Box
shoulder
Direction of Travel <<<<<
Direction of Travel <<<<<
Direction of Travel <<<<<
No Median
Direction of Travel >>>>>
Direction of Travel >>>>>
Direction of Travel >>>>>
Shoulder
Pullbox
Pullbox
Junction Box
Control Box
LEGEND
Conduit
Bored & Jacked

Figure 5C

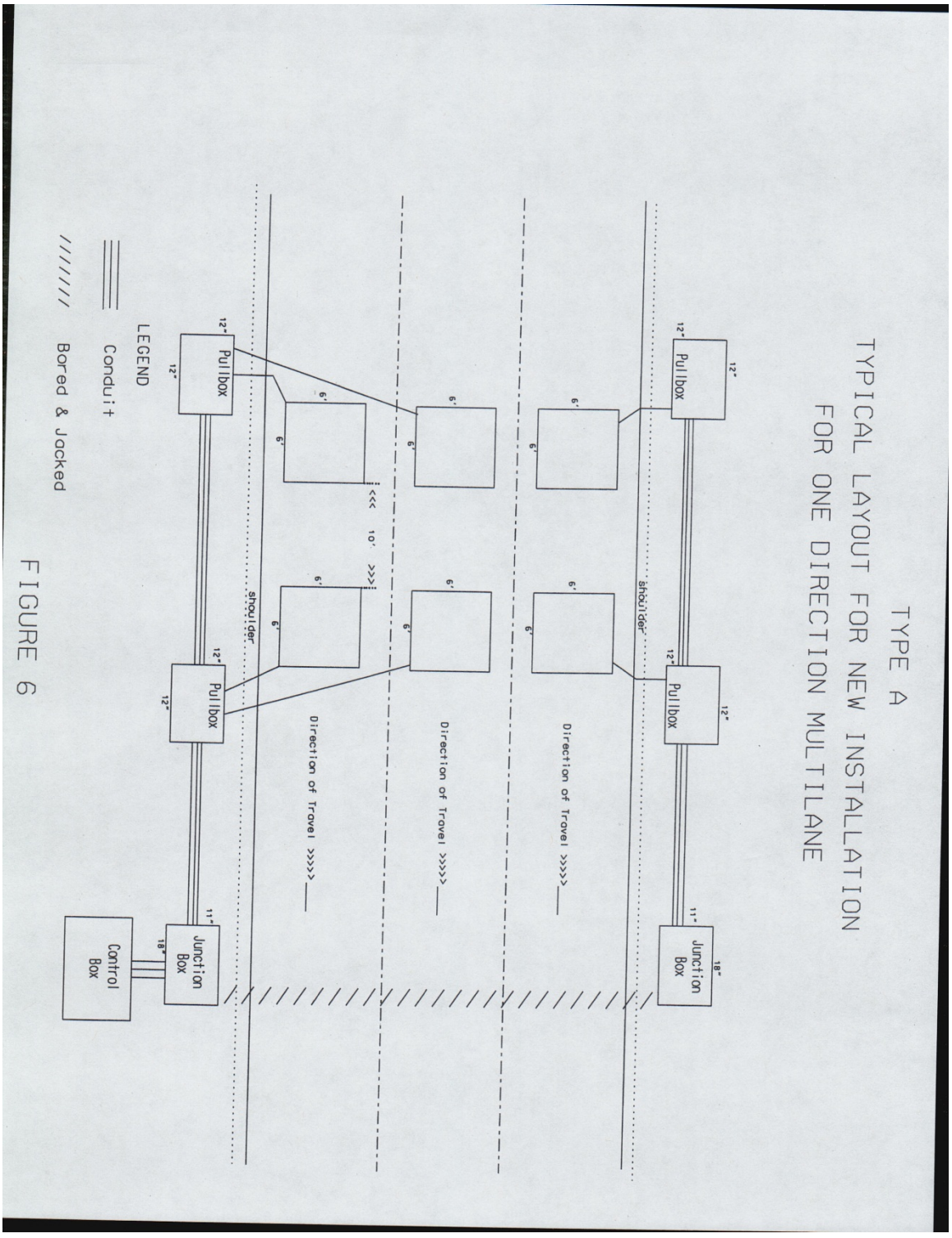

TYPE A
TYPICAL LAYOUT FOR NEW INSTALLATION
FOR ONE DIRECTION MULTILANE
Pullbox
Junction Box
Control Box
shoulder
Direction of Travel >>>>>
<<< 10' >>>
6'
12"
18"
LEGEND
Conduit
Bored & Jacked

FIGURE 6

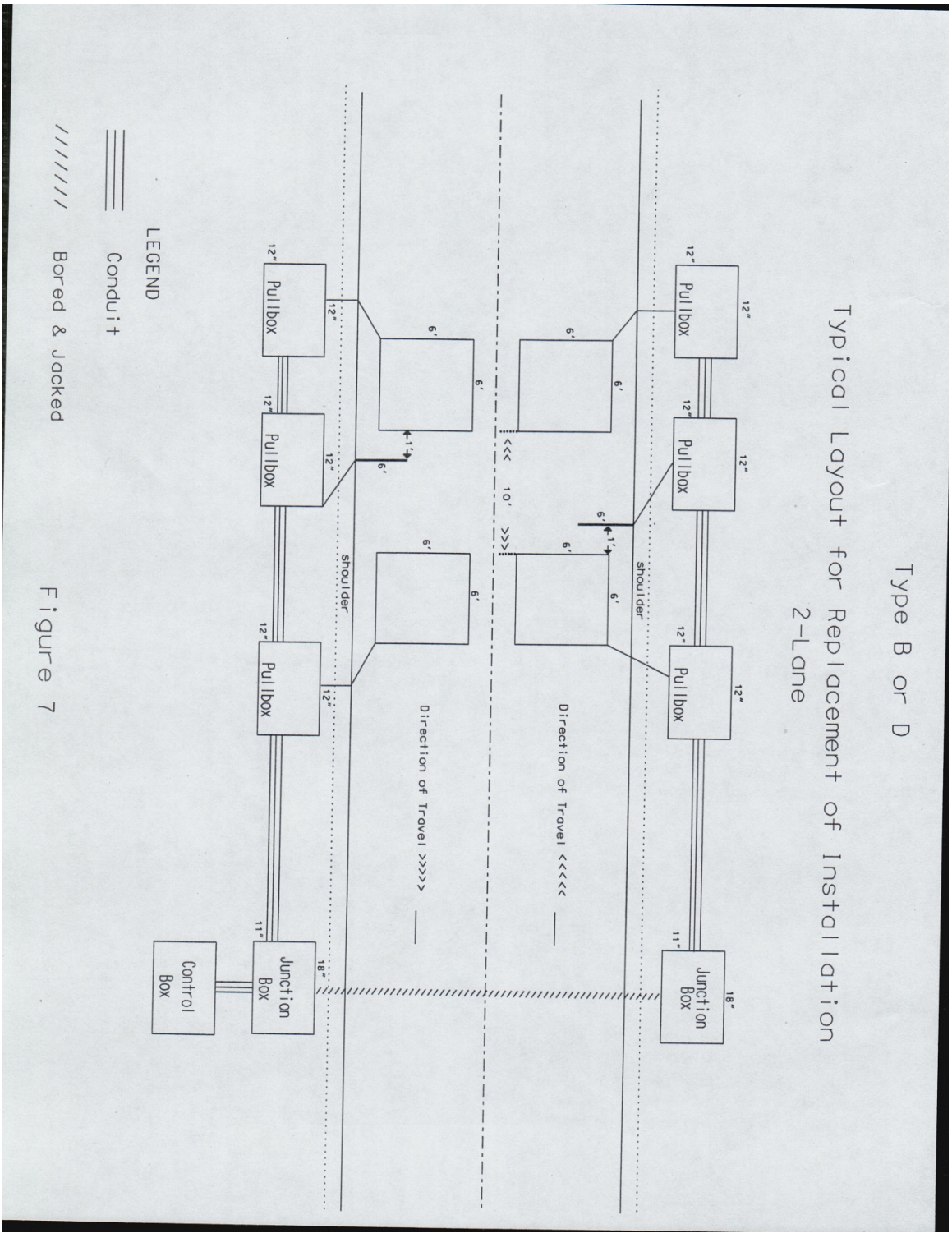

Type B or D
Typical Layout for Replacement of Installation
2-Lane
Pullbox
Junction Box
Control Box
shoulder
Direction of Travel <<<<<
Direction of Travel >>>>>
LEGEND
Conduit
Bored & Jacked

Figure 7

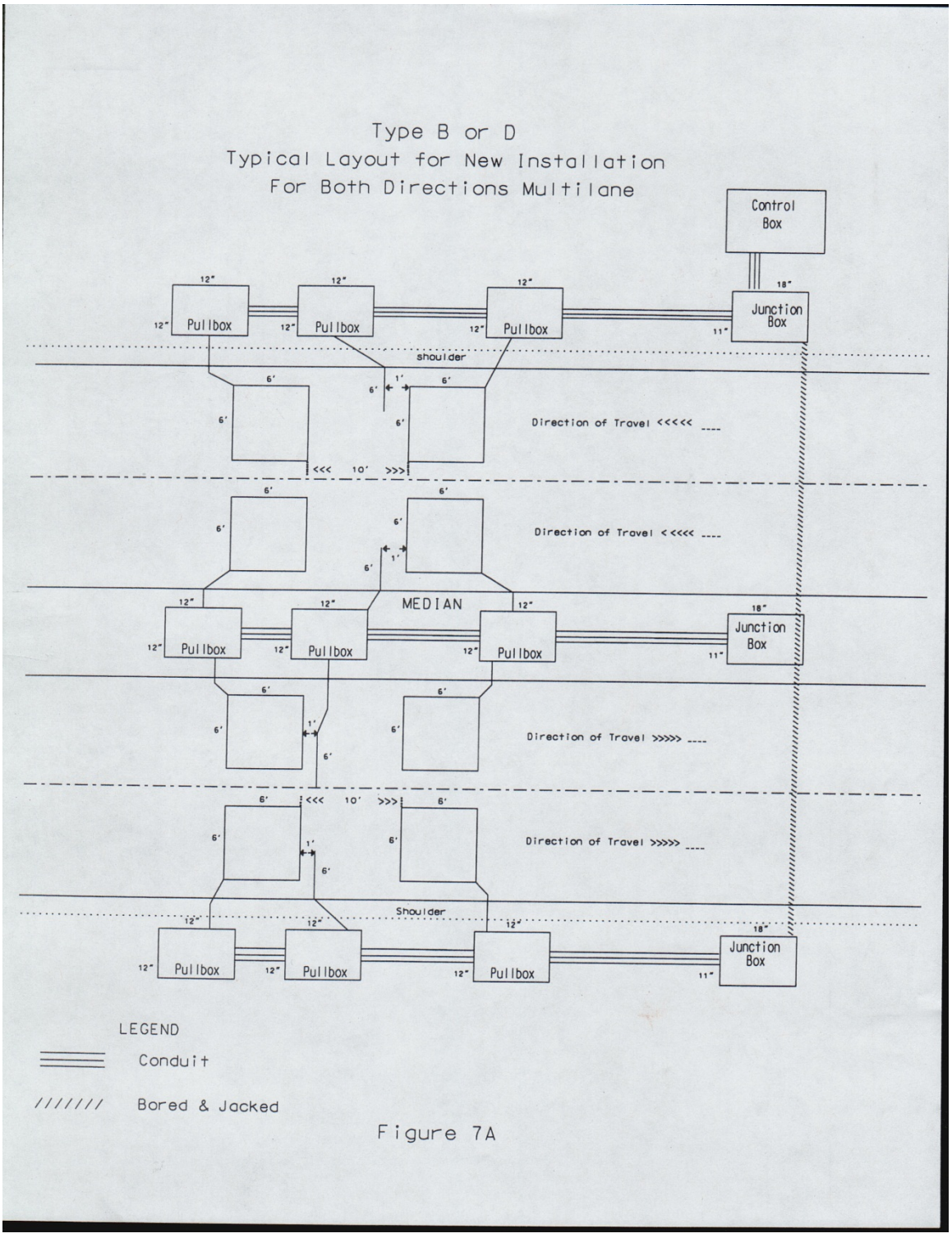

Type B or D
Typical Layout for New Installation
For Both Directions Multilane
Control Box
Pullbox
Junction Box
shoulder
Direction of Travel <<<<< ----
Direction of Travel <<<<< ----
MEDIAN
Direction of Travel >>>>> ----
Direction of Travel >>>>> ----
Shoulder
10'
LEGEND
Conduit
Bored & Jacked

Figure 7A

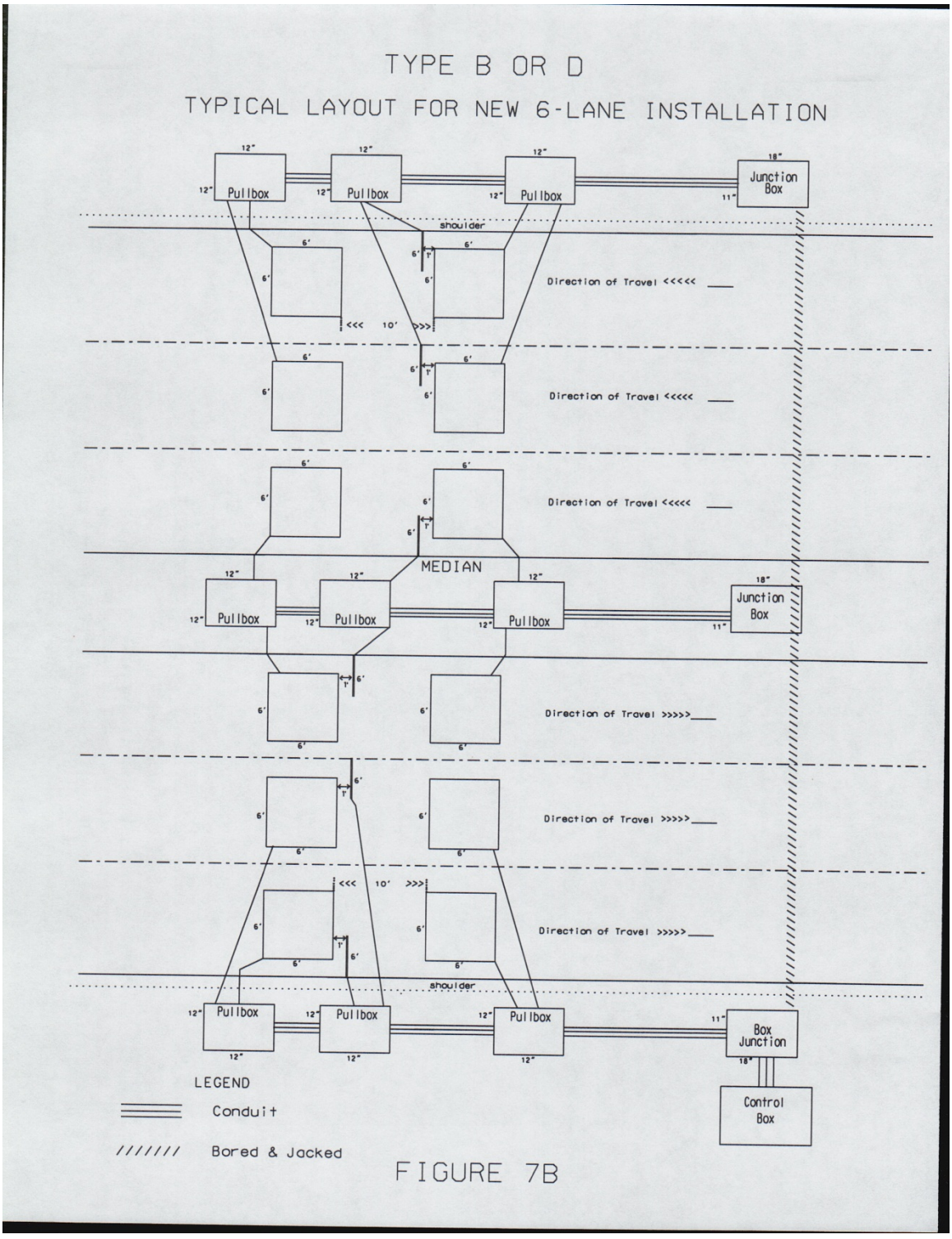
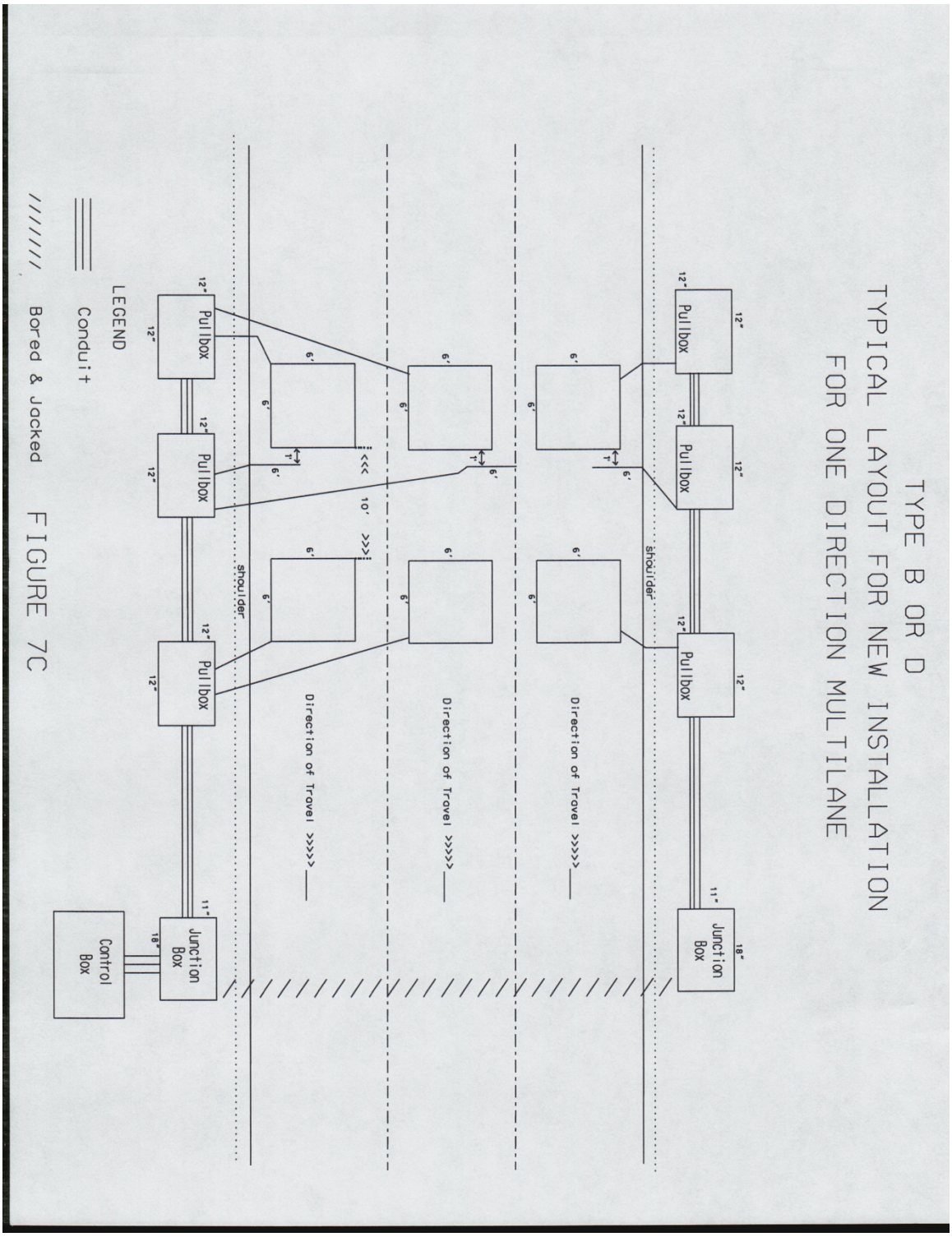

TYPE B OR D
TYPICAL LAYOUT FOR NEW 6-LANE INSTALLATION
Pullbox
Junction Box
shoulder
Direction of Travel <<<<<
Direction of Travel <<<<<
Direction of Travel <<<<<
MEDIAN
Pullbox
Junction Box
Direction of Travel >>>>>
Direction of Travel >>>>>
Direction of Travel >>>>>
shoulder
Pullbox
Box Junction
Control Box
LEGEND
Conduit
Bored & Jacked

FIGURE 7B


TYPE B OR D
TYPICAL LAYOUT FOR NEW INSTALLATION
FOR ONE DIRECTION MULTILANE
Pullbox
Junction Box
Control Box
shoulder
Direction of Travel >>>>>
LEGEND
Conduit
Bored & Jacked
FIGURE 7C

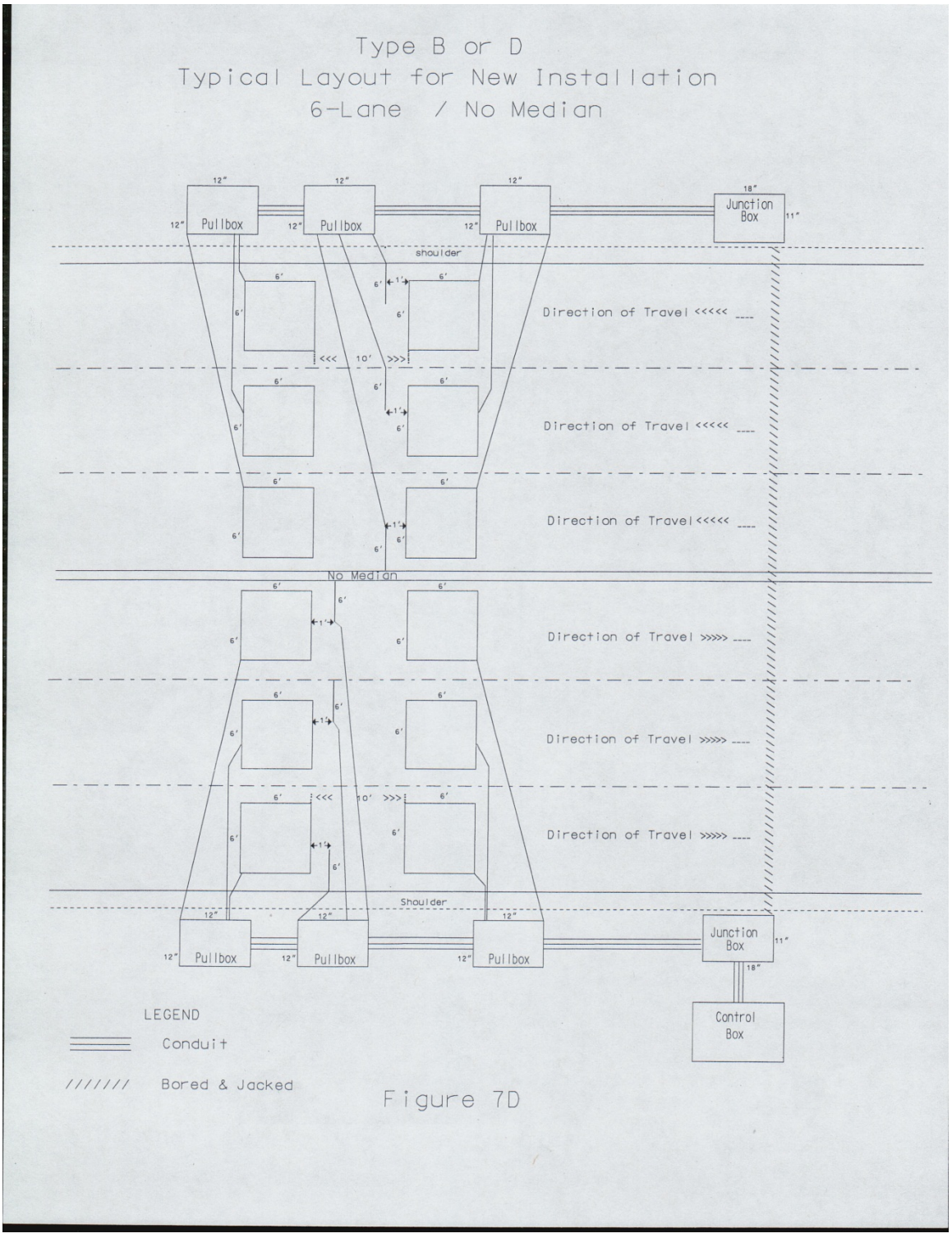

Type B or D
Typical Layout for New Installation
6-Lane / No Median
Pullbox
Junction Box
shoulder
Direction of Travel <<<<<
Direction of Travel <<<<<
Direction of Travel <<<<<
No Median
Direction of Travel >>>>>
Direction of Travel >>>>>
Direction of Travel >>>>>
Shoulder
Pullbox
Junction Box
Control Box
LEGEND
Conduit
Bored & Jacked

Figure 7D

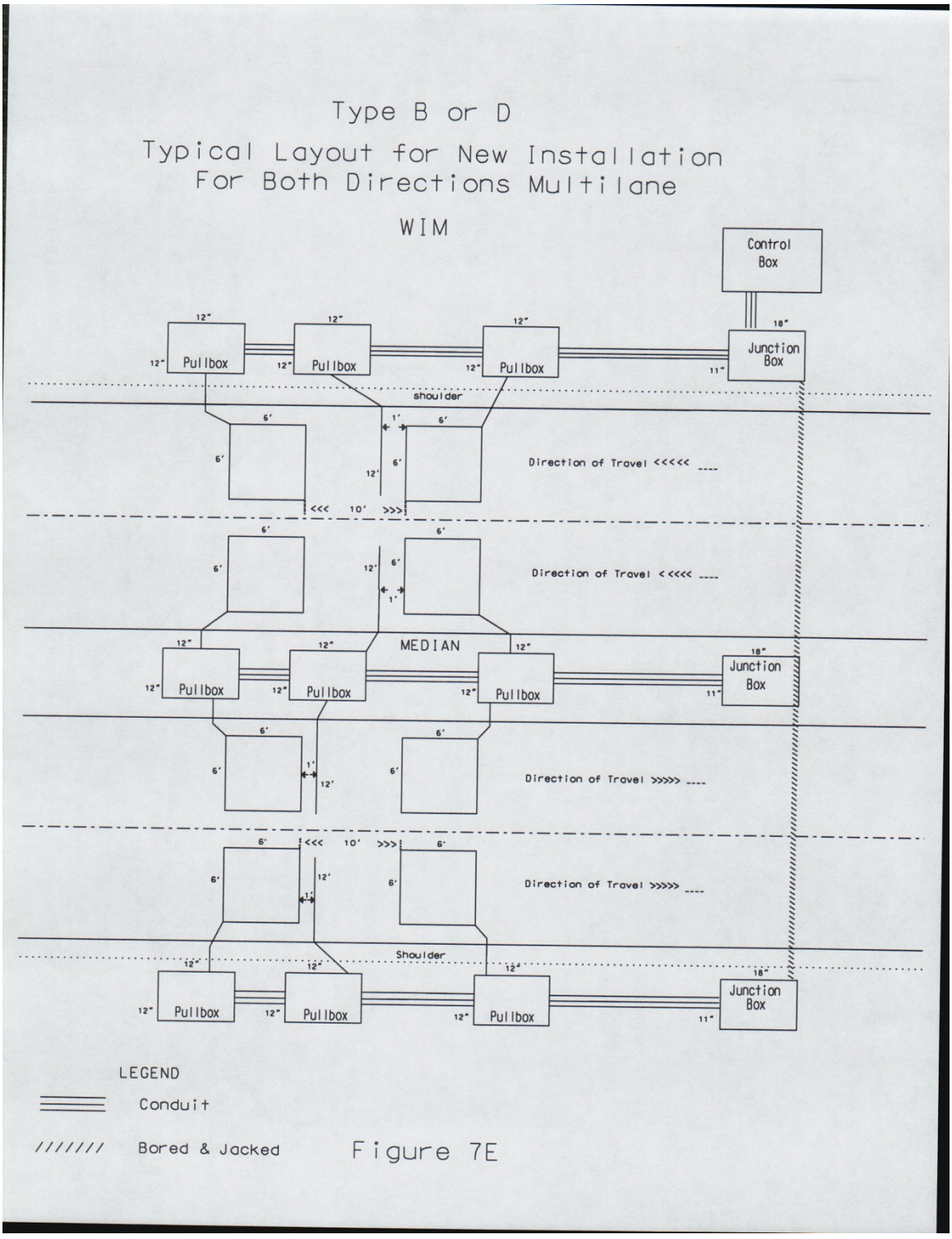

Type B or D
Typical Layout for New Installation
For Both Directions Multilane
WIM
Control Box
Pullbox
Junction Box
shoulder
Direction of Travel <<<<< ----
10'
Direction of Travel <<<<< ----
MEDIAN
Direction of Travel >>>>> ----
Direction of Travel >>>>> ----
Shoulder
LEGEND
Conduit
Bored & Jacked

Figure 7E

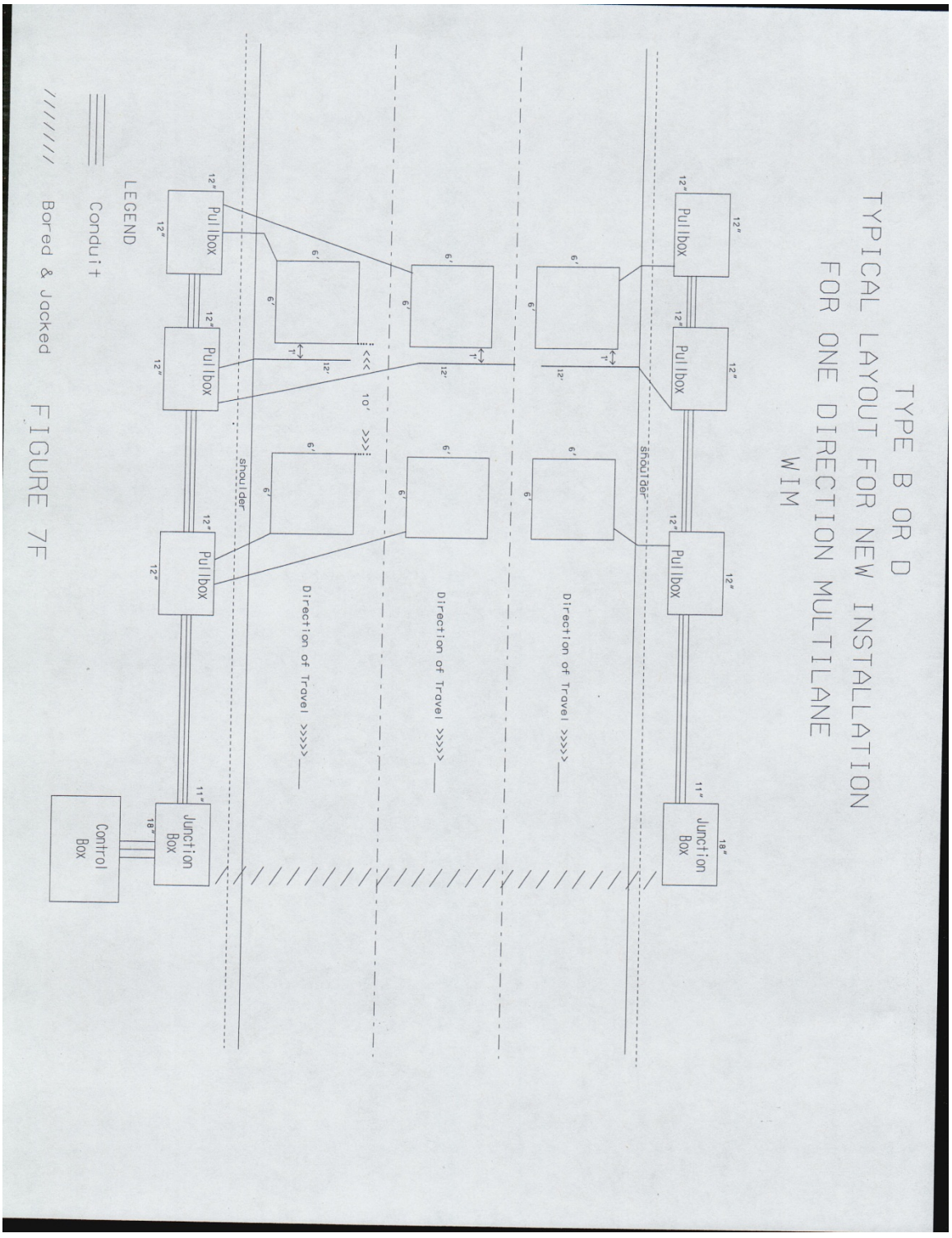

TYPE B OR D
TYPICAL LAYOUT FOR NEW INSTALLATION
FOR ONE DIRECTION MULTILANE
WIM
Pullbox
Junction Box
Control Box
Shoulder
Direction of Travel >>>>>
LEGEND
Conduit
Bored & Jacked

FIGURE 7F

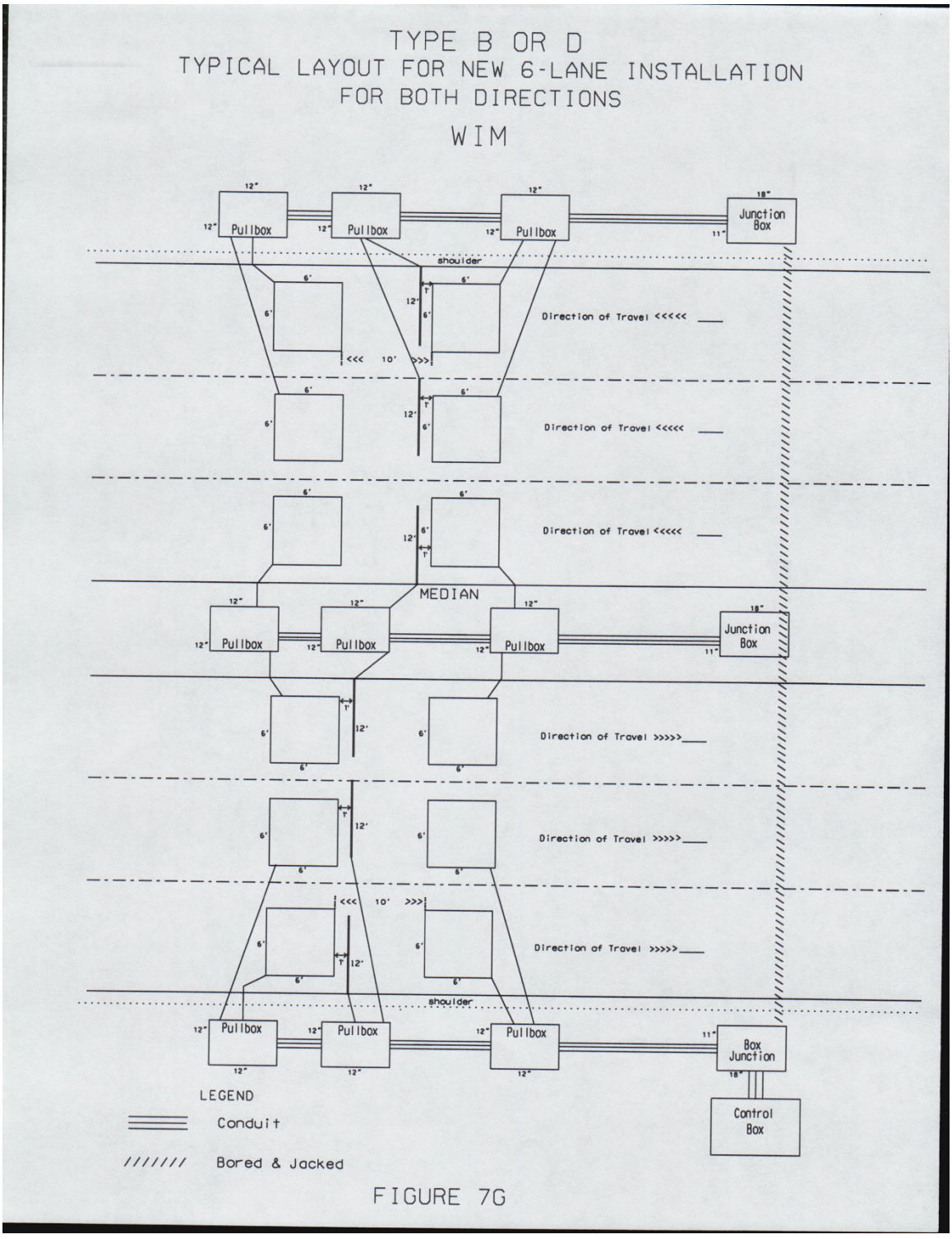

TYPE B OR D
TYPICAL LAYOUT FOR NEW 6-LANE INSTALLATION
FOR BOTH DIRECTIONS
WIM
Pullbox
Junction Box
shoulder
Direction of Travel <<<<<
Direction of Travel <<<<<
Direction of Travel <<<<<
MEDIAN
Pullbox
Junction Box
Direction of Travel >>>>>
Direction of Travel >>>>>
Direction of Travel >>>>>
shoulder
Pullbox
Box Junction
Control Box
LEGEND
Conduit
Bored & Jacked

FIGURE 7G

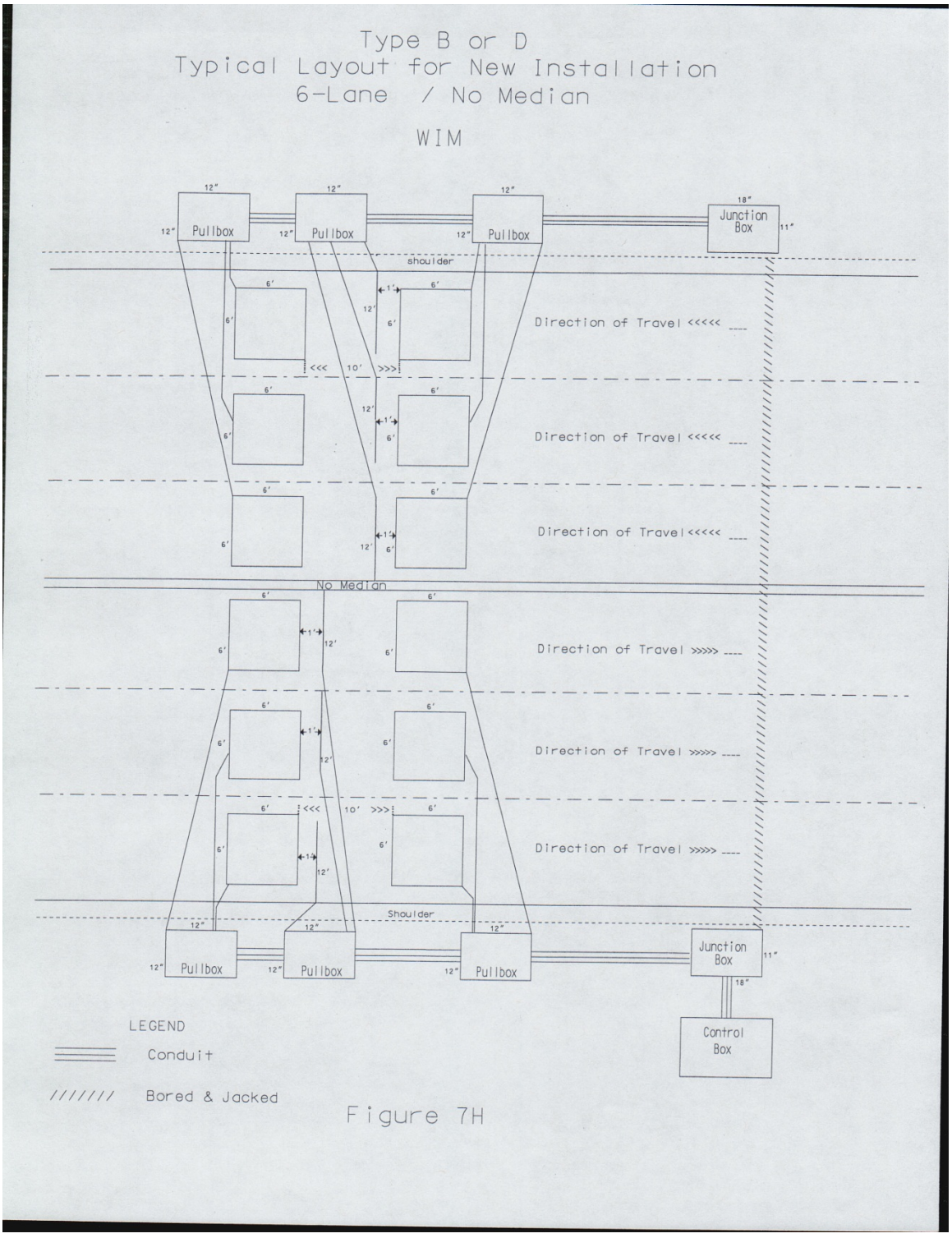

Type B or D
Typical Layout for New Installation
6-Lane / No Median
WIM
Pullbox
Pullbox
Pullbox
Junction Box
shoulder
Direction of Travel <<<<<
Direction of Travel <<<<<
Direction of Travel <<<<<
No Median
Direction of Travel >>>>>
Direction of Travel >>>>>
Direction of Travel >>>>>
Shoulder
Pullbox
Pullbox
Pullbox
Junction Box
Control Box
LEGEND
Conduit
Bored & Jacked

Figure 7H

Loop Wiring
ONE LOOP WITH FOUR TURNS OF INSULATED #14 AWG MULTI-STRAND WIRE
FILL SLOTS WITH LOOP SEALER
LEAD-IN WIRES OF 4 LOOPS
WIRE DIAMETER APPROX. 1/4 "
1" min.*
1/4"
WIRES / LOOP IN CONCRETE SHOWN
* FOR ASPHALT, SLOT SHOULD BE CUT SUCH THAT TOP WIRE IS AT A MINIMUM DEPTH OF 3 INCHES, AND A MAXIMUM DEPTH OF 4 INCHES.

FIGURE 8

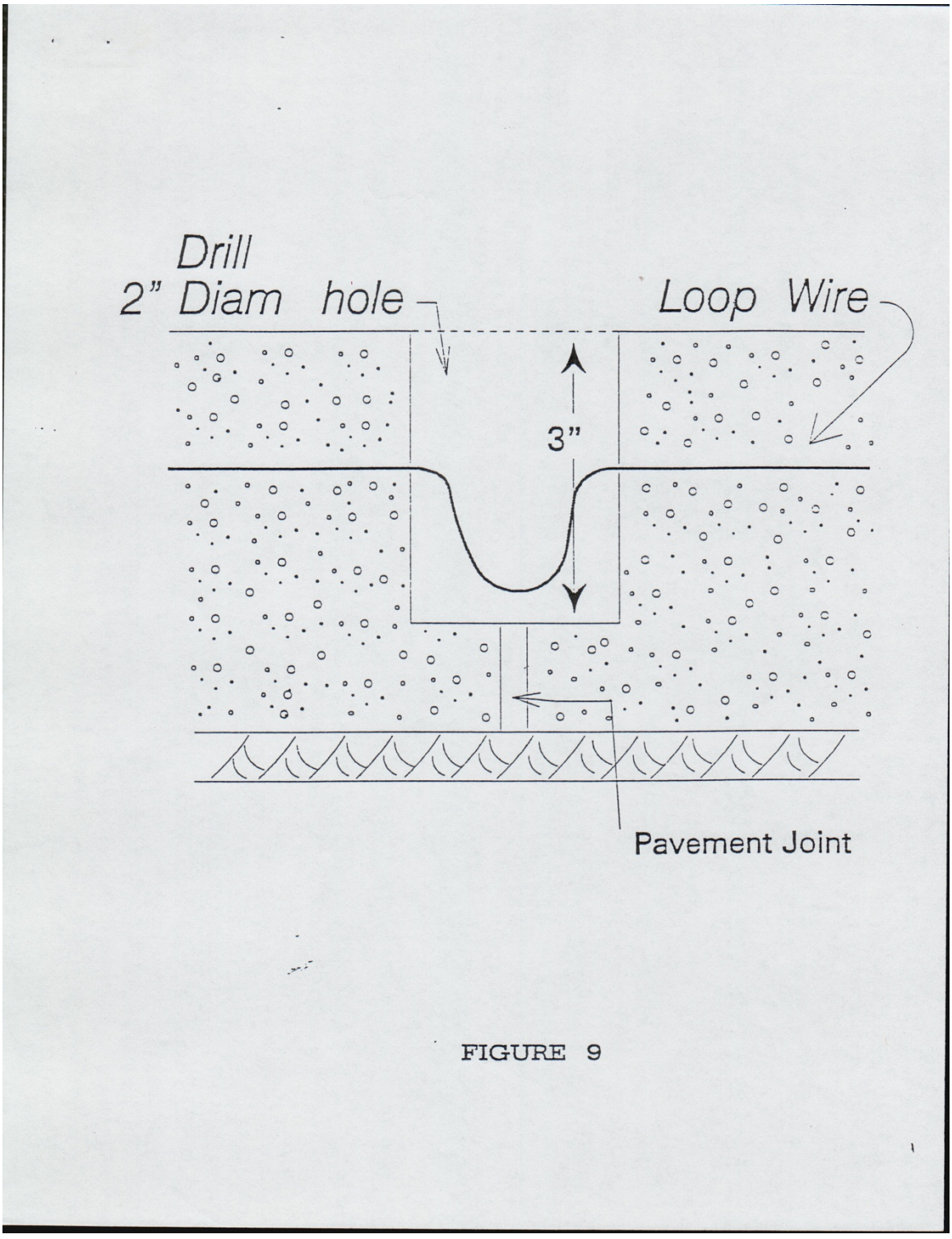
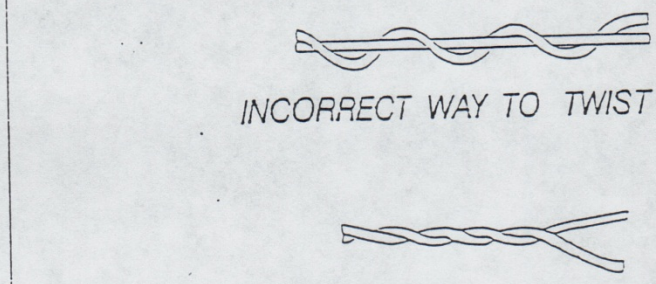


FIGURE 9

Proper Methods of Twisting Wire



INCORRECT WAY TO TWIST WIRE

CORRECT WAY TO TWIST WIRE

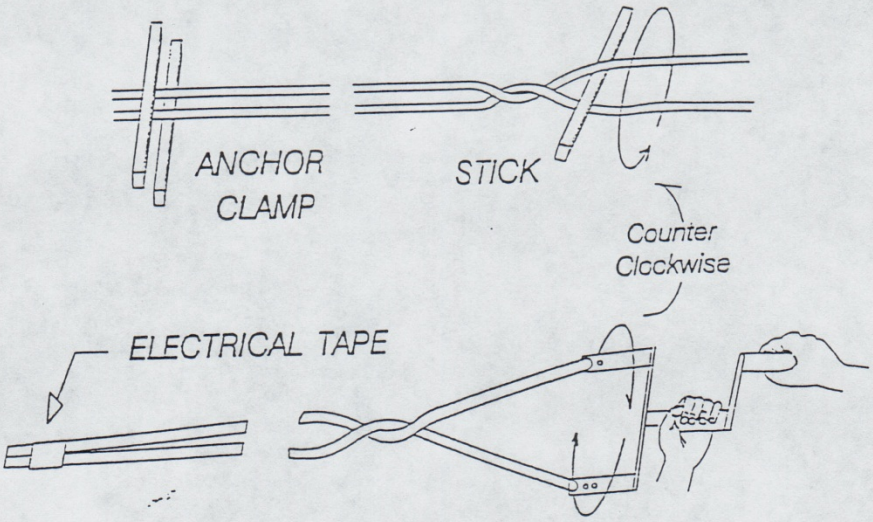


FIGURE 10

Pavement To Earth Conduit Transition Detail

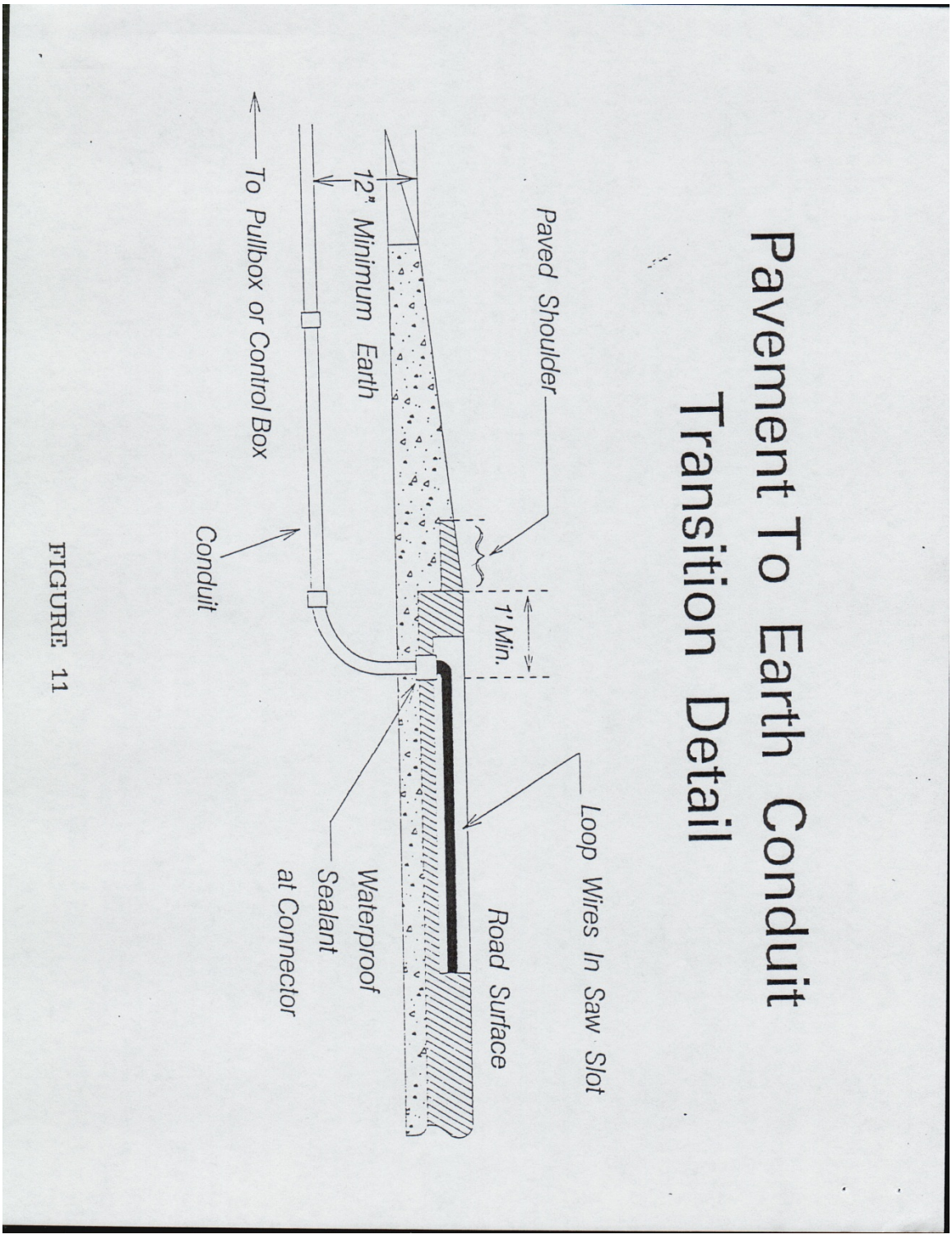


FIGURE 11

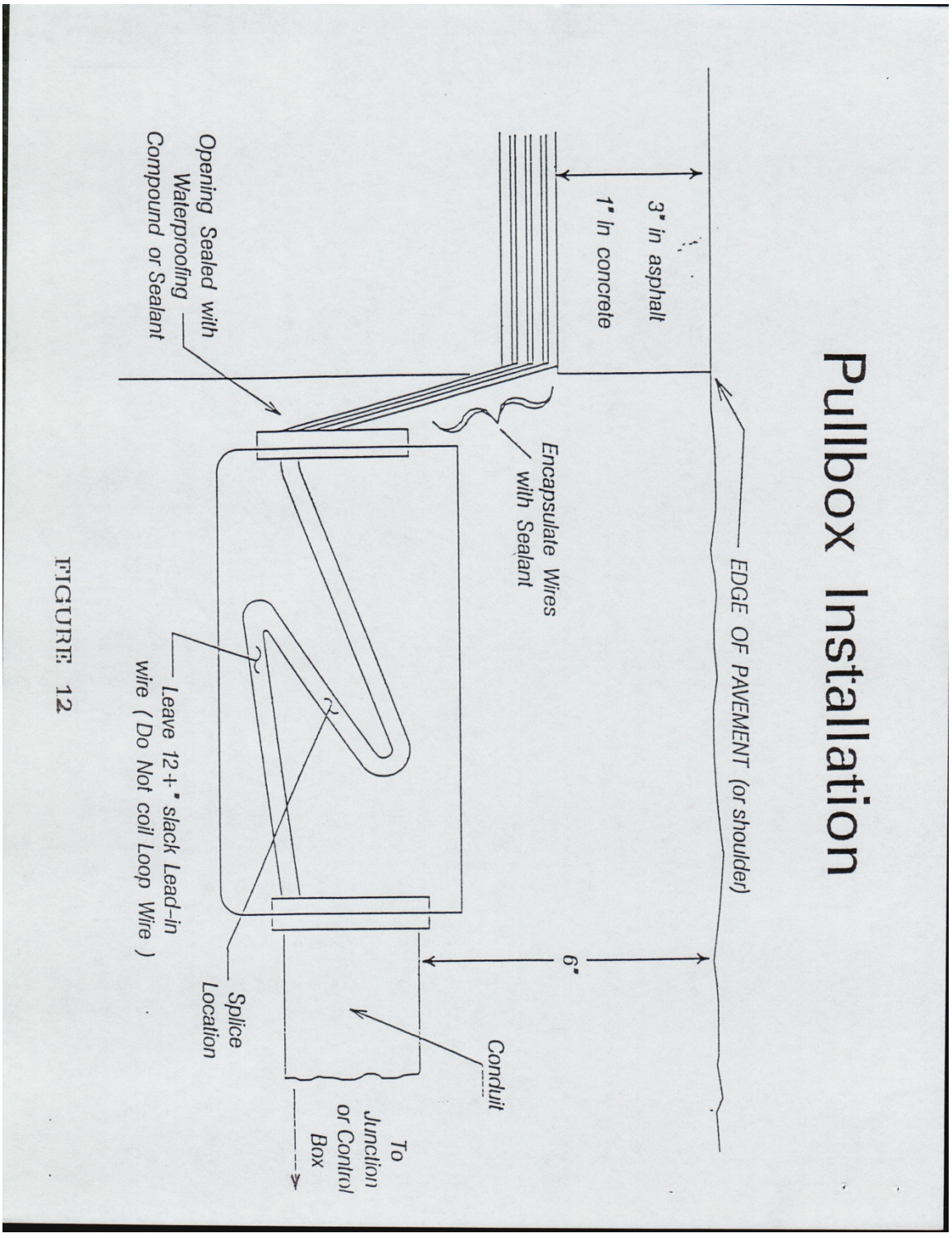

Pullbox Installation
EDGE OF PAVEMENT (or shoulder)
3" in asphalt
1" in concrete
Encapsulate Wires with Sealant
Opening Sealed with Waterproofing Compound or Sealant
6"
Conduit
To Junction or Control Box
Splice Location
Leave 12+" slack Lead-in wire (Do Not coil Loop Wire)

FIGURE 12

Typical Details
Grounding Requirements

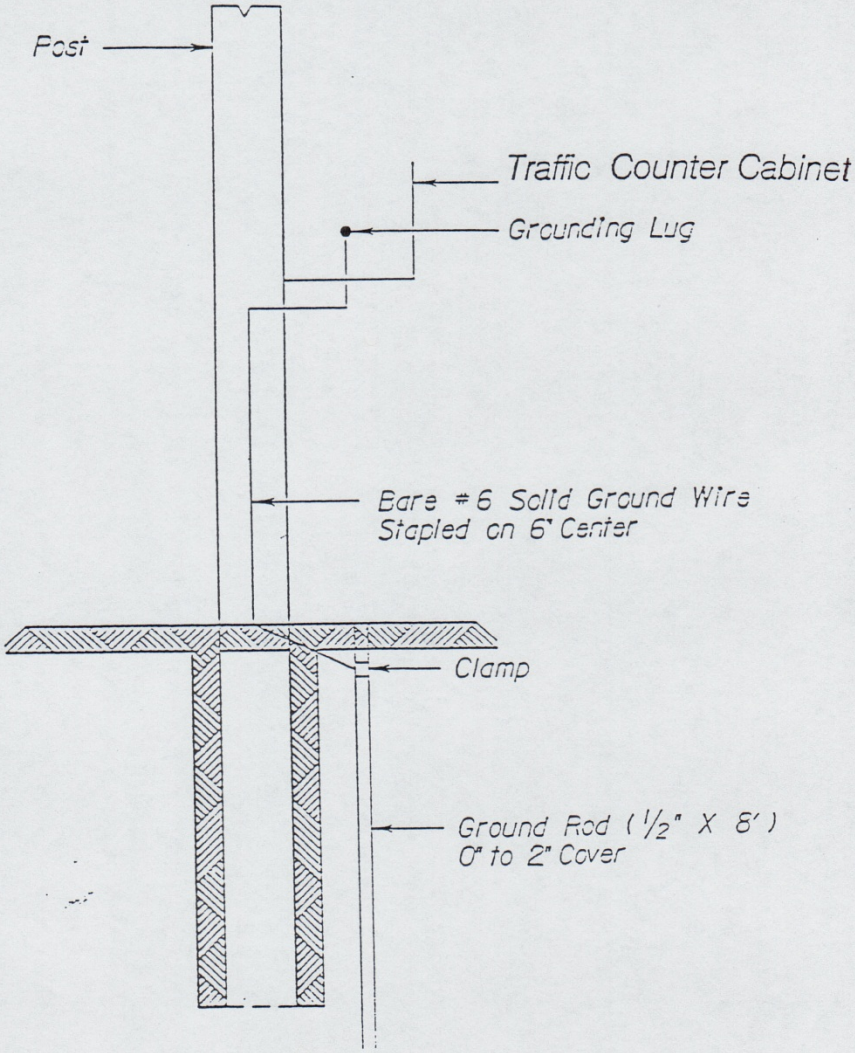


FIGURE 13

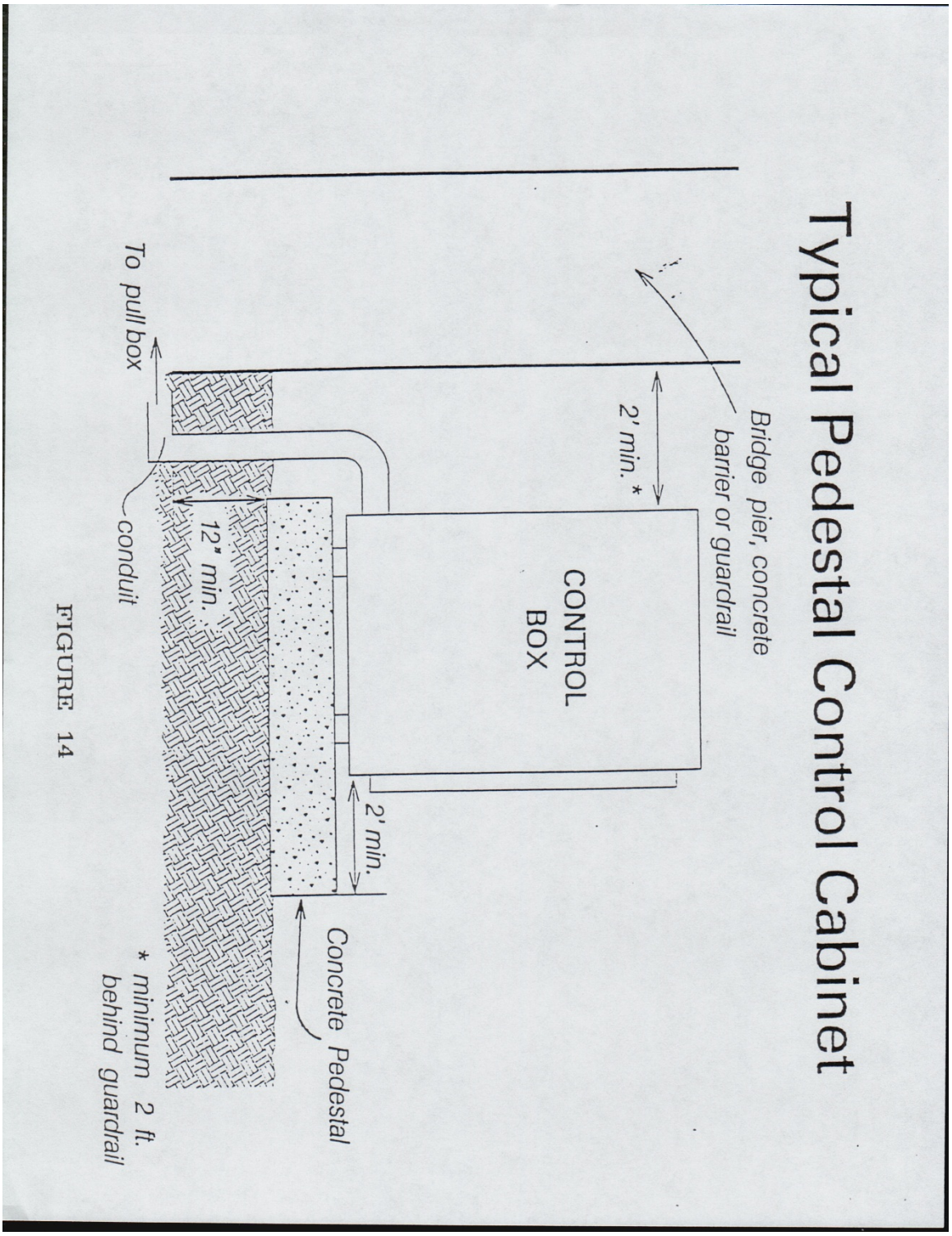

Typical Pedestal Control Cabinet
Bridge pier, concrete barrier or guardrail
2' min. *
CONTROL BOX
2' min.
Concrete Pedestal
To pull box
conduit
12" min.
* minimum 2 ft. behind guardrail

FIGURE 14

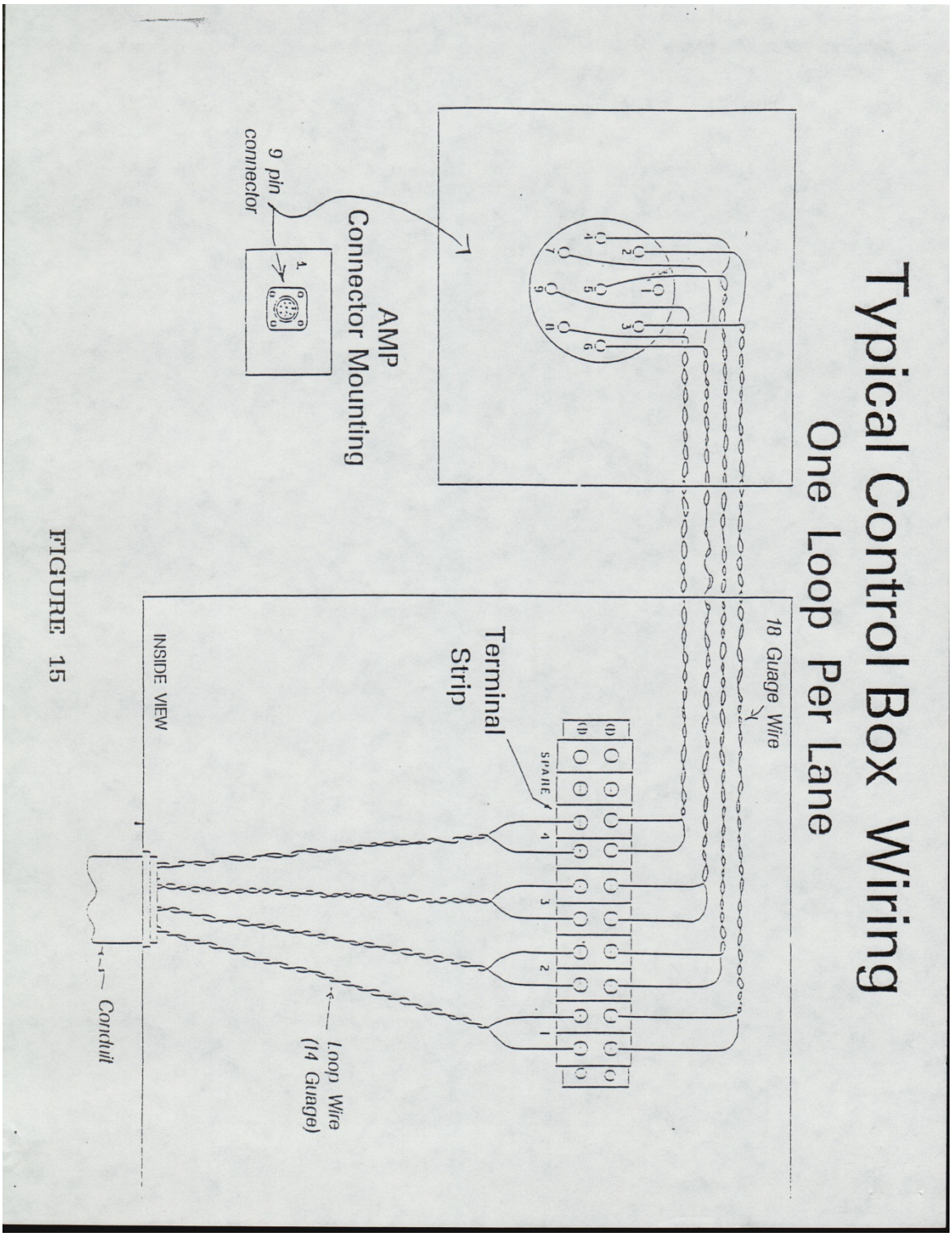

Typical Control Box Wiring
One Loop Per Lane
18 Guage Wire
AMP
Connector Mounting
9 pin
connector
Terminal
Strip
SPARE
INSIDE VIEW
Loop Wire
(14 Guage)
Conduit

FIGURE 15

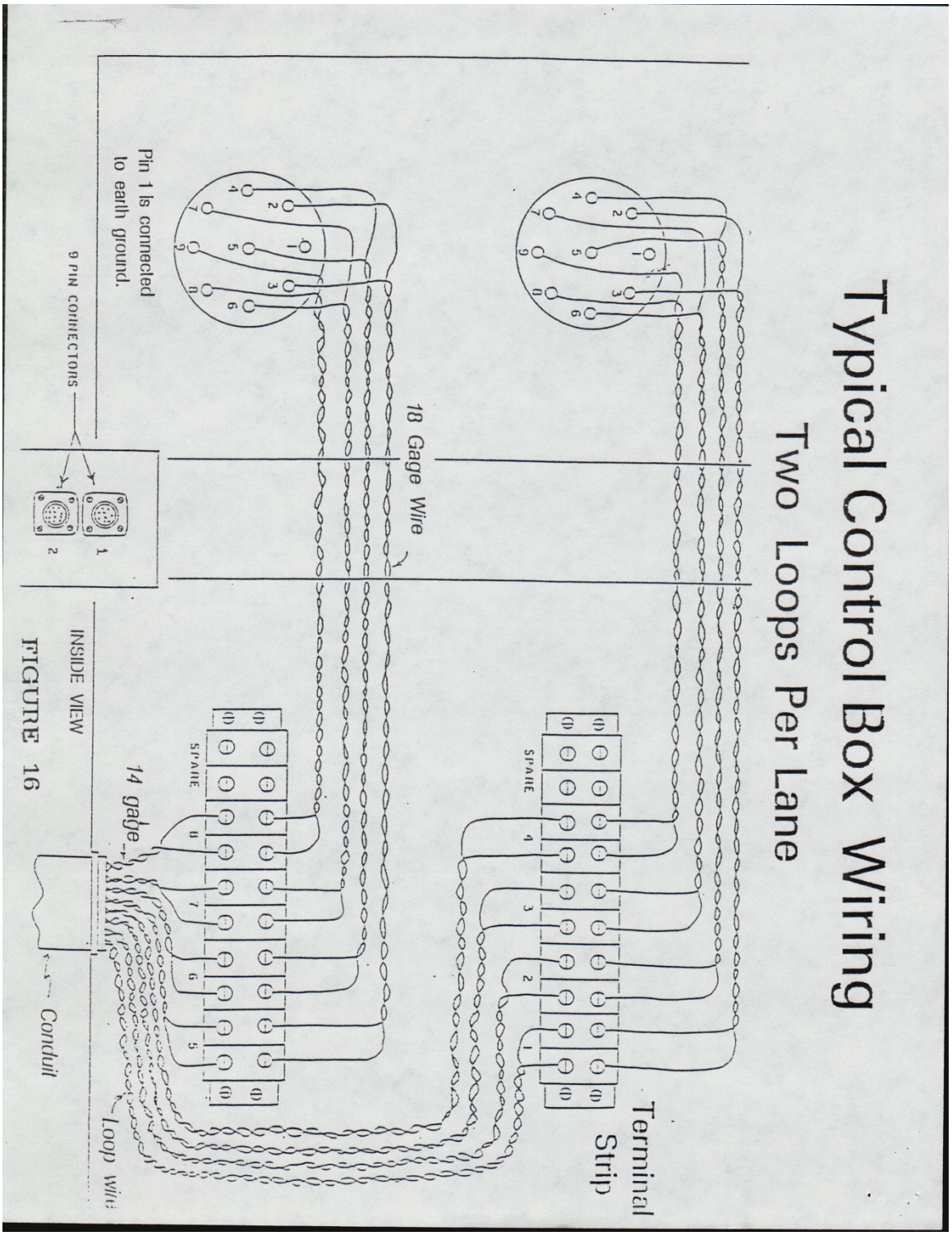

Typical Control Box Wiring
Two Loops Per Lane
Terminal Strip
SPARE
18 Gage Wire
9 PIN CONNECTIONS
Pin 1 is connected to earth ground.
INSIDE VIEW
14 gage
Conduit
Loop Wire

FIGURE 16

Typical Control Box Wiring
For Piezo Cables
18 guage wire
"+" EVEN – Inner Cable
"–" ODD – Outer Shield
Terminal Strip
spare
AMP
Connector Mounting
9 pin
connector
Pin 1 is connected to earth ground.
INSIDE VIEW
Coax Cable
From Piezo
Conduit

FIGURE 17

EXHIBIT 6

SUPPLEMENTAL SPECIFICATIONS AND FORMS

TABLE OF CONTENTS

May 4, 2009

ERRATA TO 2007 STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION

Make the changes listed below to correct errata in the SDCOT *2007 Standard Specifications for Highway Construction*:

DIVISION 100 GENERAL PROVISIONS

SECTION 101 DEFINITIONS AND TERMS

Subsection 101.2 Abbreviations and Acronyms

Amend the table of **SCDOT OFFICIALS AND OFFICES** as follows:

DELETIONS		REPLACEMENTS	
~~BDE*~~	~~Bridge Design Engineer~~	PSE*	Preconstruction Support Engineer
~~BDGE*~~	~~Bridge Design Geotechnical Engineer~~	GDSE*	Geotechnical Design Support Engineer
~~SHE*~~	~~State Highway Engineer~~	DSE*	Deputy Secretary for Engineering

*Wherever it appears in the text, replace the deleted abbreviation with the new abbreviation.

SECTION 102 BIDDING REQUIREMENTS AND CONDITIONS

Subsection 102.8 Irregular Bids

Paragraph 2, item E, first sentence; delete the word "the" after the word "When".

SECTION 105 CONTROL OF WORK

Subsection 105.6 Cooperation with Utilities

Paragraph 1, last sentence; change the word "THE" to "the".

DIVISION 200 EARTHWORK

SECTION 202 REMOVAL OF STRUCTURES AND OBSTRUCTIONS

Subsection 202.5 Measurement

Paragraph 5, second bullet; change the words "Brick sidewalk" to "Concrete, brick or stone sidewalks".

SECTION 204 STRUCTURE EXCAVATION

Subsection 204.2.1.2 Structure Excavation for Culverts

Paragraph 1, at the end of the first sentence; change "**Subsection 204.4**" to "**Subsection 204.5**".

DIVISION 400 ASPHALT PAVEMENTS

SECTION 401 HOT MIXED ASPHALT (HMA) PAVEMENT

Subsection 401.2.1.2 Liquid Anti-Stripping Agent

Paragraph 1, first sentence; delete the period at the end of the sentence and add "and SC-M-406.".

Subsection 401.2.5 Material for Full Depth Patching

Paragraph 1, delete and replace with the following:

"Use an approved SCDOT Intermediate Type C mix for all Full Depth Patching."

Subsection 401.5 Measurement

After paragraph 10, add the following paragraph:

11 The measurement of Prime Coat is the number of gallons of asphalt material applied to the completed and accepted base course.

Subsection 401.6 Payment

After paragraph 12, add the following paragraph:

13 "The payment for Prime Coat is at the contract unit price for Prime Coat and includes compensation for all labor, equipment, tools, maintenance, and incidentals necessary to complete that work."

Subsection 401.6 Payment

Paragraph 13, **Table of Pay Items**

Change paragraph reference number "13" to "14" and add the following Pay Item:

Item No.	Pay Item	Unit
4010005	Prime Coat	GAL

SECTION 403 HMA SURFACE COURSE

Subsection 403.5 Measurement

Paragraph 1, first sentence; change "HMA Intermediate Course" to "HMA Surface Course".

Subsection 403.6 Payment

Paragraph 1, first sentence; change "HMA Intermediate Course" to "HMA Surface Course".

SECTION 407 ASPHALT SURFACE TREATMENT – DOUBLE TREATMENT

Subsection 407.5 Measurement

Paragraph 1, first sentence; add the word "is" after "(Double Treatment Type (1, 2, 3, 4, or 5))".

SECTION 408 ASPHALT SURFACE TREATMENT – TRIPLE TREATMENT

Subsection 408.5 Measurement

Paragraph 1, first sentence; add the word "is" after "(Triple Treatment Type (1 or 2))".

DIVISION 600 MAINTENANCE AND TRAFFIC CONTROL

SECTION 625 PERMANENT PAVEMENT MARKINGS FAST DRY WATERBOURNE PAINT

Subsection 625.2.2.4.11 Lead Content

Paragraph 1, first sentence; change 6% to 0.06%.

SECTION 627 THERMOPLASTIC PAVEMENT MARKINGS

Subsection 627.4.10 Inspection and Acceptance of Work

Paragraph 2, first sentence; change "period of 90 days" to "period of 180 days".

Subsection 627.4.10 Inspection and Acceptance of Work

Paragraph 2, second sentence; change "90-day observation period" to "180-day observation period".

Subsection 627.4.10 Inspection and Acceptance of Work

Paragraph 3, first sentence; change "90-day period" to "180-day period".

DIVISION 700 STRUCTURES

SECTION 709 STRUCTURAL STEEL

Subsection 709.4.3.5.2 Submittals and Notification

Paragraph 1, delete the last two sentences and replace them with, “The Department’s review and acceptance are required before any field welding will be permitted.”

Subsection 709.6.3 Pay Items (page 650)

Subsection heading number; change subsection heading number from "**709.6.3**" to "**709.6.4**".

SECTION 712 DRILLED SHAFTS AND DRILLED PILE FOUNDATIONS

Subsection 712.4.4 Dry Construction Method

Paragraph 2, last sentence in A; change "*Drilled Shaft Report* " to "*Drilled Shaft Log".*

Subsection 712.4.10.4 Excavation Cleanliness

Paragraph 1, last sentence; change "*Drilled Shaft Report"* to "*Drilled Shaft Log".*

Subsection 712.4.10.6 Shaft Load Test

Change first paragraph reference number from “2” to “1”.

Subsection 712.6.10 Drilled Pile Set-Up

Insert paragraph reference number “1” to the left of the first paragraph.

SECTION 723 DECK JOINT STRIP SEAL

Subsection 723.1 Description

Insert paragraph reference number “3” to the left of the third paragraph.

SECTION 726 BRIDGE DECK REHABILITATION

Subsection 726.4.1 General

Insert paragraph reference number “1” to the left of the first paragraph.

Subsection 723.4.6 Full Depth Patching (page 790)

Subsection heading number; change subsection heading number from "**723.4.6**" to "**726.4.6**"

SECTION 727 CROSSHOLE SONIC LOGGING OF DRILLED SHAFT FOUNDATIONS

Subsection 726.6 Payment (page 807)

Subsection heading number; change subsection heading number from "**726.6**" to "**727.6**"

DIVISION 800 INCIDENTAL CONSTRUCTION

SECTION 805 GUARDRAIL

Subsection 805.5 Measurement

Paragraph 4; amend as follows:

"The quantity for the pay item 8053000 Additional Length Guardrail Post is the length of required post installed in excess of the standard length post based on the system being installed, measured by the linear foot (LF), complete, and accepted."

SECTION 815 EROSION CONTROL

Subsection 815.1 Description

Paragraph 1, first sentence; change “temporary flexible pipe” to “temporary pipe”.

Subsection 815.5 Measurement

Paragraph 13; delete the first sentence and replace it with the following sentence:
"The quantity for Temporary Pipe Slope Drains is measured and paid for in accordance with **Subsections 803.5** and **803.6** respectively."

Subsection 815.5 Measurement

Delete paragraph 19.

Subsection 815.6 Payment

After paragraph 15, add the following paragraph:

16 Payment for Removal of Silt Retained by Silt Fence is full compensation for removing and disposing of sediment deposits accumulated by silt fences as specified or directed and includes all 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.

Subsection 815.6 Payment

Change original paragraph number “16” to “17”.

Subsection 815.6 Payment

Pay Item table; change the Unit for Item No. 8156214 to "EA".

INDEX:

Amend as follows:

Page I-3, after "Bridge Deck Rehabilitation, measurement and payment:"
Delete page 807.

Page I-12, after "Letting:"
Replace page 19 with page 9.

Page I-13, after "Overhead Sign Structure:"
Replace page 488 with page 495.

Page I-15, after "Proof Rolling:"
Delete page 98.

Page I-18, after "Structural Steel, turned and ribbed bolts:"
Replace page 624 with page 625.

Page I-19, after "Waterproofing, bridge deck:"
Delete page 907.

Page I-20, after "Working Drawings:"
Replace page 543 with page 779.

February 12, 1997

CLAIMS PROCEDURE

1. Scope of Procedure

The following claims procedure covers all claims for additional time or compensation arising under this contract. The claims procedure is non-binding and is a condition precedent to litigation or any other form of dispute resolution. All communications testimony and all documents prepared for this procedure by either party from the time of filing the claims request to the conclusion of the procedure shall be deemed to be settlement negotiations and not admissible in litigation or any other dispute resolution procedure. The parties shall execute a written agreement to this effect prior to the submission of testimony or other evidence before the Dispute Review Board.

2. Continuation of Work

At all times during the pendency of a claim under this procedure, the contractor shall continue work pursuant to the contract and as directed by the engineer as provided by the contract. If the contractor fails to continue work, it may be declared delinquent in its work as provided by §108.08 of the South Carolina Standard Specifications for Highway Construction ("Standard Specifications").

3. Submission of Claim

The notice of claim and claim shall be submitted in accordance with §105.16 of the Standard Specifications. The notice of claim does not trigger this claims procedure. The claims procedure is initiated when the contractor submits a written fully detailed claim to the resident construction engineer ("RCE"). The claim shall contain, at a minimum, the information required by §105.16F of the Standard Specifications. The RCE shall immediately forward a copy of the claim to the District Engineering Administrator ("DEA") for resolution. If the DEA is unable to resolve the claim within thirty (30) days of receipt, the DEA shall forward it immediately to the Director of Construction ("DC"), together with documents supporting the Department's position. The DEA shall also submit the supporting documents to the contractor at this time. The DC shall investigate the claim and attempt to resolve it by mutual agreement with the contractor. If it cannot be resolved, then the DC shall make a decision and forward it to the contractor, no later than thirty (30) days after receipt by the DC. The contractor shall notify the DC within five (5) days of receipt of the DC's decision whether the contractor accepts or rejects the decision.

For all claims under Fifty Thousand Dollars ($50,000.00) the DC's decision shall be final and shall conclude the claims procedure. For the purpose of determining if a time only claim may be submitted to the Board, the value of a time only claim shall be deemed to be the number of days requested multiplied by the contract daily rate for liquidated damages. The contractor does not have a right to submit claims under $50,000.00 to the Dispute Review Board. If the contractor does not accept the DC's decision on its claim of less than $50,000.00, then its remedy is litigation or other mutually agreeable dispute resolution procedures.

For all claims in excess of $50,000.00, if the contractor rejects the DC's decision or fails to respond to the decision, the DC shall forward the claim to the Dispute Review Board.

4. Dispute Review Board

On designated contracts an *Ad Hoc* Dispute Review Board will be established to hear claims on that contract. On other contracts, claims will be heard by a Standing Dispute Review Board. All Board Members shall be neutral and unbiased. No party shall have any *ex parte* communication with any Board Member.

a. *Ad Hoc* Dispute Review Board

On designated contracts a Dispute Review Board shall be established within sixty (60) days after the Preconstruction Conference. The *Ad Hoc* Dispute Review board shall consist of one member selected by the Department, one member selected by the contractor, and a third member selected by the first two members. The third member shall be the chairperson of the *Ad Hoc* Dispute Review Board. The selection of qualified *Ad Hoc* Dispute Review Board members

shall be made in accordance with the Dispute Review Board rules and procedures. (See Section 6).

b. Standing Dispute Review Board

A Standing Dispute Review Board shall be established upon implementation of this claims procedure. The Standing Dispute Review Board shall consist of one member selected by the Department, one member selected by the Director of Heavy and Highway Division of the Associated General Contractors (Carolina's Branch), and a third member selected by the first two members. The third member shall be the chairperson of the Standing Dispute Review Board. The selection of qualified Standing Dispute Review Board members shall be made in accordance with the Dispute Review Board rules and procedures. (See Section 6). Each member shall serve a three (3) year term and the terms shall be staggered. The terms for the initial Board members shall be as follows:

Department Member - 1 year
AGC member - 2 years
Third member - (Chairperson) 3 years

The term for the initial members begins January 1997. Each member is limited to two (2) terms. The initial abbreviated terms of the Department and AGC members do not count as a term.

5. Hearing Procedure

When the DC forwards the claim to the Dispute Review Board, the DC shall provide three (3) copies of the claim and three (3) copies of all documents submitted by the contractor and the DEA. The DC shall notify both parties that the claim has been submitted to the Board.

Within fifteen (15) days of notice of submission of the claim to the Board, the contractor may submit to the DC four (4) copies of any additional documentation supporting its claim. The DC shall immediately forward three (3) copies to the Board and one (1) copy to the DEA.

Within fifteen (15) days of receipt of the contractor's supplemental documentation, the DEA may submit to the DC four (4) copies of its additional documentation. The DC shall immediately submit three (3) copies to the Dispute Review Board and one (1) copy to the contractor. Upon submission of supplemental documentation, the party shall notify the Board whether it requests a hearing.

The Dispute Review Board shall review all documents and notify the parties of what additional documents, if any, it requires. The Dispute Review Board shall schedule a hearing at either party's request or may schedule a hearing at its own discretion. However, if a hearing is requested, it must be held no later than sixty (60) days after the DC submits the claim to the Dispute Review Board. The location of the hearings shall be determined by the Board. While extensions of these deadlines are discouraged, the Dispute Review Board shall have authority to extend any of the above deadlines for just cause.

The Dispute Review Board shall have full authority to establish guidelines and procedures for the investigation of a claim. The entire process is intended to be flexible and the Board is encouraged to adapt the process to individual circumstances presented by particular disputes.

In the interest of timely resolution of all claims, the Board shall conduct all hearings and issue its final decision within ninety (90) days of receipt of the claim.

The Dispute Review Board Chairperson shall direct all meetings and hearings. Presentation of evidence shall be in accordance with the Dispute Review Board's rules and shall not be bound by judicial rules of evidence. Documents and testimony shall be presented in the order, manner and degree of detail that the Dispute Review Board deems most efficient and probative. Each party shall be allowed to make a brief initial presentation and to rebut any factual assertion by another party; however, the Dispute

Review Board shall determine when enough evidence has been presented and it may limit the presentation of any documentation or testimony that it deems not relevant or redundant. At the Board's option, testimony may be required to be given under oath and the oath shall be administered by the Chairperson.

Legal counsel for either party may be present at meetings or hearings as observers only. If a party intends to have its counsel present at a hearing, it must provide at least ten (10) days notice prior to the meeting or hearing. Legal counsel may not speak on behalf of a party, unless requested by the Board. Counsel may not examine or cross-examine witnesses, object to questions or statements during meetings or make legal motions or arguments during meetings or hearings. The Board, by majority vote, may suspend legal counsel's privilege to attend meetings or hearings.

The Dispute Review Board shall issue to the contractor and the State Highway Engineer a written recommendation with an explanation of the results as soon as reasonably possible following the conclusion of the hearing. However, in no event shall the Board take more than ninety (90) days from receipt of claim to conduct hearings and issue a recommendation. The Board is encouraged to reach a unanimous decision; however, it may provide a majority recommendation. The minority Board Member may provide a written explanation of his position. The Board shall provide further explanation of its decision if requested by either party within ten (10) days of the receipt of the decision. Issuance of the Board's recommendation concludes the claims procedure.

The parties may settle at any time during the procedure. If the dispute is resolved prior to issuance of a recommendation, the DC shall immediately notify the Board.

6. Dispute Review Board Rules and Procedures

a. Qualifications of Dispute Review Board Members

(1) All Dispute Review Board Members shall have substantial experience in highway or bridge design and construction. This experience may be technical, administrative or legal. The goal is to have a Board with the technical and administrative skills and experience that will promote confidence in its decisions.

(2) No Dispute Review Board Member shall be employed currently or within the last three (3) years with the Department, any contractor (currently or in the past pre-qualified with the Department), or any design consultant that has worked for the Department within the last three (3) years.

(3) No Dispute Review Board Member shall have any financial or ownership interest in any party to the contract nor any design consultant or major subcontractor.

b. Selection of Dispute Review Board Members

(1) *Ad Hoc* Dispute Review Board

Within twenty (20) days after the Preconstruction Conference, the contractor and Department shall each submit a list of three (3) proposed Dispute Review Board Members to each other.

The contractor shall send its list to the DC. The Department shall send its list to the contractor's designated representative. Within ten (10) days after receipt of the list, the contractor shall select one member from the Department's list and the Department shall select one member from the contractor's list and notify the other party of their selection. The DC shall notify the two selected members that they must select a third member within twenty (20) days. The DC shall also provide a copy of the claims procedure to the

two (2) selected members. Within twenty (20) days of the selection of the first two members, the first two members shall select the third member and the third member shall be the chairperson of the Dispute Review Board. The third member does not have to come from the lists provided by the parties.

If the first two members are not able to agree on a third member within twenty (20) days of their selection, then the third member shall be selected by the American Arbitration Association, within ten (10) days after it is determined that the first two members cannot agree on a third member. Upon selection of the third member, the DC shall provide a copy of the claims procedure to the third member.

(2) Standing Dispute Review Board

The selection process for Standing Dispute Review Board Members shall begin at the appropriate time in order to allow completion of the Member selection by beginning of the term. The selection process shall be as provided in Section 4(b); otherwise it shall be the same as for the *Ad Hoc* Board.

c. Replacement of Board Members

Each party may elect to replace its Board Member at any time with a showing of reasonable justification. The Chairperson of the Board may be replaced at any time with the consent of both parties. If any Board Member is replaced, the new member shall be selected in the same manner in which the original appointment had been made.

If disputes are pending at the end of a member's term, the existing Board shall complete its hearing on the disputes and issue a decision.

d. Costs

Board Members shall be paid a reasonable hourly rate or salary for their services. Each party shall negotiate the fee arrangements with the Member it selects, however, the other party must agree on the rate. Both parties shall agree on the fee arrangement for the Chairperson.

Board Members shall be reimbursed for out-of-pocket expenses including, but not limited to, travel, copying, telephone, clerical services, and mailings. The Board Members shall be allowed $55.00 per diem for meals and actual lodging costs provided they stay in hotels approved by the Department and they obtain a government rate. Board Members must provide documentation for all expenses.

The parties shall share all Board Members' fees and expenses equally. The total fees and expenses to hear each claim shall not exceed the following maximum amounts (one claim shall constitute all issues submitted to the Dispute Review Board at one (1) time):

$ 50,000 - $499,999.99	$10,000.00
$500,000.00 - $999,999.99	$15,000.00
$1 million - $4,999,999.99	$25,000.00
over $5 million	$50,000.00

The Department shall pay the Board Members and deduct the Contractor's share from the retainage. If retainage is not sufficient, the Contractor shall pay the Department directly for its share of the fees and expenses.

March 20, 2003

THE SOUTH CAROLINA MINING ACT

The South Carolina Mining Act enacted by the General Assembly in 1973 requires that the Department adopt reclamation standards to govern activities of the Department and any person acting under contract with the Department, on highway rights-of-way or material pits maintained solely in connection with the construction, repair and maintenance of the public road systems in South Carolina.

STANDARD PLAN FOR THE RECLAMATION OF EXCAVATED AREAS ADOPTED BY THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

Reclamation plans as stated herein shall include all areas disturbed in excavations of borrow and material pits, except planned inundated areas.

The final side slopes of areas excavated for borrow and material pits shall be left at such an angle so as to minimize erosion and the possibility of slides. The minimum slope in every case shall be not less than 3:1.

Small pools of water that are, or are likely to become noxious, odious, or foul should not be allowed to collect or remain on the borrow pit. Suitable drainage ditches, conduits, or surface gradient shall be constructed to avoid collection of noxious, odious, or foul pools of water unless the borrow pit is to be reclaimed into a lake or pond.

Borrow pits reclaimed to a lake or pond must have an adequate supply of water to maintain a water sufficient level to maintain a minimum water depth of four (4) feet on at least fifty (50) percent of the surface area of the lake or pond.

Excavated areas will be drained where feasible unless otherwise requested by the property owner where, in such instances, the property owner may wish to develop the excavated area for recreational purposes or for the raising of fish, or for other uses, in compliance with the South Carolina Mining Act.

Where material is stripped from the ground surface in relatively thin layers, the area, after excavation has been completed, will be thoroughly scarified and terraced and planted to establish satisfactory vegetation necessary to control erosion. Vegetative cover should be established on a continuing basis to ensure soil stability appropriate to the area. Conservation practices essential for controlling both on-site and off-site erosion and siltation must be established. A minimum of seventy-five (75) percent vegetative ground cover, with no substantial bare spots, must be established and maintained into the second growing season.

Excavated areas that are drained will be seeded to obtain a satisfactory vegetative cover. The side slopes of excavated area will be planted to vegetation.

The State Highway Engineer, 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 made available to the Final Plans Engineer.

All applicable regulations of agencies and statutes relating to the prevention and abatement of pollution shall be complied with by the contractor in the performance of the contract.

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The Contractor shall comply with the provisions of the Plan which 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. Bermuda shall not be planted on ground surface pit areas. The quantity of fescue seed specified in Subsection 810.04 of the Standard Specifications shall be increased by fifteen (15) pounds in lieu of the deleted bermuda seed.

January 5, 2012

PROMPT PAYMENT CLAUSE

(1) Subject to the provisions on retainage provided in Paragraph (2) below, when a subcontractor has satisfactorily performed a work item of the subcontract, the Contractor must pay the subcontractor for the work item within seven (7) calendar days of the Contractor's receipt of payment from SCDOT. A subcontractor shall be considered to have "satisfactorily performed a work item of the subcontract" when the SCDOT pays the Contractor for that work item.

(2) The 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 the SCDOT accepts the last work item of the subcontract. The Contractor must release to the subcontractor any retainage withheld within seven (7) calendar days from the date the Contractor receives payment from SCDOT for the last work item of the subcontract or within seven (7) days from SCDOT's acceptance of the last work item of the subcontract, whichever is the latest to occur. However, upon documentation of good cause provided by the contractor and written concurrence by the Director of Construction, the Contractor may continue to withhold the 5% retainage.

(3) Prior to receiving payment of each monthly estimate, the Contractor shall certify to SCDOT that the construction estimate is complete and that all subcontractors have been paid for work covered by previous estimates, in accordance with sections 1 and 2.

(4) Failure to comply with any of the above provisions shall result in one or more of the following sanctions: (1) no further payments to the Contractor unless and until compliance is achieved; (2) the Contractor being placed in default; and/or (3) the Contractor being declared delinquent, such delinquency being subject to procedures and penalties provided in 108.08 of the Standard Specifications.

November 4, 2013

CONSTRUCTION SCHEDULES

General

This supplemental specification addresses schedule requirements for SCDOT contracts. There are three levels of schedules. The level required is included in the Special Provision. The level of schedule is selected based on the design field review completed in the preconstruction phase or during estimate development.

Level 1 – Minimal Schedule Requirement
Level 2 Schedule – Standard Critical Path Method Schedule
Level 3 Schedule – Critical Path Method Schedule with Monthly Cumulative Payment Clause.

Level 1 Requirement:

Provide to the Resident Construction Engineer (RCE) a four-week look-ahead schedule identifying planned weekly work activities. Update the schedule every two weeks. The look-ahead schedule allows the RCE to schedule construction engineering and inspection personnel. The Department will not be responsible for delays which may be caused by the contractor's failure to abide by his schedule. Failure to submit the look-ahead schedule as specified may result in the withholding of partial payment estimates.

Provide the look-ahead schedule in Word or Excel format or as directed by the RCE.

The Contractor may provide a CPM schedule as indicated in **Level 2 Schedule Requirements** in lieu of the four-week look-ahead schedule as follows:

- Notify, in writing, the RCE that a CPM schedule will be provided in lieu of a four-week look-ahead schedule. Provide timely notification so that the baseline schedule is submitted in accordance with **Level 2 Schedule Requirements -** ***Submission, Review, and Acceptance Process – Baseline Schedule*****.**
- No payment will be made if the Contractor elects to provide a CPM as a Level I Requirement. **Measurement and Basis of Payment** will be according to the Level I Schedule.
- Election to provide a CPM schedule in lieu of a four-week look-ahead schedule will be for the duration of the project.

Level 2 Schedule Requirements:

For projects requiring a CPM schedule, the Contractor will provide and update a construction schedule to the SCDOT, which will be used as a quantitative basis for:

- Monitoring and evaluating the Contractor's progress in completing contracted work;
- Evaluating requests for additional contract time;
- Budgeting for construction partial payment estimates; and
- Managing SCDOT engineering and inspection personnel.

The Contractor's construction schedule shall encompass the entire contract period, and be developed consistent with the contract milestones and the contract maintenance of traffic plan. Critical path activities shall be identified for the duration of the project. The schedule shall also include sufficient information *as outlined in this supplemental specification* to provide for monetary and quantitative tracking of the work by the SCDOT.

Include and reference in the schedule at the time of occurrence, all documentation and explanations supporting a time adjustment request.

Utilities

The schedule shall reflect the utility relocations noted in the contract documents and discovered during field review and include activities of appropriate duration, location, and logic, as provided by the Utility, for the utility work. Where utility durations are unknown, the Contractor shall provide a reasonable estimate of duration. Utility durations will be reviewed in the baseline approval process as outlined in the section "Submission, Review, and Acceptance Process." Utility durations will be presented at the Preconstruction Conference for concurrence by the utility provider. In the event that the utility representative cannot provide concurrence at the Preconstruction Conference, the Contractor, the Resident Construction Engineer, and the utility provider shall work diligently to reach acceptable durations. If there is no concurrence or input from the utility provider concerning the Contractor's utility durations within 15 calendar days following the Preconstruction Conference, the submission with the Contractor's estimate of utility duration will be reviewed for baseline acceptance. Further utility duration changes beyond this point in time will be assessed in monthly schedule updates. Failure to include activities for any element of work or any known utility work will not relieve the Contractor from completing the work within the allotted contract time.

- **Schedule Submissions**

Contractors shall maintain CPM schedules for all applicable projects using at a minimum Primavera Project Management 5.0 or Primavera Contractor 5.0. The Contractor shall coordinate with the Department's District Scheduler to provide an exported schedule importable into the Primavera version used by the Department.

Templates for the CPM schedules are available to download at the SCDOT construction Extranet site located:
http://www.scdot.org/doing/constructionLetting_Extranet.aspx
When submitting schedules to the SCDOT, the Contractor shall assign file names to each schedule file (baseline and updates) according to the following conventions (dates are YYMMDD):

Type of Schedule Submitted:	Baseline	Update	As-Built
File Name Convention:	[Contract ID]b[Data Date]	[Contract ID]u[Data Date]	[Contract ID]ab[Data Date]
File Name Example:	32.82571b060201	32.82571u060201	32.82571ab060201

Note on Data Dates - The initial Baseline Construction Schedule shall have a data date equal to the Award Date and not include any work to date. Monthly schedule updates shall have a data date set 1 day beyond the most recent estimate period end date.

Extranet file names upon uploading shall include the contract ID.

All submissions shall be made within the time frames defined under "Submission, Review and Acceptance Process."
Electronic Files: Upload each baseline construction schedule and monthly update submission to the SCDOT Construction Extranet site in .xer format.
The Extranet site location is:
http://www.scdot.org/doing/constructionLetting_Extranet.aspx

Provide an Adobe file of each baseline construction schedule, monthly update submission, and schedule narrative to the District Scheduler and the Resident Construction Engineer. The schedule Adobe file shall include the following columns in 11 inch x 17 inch format: Activity ID, Activity Name, Start, Finish, Schedule % Complete, Physical % Complete, Budgeted Total Cost, Actual Total Cost, Remaining Total Cost, At Completion Total Cost, Original Duration, Remaining Duration, At Completion Duration, Earned

Value, Planned Value, Schedule Variance Index, and Total Float. Sort on "Start" prior to printing to Adobe.

Schedule Narrative: Submit a Schedule Narrative Report with the baseline and each monthly update schedule describing current project schedule status and identifying potential delays. This report will include a description of the progress made since the previous schedule submission and objectives for the upcoming 30 calendar days.

1) Address all previous schedule review comments;
2) The report shall indicate if the project is *on schedule*, *ahead of schedule* or *behind schedule* as compared to the accepted baseline. Include the Schedule Variance Index, planned value cost and earned value cost. If the project is ahead of schedule or behind schedule, the report shall include the specific number of calendar days. If the project is behind schedule, the report shall include a detailed recovery plan that will put the project back on schedule. The narrative shall compare the Substantial Completion milestone for the baseline with the update;
3) Describe the *current critical path* of the project including the lowest total float value and indicate if this has changed in the last 30 calendar days. Discuss current successes or problems that have affected either the critical path's length or have caused a shift in the critical path within the last 30 calendar days. Identify specific activities, progress, or events that may reasonably be anticipated to impact the critical path within the next 30 calendar days, either to affect its length or to shift it to an alternate path;
4) List all schedule logic or duration changes that have been made to the schedule since the previous submission. Provide an explanation for any *constraint* used. For each change, describe the basis for the change and specifically identify the affected activities by identification number;
5) Scheduling assumptions (considerations for known and foreseeable constraints or restrictions such as weather, traffic, environmental, utility, safety, etc);
6) Identify activities, either in progress or scheduled to occur within the following 30 calendar days that require Department participation, review, approval, etc;
7) Identify any calendars used that are not DOT specific, and explain the details of those calendars;
8) Identify schedule settings used;
9) Identify activity expense item changes;
10) Minimized the use of lag. Where possible, use an activity to represent lag time. In no instance shall negative lag be used;
11) Description of how the schedule is organized (e.g. broken down by road or activity);
12) Explain any actual duration exceeding the original duration;
13) Explain out of sequence activities individually and the overall effect on the schedule;
14) Explain, individually, activities that failed to start in the previous 30 days;
15) Include the current contract completion date;
16) Include the current contract amount and sum of actual cost;
17) Include approved change orders. Explain the costs and schedule change associated with them;
18) Submit the narrative with a naming convention of [Contract ID]n[Data Date].doc (e.g 32.82571n060201.doc). Contractor will upload the electronic copy [in *.doc* format] to the South Carolina Department of Transportation Construction Extranet site;
19) Explain the schedule impacts of all utility work, known or anticipated.

Schedule Details

SCDOT reserves the user_text1 and user_text2 fields.

Data Date - The Baseline Construction Schedule shall have a data date equal to award date and not include any completed work to date. Monthly schedule updates shall have a data date set to one day beyond the most recent estimate period end date.

Milestones - Schedule shall identify the following milestones as a minimum:

- ***Award Date*:** The date the Contractor is notified by the Director of Construction that he is awarded the project**.**
- ***Contract Execution Date***: The date the contract is signed by the Department.
- ***Baseline CPM Acceptance:*** *Anticipated date the baseline schedule is accepted. No work will start prior to this milestone date.*
- ***Notice to Proceed Date (NTP):*** the NTP date is determined in coordination between the Engineer and the Contractor.
- ***Work Begin Date:*** Actual date that on-site work commences. In the baseline CPM schedule, this is the anticipated work begin date by either the prime contractor or any subcontractor. Once work begins, status the schedule with the actual date recorded in SiteManager.
- ***Interim Completion Dates or Interim Milestones:*** When interim completion dates or interim milestones (associated with project stages) are included in the contract specifications.
- ***Mobilization:*** Preparations for and moving of equipment, etc., to the project site.
- ***Start of Paving:*** Date paving production and placement is to start. This includes any paving requiring a SCDOT certified inspector representing the Department.
- ***Substantial Work Complete Date:*** The point in the project when all pay items have been installed in reasonable conformance with the plans and specifications over the entire length of the project including tie-ins and all lanes of traffic are open to the public in their final configuration with the final applications of thermoplastic and raised pavement markers. The only remaining work to be performed is punch list items. Place a Finish On or Before constraint on this milestone equal to the completion date in the contract. If a change order is completed for time, update the constraint to the adjusted completion date.
- ***As-Built CPM Schedule Submission***: The point in time in which the final schedule submission is made.
- ***Project Liability Insurance Expiration Date MM/DD/YY:*** This date references the expiration of the insurance as defined in Section 103.8 of the Standard Specification for Highway Construction. Include the date that the project liability insurance expires in the milestone activity name. If the expiration renewal date is prior to the Contract Completion Date, place a “Finish On” constraint on the finish milestone. If the expiration renewal date is beyond the Contract Completion Date, place an “As Late As Possible” constraint on the finish milestone. There are no logic ties for this milestone. Inclusion of this date in the CPM schedule does not relieve the contractor of his responsibility to retain liability insurance as defined by the Standard Specifications for Highway Construction.

Activities –

- Each Activity shall be part of the logic driven network, be cost loaded using Expense Categories, and include a predecessor (except the first activity) and a successor (except the last activity).
- Each Activity Name shall include a verb and a noun and represent the work function.
- Activity Names shall include the location of the work when there are multiple activities of the same work in different locations of the project.
- Limit activity original duration to 30 calendar days.

As a minimum, and when applicable, the schedule shall include the following activities when related work is part of the contract.

- ***Mobilization:*** Provide the same number of mobilization activities as for payment in the proposal i.e.
  - ***Mobilization Payment I***
  - ***Mobilization Payment II***
- ***Clearing & Grubbing:*** Self-explanatory.
- ***Utility Relocations:*** The schedule must reflect the utility relocations noted in the contract documents and include activities of appropriate duration for the utility adjustments. Where utility durations are unknown, the Contractor shall provide a reasonable estimate of duration. Relate utility activities to the contract work activities that they effect or are affected by.

- ***Cure Period:*** The period of time between two activities needed for material curing. Examples include concrete and thermoplastic pavement markings. For this activity, use a seven day work week calendar.
    - ***Earthwork:*** Unclassified & borrow excavation, compaction, fine grading, etc.
- ***Drainage:*** Pipe, catch basins, manholes, etc.
- ***Base Course:*** Graded aggregate base courses, cement modified bases, etc.
- ***Paving:*** Hot mix asphalt base, intermediate, and surface courses; Portland cement concrete pavements, etc.
- ***Structures:*** Bridges, box culverts, retaining walls, etc.

Where sufficient detail has not been provided in included activities to determine progress of work and forecast of inspection and cost, the Department will request additional activities be added. The Department requires retain logic be used in scheduling projects. Relationship ties of all out-of-sequence activities should be corrected to reflect the actual occurrence. The use of progress override is not permitted. The monthly schedule update narrative shall justify any logic change(s).

Suspend Dates - The use of suspended dates is prohibited. If the activity is disrupted, break out into additional activities and explain in narrative.

Activity Expected Finish Dates – Activity Expected Finish dates are prohibited.

Resources – The Department will not require any input to the resource component of the schedule by the Contractor.

Expenses – Contractor shall assign the SCDOT contract items as expenses to each activity. The information provided under Expenses is used to evaluate daily production rates. SCDOT contract items will be included as Expense Categories and will be made part of the SCDOT schedule template available to download from the construction Extranet site. These shall be the only expense categories associated with activities. Under expenses, populate the fields Budgeted Units, Price/Unit, and Actual Units. If a SCDOT contract item cannot be found in the most current template, SCDOT should be contacted. The template will then be updated and uploaded to the extranet by SCDOT.

Weather - Considerations for normal weather shall be addressed within the activity duration.

Calendars – Contractor shall assign an appropriate SCDOT calendar to each activity in the schedule. Alternate calendars may be assigned, but specifics of the alternate calendars must be justified in the baseline narrative. Contractor shall assign all calendars as project specific – NOT GLOBAL. Acceptance of the alternate calendars is subject to review by the SCDOT. Considerations for weather shall be addressed within the activities – calendars shall not be modified to account for weather considerations. While calendars have been created to address established seasonal restrictions, it is the Contractor's responsibility to assure that all restrictions, as identified in the contract documents, are included. Where the Contractor elects to not utilize all available contract time in the baseline schedule submission, either by blocking out days in the calendar or including an activity for an extended period of no work, future delays against the time omitted will not warrant additional time.

The Baseline Construction Schedule shall not extend beyond the number of working days or contract completion date originally provided in the contract.

Cost Loading – All schedule activities shall be cost loaded using the contract bid items (Expense Categories), unit prices, and units (quantities) under "Expenses" in Primavera. Associated expenses shall correlate with the item of work covered by the activity.

Float – Float is not for the exclusive use or benefit of either the Department or the Contractor. Negative float in the original baseline schedule is not allowed.

Schedule Layout – Organize the schedule using a Work Breakdown Structure (WBS) consistent with the phasing and staging noted in the contract documents.

Default Values – Contractor shall use the following defaults, physical percent complete, retain logic, longest path critical activities, and under Admin Preferences, make Time Periods 8.0 hours/day, 40 hours/week, 172 hours/month, and 2,000 hours/year.

- **Submission, Review and Acceptance Process**

Baseline Schedule –

Submission:

Regular Bid Projects:
Contractor shall submit a Critical Path Method (CPM) Contract Schedule and Narrative to the District Scheduler no more than 15 calendar days after execution of the contract or 15 days prior to the preconstruction conference, whichever is earlier. Once the initial baseline schedule is submitted, a preconstruction meeting date may be assigned by the RCE and Contractor. The CPM Schedule and Narrative shall be submitted via upload to the Extranet. Upon upload, the Contractor shall immediately notify the District Scheduler and the Resident Engineer via email that the CPM schedule has been submitted. The accepted CPM baseline schedule is paid for in the first available estimate period after contract execution.

A+B Bid Projects:
Contractor shall submit a Critical Path Method (CPM) Contract Schedule and Narrative to the District Scheduler no less than 15 calendar days prior to the preconstruction conference. Once the initial baseline schedule is submitted, a preconstruction meeting date can be assigned by the RCE and Contractor. The preconstruction meeting shall be assigned no earlier than 15 calendar days after the initial baseline submission. The CPM Schedule and Narrative shall be submitted via upload to the Extranet. Upon upload, the Contractor shall immediately notify the District Scheduler and the Resident Engineer via email that the CPM schedule has been submitted.

Review:

Upon receipt of the CPM Construction Schedule, SCDOT shall review and provide comments to the Contractor within 10 business days of receipt. The Contractor will have 5 business days to respond to SCDOT comments. This process will continue until the Engineer and the District Scheduler determines the construction schedule is acceptable.

The Contractor's representative familiar with the submitted schedule shall present and discuss their accepted schedule at the Preconstruction Conference. In the event the schedule has not been accepted (i.e. review process is ongoing), the most current schedule under review shall be presented.

Acceptance:

Acceptance of the submitted schedule by the SCDOT will establish the baseline schedule for the contract. This acceptance by SCDOT does not serve to excuse any omissions or errors in the Contractor's schedule (i.e. activities not included in baseline will not be considered in any time extensions).

Review and **acceptance of baseline schedule is required prior to start of work.** Delays in reaching this acceptance will not constitute a basis for granting additional contract time. If there is no concurrence or input from the utility provider concerning the Contractor's utility durations within 15 days following the

Preconstruction Conference, the submission with the Contractor's estimate of utility duration will be reviewed for baseline acceptance. Further utility duration changes beyond this point in time will be assessed in monthly schedule updates.

Monthly Updates –

Monthly updates shall be made no later than 15 calendar days following the most recent estimate period end date, whether or not an estimate was generated and shall have a data date one day beyond the most recent estimate period end date. If no work was completed during the estimate period, an update with the most current estimate period is required. Upon upload, the Contractor shall immediately notify the District Scheduler and the Resident Engineer via email that the CPM schedule has been submitted. Failure to submit timely updates will result in SCDOT evaluating contract status from the last submitted update schedule by adjusting the data date to the most current estimate period end date. Late update submittals may result in the Contractor being evaluated for preliminary delinquency in accordance with current version of the South Carolina Department of Transportation Standard Specifications for Highway Construction. Habitually late submittals may result in automatic delinquency. Failure to submit acceptable schedule updates as required will result in the withholding of the partial payment estimate regardless of preliminary delinquency. Updates shall include the following:

- Updated schedule to show actual progress on activities;
- Updated schedule to show actual costs on activities;
- Change orders that have occurred during the last estimate period;
- Any task dependent activity greater than 30 days in actual duration that has not incurred additional costs since the last update shall be terminated and broken into additional activities. Document the activity change and reason for late completion in the narrative;
- Remaining costs on completed activities are zeroed (if remaining costs are redistributed, indicate in the narrative the activities containing the costs);
- Update remaining cost appropriately;
- Updated schedule to show actual completion on milestones;
- Narrative to describe progress, planned activities, issues, adjustments to remedy any activities or milestones behind schedule, etc., in the format described in Schedule Submissions***;***
- Any changes other than those to actual start, actual finish, remaining duration, and Percent Complete are considered revisions. Revisions to a schedule update are subject to acceptance by the Engineer;

As-Built Schedule – A final As-Built Schedule shall be submitted within 15 calendar days following the contract completion. The as-built schedule should reflect the final project including extra work from change orders.

- **Baseline Schedule Changes –** Once the baseline schedule has been accepted, all subsequent schedules provided will be considered schedule updates and compared to the original baseline. A new baseline will only be considered when significant changes in contract scope, changes in SCDOT priorities, or delays beyond the control of the Contractor occur.

If a baseline change is needed, the Contractor shall provide, in writing, a request to the Resident Construction Engineer with the following information:

- An electronic copy of the proposed baseline schedule using the following naming convention and in accordance with **Schedule Types** (included previously)

Type of Schedule Submitted:	Updated Baseline
File Name Convention:	[Contract ID]ub[Data Date]
File Name Example:	32.82571ub060201

- Narrative identifying changes warranting a new baseline

A decision for an updated baseline will be made jointly between the Resident Engineer and the District Scheduler within 10 business days of receipt of request.

Progress Meetings- The contractor shall present the most current schedule at progress meetings to discuss any issues and upcoming events. If found necessary by the SCDOT, the contractor shall attend meetings to specifically discuss issues about the schedule.

Level 3 Schedule Requirements

Level 3 schedule requirements will be enforced on contracts where the bid amount exceeds $20 million and one of the following occurs:

- SCDOT financial status warrants the specific control of large project monthly payouts
- The contract SVI is less than -0.50 or greater than 0.50 for two consecutive months indicating the project is significantly behind or ahead of the Contractor's baseline schedule.

In the event that the Department chooses to enforce the Level 3 Schedule Requirement, the Contractor will submit an updated baseline schedule within 15 days of notification. The Contractor schedule will be used for payment purposes once the baseline schedule has been accepted by the Department. In addition to meeting the requirements of the Level 2 Schedule, the following shall apply.

Once accepted by SCDOT, the project's initial baseline cost loaded CPM will be used for SCDOT budget purposes and the contractor will not be paid in excess of the cumulative amount shown on the schedule through each payment date; regardless of what subsequent monthly updates indicate. For example, see chart below:

Pay period ending	12/31/11	1/31/12	2/29/12	3/31/12	4/30/12	5/31/12
Baseline CPM Planned Payout in Millions (Cumulative to Date)	2.0 (2.0)	3.0 (5.0)	3.0 (8.0)	4.0 (12.0)	4.0 (16.0)	3.0 (19.0)
Actual work performed (Cumulative to Date)	1.5 (1.5)	2.0 (3.5)	3.5 (7.0)	6.0 (13.0)	3.0 (16.0)	4.0 (20.0)
Payout by SCDOT (Cumulative to Date)	1.5 (1.5)	2.0 (3.5)	3.5 (7.0)	5.0 (12.0)	4.0 (16.0)	3.0 (19.0)

Partial payment estimates will be generated in SiteManager (computerized construction management system) based on actual quantities installed. If actual quantities installed exceed the cumulative schedule amount to date, a negative adjustment will be made in SiteManager to adjust the pay as necessary. For previous work exceeding the schedule amount, payments will be released as work progresses and payouts fall below the scheduled cumulative amount, never to exceed the cumulative scheduled amount through that pay period.

If significant contract changes are necessary, and upon approval by the SCDOT, a re-baseline to the initial CPM will be allowed per the CPM schedule specification and the payout schedule may be adjusted accordingly.

All subcontractors must be paid in accordance with the Prompt Payment Clause (Supplemental Specification dated June 14, 2000) for the quantities used to generate the partial payment estimates. In instances where a payout by SCDOT is less than the actual work installed under a given estimate, the Prompt Payment Clause is hereby amended to require full payment to all subcontractors, for work complete, within 7 days of receipt of said SCDOT payout.

Contract Schedule Performance Evaluation:

Project performance is not measured for contracts where the percent time < 0.30 for projects with a Level I Requirement and percent time < 0.20 for projects with the Level II Requirement or Level III Requirement.

Percent Time = (Last Estimate Date – NTP)/[(Adj Completion Date)-(NTP)]

Level I Requirement: Contracts with a minimal schedule requirement that are not deemed "on-call:"

Performance curves were developed using historical data from SiteManager based on contract type and ranges of contract amount. For each of these groupings, three curves identifying minimal performance levels are used to measure project performance. On the example below, the curves indicate that projects falling below the 50th percentile line are slower than 50 percent of the projects of same type and in the range of the bid amount indicated. Projects falling below the 40th percentile line are slower than 60 percent of the projects of the same type and in the range of the bid amount indicated. Projects falling below the 25th percentile line are slower than 75 percent of the projects of the same type and in the range of the bid amount indicated.

On a monthly basis at the end of the estimate period, a comparison of Time Percent Complete vs. Work Percent Complete will be made and plotted on a performance curve matching the contract type within the bid amount. The measurements are defined as:

Time Percent Complete = (Last Estimate Date – NTP)/[(Adj Completion Date)-(NTP)]

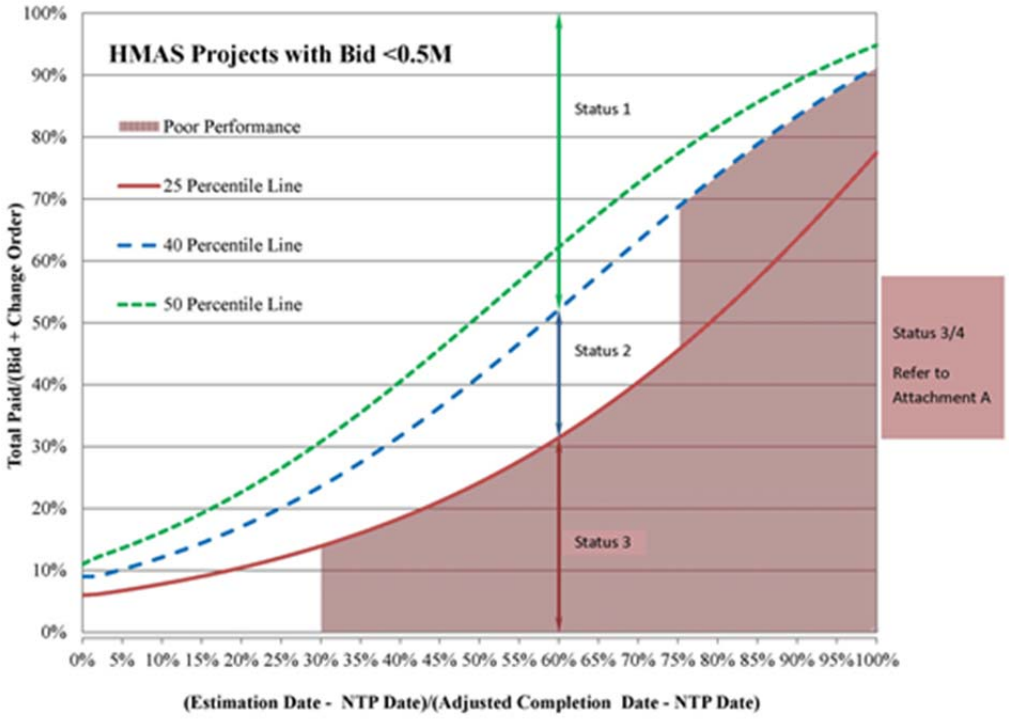
Work Percent Complete = Total Paid/(Total Bid + CO)

Poor Performance is considered when any contract is beyond its Adjusted Contract Completion date or when Time Percent Complete versus Work Percent Complete plots in the shaded area (on the appropriate performance curve) as defined by:

[30%, 75%) time below the 25th percentile line

-or-

[75%,100%] time below the 40th percentile line.



Example Performance Curve

Performance curves may be found under Construction Schedule Templates on the Extranet at:

http://www.scdot.org/doing/constructionLetting_Extranet.aspx

Contracts with a CPM – Level II and III Schedule:

- Monthly CPM updates are required for contracts with a CPM Level II or Level III schedule requirement as defined under **Submission, Review and Acceptance Process.** The contractor shall update actual completed quantities and physical percent complete (% of work complete for the activity) for all activities impacted during the most recent estimate period. Budgeted cost of the work

performed (Earned Value) from the schedule update and budgeted cost of work planned (Planned Value) from the accepted baseline schedule are used to determine project variance in Primavera utilizing Schedule Variance Index (SVI). The calculation used by Primavera is:

Schedule Variance Index (SVI) = (Earned Value – Planned Value)/Planned Value

Where SVI<-0.10, the contract is considered to be slipping behind plan.

Contract Performance Action:

A summary of progress performance action is included in Attachment A. Preliminary Notice of Delinquency is abbreviated as PND.

Level I Schedules:
When plotting Time Percent Complete vs Work Percent Complete as indicated above, if the contract falls in the shaded section on the appropriate performance curve,

First Offense:
-PND w/o bonding notification
-Request recovery plan

Second Offense:
-PND w/bonding notice
-Request recovery plan
-Hold PND to monitor recovery plan. If plan not met, move to delinquency

Level II or III Schedules:
In any estimate period where the SVI is (-0.20,-1.0] as defined under: **Contracts with a CPM – Level II and III Schedule:**

First Offense:
-PND w/o bonding notification
-Request recovery plan

Second Offense:
-PND w/bonding notice
-Request recovery plan
-Hold PND to monitor recovery plan. If plan not met, move to delinquency

Measurement and Basis of Payment

Level 1 Schedule
There is no separate measurement or payment for look-ahead schedules. All costs associated with the preparation or revision of a look-ahead schedule are considered incidental to the work.

Level 2 and 3 Schedules
The Department will make partial payments according to Section 109, Standard Specifications for Highway Construction, and as modified by the following schedule:

Basis of Payment	Percentage of Contract Unit Price of Item
After the Engineer has accepted the CPM Baseline schedule	60
After the Engineer has accepted the As-Built CPM schedule	40

Type of	Ahead of	Status 1	Status 2	Status 3	Status 3	Status 4

Schedule	Schedule	Action	Action	Action	Action	Action
Level I Performance Curve	Projects falling above the 50% curve Monitor payouts	No Action	When plotting Time Percent Complete vs Work Percent Complete, if the contract falls in the shaded section of Status 2 or Status 3 on the appropriate performance curve,		If the contract has not reached substantial completion and is beyond contract completion < 45 days	If has not reached substantial completion and contract is beyond the contract completion > 45 days,
			<u>First Offense</u>: -PND w/o bonding notification -Request recovery <u>Second Offense</u>: -PND w/bonding notice -Request recovery plan -Hold PND to monitor recover plan. If plan not met, move to delinquency.		Preliminary Notice of Default w/bonding notice - Request plan to complete -Hold preliminary notice to monitor plan to complete. If plan not met, move to Default.	Notice of Default according to the Standard Specifications -Request plan to complete
Level II or III CPM	SVI > 0.10 Monitor payouts	SVI > -0.10 No Action	SVI (-0.10, -0.25]	SVI (-0.25, -1.0]	If the contract is beyond contract completion < 45 days	If contract is beyond the contract completion > 45 days,
			Where SVI (-0.20, -1.0] <u>First Offense</u>: -PND w/o bonding notification -Request recovery <u>Second Offense</u>: -PND w/bonding notification -Request recovery plan -Hold PND to monitor recover plan. If plan not met, move to delinquency.		Preliminary Notice of Default w/bonding notice - Request plan to complete -Hold preliminary notice to monitor plan to complete. If plan not met, move to Default.	Notice of Default according to the Standard Specifications - Request plan to complete
	Notes: [indicates inclusive of value (indicates exclusive of value					

Attachment A – Summary of Progress Performance Action

April 11, 2007

CSXT SPECIAL PROVISIONS

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.

I. 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.

II. 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.

III. 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.

IV. 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.

V. 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.

VI. 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 anytime 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.

VII. 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.

VIII. 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.

IX. 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.

X. 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.

XI. 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 as economical as possible.

XII. 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.

XIII. 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.

XIV. 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.

XV. INSURANCE PROVISIONS

A. Insurance Policies:

Contractor shall procure and maintain the following insurance policies:

1. Commercial General Liability 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 named insured, with endorsement CG 24 17 10 01 (Contractual Liability - Railroads), and a waiver of subrogation against CSXT and its affiliates.

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.

3. Business automobile liability insurance with limits of not less than $500,000 combined single limit for bodily injury and/or property damage per occurrence and such other insurance as CSXT may reasonably require.

4. Railroad protective liability 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. Such insurance shall satisfy the following additional requirements:

   a. The insurer must be financially stable and rated B+ or better in Best's Insurance Reports.
   b. The CSXT Protective Insurance Policy must be on the ISO/RIMA Form of CSXT Protective Insurance - Insurance Services Office (ISO) Form CG 00 35.

   c. CSX Transportation must be named as the named insured on the Railroad Protective Insurance Policy.

   d. Name and Address of Contractor and DEPARTMENT must be shown on the Declarations page.

   e. Description of operations must appear on the Declarations page and must match the Project description, including project or contract identification numbers.

   f. Authorized endorsements must include the 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) 30-day Advance 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) A Punitive or Exemplary Damages Exclusion
      (iii) A "Common Policy Conditions" Endorsement
      (iv) Any endorsement that is not named in Section 4 (f) or (g) above.
      (v) Policies that contain any type of deductible

5. Such additional or different insurance as CSXT may require.

B. Additional Terms

1. Contractor must submit its original insurance policies and two copies and all notices and correspondence regarding the insurance policies, together with completed Insurance Approval Request Form (attached) to:

   Deborah A. Tauro
   Risk Manager, Planning & Analysis
   CSX Transportation, Inc.
   500 Water Street – C907
   Jacksonville, FL 32202
   904-366-5088 (Phone)

904-245-3506 (Fax)

2. Contractor may not begin 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 until it has received CSXT's written approval of the required insurance policies.

XVI. 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 _____, 2004, 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 indemnification 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: _____
Date: _____ Title: _____

April 1, 2008

AS-BUILT CONSTRUCTION PLANS

GENERAL

The Contractor shall produce and deliver to the Department the final As-Built plans for this contract. This set of As-Built plans is not intended to document final quantities, but is intended to show approved revisions to the contract design including but not limited to: revised roadway profiles and cross sections, revised typical sections, revised drainage installations, any changes to the demolition and removal items and any other changes to the original design.

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 As-Built plans shall be neat, legible and of the correct size. Bridge projects and any road projects which include Plan, Profile and Cross-Section Sheets shall be full size. In general, if the job was let with full size plans (22" X 36"), the As-Builts shall be full size. All revisions to the original plans shall be delineated in red ink, located properly on the drawing, they shall be legible and true to scale. Every As-Built Plan, Profile and Cross-section Sheet shall be designated as such by note or stamp "As-Built" in red. The As-Built Plans shall be bound in the same manner as they were let, not combined. In other words, if a project includes road and bridge work and each is bound separately, keep them separate for As-Builts, each with its own AB201 cover sheet.

In submitting As-Built Plans, the Contractor shall be required to complete FORM AB205 or AB206 whichever is applicable, and submit the form with the required deliverables to the RCE. The items and notes on these forms that apply to this project establish the minimum requirements for As-Built Plans. The forms can be found on the SCDOT website at http://www.scdot.org/doing/default.html.

The final As-Built plans shall be submitted within forty-five (45) days following the substantial work complete date of the project.

MEASUREMENT

Measurement is to be on a lump sum basis.

PAYMENT

Payment for this item is to be as follows:

> 50% of the contract amount is to be distributed over the duration of the project, and paid in amount proportional to the amount of contract work completed.
>
> The remaining 50% of the contract amount is to be paid on the final estimate if As-Built plans meet the requirements to the satisfaction of the Resident Engineer.

In no case is payment to be in excess of the original bid amount for this item.

The Bid Item for this work is as follows:

Item Number	Item	Unit
1090200	As-Built Construction Plans	LS

October 15, 1991

GEOTEXTILE FOR DRAINAGE FILTRATION

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 requirements[1] 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:

$$EOS\ No.\ (fabric) \geq 30\ U.S.\ Std.\ Sieve\ No.$$

B. Soils with more than 50% particles by weight passing U.S. No. 200 sieve:

$$EOS\ No.\ (fabric) \geq 50\ U.S.\ Std.\ Sieve\ No.$$

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:

Critical/Severe Applications *	Normal Applications
$k\ (fabric) \geq 10\ k\ (soil)^2$	$k\ (Fabric) \geq k\ (soil)^2$

* 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 Team (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.

August 6, 2008

PREFABRICATED EARTHQUAKE DRAIN with FILTER FABRIC

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 instructions and additional requirements.

2.0 QUALITY ASSURANCE

2.1 Standards: American Society for Testing and Material (ASTM)

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

ASTM D4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

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 20 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 500,000 square 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 or spudding.

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 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 earthquake drain with filter fabric meets or exceeds the material requirements of this specification.

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. Approval 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 Supplemental Specifications. 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 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 earthquake drain installation. Such plans shall include the locations of the earthquake 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 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: (ASTM D4491)	0.01 in/sec (K-value)
Minimum Water Permittivity, fabric: (ASTM D4491)	0.1 sec^{-1}
Minimum Tear Strength, fabric: (ASTM D4533)	50 lb
Minimum Tensile Strength, fabric: (ASTM 4632)	130 lb

Minimum Elongation at break: (ASTM D4632)	60 percent
Minimum Puncture Strength, fabric: (ASTM 4833)	50 lb
Minimum Mullen Burst, fabric: (ASTM D3786)	150 psi

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 consolidation settlement without damage.

e.) The filter fabric shall not undergo cracking and peeling during installation of the earthquake drain.

f.) 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 foundations 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 damaged because of the Contractor's activities will be the responsibility of the Contractor, as described in the Supplemental Specifications for the geotechnical instrumentation.

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 nearest tenth of a 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 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 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 or spudding 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, 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 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.

5.15 Earthquake drains shall be installed using a continuous push using either static weight and/or 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 MEASURMENT

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.

Area improved by earthquake drains for liquefaction mitigation shall be measured to the nearest tenth of a square foot. The improved area to be paid for shall be as indicated in the plans.

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 (top of fill soil) 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 Prefabricated Earthquake Drains: Payment for earthquake drains shall be made at the contract unit price per square foot for improved area, which price shall be full compensation for the cost of furnishing the full length of the earthquake drain material, installing the earthquake 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 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 square foot.

No payment will be made for earthquake 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 earthquake 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, an 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
2052200	Earthquake Drain with Fabric	SF
8990204	Obstructions	LF

July 1, 2010

TRANSPORTATION AND DELIVERY OF MIXES

Subsection 401.4.17, Transportation and Delivery of Mixes, of the Standard Specification will be deleted in its entirety and replaced with the following:

Transport the HMA from the plant to the point of use in vehicles meeting the requirements of Subsection 401.3.7. Do not permit any load of HMA to leave the plant so late in the day that it cannot be spread, finished, and compacted during daylight of that same day unless an approved artificial lighting system is provided. Ensure that HMA mixtures containing the asphalt binder grades below are produced and delivered to the jobsite within the acceptance range listed in the table below with exception that Base C and D mixtures will be produced and delivered at a temperature range of 240º-275º F. The mix temperatures will be checked using SC-T-84. Ensure the HMA mixtures are held within the acceptance range based on Binder Performance Grade in the Job Mix Formula. Deliver mixture within the acceptance range for temperature to assist in obtaining density requirements which provide smooth riding pavements with uniform texture.

Binder Performance Grade	Acceptance Range (ºF)
PG 64-22	265º-325º
PG 70-22	285º-335º
PG 76-22	300º-350º

Note: This temperature specification does not apply to WMA (SC-M-408). Refer to the HMA Contractor's QC Plan for mix acceptance range based on selected asphalt plant WMA technologies.

July 2, 2009

HIGH PRESSURE WATER METHOD
For
REMOVAL OF PAVEMENT MARKINGS

1. Description. -

This item consists of removal of pavement markings from an asphalt or concrete pavement course by utilization of high pressure water. Eradicate and remove existing and temporary pavement markings, including waterborne fast dry paint, thermoplastic, and epoxy pavement markings, from the pavement surface by high pressure water where directed by the plans, the special provisions, the standard specifications, the MUTCD, and the Engineer.

2. Requirements. -

The Contractor shall conduct the removal operations of the pavement markings without damaging the surface or texture of the pavement course.

The Contractor shall remove no less than 95 percent of the total area of the pavement markings designated for removal to provide uniform exposure of the pavement surface. The presence of remnant pavement markings that indicate or may be perceived as a line shall require the Contractor to repeat the removal process.

The area of removal shall extend beyond all edges of the pavement marking designated for removal no less than ½ inch.

The Contractor shall remove all recoverable residue from the water blast cleaning method, including the water. When operating within 10 feet of a travel lane open to traffic or in an area that the residue may encroach onto the adjacent travel lane, the Contractor shall remove the residue immediately after contact between the water and the pavement surface. The removal process shall require a vacuum attachment operating concurrently with the blast operation or by an alternate method as approved by the Engineer. The Contractor is responsible for maintaining safety as required by the Department and all federal, state, and local laws.

In areas where pavement joints are present, the Contractor shall provide adequate protection of the pavement joints to prevent damage, disfigurement, compaction, or recession of the pavement joint material. The Contractor shall obtain approval of the proposed methods for providing protection of the joint material from the Engineer prior to beginning the work.

Removal of pavement markings by high pressure water is prohibited when the ambient air temperature is 40 degrees Fahrenheit or less or anticipated to decrease to 40 degrees Fahrenheit or less within 2 hours.

3. Method of Measurement. -

The Department will pay for removal of the pavement markings designated for removal by high pressure water at the contract unit price bid.

Measure the pavement markings designated for removal in square feet of the actual pavement markings to be removed. Determine the length of the pavement marking by measuring along the center of the line by the linear foot, excluding the spaces between broken lines, and multiplying by the width of the pavement marking in place. The measurement shall include the area of the marking only and shall

exclude the area that extends ½" beyond the edges of each pavement marking designated for removal. The area ½" beyond the edges of each pavement marking shall be considered incidental.

Measure the removal of arrows, words, and railroad crossing symbols by the square footage of the full area occupied by the arrow, word, or railroad crossing symbol. To determine the square footage of arrows and words, measure the area as a complete square or rectangular area to encompass the complete arrow or word. The edges of the square or rectangular area designated for removal shall be parallel and perpendicular to the adjacent edge of pavement. A railroad crossing symbol consists of an "X" and two "R" 's. Determine the area of the railroad crossing symbol for removal, including only the area occupied by the "X" and two "R" 's, as a complete square or rectangle as designated above.

The Department will make no separate measurement for payment for traffic control during removal of pavement markings. Include all costs for traffic control in the contract lump sum price bid item for "Traffic Control". In the absence of a bid item for "Traffic Control", consider traffic control for application and removal of pavement markings incidental to the pavement marking bid items.

4. Basis of Payment.

The Department shall provide full compensation for providing all materials necessary to complete the job properly. Payment shall include the removal of the pavement markings, furnishing the materials, all labor, hardware, equipment, tools, incidentals, and any miscellaneous items necessary to complete the item of work.

Payment for each item includes all direct and indirect costs and expenses required to complete the work.

Payment will be made under:

ITEM NO.	PAY ITEM	PAY UNIT
6091405	REMOVAL OF PAVEMENT MARKINGS (HIGH PRESSURE WATER)	SF

September 1, 2012

TRAILER MOUNTED
AUTOMATED FLAGGER ASSISTANCE DEVICE SYSTEM
(AFAD)

1. Description:

This specification details the minimum requirements of all Automated Flagger Assistance Device Systems (AFAD) utilized and placed into operation on the roadways of the state of South Carolina.

An automated flagger assistance device system is a temporary traffic control device system for controlling the flow of traffic through temporary traffic control areas, typically work zones, that generate the requirement for two-way traffic to share a single travel lane. An automated flagger assistance device system shall consist of no less than 2 individual AFAD units linked and remotely controlled by wireless communications. A flagger(s), who has successfully completed a flagger training course sponsored by a South Carolina Department of Transportation approved work zone traffic control training provider, shall operate the system. Install, operate and maintain each AFAD unit as designated by these Supplemental Specifications, the manufacturer's specifications, the Standard Drawings for Road Construction, the Plans and the Engineer.

An automated flagger assistance device system acceptable for use on the roadways of the state of South Carolina shall be either a Type I "RED / YELLOW" Lens system or a Type II "STOP / SLOW" Sign system.

The automated flagger assistance device system shall comply with all requirements for Automated Flagger Assistance Devices as specified and directed by the MUTCD, latest edition, and this supplemental specification. An automated flagger assistance device system shall operate and comply with all requirements for flagging operations as specified and directed by the latest editions of the MUTCD, the South Carolina Flagger's Handbook and the Standard Specifications for Highway Construction. Also, an automated flagger assistance device system shall operate and comply with all requirements for flagging operations as specified and directed by the Standard Drawings for Road Construction, the special provisions, the plans and the Engineer.

2. Operations Requirements:

A. General: Automated flagger assistance device systems are only permitted for use on two-lane two-way roadways where each single travel lane of opposing traffic is required to utilize and share one travel lane. An AFAD system is PROHIBITED for use on multilane roadways with reduced numbers of travel lanes. An AFAD is not a traffic control signal and shall not be used as a temporary traffic control signal or to control traffic at any location with more than 2 opposing single travel lanes seeking to share one travel lane.

B. Documentation: Provide documentation to the SCDOT to verify that each operator of an automated flagger assistance device system has successfully completed instruction in the operation of a system by the manufacturer of that system. Also, provide documentation to verify that each operator has successfully completed a flagger training course sponsored by a South Carolina Department of Transportation approved work zone traffic control training provider.

1. **Work Conducted under Contract to SCDOT** - Provide documentation of proof of successful completion of training in the proper operation of the AFAD system by the manufacturer of the system and successful completion of training as a flagger by a South Carolina Department of Transportation approved work zone traffic control training provider to the Resident Engineer no less than 7 days prior to placing an automated flagger assistance device into operation.

2. **Work Conducted under Encroachment Permit** - Provide documentation of proof of successful completion of training in the proper operation of the AFAD system by the manufacturer of the system and successful completion of training as a flagger by a South Carolina Department of Transportation approved work zone traffic control training provider along with submittal of the encroachment permit to the SCDOT.

C. Operator: The operator of the an automated flagger assistance device system shall be a recipient of and have successfully completed instruction in the operation of the system by the manufacturer of that system. The operator shall have successfully completed a flagger training course sponsored by a South Carolina Department of Transportation approved work zone traffic control training provider.

The South Carolina Department of Transportation only recognizes the following entities as acceptable providers of work zone traffic control training for organizations outside of the SCDOT who perform work activities within the highway rights-of-way in South Carolina under either contract to SCDOT or encroachment permit:

American Traffic Safety Services Association (ATSSA)
Institute for Transportation Research and Education at North Carolina State University (ITRE)
Carolinas Association of General Contractors (AGC)
National Safety Council South Carolina Chapter

The operator shall control the automated flagger assistance device system from a location with an unobstructed view of the AFAD unit as well as an unobstructed view of the approaching traffic. If a single operator is controlling more than one unit, the operator shall have an unobstructed view of traffic from both directions. At no time is the operator permitted to leave the AFAD unattended when the AFAD is operating.

D. Site Location: When sufficient shoulder space is available, place and position the AFAD unit on the shoulder of the roadway no closer than 1 foot from either the near edge line or the near edge of pavement when an edge line is absent to the near edge of the trailer when the gate arm is in the upright position. When sufficient shoulder space to attain the minimum 1 foot requirement is unavailable, minimal encroachment of the unit upon the adjacent travel lane is permitted.

Place and position the AFAD unit to allow the end of the gate arm, when in the down position, to reach the center of the adjacent travel lane being controlled by the unit. Encroachment by the gate arm when in the down position to a point less than to the center of the adjacent travel lane or into the opposing travel lane beyond the center of the roadway is PROHIBITED.

Install the advance warning signs required for typical flagging operations on each approach. In addition to the typical flagging operations sign array, also include and install a “Be Prepared To Stop” sign (W3-4-48) between the “Flagger” symbol sign (W20-7-48) and the AFAD unit on each approach. Therefore, the required advance warning signs for each approach are, “Be Prepared To Stop” (W3-4-48), “Flagger” symbol (W20-7-48), “One Lane Road Ahead” (W20-4-48-A) and “Road Work Ahead” (W20-1-48-A).

E. Nighttime AFAD Flagging Operations: During nighttime operations, illuminate each AFAD unit 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 operations, operators 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.

Supplement the array of advance warning signs with a changeable message sign for each approach during nighttime AFAD flagging operations. These changeable message signs are not required

during daytime operations. Install the changeable message signs 500' in advance of the advance warning sign arrays. Messages should be "Flagger Ahead" and "Prepare To Stop".

3. System Requirements:

A. General: An automated flagger assistance device system shall consist of a Main AFAD unit and a Remote AFAD unit, linked and remotely controlled by wireless communications. The individual trailer-mounted units shall have nesting capabilities to permit towing of both units in a single trailer configuration. When nested, all lights including stop, tail and turn signal lights of both units shall operate uniformly.

B. Power Source: The electrical power for operation of the sign shall be supplied by a 12 VDC power source or a 110 VAC or a 120 VAC power source. Provide and mount a D/C power source for the unit on the trailer. An adaptable 110 VAC or 120 VAC power source may be used when available and selected for use.

1. **D/C Powered:** Power the unit by means of a battery bank charged by photovoltaic solar panels and/or a built-in 110 VAC 10 amp battery charger. House the battery bank in a lockable heavy duty weatherproof box or cabinet. The battery bank shall have the capability to provide sufficient operating power to the unit for no less than 7 continuous days.

2. **A/C Powered:** Power the unit by means of a 110 VAC or 120 VAC power source. Equip the unit with ground fault circuit interrupter circuit breakers. Conduct all A/C power adaptations with UL approved equipment and methods.

C. Remote Control: Equip each AFAD unit with a controller capable of receiving and implementing instructions through wireless communications from a handheld transceiver. Also, equip each AFAD unit with a handheld transceiver that provides wireless communication with the unit controller to permit operation of the individual unit or the system by an operator or operators from remote locations. The system shall provide the capability for total system operation and control of both units by one operator from a primary handheld transceiver as well as allow independent unit operation by one operator per unit from unit specific handheld transceivers.

Monitor and verify data transmissions utilized to control the AFAD units. Digitally encode signal transmissions to minimize interference. Comply with all applicable requirements of the Federal Communications Commission. In the event communications are disrupted or lost, the system shall go into a "fail safe" mode and display the "Circular Red" / "STOP" indications and lower the gate arms.

D. Gate Arm: Equip each AFAD unit with an automated gate arm that descends to a down position across the travel lane that approaching traffic is operating in when the AFAD unit displays the condition for approaching traffic to stop. The automated gate arm shall ascend to an upright position when the AFAD unit displays the condition to allow stopped traffic to proceed past the location of the AFAD unit.

Acceptable operation of the gate arm shall require the gate arm to begin descent to the down position no less than 2 seconds or more than 4 seconds after the AFAD unit displays the condition for approaching traffic to stop. The gate arm shall begin ascent to the upright position not less than 1 second or more than 2 seconds prior to display of the condition to allow stopped traffic to proceed.

The gate arm shall measure no less than 8 feet in length and shall have a minimum vertical height of 4 inches when placed in the down position. Reflectorize both sides of the gate arm with a Type III Microprismatic retroreflective sheeting with vertical alternating red and white stripes at 16 inch intervals.

The gate arm shall deflect in the event an errant vehicle drives through and strikes the gate arm and then return to a functional position after the errant vehicle clears the gate arm.

E. Trailer: Fabricate and equip each trailer with a single axle, springs, support assembly and four (4) leveling or stabilizer jacks. Properly equip the trailer to comply with South Carolina Law governing motor vehicles. The minimum requirement for lights and reflectors shall include turn signals, dual tail lights, and

brake lights. Equip each trailer with Safety chains meeting SAE J-697 standards and paint each trailer with Federal Standard No. 595, Orange No. 12246.

Each trailer mounted AFAD unit shall have the capability to withstand winds up to 80 MPH without overturning when in the operating configuration or position.

4. Type I "RED / YELLOW" Lens System:

A Type I "RED / YELLOW" Lens AFAD system shall alternately display a steadily illuminated Circular RED lens and a flashing Circular YELLOW lens to control traffic without the need for a "human flagger" in the immediate vicinity of the AFAD unit. The steadily illuminated Circular RED lens shall illuminate when approaching traffic is required to stop and the flashing Circular YELLOW lens shall illuminate when stopped or approaching traffic is permitted to proceed pass the location of the AFAD unit.

A RED / YELLOW Lens AFAD unit shall have no less than one set of Circular RED and Circular YELLOW lenses in a vertical configuration that have diameters of no less than 12 inches. Arrange the lenses to place the Circular RED above the Circular YELLOW and provide a minimum height of no less than 7 feet from the bottom of the apparatus housing the Circular YELLOW lens to the grade elevation of the travel lane under control of the AFAD unit. However, if the lenses are located over any portion of a travel lane in which traffic is operating and may pass underneath the lenses, the minimum mounting height shall be no less than 15 feet from the bottom of the apparatus housing the YELLOW lens to the grade elevation of the travel lane under control of the AFAD unit in which traffic is operating.

The gate arm shall begin its descent to the down position not less than 2 seconds or more than 4 seconds after the Circular RED lens is illuminated. The automated gate arm shall begin its ascent to the upright position not less than 1 second or more than 2 seconds prior to illumination of the flashing Circular YELLOW lens.

Install a "Stop Here On Red" sign (R10-6-36) or (R10-6a-30) on the right side of the approach at the point at which motorists are expected to stop when the Circular RED lens is illuminated.

Transition Between RED and YELLOW Conditions -

Transition to Circular RED condition - The flashing Circular YELLOW lens shall enter into a minimum 5 second steady illumination phase prior to transitioning to the steadily illuminated Circular RED condition. The gate arm shall begin its descent not less than 2 seconds or more than 4 seconds after the Circular RED lens is illuminated.

Transition to Circular YELLOW condition - The gate arm shall complete its ascent to the upright position not less than 1 second or more than 2 seconds prior to illumination of the flashing Circular YELLOW lens. The steadily illuminated Circular RED lens shall transition to the flashing Circular YELLOW lens.

The Type I "RED / YELLOW" Lens AFAD system shall include a fail-safe system with a conflict monitor or similar device to prevent display of conflicting indications between units. Also, the system shall provide indicators to notify the operators of power loss that may impede proper operation of the system.

5. Type II "STOP / SLOW" Sign System:

A Type II "STOP / SLOW" Sign AFAD system shall have a STOP / SLOW sign that alternately displays the STOP (R1-1-36) face and the SLOW (W20-8-36) face of a STOP / SLOW paddle to control traffic without the need for a "human flagger" in the immediate vicinity of the AFAD unit. The STOP sign face shall display when approaching traffic is required to stop and the SLOW sign face shall display when stopped or approaching traffic is permitted to proceed pass the location of the AFAD unit.

The STOP / SLOW sign, fabricated from a rigid material, shall have an octagonal shape with a minimum face size of 36 inches by 36 inches. Reflectorize each face of the sign with a Type VII, Type

VIII or Type IX Prismatic Retroreflective sheeting included on the latest edition of the *SCDOT Qualified Products List 20*. The STOP sign face shall have a red background with white letters and border and the SLOW sign face shall have a diamond shaped orange background with black letters and border. The letters shall have a minimum height of 8 inches. The sign faces shall have a minimum mounting height of 7 feet from the bottom of the sign to the grade elevation of the travel lane under control of the AFAD unit.

Supplement the Type II "STOP / SLOW" Sign AFAD unit with active conspicuity devices. Include a steadily illuminated RED lens beacon to illuminate when the STOP sign face is displayed and a flashing YELLOW lens beacon to illuminate when the SLOW sign face is displayed. Each beacon shall have a 12 inch signal lens. Mount the RED lens beacon no more than 24 inches above the top of the STOP sign face and YELLOW lens beacon no more than 24 inches above the top or to the side of the SLOW sign face.

Type B warning lights are PROHIBITED as alternatives to the 12 inch signal lens beacons.

The gate arm shall begin its descent to the down position 2 seconds or more than 4 seconds after the transition to a complete display of the STOP sign face is accomplished and the illumination of the steadily illuminated RED lens beacon. The automated gate arm shall begin its ascent to the upright position not less than 1 second or more than 2 seconds prior to the initiation of the transition from the STOP sign face to the SLOW sign face.

Install a "Wait On Stop" sign (R1-7-30) and a "Go On Slow" sign (R1-8-30) either on the same support structure as the AFAD unit or immediately adjacent to the AFAD unit.

Transition Between STOP and SLOW Conditions -

Transition to STOP condition - The RED lens beacon shall enter into a "flashing mode" no less than 5 seconds prior to transitioning from the SLOW sign face to the STOP sign face. Immediately upon completion of the transition to complete display of the STOP sign face, the "flashing mode" of the RED lens beacon shall transition to a steadily illuminated condition. The gate arm shall begin its descent in not less than 2 seconds or more than 4 seconds after completion of the transition to a complete display of the STOP sign face and illumination of the steadily illuminated RED lens beacon.

Transition to SLOW condition - The STOP sign face shall begin the transition to the SLOW sign face. The gate arm shall begin its ascent to the upright position not less than 1 second prior to the initiation of the transition from the STOP sign face to the SLOW sign face. The RED lens beacon shall cease to illuminate and the flashing YELLOW lens beacon shall begin to illuminate immediately upon completion of the transition of the STOP sign face to the SLOW sign face and the ascent of the gate arm to its completed upright position.

The Type II "STOP / SLOW" Sign AFAD system shall include a fail-safe system with a conflict monitor or similar device to prevent display of conflicting indications between units. Also, the system shall provide indicators to notify the operators of power loss that may impede proper operation of the system.

3. Method of Measurement: Unless otherwise specified, Automated Flagger Assistance Device Systems (AFAD's) are not measured for separate payment but are included in the contract lump sum bid price item Traffic Control as specified in Subsections 107.12 and 601.5 of the *2007 Standard Specifications for Highway Construction*.

4. Basis of Payment: Unless otherwise specified, payment for an Automated Flagger Assistance Device System (AFAD) is included in the contract lump sum bid price item Traffic Control as specified in Subsections 107.12 and 601.5 of the *2007 Standard Specifications for Highway Construction*. The payment shall be full compensation for providing, installing, removing, and relocating as necessary, operating, and maintaining an Automated Flagger Assistance Device System (AFAD). Payment shall include furnishing all labor, hardware, equipment, tools, incidentals, and any miscellaneous items necessary for installing, operating, and maintaining the system.

September 1, 2008

ADHESIVELY BONDED ANCHORS AND DOWELS

1.0 Adhesively Bonded Anchors and Dowels

1.1 Scope

Furnish all required labor, equipment, and materials and perform all operations necessary for installing anchors and dowels in concrete using an adhesive bonding system in accordance with the details shown on the Plans and with the requirements of this Specification. Provide a material system specifically intended for use in structural applications for bonding anchors and dowels to hardened concrete. Limit applications to anchors and dowels installed in horizontal, vertical, and downwardly inclined positions. Do not use adhesive anchors in overhead or upwardly inclined installations. See Figure 1.1.

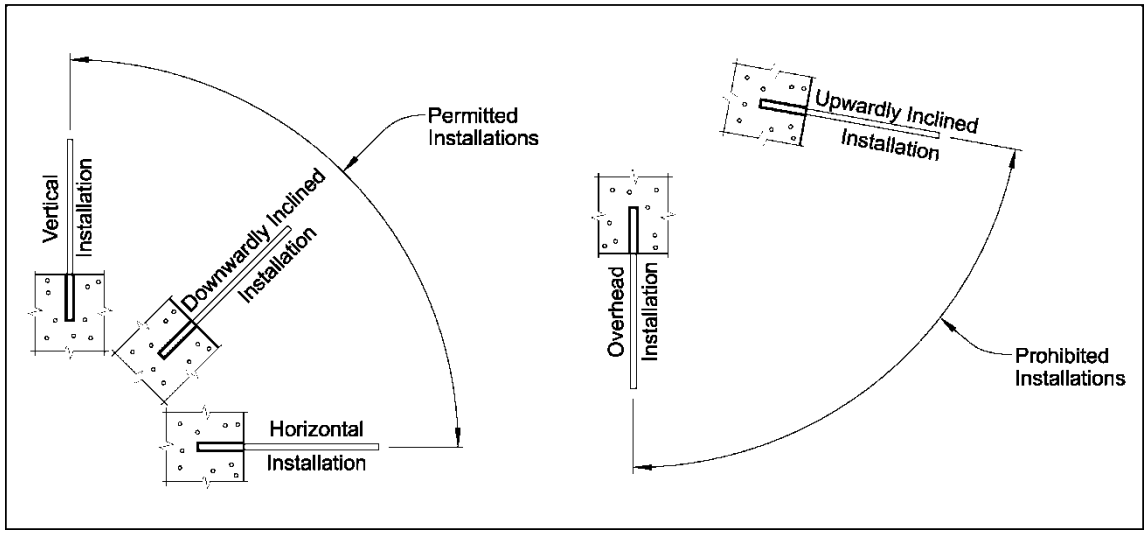


Figure 1.1

Submit a description of the proposed adhesive bonding system to the RCE for review, comments, and acceptance. Include in the description the anchor type, equipment, Manufacturer's recommended hole diameter, material specifications, and any other material, equipment or procedure not covered by the contract documents. List the properties of the adhesive, including density, minimum and maximum temperature application, setting time, shelf life, pot life, shear strength, bond strength, and compressive strength. If anchors or dowels containing a corrosion protective coating are required, provide an adhesive that does not contain any chemical elements that are detrimental to the coating and include a statement to this effect in the submittal concerning the contents as required by State or Federal Laws and Regulations.

Submit to the RCE Manufacturer's certification that the adhesive bonding system, when tested for tension pull-out according to ASTM E 488 utilizing identical anchorages, embedment depths, and concrete strengths as those specified on the Plans, does not fail by any mode listed in Section 12 of ASTM E 488 when loaded to the lesser of 85 percent of the specified bond strength (based on the nominal anchorage diameter and embedment depth) or 90 percent of the yield strength of the anchor. Also, submit to the RCE long term load (creep) test results performed in accordance with ASTM E 1512, ICC–ES AC 58, or ICC–ES AC 308. When specified on the Plans, field testing will also be required for adhesive anchorages.

1.2 Materials

Provide adhesive bonding material systems for structural applications that meet the requirements of ASTM C 881, Type IV, Grade 3, Class B or C (depending on site conditions). Do not use "Fast Set epoxy." Package components of the adhesive in containers of such size that one whole container of each component is used in mixing one batch of adhesive. Use containers of such design that all of the contents may be readily removed, and are well sealed to prevent leakage. Do not use material from containers which are damaged or have been previously opened. Use only full packages of components. Furnish adhesive material that requires hand mixing in two separate containers designated as Component A and Component B or in a self contained cartridge or capsule that consists of two components which will be automatically mixed as they are dispensed, as in the case of a cartridge, or drilled into, as in the case of a capsule.

Provide packages clearly marked by the Manufacturer with the following information:

- Manufacturer's name and address
- Product Name
- Date of Manufacture
- Expiration Date
- LOT Identification Number
- Storage and Handling Requirements

With each package include the Manufacturer's instructions for anchor and dowel installation. Include the following information with the instructions:

- Diameters of drilled holes for applicable anchor and dowel sizes.
- Cleaning procedure for drilled holes, including a description of permitted and prohibited equipment and techniques.
- Allowable temperature ranges for storage, installation and curing.
- Identification of acceptable mixing/dispensing nozzles.
- Fabrication requirements for anchors and dowels.
- Description of tools permitted or required for installation.
- Method of identifying properly proportioned and mixed adhesive materials.
- Time and temperature schedule for initial set ('gel time') and full-strength cure.
- Requirements for special installation conditions such as horizontal or near horizontal orientation of the anchor or dowel.

1.3 Construction Requirements

1.3.1 Storage

Deliver the adhesive bonding material system to the job-site in original unopened containers with the Manufacturer's label identifying the product. Store materials delivered to the job-site in the original unopened containers within an appropriate facility capable of maintaining storage conditions consistent with the Manufacturer's recommendations.

1.3.2 Installation

Install the adhesive anchors and dowels perpendicular to the plane surface of the structural member, in accordance with Manufacturer's recommendations, and when the concrete is above 40 degrees Fahrenheit and has reached its 28 day strength. Install the anchorages before the adhesive's initial set ('gel time').

1.3.2.1 Drilling of Holes into Concrete

Ensure that concrete members receiving adhesive-bonded anchors or dowels are structurally sound and free of cracks in the vicinity of the anchor or dowel to be installed. When directed by the RCE, use a jig or fixture to ensure the holes are positioned and aligned correctly during the drilling process.

Use a metal detector specifically designed for locating steel in concrete to avoid conflicts with existing steel reinforcement whenever placement tolerances and edge clearances permit. Unless other equipment is recommended by the Manufacturer, drill holes to the diameter required by the Manufacturer using a rotary hammer drill and bit. Perform core drilling to clear existing steel reinforcement only when approved by the RCE. Dry the drilled holes completely prior to cleaning and installing the anchors or dowels. Clean and prepare drilled holes in accordance with the Manufacturer's recommendations, but as a minimum, use oil-free compressed air to remove loose particles from drilling, brush inside surface to free loose particles trapped in pores, then use compressed air again to remove the remaining loose particles. Use a non-metallic bristle brush and avoid over-brushing to prevent polishing the inside surface of the drilled hole. Check each hole with a depth gauge to ensure proper embedment depth. Repair spalled or otherwise damaged concrete using methods approved by the RCE.

1.3.2.2 Inspection of Holes

Inspect each hole immediately prior to placing the adhesive and the anchors/dowels. Ensure all holes are dry and free of dust, dirt, oil, and grease.

1.3.2.3 Mixing of Adhesive

Mix the adhesive in strict conformance with the Manufacturer's instructions.

1.3.2.4 Embedment of Anchors and Dowels

Remove all debris, oils, and any other deleterious material from the anchors and dowels to avoid contamination of the adhesive bonding material. Insert the anchor or dowel the specified depth into the hole and slightly agitate it to ensure wetting and complete encapsulation. After insertion of the anchor or dowel, strike off any excessive adhesive flush with the concrete face. Should the adhesive fail to fill the hole, add additional adhesive to the hole to allow a flush strike-off. Do not disturb the anchors and dowels while adhesive is hardening. For horizontal and inclined installations, provide temporary supports to maintain the alignment of the anchors or dowels until the adhesive bonding material has cured.

1.3.3 Field Testing

When specified on the Plans, field test the installed anchors and dowels. Perform field testing of the installed anchors and dowels in accordance with the applicable sections of ASTM E 488. Inform the RCE and the Manufacturer when the tests will be performed at least 2 days prior to testing. For testing, use a calibrated hydraulic centerhole jack system that will not damage the anchor or dowel. Place the jack on a plate washer that has a hole at least 1/4" larger than the hole drilled into the concrete. Position the plate washer on center to allow an unobstructed pull. Position the anchors/dowels and the jack on the same axis. Have an approved testing agency calibrate the jack within 6 months prior to testing. Supply the RCE with a certificate of calibration.

Divide the anchors and dowels into LOTs for field testing and acceptance. A LOT consists of anchors or dowels of the same type, diameter, strength, embedment length, and adhesive bonding system. Prior to performing field tests, submit proposed testing locations to the RCE for review, comments, and acceptance. In the presence of the RCE, field test the anchors or dowels for each LOT in accordance with the following:

Test a minimum of 1 anchorage but not less than 10% of all anchors in the LOT to the test load shown on the Plans.

If less than 60 anchorages are to be installed: Install and test the minimum required number of anchorages prior to installing the remaining anchorages. After installing the remaining anchorages, test a minimum of 2 of these anchorages at random locations selected by the RCE.

If more than 60 anchorages are to be installed: Test the first 6 anchorages prior to installing the remaining anchorages. Then test, at random locations selected by the RCE, 10% of the number in excess of 60 anchorages.

For every failed field test, perform two additional field tests on adjacent untested anchors or dowels within the LOT. Continue additional field tests until no more test failures occur, or until all anchors and dowels within the LOT are tested.

Begin testing after the Manufacturer's recommended cure time has been reached. For testing, apply and hold the test load for three minutes. If the jack experiences any drop in gage reading, restart the test. For the anchorage to be deemed satisfactory, hold the test load for three minutes with no movement or drop in gage reading.

Remove all anchors and dowels that fail the field test, without damage to the surrounding concrete. Re-drill holes to remove adhesive bonding material residue and clean the hole in accordance with Subsection 1.3.2.1. For reinstalling replacement anchors or dowels, follow the same procedures as new installations. Do not reuse failed anchors or dowels unless approved by the RCE.

Determine failure of the field test in accordance with ASTM E 488. Submit certified test reports to the RCE. Final acceptance of the adhesively anchored system is based on the conformance of the pull test to the requirements of this Specification. Failure to meet the criteria of this Specification is grounds for rejection.

1.4 Measurement

No separate measurement for payment will be made for furnishing, installing, and testing of adhesively bonded anchors and dowels.

1.5 Payment

Include all costs of adhesively bonded anchors and dowels in the contract unit price bid for the items to be anchored.

April 5, 2010

CONCRETE BATCHING AND MIXING

Delete subsection 701.4.4.1 Concrete Batching and Mixing – General, of the Standard Specifications in its entirety and replace it with the following:

701.4.4 Concrete Batching and Mixing

701.4.4.1 General

1 When concrete is furnished by a transit or central-mix plant, use batching equipment that is sufficient to weigh a load of the required size in less than 15 minutes.

2 Make certain that an SCDOT-certified concrete field technician is present at the plant when concrete is being produced for SCDOT work. The SCDOT-certified concrete field technician may be an employee of the Contractor, the concrete supplier, or an independent testing laboratory. While concrete is being produced for SCDOT work, ensure that the SCDOT-certified concrete field technician's sole, full-time responsibility is to maintain quality control records and conduct physical testing of concrete and its constituent materials.

3 Ensure that an SCDOT-certified concrete field technician completes and signs *Form 700.04* for the first load of each class of concrete delivered to the job site each day. After the completion of *Form 700.04* for the first delivered load, subsequent loads of each class of concrete will require *Form 700.04* or an OMR pre-approved batch ticket containing the appropriate information. A batch ticket may be pre-approved for use in SCDOT work through the Structural Materials Engineer if the batch ticket format contains at a minimum: date and time batched, load size, ticket number, aggregate moistures, amount of free water in aggregates, design target weights or measures for all materials, actual batch weights or measures for all materials, batched variances from targets listed as a percentage for all materials, designed water/cementitious materials ratio, batched water/cementitious materials ratios, designed batch water in gallons, actual batch water in gallons, and water in gallons held back from target value at the plant that can be added at the job site.

4 Except for Class 2500 concrete, prestressed concrete, and precast concrete, the Department will not accept concrete unless a completed *Form 700.04* or preapproved batch ticket that is signed and certified by the SCDOT-certified concrete technician, accompanies the delivery of the concrete. If a pre-approved batch ticket is being used and conditions warrant that the use of a batch ticket is unacceptable to the RCE, the SCDOT-certified concrete technician will discontinue using the batch ticket for acceptance and return to the use of *Form 700.04* until such time that the deficiencies of the batch ticket have been resolved and accepted by the RCE.

5 Provide sufficient advance notification to the RCE as to the name of the plant supplying the concrete in order to permit time to make the necessary arrangements for inspection of equipment at the plant.

April 1, 2013

Concrete Structures –
Preformed Joint Filler

Delete Subsection 702.2.2.1 of the Standard Specifications in its entirety and replace it with the following:

702.2.2.1 Preformed Joint Filler

Use preformed joint material that meets AASHTO M 153 or AASHTO M 213 with the following exceptions:

1. Use only materials manufactured from rubber.
2. Use materials that require a load of not less than 340 kPa or greater than 5200 kPa to compress to 50% of its thickness when tested in accordance with AASHTO T 42.
3. Use materials that have a recovery of at least 70% when tested in accordance with AASHTO T 42.

Use preformed joint material that is listed on QPL 81.

Provide a manufacturer's certification that states that the material conforms to SCDOT specifications.

April 1, 2004.

GEOTEXTILE FOR DRAINAGE FILTRATION

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 requirements[1] 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:

$$EOS\ No.\ (fabric) \geq 30\ U.S.\ Std.\ Sieve\ No.$$

B. Soils with more than 50% particles by weight passing U.S. No. 200 sieve:

$$EOS\ No.\ (fabric) \geq 50\ U.S.\ Std.\ Sieve\ No.$$

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:

Critical/Severe Applications *	Normal Applications
$k\ (fabric) \geq 10\ k\ (soil)^2$	$k\ (Fabric) \geq k\ (soil)^2$

* 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 Team (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.

January 1, 2009

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.

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.

January 2, 2013

Grout for Post-Tensioning and Prestressed Cored Slabs

Delete Subsection 704.2.6 and 704.2.7 of the Standard Specifications in their entirety and replace them with the following:

704.2.6 Post-Tensioning Grout

Use a commercial premixed grout specifically designed for grouting steel cables, anchorages, and rods meeting ASTM C 1107 requirements and approved in writing by the SME or BCE. Ensure that the commercial premixed grout is non-shrink, non-corrosive and non-metallic. At the option of the contractor a mixture of cement, water, and sand in the proportions of 1 bag of cement to 50 pounds of sand (all passing the No. 30 sieve) to about 5½ gallons of water may be used instead of the commercial premixed grout. Ensure that the sand and cement are from sources listed on the most recent editions of *SCDOT Qualified Products List 1* and *SCDOT Qualified Products List 6*. Ensure that water meets the requirements of **Subsection 701.2.11**. Use the amount of water necessary to provide a grout of the consistency of thick paint. The sand may be omitted if desired, but take care to obtain the consistency stated above. Mix the grout in a mechanical mixer for at least 2 minutes and keep it constantly agitated.

704.2.7 Grout for Prestressed Cored Slabs

Use a non-shrink, non-corrosive, and non-metallic grout meeting ASTM C 1107 requirements and approved in writing by the SME or BCE in the shear keys, dowel holes, and all recesses in the prestressed concrete of cored slabs that reaches a compressive strength of 5000 psi in 24 hours.

February 21, 2002

SEISMIC RESTRAINERS

DESCRIPTION:

Seismic restrainer units of the type or types shown on the plans, consisting of cable assemblies (cable restrainer units) and associated materials or components, shall conform to the details shown on the plans and the requirements of these special provisions.

MATERIALS:

The associated materials or components required for each seismic restrainer unit shall be as shown on the plans or as specified in these special provisions and include the following: structural steel components, studs and nuts, bearing plates, polyvinyl chloride pipe (including expansion fitting), elastomeric pads, and incidentals.

Cables shall be ¾" preformed, 6 x 19, wire strand core or independent wire rope core (IWRC), galvanized in conformance with the requirements in Federal Specification RR-W-410D, right regular lay, manufactured of improved plow steel with a minimum breaking strength of 45 kips. Two certified copies of mill test reports of each manufactured length of cable used shall be furnished to the Engineer.

Cable assemblies (cable restrainer units) shall consist of cables, swaged fittings, studs, nuts, washers cable yield indicators, disk springs and shall conform to the following requirements:

The swaged fitting shall be machined from hot-rolled bars of steel conforming to the requirements in AISI Designation: C1035, and shall be annealed, suitable for cold swaging. A lock pinhole to accommodate a ¼" plated spring steel pin shall be drilled through the head of the swaged fitting to retain the stud in proper position. The manufacturer's identifying mark shall be stamped on the body of the swaged fitting.

The 1" diameter stud shall conform to the requirements in ASTM A 449 after galvanizing. Prior to galvanizing, a 3/8" slot for the locking pin shall be milled in the stud end.

Nuts shall conform to the requirements in ASTM A563.

The Contractor shall furnish cable yield indicators manufactured by the following, or others, as approved by the Engineer:

Cable Moore Inc.
P.O. Box 23036
Oakland, CA 94623-0036
Phone: (510) 272-0218
Fax: (510) 272-0829

The cable yield indicators shall be machined from hot-rolled bars of steel conforming to the requirements in AISI Designation: C 1035 and shall be annealed, suitable for cold swaging. The heat number and manufacturer's identifying mark shall be stamped on the end surface of each cable yield indicator. The wall thickness of the reduced section of the cable yield indicator shall be machined by the Contractor so that the indicator yields at a load between 36 kips and 38 kips when tested in compression along the major axis at a test speed not to exceed ½" per minute. Two certified copies of the mill test and heat treating reports of each heat of bars used for cable yield indicators shall be furnished to the Engineer.

The disc springs shall be made from steel conforming to the requirements in ASTM A 684, Grade 1075. Galvanizing of the disc springs will not be required. The disc springs shall be cleaned and painted with a paint recommended by the manufacturer and color coded as shown on the plans.

The swaged fittings, stud and nut assembly shall develop the specified breaking strength of the cable.

The cable assemblies shall be shipped as a complete unit including cable yield indicators, disk springs, washers, stud and nut.

The Contractor shall be responsible for determining the required lengths of the cable assemblies.

The Contractor shall notify the Engineer, in writing, at least 2 days prior to tightening and setting of cable restrainer units.

The following materials shall be furnished to the Engineer for testing at the manufacturer's plant:

1. One sample cable assembly, consisting of a cable properly fitted with a swaged fitting and right hand thread stud at both ends, three (3) feet in total length, for each 200 cable assemblies or fraction thereof produced. In no case shall less than one sample of the cable assembly be furnished.

2. One percent of the cable yield indicators, but not fewer than 8, produced from each mill heat.

3. Two disc springs of each size produced from each mill heat.

Free ends of cable for restrainer units shall be securely wrapped at each end to prevent separation.

An approved thread locking system, consisting of a cleaner, primer and anaerobic adhesive, shall be applied where shown on the plans. Lubricants and foreign materials shall be removed from the threaded areas of both parts using the cleaner and small wire brush. The primer shall be applied to cover the threaded areas of both parts. The anaerobic adhesive shall be applied to fill the male threads in the area of the final position of the nut. The nut shall be installed at the location or to the torque shown on the plans, and an additional fillet of anaerobic adhesive shall be applied completely around the exposed junctions of the nut and male part.

Unless otherwise specified, steel parts shall conform to the requirements in AASHTO M 183. Steel for bearing bars or pins shall conform to the requirements in AASHTO M 183 or ASTM A 576 Grade 1030 (AISI 1030) and shall be other than rimmed or capped steel.

Steel parts shall be galvanized in conformance with the provisions in these special provisions Holes may be drilled after galvanizing provided all holes are repaired as provided in these special provisions.

Elastomeric pads shown with restrainer units shall conform to the provisions in "Elastomeric Bearings" of the Standard Specifications. Pads may consist of elastomer only regardless of thickness. Laminated reinforcement will not be required.

Polyvinyl chloride (PVC) pipe shall be commercial quality.

Each seismic restrainer unit shall consist of the number of cable units shown on the plans.

GALVANIZING

All components of seismic restrainer units, except disc springs, shall be galvanized in accordance with AASHTO M111 or M232 as applicable. Galvanizing of material shall be performed after fabrication.

Fabrication shall include all operations such as shearing, cutting, punching, forming, drilling, milling, and bending.

Components of bolted assemblies shall be galvanized separately before assembly.

Tapping of nuts or other internally threaded parts to be used with zinc coated bolts, anchor bars or studs shall be done after galvanizing and shall conform to the requirements for thread dimensions and overtapping allowances in ASTM A563.

Galvanized surfaces that are abraded or damaged at any time after the application of the zinc coating shall be field repaired in accordance with ASTM A780, except noted below:

> Galvanized surfaces that are abraded or damaged at any time after the application of the zinc coating shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the cleaned areas shall be painted with 2 applications of un-thinned zinc-rich primer (organic vehicle type) of a type approved by the Engineer. Aerosol cans shall not be used. Thickness of repair shall be not less than 3.5 mils. The Engineer will be the sole judge of the severity of damaged areas for purposes of repair or replacement.

CORROSION RESISTANT COATINGS

In addition to galvanization, cable restrainers shall have the following corrosion protection:

A. The cables shall be fully coated with corrosion inhibiting grease and then encapsulated by a smooth, high-density polyethylene (HDPE) sheath.
B. The swaged fittings and portion of the adjacent sheathed cable and threaded stud shall be covered with a mastic-lined heat shrink tubing.
C. Cable yield indicators, washers, disk springs, nuts, and threaded studs shall be coated with a prime coat of red calcium sulphonate penetrant.
D. Cable yield indicators, washers, disk springs, nuts, and the portions of threaded studs from the outer face of the nuts to and including the end of the rods shall be coated with a finish coat of gray calcium sulphonate/alkyd.

The grease, sheath, and heat shrink tubing, and the prime and finish coatings shall be applied at the manufacturer's plant, except that no finish coat shall be applied to any portion of the threaded stud that is within 40 mm from the exposed end of the stud. After the installation of cable restrainers is completed, all components described in item D above, which are accessible, shall be recoated with the finish coat.

The nuts shall be hot dipped galvanized conforming to the requirements of ASTM Designation: A563.

The materials to be furnished to the Engineer as specified in the “Materials Section” of this provision shall be furnished with all manufacturer's plant applied coatings.

The corrosion inhibiting grease shall fill all space between strand wires and shall encapsulate the strand giving an encasement diameter at least 0.12-mm greater than the diameter of the bare strand. The sheath shall be hot melt extruded onto the strand or shall be shop applied by an approved method that assures that all spaces between the sheath and the strand, and between the strand wires are filled with corrosion inhibiting grease.

The corrosion inhibiting grease shall 1) provide a continuous nonbrittle film of corrosion protection to the cable and lubrication between the cable and the sheathing, 2) resist flow from the sheathing, 3) be chemically stable and nonreactive with the cable, sheathing material and concrete, and 4) be organic with appropriate polar, moisture displacing, and corrosion inhibiting additives.
The corrosion inhibiting grease shall have the physical properties listed in Table 3.2.1 of the Post Tensioning Manual, Fourth Edition, but the Post Tensioning Institute and as modified below. At least 40 days before use, a sample from the lot to be used and test results shall be provided for the corrosion inhibiting grease.

TEST	REQUIREMENT	ASTM DESIGNATION
Water Soluble Ions: Nitrates	10g/kg maximum	D 3867
Corrosion Tests: 5 percent Salt Fog at 38˚C. 125 µm coating on 76 mm x 152 mm Q panel Type S, 1000 hrs minimum	Grade 7 or better	B 117, D 610
Compatibility with sheathing: Hardness change and volume change of polymer after exposure to grease 40 days at 66˚C.	15 percent maximum 10 percent maximum	D 4289, Except use D 792 for density

A Certificate of Compliance conforming to the Special Provisions shall be furnished to the Engineer certifying that the corrosion inhibiting grease complies with the requirements herein if sample and test results are not provided for the lot used.

HDPE sheathing shall 1) have a density between 940 kg/m^3 and 960 kg/m^3 as measured in conformance with ASTM Designation: D 792, A-2, 2) have a minimum wall thickness of 2 mm, 3) have sufficient strength to prevent damage during construction operations, 4) be watertight, 5) be chemically stable without embrittlement or softening, 6) be nonreactive with concrete, steel, or corrosion inhibiting grease, and 7) be flush with the ends of the galvanizing swaged fittings. Burned or damaged HDPE sheathing will be rejected.

The mastic-lined heat shrink tubing shall be placed over the galvanized swaged fitting and, after shrinking, shall extend a length of 50 mm onto both the sheathed cable and the threaded stud.

Heat shrink tubing shall conform to the requirements in Military Specification MIL-DTL-23053/15, UL Standard 468D, ANSI C119.1 or the Western Underground Guide Nos. 2.4 and 2.5.

The shrink tubing shall be installed as a continuous tube. Cutting the tube lengthwise and wrapping it around the assembly will not be permitted.

All sharp edges and burrs that may damage the shrink tubing shall be removed before applying the shrink tubing.

The inside surface of the shrink shall be kept free of foreign debris prior to and during application. All oil, dirt, grease, solvents, or other deleterious material shall be removed from the outer HDPE sheathing and the cable restrainer assembly immediately prior to applying the shrink tubing.

The shrink tubing shall be uniformly heated to the minimum temperature of 121˚C, from the center of the shrink tube region outward, until the tubing is completely shrunk and the adhesive is protruding from both ends of the tubing. The heat source shall be an electric heat gun capable of producing the uniform temperature. The heating method shall not burn or damage the shrink tubing or the HDPE sheathing.

Any damaged shrink tubing will be rejected. Damage shall include cuts, tears, pinholes, burns, or other defects.

Prior to coating with the prime coat of red calcium sulphonate penetrant, cable yield indicators, washers, disk springs, nuts, and threaded rods shall be steam cleaned in conformance with the provisions in the "Steam Cleaning," of this provision.
Pigment composition and physical properties of the penetrant shall conform to the following:

PROPERTY	REQUIREMENT	TEST METHOD
Total Pigment Content:	20 to 26 percent	Federal Test Method Standard (FTMS) No. 141, Method 4021.1
Pigment Component:		
Synthetic Red Iron Oxide	19 to 23 percent	ASTM D 3721
Zinc Hydroxy Phosphite	33 to 37 percent	ASTM D 4462
Barium Sulfate	40 to 48 percent	ASTM D 602
Nonvolatile Content	60 percent, minimum	ASTM D 2369
Consistency	60 to 165 grams (50 to 75 KU)	ASTM D 562
Density	1.139±0.024 grams per milliliter	ASTM D 1475
Drying Time, Dry to Recoat, 100 µm wet film	24 hours	ASTM D 1640
Flash Point	40˚C, minimum	ASTM D 3278
Salt Fog Performance, 25 to 50 µm dry film on SSPC-SP5 blasted cold-rolled steel panel	500 hours, no rust or creepage at scribe	ASTM B 117

The penetrant vehicle shall consist of 75 to 79 percent calcium sulphonate solution and 21 to 25 percent driers and aliphatic hydrocarbons.

The total dry film thickness of the prime coat shall be not less than 25 µm.

Disk springs shall be color coded, as shown on the plans, after application of the prime coat of calcium sulphonate penetrant.

Pigment composition and physical properties of the finish coat shall conform to the following:

PROPERTY	REQUIREMENT	TEST METHOD
Total Pigment Content:	22 to 28 percent	FTMS No. 141, Method 4021.1
Pigment Component:		
Titanium Dioxide	40 to 43 percent	ASTM D 476, Type III or IV
Carbon Black	0.04 to 1.00	ASTM D 561
Zinc Hydroxy Phosphite	28 to 32 percent	ASTM D 4462
Barium Sulfate	26 to 30 percent	ASTM D 602
Nonvolatile Content	70 percent, minimum	ASTM D 2369
Consistency	250 to 600 grams (90 to 120 KU)	ASTM D 562
Density	1.139±0.024 grams per milliliter	ASTM D 1475
Drying Time, 100 µm wet film		ASTM D 1640
Dust Free	1 to 4 hours	
Tack Free	5 to 12 hours	
Dry Hard	24 to 48 hours	
Flash Point	40˚C, minimum	ASTM D 3278
Sag Resistance	300 µm	FTMS 4494
Salt Fog Performance, 100 µm	1000 hours, no more than 1	ASTM B 117

dry film on SSPC-SP5 blasted cold-rolled steel panel	percent rust undercutting, blistering, or peeling	

The finish coat vehicle shall consist of 77 to 81 percent calcium sulphonate solution, 12 to 16 percent modified alkyd and 7 to 9 percent driers and aliphatic hydrocarbons.

The finish coat color shall match Federal Standard 595B, No. 26373. The total dry film thickness of the finish coat shall be not less than 200 µm.
The calcium sulphonate solution for the prime and finish coats shall be on the Department's list of approved products that are available from the Transportation Laboratory.

STEAM CLEANING

All dirt, grease, loose chalky paint or other foreign material which has accumulated on the previously painted or galvanized surfaces shall be removed with a steam cleaning apparatus which shall precede all other phases of cleaning. The temperature of the steam produced by the steam cleaning apparatus shall be between 130°C and 190°C at the nozzle. Gloss on the existing paint shall be removed without removing sound paint. Areas of gloss on the existing paint that are not removable by steam cleaning and rinsing, shall be lightly roughened by sanding with 100- to 200-grit sandpaper. Any paint, which becomes loose, curled or lifted or loses its bond with the preceding coat or coats after steam cleaning, shall be removed to sound paint or metal surface by the Contractor, at the Contractor's expense.

A biodegradable detergent shall be either added to the feed water of the steam generator or applied to the surface to be cleaned. The detergent shall be of such composition and shall be added or applied in such quantity that the cleaning as provided in the above paragraph is accomplished.

Steam cleaned surfaces shall be rinsed clean with fresh water to remove any residue, detergent or other foreign material.

Steam cleaning shall not be performed more than 2 weeks prior to painting or other phases of cleaning. Subsequent painting shall not be performed until the cleaned surfaces are thoroughly dry and in no case in less than 24 hours after cleaning.

CONSTRUCTION REQUIREMENTS:

Placing

Seismic restrainers shall be installed through PVC pipe in concrete enclosures as shown on the plans. The restrainers shall be installed after the concrete enclosures are poured.

METHOD of MEASUREMENT:

Seismic restrainer units will be measured by each unit. A group of _____ cables and associated components together will be considered as a single unit.

METHOD of PAYMENT:

The contract prices paid per each for seismic restrainer units shall include full compensation for furnishing all labor, materials (including non-metallic materials for restrainer units), tools, equipment and incidentals, and for doing all the work involved in furnishing and installing the seismic restrainer units, complete in place, as shown on the plans, and as specified in these special provisions, and as directed by the Engineer.

If a portion or all bridge joint restrainer units are fabricated more than 300 airline miles from Columbia, additional shop inspection expenses will be sustained by the State. Whereas it is and will be

impracticable and extremely difficult to ascertain and determine the actual increase in these expenses, it is agreed that payment to the Contractor for the joint restrainer units item of work will be reduced $5000 for each fabrication site located more than 300 air line miles from Columbia and an additional $3000 ($8000 total) for each fabrication site located more than 3000 air line miles from Columbia.

Item No.	Pay Item	Pay Unit
7093600	Seismic Restrainer (__ Cable Unit)	Each

June 1, 2010

ELASTOMERIC CONCRETE FOR EXPANSION JOINT HEADERS

1.0 Elastomeric Concrete for Expansion Joint Headers

1.1 Scope

Furnish all required labor, equipment, and materials and perform all operations necessary for installing the elastomeric concrete in accordance with the details shown on the Plans and with the requirements of this Specification.

1.2 Materials

Provide elastomeric concrete that is a mixture of a two-part polymer consisting of polyurethane and/or epoxy and kiln-dried aggregate, with the materials being supplied as a unit by the Manufacturer.

Provide materials that comply with the following minimum requirements at either 14 days or at the end of the specified curing time.

ELASTOMERIC CONCRETE PROPERTIES	TEST METHOD	MINIMUM REQUIREMENT
Compressive Strength, psi	ASTM D 695	2000
5% Deflection Resilience	ASTM D 695	95%
Splitting Tensile Strength, psi	ASTM D 3967	625
Bond Strength to Concrete, psi	ASTM C 882	450
Durometer Hardness	ASTM D 2240	50

BINDER PROPERTIES (without aggregate)	TEST METHOD	MINIMUM REQUIREMENT
Tensile Strength, psi	ASTM D 638	1000
Ultimate Elongation	ASTM D 638	150%
Tear Resistance, lb/in	ASTM D 624	200

In addition to the requirements above, provide elastomeric concrete that is resistant to water absorption, is resistant to chemical, UV, and ozone exposure, and is capable of withstanding temperature extremes.

Furnish a Manufacturer's certification verifying that the materials satisfy the above requirements. Provide samples of elastomeric concrete to the RCE, if requested, to independently verify conformance with the above requirements.

Provide material in packages clearly marked by the Manufacturer with the following information:

- Manufacturer's name and address
- Product Name
- Date of Manufacture
- Expiration Date
- Batch Number

- Mixing Instructions
- Storage and Handling Requirements
- Material Safety Data Sheets

1.3 Construction Requirements

1.3.1 Storage

Prior to beginning construction, deliver sufficient materials to the job-site to construct entirely the elastomeric concrete headers as detailed on the Plans. Store materials delivered to the job-site in the original unopened containers within an appropriate facility capable of maintaining storage conditions consistent with the requirements of the Manufacturer.

1.3.2 Installation

Provide a Manufacturer's representative on the job-site during the first installation of the elastomeric concrete to ensure that all aspects of the installation is in compliance with the Manufacturer's requirements. Do not proceed with installation until the weather conditions meet the requirements of the Manufacturer.

Place a bond breaker on the area where the elastomeric concrete headers are to be constructed before placing the asphaltic concrete overlay over the joints. After the overlay is placed, sawcut the overlay to the width shown on the plans, and remove the bond breaker and overlay material in the joint area.

Clean and dry the bonding surfaces and prepare joint surfaces according to the Manufacturer's instructions. Prepare and apply a primer to areas specified by the Manufacturer and in accordance with Manufacturer's instructions. Mix and place the elastomeric concrete, in accordance with the Manufacturer's instructions, into the prepared area on each side of the expansion joint.

Form and cast the elastomeric concrete headers to smoothly match the surface of the finished roadway. Finish the surface to a moderately rough texture such as that produced by a wood float. Protect the elastomeric concrete header material from damage, and allow the headers to cure properly prior to opening the work area to traffic. Do not open to traffic without the written approval of the Manufacturer. Provide a copy of this approval to the RCE.

1.3.3 Warranty

Provide a Manufacturer's warranty that the elastomeric concrete will not delaminate, debond, rut, or otherwise fail to perform for five years after the time the bridge is opened. Include in the warranty that the Manufacturer is required to repair or replace, at the discretion of SCDOT, all elastomeric joint headers that fail during the warranty period at no additional cost to the SCDOT and within three months of SCDOT's written request to do so. Also include the SCDOT file number and the estimated date the bridge will be opened. Do not include in the warranty acts of God or failures adjacent to the installation. If the joint needs to be repaired or replaced by the Manufacturer before the warranty expires, SCDOT will provide, with three weeks notice, traffic control for a time interval specified by the Manufacturer. Include in the warranty that if the replacement or repair affects the expansion joint material, the Manufacturer is required to install new expansion joint material. Replaced or prepared installations must use materials meeting the requirements of this Specification and the original Plans.

1.4 Measurement

No separate measurement for payment will be made for furnishing and installing of elastomeric concrete, providing the Manufacturer's representative, or for furnishing the warranty.

1.5 Payment

Include all costs of elastomeric concrete in the contract unit price bid for Expansion Joint System with Concrete Header.

January 03, 2013

LANE CLOSURE RESTRICTIONS

Delete Subsection 601.1.3 of the Standard Specifications in their entirety and replace them with the following:

601.1.3 Restrictions

1 Installation and maintenance of a lane closure is PROHIBITED when not actively engaged in work activities specific to the location of the lane closure unless otherwise specified and approved by the

RCE. 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 within the contract unless otherwise specified and approved by the RCE. Also, a maximum lane closure length specified within a contract 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 contract specified parameters, shall require approval by the RCE prior to installation. The length and duration of each lane closure may be reduced by the RCE if the work zone impacts generated by a lane closure are deemed excessive or unnecessary.

2 When hourly lane closure prohibitions are specified, 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 the 15 to 30 foot clear zone based upon the roadway speed limit during the prohibitive hours specified.

3 The Department reserves the right to restrict the installation of lane closures, road closures, shoulder closures, pacing operations or any operations that will impact the efficient flow of traffic or hinder normal traffic operations on the roads of the South Carolina state highway system during peak travel hours, holidays, holiday weekends, extended holiday periods, weekends, special events or any time traffic volumes are high. Do not close travel lanes of high volume highways during peak traffic periods or at any time traffic volumes exceed the numerical values determined to be acceptable by the Department. Do not close lanes or roads with high volume commuter traffic in cities and urban areas during peak traffic periods. Waiver or modification of these restrictions or the established hourly lane closure prohibition hours shall require written approval from either the Deputy Secretary of Engineering, the District Engineering Administrator or the Director of Construction. When determined to request such a waiver or modification of these restrictions, submit the request to the RCE no less than 30 days prior to the day in question.

4 The Department prohibits lane closures on interstate highways and high volume multilane primary routes during holiday weekends, extended holiday periods or special events as defined below unless otherwise directed by the Department. The Department's holiday lane closure restrictions for holidays that are observed on a Monday will include the weekend and are considered a holiday weekend unless otherwise established by these specifications. The Department defines the typical Monday holiday weekend as from 6:00 am of the Friday before the weekend until 6:00 a.m. of the Tuesday after the holiday. Lane closures, road closures, shoulder closures, pacing operations or any operations that will impact the efficient flow of traffic or hinder normal traffic operations during these Monday holiday weekends as defined above are prohibited unless otherwise directed by the Department.

5 Easter and Thanksgiving holidays are varied and extended holiday periods of a holiday weekend. Easter holidays are defined as from 12:00 noon of the Thursday before Easter until 6:00 p.m. of the Monday after Easter. Thanksgiving holidays are defined as from 12:00 noon of the Wednesday before Thanksgiving Day until 6:00 a.m. of the Monday after Thanksgiving Day. Lane closures, road closures, shoulder closures, pacing operations or any operations that will impact the efficient flow of traffic or hinder normal traffic operations during the Easter and Thanksgiving holidays as defined above are prohibited unless otherwise directed by the Department.

[6] The 4th of July holiday is considered an extended holiday period. Considering the progressive nature of the calendar, this extended holiday period will vary from year to year depending the upon day of the week the holiday occurs. See the table below. Lane closures, road closures, shoulder closures, pacing operations or any operations that will impact the efficient flow of traffic or hinder normal traffic operations during the 4th of July holiday as defined below are prohibited unless otherwise directed by the Department.

4th of JULY HOLIDAY	
DAY OF WEEK	**DURATION**
MONDAY	6:00 AM FRIDAY, JULY 1ST through 10:00 PM SUNDAY JULY 10TH
TUESDAY	6:00 AM FRIDAY, JUNE 30TH through 10:00 PM SUNDAY JULY 9TH
WEDNESDAY	6:00 AM FRIDAY, JUNE 29TH through 10:00 PM SUNDAY JULY 8TH
THURSDAY	6:00 AM FRIDAY, JUNE 28TH through 10:00 PM SUNDAY JULY 7TH
FRIDAY	6:00 AM FRIDAY, JUNE 27TH through 10:00 PM SUNDAY JULY 13TH
SATURDAY	6:00 AM FRIDAY, JUNE 26TH through 10:00 PM SUNDAY JULY 12TH
SUNDAY	6:00 AM FRIDAY, JUNE 25TH through 10:00 PM SUNDAY JULY 11TH

[7] The Christmas holidays are considered an extended holiday period. Considering the progressive nature of the calendar, this extended holiday period will vary from year to year depending the upon day of the week the holiday occurs. See the table below. Lane closures, road closures, shoulder closures, pacing operations or any operations that will impact the efficient flow of traffic or hinder normal traffic operations during the Christmas holidays as defined below are prohibited unless otherwise directed by the Department.

CHRISTMAS HOLIDAYS	
DAY OF WEEK	**DURATION**
MONDAY	6:00 AM FRIDAY, DECEMBER 22ND through 10:00 PM WEDNESDAY JANUARY 3RD
TUESDAY	6:00 AM FRIDAY, DECEMBER 21ST through 10:00 PM THURSDAY JANUARY 3RD
WEDNESDAY	6:00 AM FRIDAY, DECEMBER 20TH through 10:00 PM FRIDAY JANUARY 3RD
THURSDAY	6:00 AM TUESDAY, DECEMBER 23RD through 10:00 PM SUNDAY JANUARY 4TH
FRIDAY	6:00 AM WEDNESDAY, DECEMBER 23RD through 10:00 PM SUNDAY JANUARY 3RD
SATURDAY	6:00 AM THURSDAY, DECEMBER 23RD through 10:00 PM MONDAY JANUARY 3RD
SUNDAY	6:00 AM FRIDAY, DECEMBER 23RD through 10:00 PM TUESDAY JANUARY 3RD

[8] Special events are events generating excessive traffic as determined by the Department. Lane closures, road closures, shoulder closures, pacing operations or any operation that would impact the efficient flow of traffic or hinder normal traffic operations during special events are prohibited unless otherwise directed by the Department.

[9] Observe all time restrictions regarding lane closures, road closures, shoulder closures or pacing operations. The RCE may extend these time restrictions as traffic conditions warrant. The Department reserves the right to suspend a lane closure, road closure, shoulder closure, pacing operation or any operation if the RCE determines a delay or a resulting traffic backup is excessive. Observe and maintain all project specific time restrictions as specified by the Plans, the Specifications and the RCE. Install and remove lane closures, road closures, shoulder closures or pacing operations including all relative traffic control devices and signs, within the time restrictions. Coordinate work activities requiring lane closures, road closures, shoulder closures or pacing operations in accordance with all restrictions.

July 1, 2011

Erosion Control

Section 815.2.5.1 Posts

Replace Section 815.2.5.1 in its entirety with the following:

Furnish steel posts a minimum of 60 inches long and meeting the minimum physical requirements specified in Subsection 815.2.12 or Furnish Rigid PVC T-posts a minimum of 60 inches long meeting the physical requirements specified in paragraph 3 of this subsection.

When sandy soils are present on site and steel posts are utilized, provide a metal plate welded near the bottom of the steel post so that when the post is driven to the proper depth, the plate is below the ground level for added stability. In areas where conditions warrant, larger posts or reduced post spacing may be required to provide an adequate fence to handle the stress from sediment loading.

Rigid PVC T-posts shall meet the following physical requirements. Material shall consist of Rigid Polyvinyl Chloride with cell classification of 30304311 as determined in accordance with ASTM D4216. Width of the flange shall be a minimum of 2.1". Depth of the web shall be a minimum of 1.625". The thickness of the flange and the thickness of the web shall each be a minimum of 0.35" at the intersection of the flange and web. Weight per unit length shall be no less than 0.8lb/ft. Posts shall have only a single 3/8" hole in the center of the web spaced every 3" in the top 3' of the post. No holes shall be present on any part of the flange. Silt fence shall be placed directly against the flange of the post, with the flange parallel to the run of silt fence. In areas where conditions warrant, reduced post spacing may be required to provide an adequate fence to handle the stress from sediment loading.

January 3, 2013

Lane Closure Restrictions

Delete Subsection 601.1.3 of the Standard Specifications in their entirety and replace them with the following:

601.1.3 Restrictions

1 Installation and maintenance of a lane closure is PROHIBITED when not actively engaged in work activities specific to the location of the lane closure unless otherwise specified and approved by the RCE. 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 within the contract unless otherwise specified and approved by the RCE. Also, a maximum lane closure length specified within a contract 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 contract specified parameters, shall require approval by the RCE prior to installation. The length and duration of each lane closure may be reduced by the RCE if the work zone impacts generated by a lane closure are deemed excessive or unnecessary.

2 When hourly lane closure prohibitions are specified, 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 the 15 to 30 foot clear zone based upon the roadway speed limit during the prohibitive hours specified.

3 The Department reserves the right to restrict the installation of lane closures, road closures, shoulder closures, pacing operations or any operations that will impact the efficient flow of traffic or hinder normal traffic operations on the roads of the South Carolina state highway system during peak travel hours, holidays, holiday weekends, extended holiday periods, weekends, special events or any time traffic volumes are high. Do not close travel lanes of high volume highways during peak traffic periods or at any time traffic volumes exceed the numerical values determined to be acceptable by the Department. Do not close lanes or roads with high volume commuter traffic in cities and urban areas during peak traffic periods. Waiver or modification of these restrictions or the established hourly lane closure prohibition hours shall require written approval from either the Deputy Secretary of Engineering, the District Engineering Administrator or the Director of Construction. When determined to request such a waiver or modification of these restrictions, submit the request to the RCE no less than 30 days prior to the day in question.

4 The Department prohibits lane closures on interstate highways and high volume multilane primary routes during holiday weekends, extended holiday periods or special events as defined below unless otherwise directed by the Department. The Department's holiday lane closure restrictions for holidays that are observed on a Monday will include the weekend and are considered a holiday weekend unless otherwise established by these specifications. The Department defines the typical Monday holiday weekend as from 6:00 am of the Friday before the weekend until 6:00 a.m. of the Tuesday after the holiday. Lane closures, road closures, shoulder closures, pacing operations or any operations that will impact the efficient flow of traffic or hinder normal traffic operations during these Monday holiday weekends as defined above are prohibited unless otherwise directed by the Department.

5 Easter and Thanksgiving holidays are varied and extended holiday periods of a holiday weekend. Easter holidays are defined as from 12:00 noon of the Thursday before Easter until 6:00 p.m. of the Monday after Easter. Thanksgiving holidays are defined as from 12:00 noon of the Wednesday before Thanksgiving Day until 6:00 a.m. of the Monday after Thanksgiving Day. Lane closures, road

closures, shoulder closures, pacing operations or any operations that will impact the efficient flow of traffic or hinder normal traffic operations during the Easter and Thanksgiving holidays as defined above are prohibited unless otherwise directed by the Department.

6 The 4th of July holiday is considered an extended holiday period. Considering the progressive nature of the calendar, this extended holiday period will vary from year to year depending the upon day of the week the holiday occurs. See the table below. Lane closures, road closures, shoulder closures, pacing operations or any operations that will impact the efficient flow of traffic or hinder normal traffic operations during the 4th of July holiday as defined below are prohibited unless otherwise directed by the Department.

4th of JULY HOLIDAY	
DAY OF WEEK	**DURATION**
MONDAY	6:00 AM FRIDAY, JULY 1ST through 10:00 PM SUNDAY JULY 10TH
TUESDAY	6:00 AM FRIDAY, JUNE 30TH through 10:00 PM SUNDAY JULY 9TH
WEDNESDAY	6:00 AM FRIDAY, JUNE 29TH through 10:00 PM SUNDAY JULY 8TH
THURSDAY	6:00 AM FRIDAY, JUNE 28TH through 10:00 PM SUNDAY JULY 7TH
FRIDAY	6:00 AM FRIDAY, JUNE 27TH through 10:00 PM SUNDAY JULY 13TH
SATURDAY	6:00 AM FRIDAY, JUNE 26TH through 10:00 PM SUNDAY JULY 12TH
SUNDAY	6:00 AM FRIDAY, JUNE 25TH through 10:00 PM SUNDAY JULY 11TH

7 The Christmas holidays are considered an extended holiday period. Considering the progressive nature of the calendar, this extended holiday period will vary from year to year depending the upon day of the week the holiday occurs. See the table below. Lane closures, road closures, shoulder closures, pacing operations or any operations that will impact the efficient flow of traffic or hinder normal traffic operations during the Christmas holidays as defined below are prohibited unless otherwise directed by the Department.

CHRISTMAS HOLIDAYS	
DAY OF WEEK	**DURATION**
MONDAY	6:00 AM FRIDAY, DECEMBER 22ND through 10:00 PM WEDNESDAY JANUARY 3RD
TUESDAY	6:00 AM FRIDAY, DECEMBER 21ST through 10:00 PM THURSDAY JANUARY 3RD
WEDNESDAY	6:00 AM FRIDAY, DECEMBER 20TH through 10:00 PM FRIDAY JANUARY 3RD
THURSDAY	6:00 AM TUESDAY, DECEMBER 23RD through 10:00 PM SUNDAY JANUARY 4TH
FRIDAY	6:00 AM WEDNESDAY, DECEMBER 23RD through 10:00 PM SUNDAY JANUARY 3RD
SATURDAY	6:00 AM THURSDAY, DECEMBER 23RD through 10:00 PM MONDAY JANUARY 3RD
SUNDAY	6:00 AM FRIDAY, DECEMBER 23RD through 10:00 PM TUESDAY JANUARY 3RD

8 Special events are events generating excessive traffic as determined by the Department. Lane closures, road closures, shoulder closures, pacing operations or any operation that would impact the efficient flow of traffic or hinder normal traffic operations during special events are prohibited unless otherwise directed by the Department.

9 Observe all time restrictions regarding lane closures, road closures, shoulder closures or pacing operations. The RCE may extend these time restrictions as traffic conditions warrant. The Department reserves the right to suspend a lane closure, road closure, shoulder closure, pacing operation or any operation if the RCE determines a delay or a resulting traffic backup is excessive. Observe and maintain all project specific time restrictions as specified by the Plans, the Specifications and the RCE. Install and remove lane closures, road closures, shoulder closures or pacing operations including all relative traffic control devices and signs, within the time restrictions. Coordinate work activities requiring lane closures, road closures, shoulder closures or pacing operations in accordance with all restrictions.

August 1, 2013

CRANE SAFETY

The contractor's attention is directed to the following Crane Safety criteria. All applicable items under the submittal list section shall be submitted to the Resident Construction Engineer (RCE) before any crane operations may begin. If any personnel or equipment is changed or added, all applicable items shall be updated and submitted to the RCE before continuing with crane(s) operations.

All contractors shall comply with the manufacturer specifications and limitations applicable to the operation of any and all cranes and derricks. Prime contractors and sub-contractors shall comply with the latest Occupational Safety and Health Administration (OSHA) regulations, adopted American National Standards Institute (ANSI) and American Society of Mechanical Engineers (ASME) crane standards, and other applicable standards including, but not limited to the following:

- OSHA 29 CFR 1926 Subpart CC "Cranes and Derricks in Construction"
- OSHA 29 CFR 1926.251 "Rigging Equipment for Material Handling"
- ASME B30.5-2007 "Mobile and Locomotive Cranes"
- ASME B30.8-2010 " Floating Cranes and Floating Derricks"
- ASME B30.22-2005 "Articulating Boom Cranes"
- ASME B30.26-2010 "Rigging Hardware"

Submittal List

1. **Crane Operators:** All crane operators shall be certified by the National Commission for the Certification of Crane Operators (NCCCO), National Center for Construction Education and Research (NCCER), or Crane Institute of America Certification (CIC).

   a. Contractor shall submit a copy of the NCCCO, NCCER, or CIC certification for each crane operator prior to performing any crane operations on the job site. The original certification card shall be available for review upon request and must remain current within a 5 year expiration date for the duration of the job. (Contractors with a crane operator-in- training on the jobsite shall comply with all the OSHA Subpart CC requirements).

   b. Contractor shall submit a copy of the current Crane Operators Medical Evaluation card (3 year expiration) in the form of NCCCO, NCCER or CIC Physical Examination form or equivalent meeting the ASME B30.5 requirement or a current USDOT Medical Examiner's Certificate card (2 year expiration). The original medical card or equivalent for all crane operators shall be available for review upon request.

2. **Competent Person:** The named competent person will have the responsibility and authority to stop any work activity due to safety concerns.

   a. Contractor shall submit the name and qualifications of the "Competent Person" as defined by OSHA Subpart CC responsible for all crane safety and lifting operations.

September 1, 2013

WORK ZONE TRAFFIC CONTROL TRAINING REQUIREMENTS FOR CONTRACTORS / SUBCONTRACTORS

1. Description:

This specification details the work zone traffic control training requirements for employees and representatives of a contractor or subcontractor under contract to the South Carolina Department of Transportation (SCDOT) whose job duties include responsibilities relative to implementation and maintenance of the Transportation Management Plan (TMP). "Employees and representatives of a contractor or subcontractor" will henceforth be referred to as "employee" or "employees" and "contractor or subcontractor" will henceforth be referred to as "contractor".

The SCDOT requires the contractor to provide documentation to substantiate successful completion and attainment of a passing score of a prescribed training course conducted by an SCDOT approved provider by those employees whose job duties categorize them as "designated trainees" as defined hereinafter.

2. Implementation:

These requirements for work zone traffic control training for employees of those entities under contract to the SCDOT whose job duties include responsibilities relative to implementation and maintenance of a TMP shall become effective on all projects let to contract after September 1, 2013.

3. Designated Trainees:

An employee whose job duty responsibilities, as designated hereto, impact or involve any of or all of the components of a TMP must successfully complete an advanced work zone traffic control training program. These components include the primary component, the "Temporary Traffic Control" plan, and the secondary components, the "Transportation Operations" plan and the "Public Information" plan.

An employee whose job duties include any of the following responsibilities regarding the TMP shall successfully complete an advanced work zone traffic control training program conducted by an SCDOT approved work zone traffic control training provider:

Supervision of the field installation of any or all components of the TMP
Supervision of the maintenance of any or all components of the TMP
Supervision of the removal of any or all components of the TMP
Design and development of revisions to an existing TMP
Design and development of a new or alternate TMP
Any decision-making responsibilities regarding the TMP

Those employees whose job duties do not include responsibilities relative to the TMP as stated above are not required to attend an advanced work zone traffic control training program. However, it is recommended that all employees whose job duties place them on the job site within the highway rights-of-way within 30 feet or less of a travel lane open to traffic should attend a basic work zone traffic control training course.

Also, an employee whose job duties include "flagger" shall successfully complete a "Flagger Training" course. However, regarding an employee whose job duties include "flagger" but does not involve any of the responsibilities listed above, successful completion of a "Flagger Training" course is the only mandatory work zone traffic control training course required for this employee; other work zone traffic control training courses are elective.

4. Approved Work Zone Traffic Control Training Providers:

The SCDOT recognizes the following organizations as acceptable providers of an advanced work zone traffic control training program, a "Flagger Training" course or the optional basic work zone traffic control training course:

American Traffic Safety Services Association (ATSSA)
Institute for Transportation Research and Education at North Carolina State University (ITRE)
Carolinas Association of General Contractors (AGC)
National Safety Council South Carolina Chapter

These organizations provide work zone traffic control training in compliance with the MUTCD and reference requirements specific to SCDOT. Therefore, work zone traffic control training provided by entities other than those listed above are not considered comparable and shall be unacceptable.

Specific course material for work zone traffic control training courses designated as "Basic", "Advanced", "Supervisor" or "Flagger" and any additional training courses not specified here is determined by the work zone traffic control training course provider and has undergone review and received acceptance by SCDOT. Also, the passing score for each training course is determined by the work zone traffic control provider.

5. Training Requirements / Qualifications:

Successful completion of an advanced work zone traffic control training program is defined as achieving a passing score in all courses, including any prerequisite courses, to attain a level considered "advanced", "supervisor" or any other relative term as designated by the provider to imply the trainee has an understanding of the course material inclusive of design, implementation and maintenance of work zone traffic control scenarios. Upon successful completion of the program, the trainee should also possess an understanding for determining the need for and developing and implementing adjustments as necessary when applying typical work zone traffic control applications to non-typical work site conditions and scenarios.

The employee whose job duty responsibilities mandate successful completion of an advanced work zone traffic control training program shall do so prior to performing any job duties with responsibilities relative to design and development of a TMP or revisions of an existing TMP or any decision-making responsibilities regarding the TMP or supervision of the field installation and maintenance of any and all components of the TMP.

Also, an employee whose job duties mandate successful completion of a "Flagger" training course shall do so prior to performing any job duties relative to flagging traffic.

Each employee who has successfully completed an approved advanced work zone traffic control training program or a "Flagger" training course shall attend and complete a refresher course relative to the employee's job duties on a 5-year incremental time frame.

6. Documentation:

The contractor shall provide proof of successful completion of an acceptable advanced work zone traffic control training class by those employees whose job duty responsibilities mandate successful completion of approved work zone traffic control training to the Resident Engineer prior to the employee performing the job duties that incorporate responsibilities which necessitate approved work zone traffic control training. For proof of successful completion of an approved work zone traffic control training class, provide a copy of the certificate of training from the organization who conducted the training to the Resident Engineer. Failure to provide the required documentation as specified shall prevent SCDOT acceptance of the employee as properly trained and acceptable for conducting those job duties that necessitate the prescribed work zone traffic control training.

The contractor shall provide proof of successful completion of an acceptable “Flagger Training” course by all employees whose job duties require them to be the “Flagger” within a flagging operation to the Resident Engineer prior to the employee performing any “Flagger” job duties.

The contractor shall provide proof of successful completion of an acceptable advanced work zone traffic control refresher course for those employees no later than 60 days beyond the 5 year anniversary date of the employee’s certificate date of completion of a previous advanced work zone traffic control training program.

Documentation of proof of completion of a basic work zone traffic control training course by employees whose job duties require their presence on the job site within the highway rights-of-way but exclude any responsibilities relative to the TMP is not required.

STATE OF SOUTH CAROLINA)
)
COUNTY OF)

CLAIM CERTIFICATION

Personally appeared before me_____who being duly sworn deposes and states that:

1. He is _____of _____.
   Position Name of Contractor
2. He has submitted a claim on behalf of _____.
   Name of Contractor
3. SCDOT and the claim is submitted pursuant to Section 105.16 of the Standard Specifications.
4. The claim was prepared in accordance with the requirements of Section 105.16 and to the extent available all information required by Section 105.16 is included.
5. The claim is made in good faith.
6. The supportive data are accurate and complete to the best of my knowledge.
7. The amount of claim accurately reflects the amount that I in good faith believe is the DOT's liability.

_____

SWORN to before me this
_____day of_____ ,_____.

_____
Notary Public for South Carolina
My commission expires: _____

Form 616 (7/10/89)

CONTRACTOR NOTICE OF CLAIM

DATE: _____

FILE NO. _____

CONTRACTOR: _____

NOTICE OF CLAIM FOR ADJUSTMENT DUE TO: (circle as appropriate)

ALTERATION OF PLANS	CHANGED/DIFFERING SITE CONDITIONS	DELAY/SUSPENSION OF WORK
EXTRA WORK	TIME EXTENSION	OTHER

NATURE OF THE EVENT:

CAUSE OF THE EVENT:

IMPACT OF THE EVENT: (on time of performance on contract price)

In the event this issue is not resolved by Supplemental Agreement or Force Account Order, the Contractor shall submit to the Department at the appropriate time a fully detailed request ("Claim") for additional time or compensation.

Copy of this notice was delivered to the RESIDENT ENGINEER on

_____, 20__ by_____.

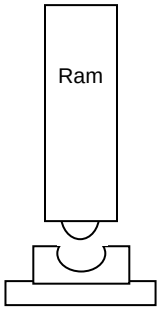
SIGNED: _____
(Contractor's Representative)

RECEIVED BY:

_____ DATE: _____
RESIDENT ENGINEER

Director of Construction Date Sent to FHWA_____

File No.		Project No. (PIN):	
County:		Route:	
Description:			
Contractor:			



Hammer

Manufacturer:		Model:			
Type:		Serial No.			
Rated Energy (k-ft)		at		Length of stroke (ft)	
Lead Size (in):					
Modifications:					

Note: Attach any hammer modification specifications. Manufacturer's Specifications may be required if hammer is not found in Wave Equation database.

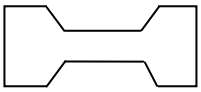
Date of Last Maintenance:	
Type of Maintenance:	
Performed By:	

Striker Plate

Weight (kips):			
Diameter (in):		Thickness (in):	

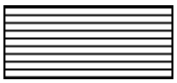
Hammer Cushion

Description:				
Material Description		No. of Layers	Modulus of Elasticity (ksi)	Thickness (in)
1				
2				
Area (sq. in):		Total Thickness (in)		
Coefficient of Restitution:				



Pile Cap (Helmet)

Dimension:	
Pile Cap Weight (kips):	
Inserts Weight (kips):	



Pile Cushion

Material:			
Thickness (in.)		Area (sq. in):	
Modulus of Elasticity (ksi):			
Coefficient of Restitution:			

Pile

Pile Type/Size & Pile Point:			
Total Pile & Point Length (ft):		Exposed Pile Point Length (ft):	
Pile Cross-Sectional Area (sq.in):			
Pipe Pile Wall Thickness (in):			
Pile Tip Description:			
Splice Description:			
Splice Location From Pile Top (ft):			
Concrete Pile Strength, f'_c (psi):			
Steel Pile Yield Strength, F_y (ksi):			

Note: Within 30 calendar days after award of contract or no later than 30 days before driving the first pile, submit form and Pile Installation Plan to the Geotechnical Design Support Engineer, with copy to the Bridge Construction Engineer and RCE.

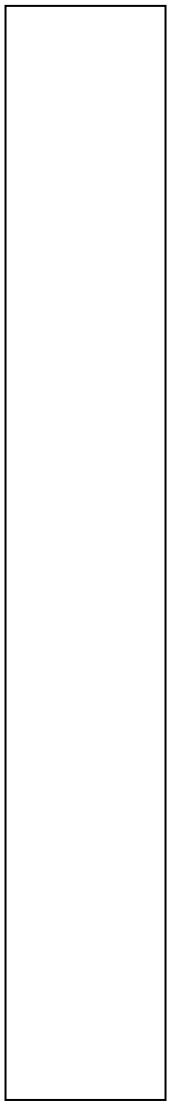
SCDOT – Preconstruction Support Geotechnical Design Support Engineer P.O. Box 191 Columbia, SC 29202-0191 Telephone (803) 737-1571 FAX (803) 737-0608	Submitted By:		
	Title:		
	Telephone No.	( )-	Date:

DRILLED SHAFT LOG (REV 06-03-02)

Project Name _____ Page 1 of 6
File No. _____ Bent No. _____
Contractor _____ Shaft No. _____
Completed By Contractor DS Foreman - Date / / Station _____
Reviewed By SCDOT Inspector - Date / / Offset _____

Date Cased _____
Date Opened _____
Date Poured _____

Elevation (ft)



	Construction	Temporary
Casing Type:		
Casing Dimension (OD):		
Bottom of Casing Elevation (FT)		
Top of Casing Elevation (FT)		

Diameter of Rock Socket (IN) _____
Diameter of Shaft (IN) _____
Mud-line/Ground Surface Elevation (FT) _____
Wet & Dry Shaft Length (FT) _____
Rock Socket Length (FT) _____
Top of Shaft Elevation (FT) _____
Tip Elevation (FT) _____
Constructed Shaft Length (FT) _____
Testing/Other: _____

Volume of Concrete: Theoretical (VT) CY _____
OP = VP-VT = _____ UP = VT - VP= Actual (VP) CY _____
Reinforcement Cage Installed: Type _____
Duration of Pour (min) _____

Legend

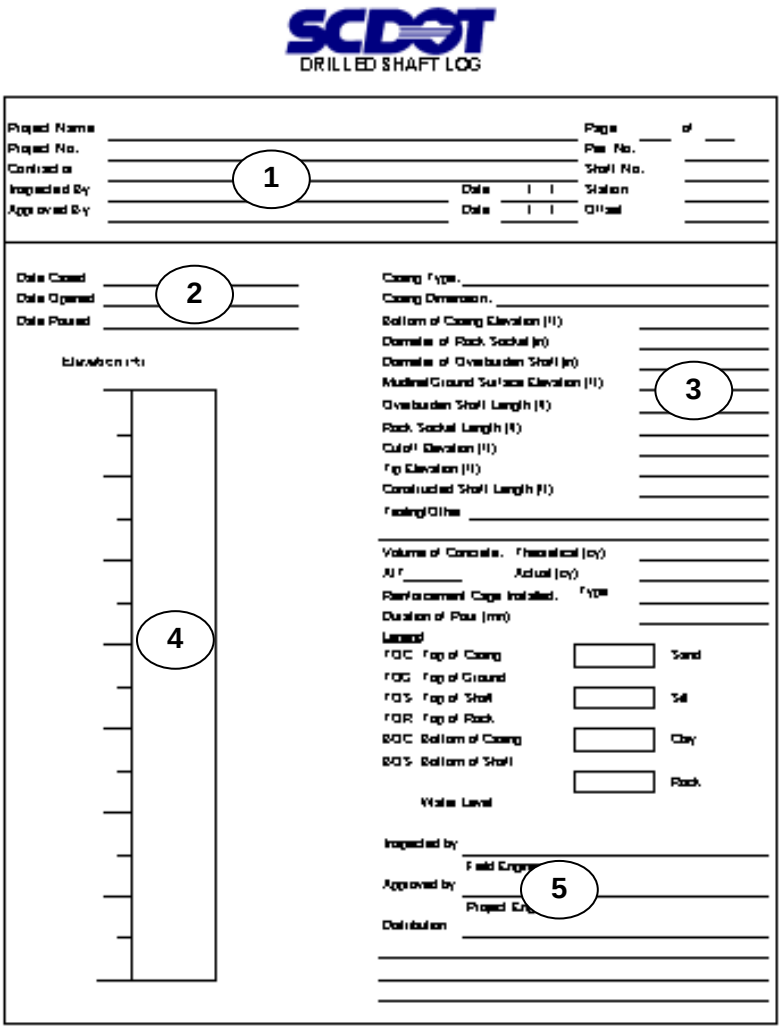
TOC	Top of Casing		Sand
TOG	Top of Ground		
TOS	Top of Shaft		Silt
TOR	Top of Rock		
BOC	Bottom of Casing		Clay
BOS	Bottom of Shaft		
BOR	Bottom of Rock		Rock

Water Level

Completed by Contractor _____ DS Foreman/Engineer
Reviewed by SCDOT _____ Inspector/Engineer
Notes: _____
Shaft location variance at top: _____

EXHIBIT 6 - SUPPLEMENTAL SPECIFICATIONS AND FORMS

HOW TO COMPLETE THE
DRILLED SHAFT LOG



Fill in every blank on the form. If it does not apply put an “N/A” or a long dash.

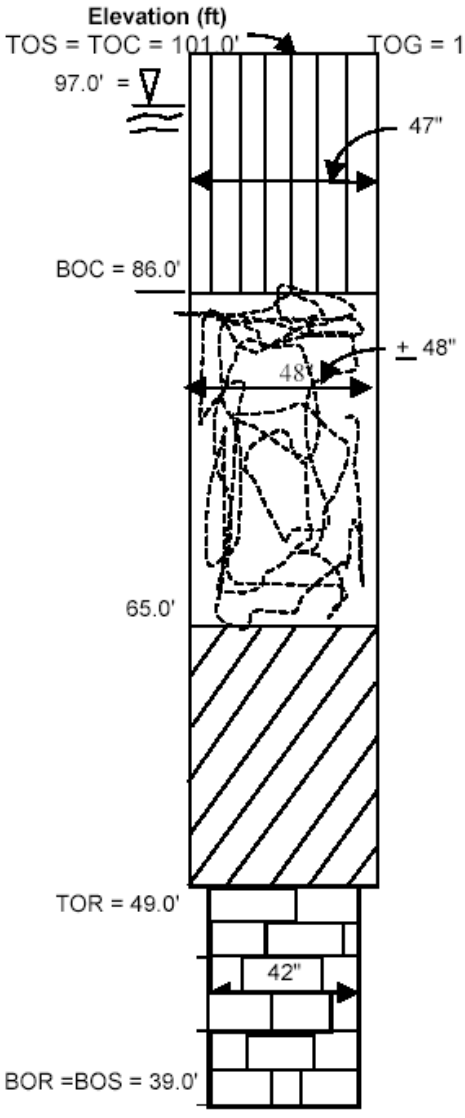
Use pencil – but never erase. If you need to change something, strike a single line through the item and insert the correct information above it. If there is insufficient room to make a note, footnote the item and go to the bottom of the page, or use a separate page.

1. Heading: - Fill in <u>before</u> drilling starts.
   - Be sure to print your name and the start date of drilling.
   - The Geotechnical Engineer will sign approval line.
2. Shaft Data: - Fill in appropriate dates, elevations, and diameters.
3. Concrete Data: Record data from the Concrete Volumes form.
4. Construct Shaft Illustration using the symbols provided.
5. Fill in “Inspected by” and “Distribution”.

DRILLED SHAFT LOG (REV 06-03-02)
SAMPLE 1 Construction Casing

Project Name	Replace Bridge over Cooper Creek along US-322			Page 1 of 6	
File No.	4.995			Bent No.	3
Contractor	Drilled Shaft, Inc.			Shaft No.	3
Completed By Contractor	DS Foreman - John Q. Doe	Date	06/05/02	Station	508 + 36
Reviewed By SCDOT	Inspector - John Smith	Date	06/05/02	Offset	24 FT. Right

Date Cased	06/04/02
Date Opened	06/04/02
Date Poured	06/05/02



	Construction	Temporary
Casing Type:	Steel	
Casing Dimension (OD):	48.0 IN.	
Bottom of Casing Elevation (FT)	86.0 FT. msl	
Top of Casing Elevation (FT)	101.0 FT. msl	
Diameter of Rock Socket (IN)	42.0 IN.	
Diameter of Shaft (IN)	37 Ft. @ +48.0 IN. & 15 FT. @ 47 IN.	
Mud-line/Ground Surface Elev. (FT)	100.0 FT. msl	
Wet & Dry Shaft Length (FT)	52.0 FT.	
Rock Socket Length (FT)	10.0 FT. @ 42IN.	
Top of Shaft Elevation (FT)	101.0 FT. msl	
Tip Elevation (FT)	39.0 FT. msl	
Constructed Shaft Length (FT)	62.0 FT.	

Testing/Other: Slurry, Slump, Air, Compression Cylinders, & CSL

Volume of Concrete:
OP = VP-VT = 0.6 CY UP = VT - VP=

Theoretical (VT) CY	27.2
Actual (VP) CY	27.8

Reinforcement Cage Installed: Type Spiral

Duration of Pour (min): 100 Min.

Legend

TOC	Top of Casing
TOG	Top of Ground
TOS	Top of Shaft
TOR	Top of Rock
BOC	Bottom of Casing
BOS	Bottom of Shaft
BOR	Bottom of Rock

Sand, Silt, Clay, Rock

Water Level

Completed by Contractor	DS Foreman/Engineer - John Q Doe
Reviewed by SCDOT	Inspector/Engineer - John Smith

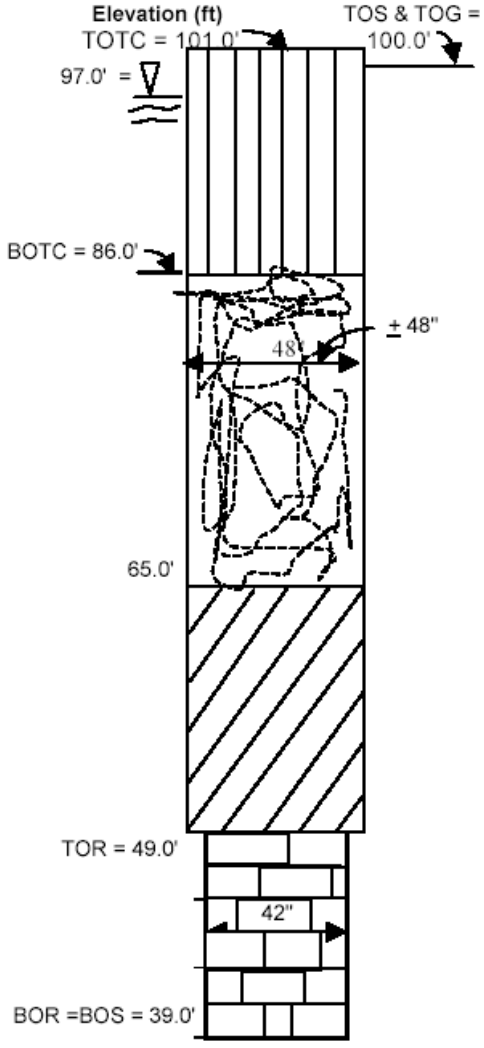
Notes:
Shaft location variance at top: 2" after plan station & 1" right.

EXHIBIT 6 - SUPPLEMENTAL SPECIFICATIONS AND FORMS

DRILLED SHAFT LOG (REV 06-03-02)
SAMPLE 2 Temporary Casing

Project Name	Replace Bridge over Cooper Creek along US-322			Page 1 of 6	
File No.	4.995			Bent No.	6
Contractor	Drilled Shaft, Inc.			Shaft No.	3
Completed By Contractor	DS Foreman - John Q. Doe	Date	06/05/02	Station	508 + 36
Reviewed By SCDOT	Inspector - Jane Smith	Date	06/05/02	Offset	24 FT. Right

		Construction	Temporary
Date Cased	06/04/02	Casing Type:	Steel
Date Opened	06/04/02	Casing Dimension (OD):	48.0 IN.
Date Poured	06/05/02	Bottom of Casing Elevation (FT)	86.0 FT.
		Top of Casing Elevation (FT)	101.0 FT.



Diameter of Rock Socket (IN)	42.0 IN.
Diameter of Shaft (IN)	± 48.0 IN.
Mud-line/Ground Surface Elev. (FT)	100.0 FT. msl
Wet & Dry Shaft Length (FT)	51.0 FT.
Rock Socket Length (FT)	10.0 FT.
Top of Shaft Elevation (FT)	100.0 FT. msl
Tip Elevation (FT)	39.0 FT. msl
Constructed Shaft Length (FT)	61.0 FT.

Testing/Other: Slurry, Slump, Air, Compression Cylinders, & CSL

Volume of Concrete:	Theoretical (VT) CY	27.3
OP = VP-VT = 0.5 CY UP = VT - VP=	Actual (VP) CY	27.8
Reinforcement Cage Installed:	Type: Welded Hoops	
Duration of Pour (min)	100 Min.	

Legend

TOC	Top of Casing		Sand
TOG	Top of Ground		
TOS	Top of Shaft		Silt
TOR	Top of Rock		
BOC	Bottom of Casing		Clay
BOS	Bottom of Shaft		
BOR	Bottom of Rock		Rock

Water Level

Completed by Contractor	DS Foreman/Engineer - John Q Doe
Reviewed by SCDOT	Inspector/Engineer - Jane Smith

Notes:

Shaft location variance at top: 1" after plan station & 4" left. Called Bridge Construction Engineer prior to pour. Received verbal approval to cast concrete from BCE. Contractor told to submit letter covering this shaft variance.

DRILLED SHAFT EXCAVATION LOG (REV 06-03-02)

Project Name _____ Page 2 of 6
File No. _____ Bent No. _____
Contractor _____ Shaft No. _____
Completed By Contractor DS Foreman - Date / / Station _____
Reviewed By SCDOT Inspector - Date / / Offset _____

Note: Preaugering not allowed when using construction casing.

Casing Information

ID	OD	Top Elev.	Length	Bot. Elev.

Soil Auger Diam. _____
Rock Core Diam. _____
Ground Surface Elev. _____
Water Table Elev. _____
Reference Elev. _____
Drilling Mud _____

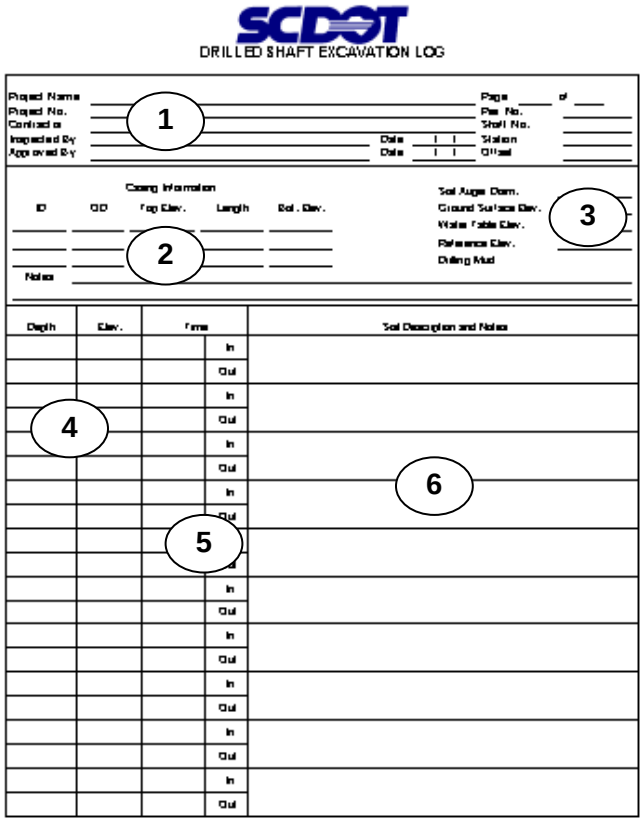
Notes _____

Depth ( )	Elev. ( )	Time		Soil Description and Notes
			In	
			Out	
			In	
			Out	
			In	
			Out	
			In	
			Out	
			In	
			Out	
			In	
			Out	
			In	
			Out	
			In	
			Out	
			In	
			Out	
			In	
			Out	

EXHIBIT 6 - SUPPLEMENTAL SPECIFICATIONS AND FORMS

HOW TO COMPLETE THE

DRILLED SHAFT EXCAVATION LOG



Fill in every blank on the form. If it does not apply put an "N/A" or a long dash.

Use pencil – but never erase. If you need to change something, strike a single line through the item and insert the correct information above it. If there is insufficient room to make a note, footnote the item and go to the bottom of the page, or use a separate page.

1. Heading:
   - -Fill in <u>before</u> drilling starts.
   - -Be sure to print your name and the start date for drilling.
   - -The Geotechnical Engineer will sign approval line.

2. Casing:
   - -Measure Length (L) in the field.
   - -Surveyor provides Top of Casing elevation (TE).
   - -Compute bottom elevation*(BE): TE-L=BE*

3. Site Data
   - -Soil Auger diameter – measure and record in inches.
   - -Ground surface elev. – provided by surveyor.
   - -Water table elev. – measure w/tape in hole before slurry is introduced (if applicable).
   - -Water table may need to be estimated from seepage in dry hole method.
   - -Reference Elevation – provided by surveyor.
   - -Drill mud – If used, complete the "**Slurry Inspection Log**"; compare to Installation Plan

4. Depth/Elevation:
   Depth (D) can be measured by:
   1) Contractor has kelly bar marked (spot checking only)
   2) Weighted tape (for accurate measurements)

   Reference elevation is always known; i.e., template, top of casing, or top of ground.

   Elevation (E) – compute *TE-D=E*
   Enter Depth/Elev. For EVERY change in the soil/rock condition.

5. Time:
   May use military or 24 hour clock. Be consistent and correct! Remember that shaft drilling can occur over several days, so be sure to <u>mark date changes</u>.

6. Material:
   Use this form to record all activity during shaft excavation. Label all major soil strata.

DRILLED SHAFT EXCAVATION LOG (REV 06-03-02)
SAMPLE 1 Construction Casing

Project Name	Replace Bridge over Cooper Creek along US-322			Page	2 of 6
File No.	4.995			Bent No.	3
Contractor	Drilled Shaft, Inc.			Shaft No.	3
Completed By Contractor	DS Foreman - John Q. Doe	Date	06/03/02	Station	508 + 36
Reviewed By SCDOT	Inspector - John Smith	Date	06/03/02	Offset	24 Ft. Right

Note: Preaugering not allowed when using construction casing.

Casing Information: Construction ___X___ Temporary _____

ID	OD	Top Elev.	Length	Bot. Elev.
47"	48"	101.0 MSL	15'	86.0 MSL

Soil Auger Diam.	46"
Rock Core Diam.	42"
Ground Surface Elev.	100.0 MSL
Water Table Elev.	97.0 MSL
Reference Elev.	101.0 MSL
Drilling Mud	Slurry

Notes: Switched to 42" Rock Core @ 52.0' (49.0 ' MSL) at 1:50 pm.

Depth (Feet)	Elev. (Ft. MSL)	Time		Soil Description and Notes
1.0	100.0	7:30 am	In	Tan Silty Sand
15.0	86.0	9:00 am	Out	Tan Silty Sand
15.0	86.0	9:10 am	In	Dark Tan Sand
36.0	65.0	11:30 am	Out	Dark Tan Sand
36.0	65.0	11:40 am	In	Dense Silty Sand (PWR) w/Mica
52.0	49.0	1:30 pm	Out	Dense Silty Sand (PWR) w/Mica
52.0	49.0	1:50 pm	In	Very Dense Rock (Granite)
61.0	40.0	4:50 pm	Out	Very Dense Rock (Granite)
61.0	40.0	7:15 am	In	Very Dense Rock (Granite) Continued drilling from previous day
62.0	39.0	7:30 am	Out	Very Dense Rock (Granite) Continued drilling from previous day
			In	
			Out	
			In	
			Out	
			In	
			Out	
			In	
			Out	
			In	
			Out	

DRILLED SHAFT EXCAVATION LOG (REV 06-03-02)
SAMPLE 2 Temporary Casing

Project Name	Replace Bridge over Cooper Creek along US-322			Page 2 of 6	
File No.	4.995			Bent No.	6
Contractor	Drilled Shaft, Inc.			Shaft No.	3
Completed By Contractor	DS Foreman - John Q. Doe	Date	06/03/02	Station	508 + 36
Reviewed By SCDOT	Inspector - Jane Smith	Date	06/03/02	Offset	24 Ft. Right

Note: Preaugering not allowed when using construction casing.

Casing Information: Construction ____ Temporary ___X___

ID	OD	Top Elev.	Length	Bot. Elev.
47"	48"	101.0 MSL	15'	86.0 MSL

Soil Auger Diam.	46"
Rock Core Diam.	42"
Ground Surface Elev.	100.0 MSL
Water Table Elev.	97.0 MSL
Reference Elev.	101.0 MSL
Drilling Mud	Slurry

Notes: Switched to 42" Rock Core @ 52.0' (49.0 ' MSL) at 1:50 pm.

Depth (Feet)	Elev. (Ft. MSL)	Time		Soil Description and Notes
1	100.0	7:30 am	In	Tan Silty Sand
15.0	86.0	9:00 am	Out	Tan Silty Sand
15.0	86.0	9:10 am	In	Dark Tan Sand
36.0	65.0	11:30 am	Out	Dark Tan Sand
36.0	65.0	11:40 am	In	Dense Silty Sand (PWR) w/Mica
52.0	49.0	1:30 pm	Out	Dense Silty Sand (PWR) w/Mica
52.0	49.0	1:50 pm	In	Very Dense Rock (Granite)
61.0	40.0	4:50 pm	Out	Very Dense Rock (Granite)
61.0	40.0	7:15 am	In	Very Dense Rock (Granite) Continued drilling from previous day
62.0	39.0	7:30 am	Out	Very Dense Rock (Granite) Continued drilling from previous day
			In	
			Out	
			In	
			Out	
			In	
			Out	
			In	
			Out	
			In	
			Out	

EXHIBIT 6 - SUPPLEMENTAL SPECIFICATIONS AND FORMS

SLURRY INSPECTION LOG (REV 06-03-02)

Project Name _____

File Number _____

Bent No. _____ Shaft No. _____

Water Source: * _____

Date of Initial Hydration ____/____/____ Time _____

Composition:	Brand	Type	Proportions
Mineral Type			
Additives			

TEST PROPERTIES

Sampling	Before Introduction of Slurry	First 8 Hours During Construction **				Additional Testing		At End of Excavation	Before Concreting Test 1	Before Concreting Test 2
		Test 1	Test 2	Test 3	Test 4	Test 1	Test 2			
Date:										
Time:										
Test Depth at Levels:	Holding Tank							At Bottom	At Bottom	At Bottom
Density										
Viscosity										
% Sand										
pH										
Cake / Filtrate	N/A									

Notes: * **Salt water shall not be used to hydrate the slurry or stabilize the excavation.**

** **A minimum of 4 sets of tests shall be made during the first 8 hours of slurry use. Slurry sampling and testing shall be observed by the Engineer. When the results show consistent behavior, the testing frequency may be decreased to 1 set every 4 hours of slurry use.**

Contractor DS Foreman: _____ Date: ____/____/____

SCDOT Inspector: _____ Date: ____/____/____

HOW TO COMPLETE THE
SLURRY INSPECTION LOG

SLURRY INSPECTION LOG

Project No. _____
Drilled Shaft No. _____ (1)
Shaft Location _____
Water Source: ** _____

Composition:	Brand	Type	Proportions
Mineral Type		(2)	
Additives			

TEST PROPERTIES

Sampling	Before Introduction of Slurry	First 8 Hours During Construction *				Additional Testing		At End of Excavation	Before Concreting Test 1	Before Concreting Test 2
		Test 1	Test 2	Test 3	Test 4	Test 1	Test 2			
Date:										
Time:										
Properties	Test Depth at Levels:			(3)				At Bottom	At Bottom	At Bottom
Density										
Viscosity										
% Sand										
pH										
Cake / Filtrate										

Notes: * A minimum of 4 sets of tests shall be made during the first 8 hours of slurry use. Slurry sampling and testing shall be observed by the Engineer. When the results show consistent behavior, the testing frequency may be decreased to 1 set every 4 hours of slurry use.
** Saltwater shall not be used to hydrate the slurry (4) the excavation.

Contractor Representative: _____ (5) Date: / /
State Inspector: _____ Date: / /

1. Heading: - Fill in <u>before</u> drilling starts.
   - The Project Resident Engineer will sign approval line.

2. Slurry Data: - Fill in appropriate brands, types, and proportion.

3. Test Data: - Record test data as the testing Inspector performs the tests.
   - Note the depth at which the samples were obtained.
   - Make sure that a minimum of 4 tests are performed within the first 8 hours of slurry use.

4. Notes: Record any unusual events or results.

5. Fill in “Contractor Representative” and “State Inspector”.

Fill in every blank on the form. If it does not apply put an “N/A” or a long dash.

Use pencil – but never erase. If you need to change something, strike a single line through the item and insert the correct information above it. If there is insufficient room to make a note, footnote the item and go to the bottom of the page, or use a separate page.

SCDOT

SLURRY INSPECTION LOG (REV 06-03-02)
SAMPLE 1 Construction Casing

Project Name: Replace Bridge over Cooper Creek along US-322

File Number: 4.995

Bent No. 3 Shaft No. 3

Water Source: * Hydrant (City water)

Date of Initial Hydration 06/03/02 Time 9:00 am

Composition:	Brand	Type	Proportions
Mineral Type	Augua Gel	Bentonite	1400 LBS / 5000 GAL
Additives			

TEST PROPERTIES

Sampling	Before Introduction of Slurry	First 8 Hours During Construction **				Additional Testing		At End of Excavation	Before Concreting Test 1	Before Concreting Test 2
		Test 1	Test 2	Test 3	Test 4	Test 1	Test 2			
Date:	06/04/02	06/04/02	06/04/02	06/04/02	06/04/02			06/05/02	06/05/02	06/05/02
Time:	11:00 am	1:30 pm	2:30 pm	4:00 pm	5:00 pm			7:30 am	8:15 am	9:20 am
Test Depth at Levels:	Holding Tank	50 FT	53 FT	58 FT	60 FT			At Bottom	At Bottom	At Bottom
Density	65	67.1	67.3	65.8	66.3			69.1	66.1	66.3
Viscosity	33	37	38	36	37			42	38	37
% Sand	0%	3%	4%	2%	2.5%			10%	2%	2%
pH	10	9	9	9	9			9	10	10

Notes: * **Salt water shall not be used to hydrate the slurry or stabilize the excavation.**

** **A minimum of 4 sets of tests shall be made during the first 8 hours of slurry use. Slurry sampling and testing shall be observed by the Engineer. When the results show consistent behavior, the testing frequency may be decreased to 1 set every 4 hours of slurry use.**

Note: Side of shaft caked. Cleaned shaft sides.

Contractor DS Foreman: John Q. Doe Date: 06/05/02

SCDOT Inspector: John Smith Date: 06/05/02

EXHIBIT 6 - SUPPLEMENTAL SPECIFICATIONS AND FORMS

SCDOT

SLURRY INSPECTION LOG (REV 06-03-02)
SAMPLE 2 Temporary Casing

Project Name: Replace Bridge over Cooper Creek along US-322

File Number: 4.995

Bent No. 6 Shaft No. 3

Water Source: * Hydrant (City water)

Date of Initial Hydration 06/03/02 Time 9:00 am

Composition:	Brand	Type	Proportions
Mineral Type	Augua Gel	Bentonite	1400 LBS / 5000 GAL
Additives			

TEST PROPERTIES

Sampling	Before Introduction of Slurry	First 8 Hours During Construction **				Additional Testing		At End of Excavation	Before Concreting Test 1	Before Concreting Test 2
		Test 1	Test 2	Test 3	Test 4	Test 1	Test 2			
Date:	06/04/02	06/04/02	06/04/02	06/04/02	06/04/02			06/05/02	06/05/02	06/05/02
Time:	11:00 am	1:30 pm	2:30 pm	4:00 pm	5:00 pm			7:30 am	8:15 am	9:20 am
Test Depth at Levels:	Holding Tank	50 FT	53 FT	58 FT	60 FT			At Bottom	At Bottom	At Bottom
Density	65	67.1	67.3	65.8	66.3			69.1	66.1	66.3
Viscosity	33	37	38	36	37			42	38	37
% Sand	0%	3%	4%	2%	2.5%			10%	2%	2%
pH	10	9	9	9	9			9	10	10

Notes: * **Salt water shall not be used to hydrate the slurry or stabilize the excavation.**

** **A minimum of 4 sets of tests shall be made during the first 8 hours of slurry use. Slurry sampling and testing shall be observed by the Engineer. When the results show consistent behavior, the testing frequency may be decreased to 1 set every 4 hours of slurry use.**

Note: Side of shaft caked. Cleaned shaft sides.

Contractor DS Foreman: John Q. Doe Date: 06/05/02

SCDOT Inspector: Jane Smith Date: 06/05/02 Page 3 of 6

EXHIBIT 6 - SUPPLEMENTAL SPECIFICATIONS AND FORMS

DRILLED SHAFT INSPECTION LOG (REV 06-03-02)

Project Name _____ Page 4 of 6
File No. _____ Bent No. _____
Contractor _____ Shaft No. _____
Completed By Contractor DS Foreman - _____ Date _____ Station _____
Reviewed By SCDOT Inspector - _____ Date _____ Offset _____

Type of Drilling Fluid _____
DS Location Variance at Top _____
Bottom Cleanout Method _____
Time/Date Final Cleanout _____
Shaft Bottom Elev. _____
Est. Shaft Bottom Dia. _____

Shaft Plumbness Check/4' _____
Rebar Cage: Proper # Vert. Bars _____
Proper # Horiz. Bars _____
Side Spacers _____
Bottom Spacers _____
Ties & Connections _____

* Based on Compass Direction

Inspected By: _____ Visual____ Sounding ____
Time Test Started _____
Time Test Finished _____
Time Test Started _____
Time Test Finished _____

N *

Test just prior to placing Rebar cage ☐ (inches)
Test just prior to placing concrete ◯ (inches)
*** Direction**

W *

E *

S *

Note: 50% of base shall have < 1/2 Inch of sediment.
No area of shaft bottom shall be more than 1 1/2 Inches.

Notes

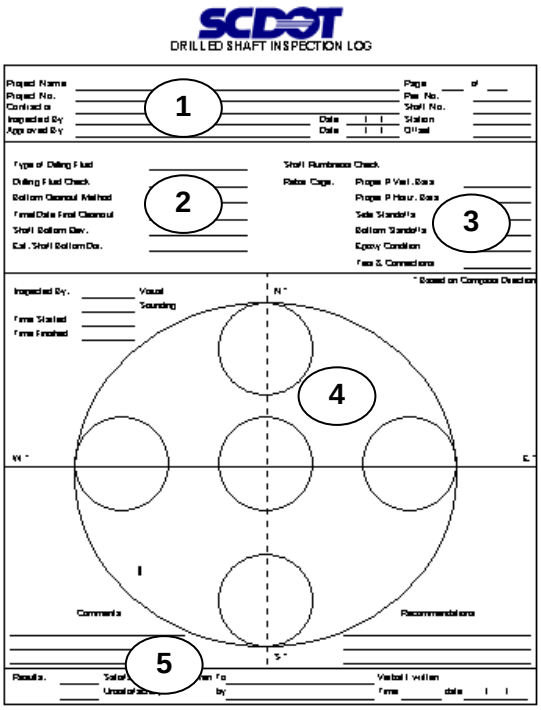
Comments/Recommendations

Results: _____ Satisfactory DS Foreman _____
_____ Unsatisfactory SCDOT Inspector _____ Time _____ Date _____

NOTE**: Specification Tolerances - Location Variance at Top = 3 inches Max. Vertical (Plumbness) = 1 inch per 4 Ft. Max.**

HOW TO COMPLETE THE

DRILLED SHAFT INSPECTION LOG



Fill in every blank on the form. If it does not apply put an "N/A" or a long dash.

Use pencil – but never erase. If you need to change something, strike a single line through the item and insert the correct information above it. If there is insufficient room to make a note, footnote the item and go to the bottom of the page, or use a separate page.

1. Heading:
   - -Fill in <u>before</u> drilling starts.
   - -Be sure to print your name and the start date of drilling.
   - -The Project Resident Engineer or designated representative will sign approval line.

2. Shaft Status: Drill Fluid Check – Responsibility of Contractor. Record density check performed by Contractor or Inspector.

Type of Drill Fluid – record
a) Natural
b) Mineral (commercial)
c) Plain water
Remember: Polymer slurry not allowed

   - -Bottom Cleanout Method: Observe and record equipment type (i.e., cleanout bucket, air lift, submersible pump, etc.). Must match Installation Plan.
   - -Time/Date Final Cleanout: Record when last cleanout performed prior to rebar cage placement.
   - -Shaft Bottom Elevation – Use weighted tape to measure; record.
   - -Estimate Shaft Bottom Diameter – record auger diameter.

3. Cage Check:
   - -Reinforcing cage usually checked by others.
   - -Proper number of Vertical bars – count and record # of vertical bars in hole; compare to plan.
   - -Epoxy – you should <u>never</u> see coated rebar

4. Shaft Cleaniness: – check procedure being used, record
   1) Using S.I.D., visually inspect the shaft bottom in each of a minimum of 5 locations as shown on form.
   2) Using a weighted tape, sound the shaft in each of a minimum of 5 locations as shown on form. "Feel" for hard bottom – it translates to clean hole. Remember specifications.

5. Record Results:

DRILLED SHAFT INSPECTION LOG (REV 06-03-02)
SAMPLE 1 Construction Casing

Project Name	Replace Bridge over Cooper Creek along US-322			Page	4 of 6
File No.	4.995			Bent No.	3
Contractor	Drilled Shaft, Inc.			Shaft No.	3
Completed By Contractor	DS Foreman - John Q. Doe	Date	06/05/02	Station	508 + 36
Reviewed By SCDOT	Inspector - John Smith	Date	06/05/02	Offset	24 FT. Right

Type of Drilling Fluid	Bentonite	Shaft Plumbness Check/4'	1/2 In. per 4 Ft.
DS Location Variance at Top	2" After Sta. & 1" Right	Rebar Cage: Proper # Vert. Bars	16 EA # 36 Bars
Bottom Cleanout Method	Airlift	Proper # Horiz. Bars	# 19 Bar @ 4 3/8 " Spiral
Time/Date Final Cleanout	7:45 am on 06/05/02	Side Spacers	4 EA every 10 Ft.
Shaft Bottom Elev.	39.0 msl	Bottom Spacers	16 EA @ 6" Length
Est. Shaft Bottom Dia.	42 Inches	Ties & Connections	Checked and okay.

* Based on Compass Direction

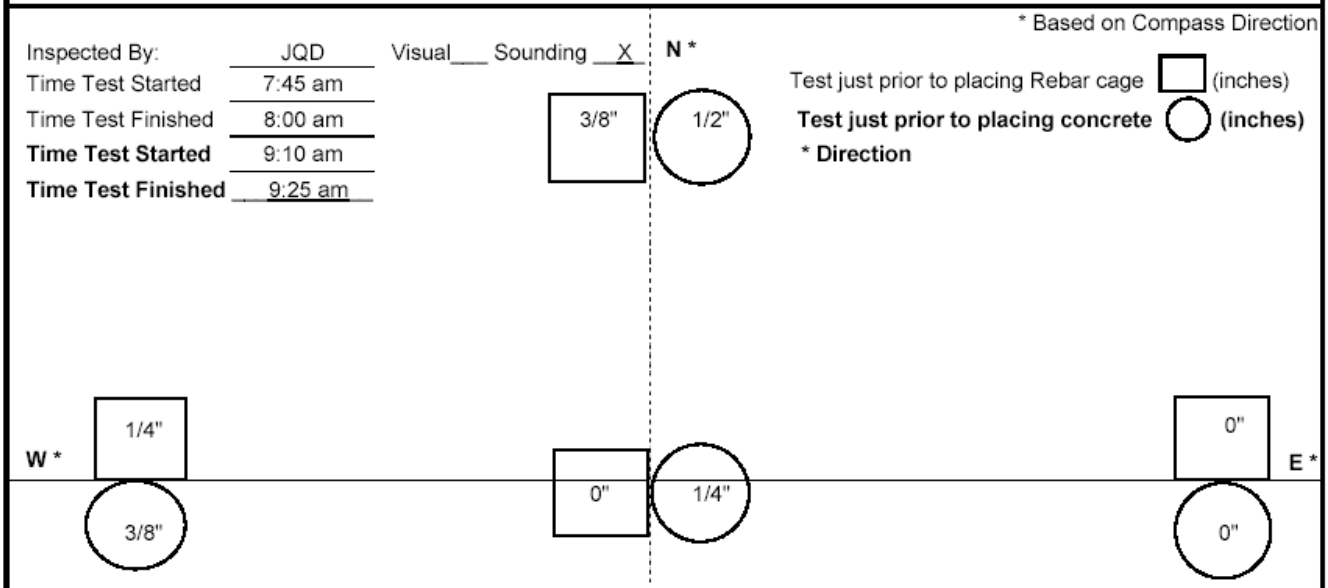
Inspected By: JQD Visual___ Sounding __X__

Time Test Started 7:45 am

Time Test Finished 8:00 am

Time Test Started 9:10 am

Time Test Finished 9:25 am



Test just prior to placing Rebar cage ☐ (inches)

Test just prior to placing concrete ◯ (inches)

*** Direction**

Note: 50% of base shall have < 1/2 Inch of sediment.

No area of shaft bottom shall be more than 1 1/2 Inches.

Notes	Comments/Recommendations
80% area < 1/2", first test okay.	Rebar cage placed & concrete ordered after first test.
60% area < 1/2", second test okay.	Concrete placed after second test was okay.

Results: X Satisfactory — DS Foreman: John Q Doe

Unsatisfactory — SCDOT Inspector: John Smith — Time: 9:25 am — Date: 06/05/02

NOTE: **Specification Tolerances - Location Variance at Top = 3 inches Max. Vertical (Plumbness) = 1 inch per 4 Ft. Max.**

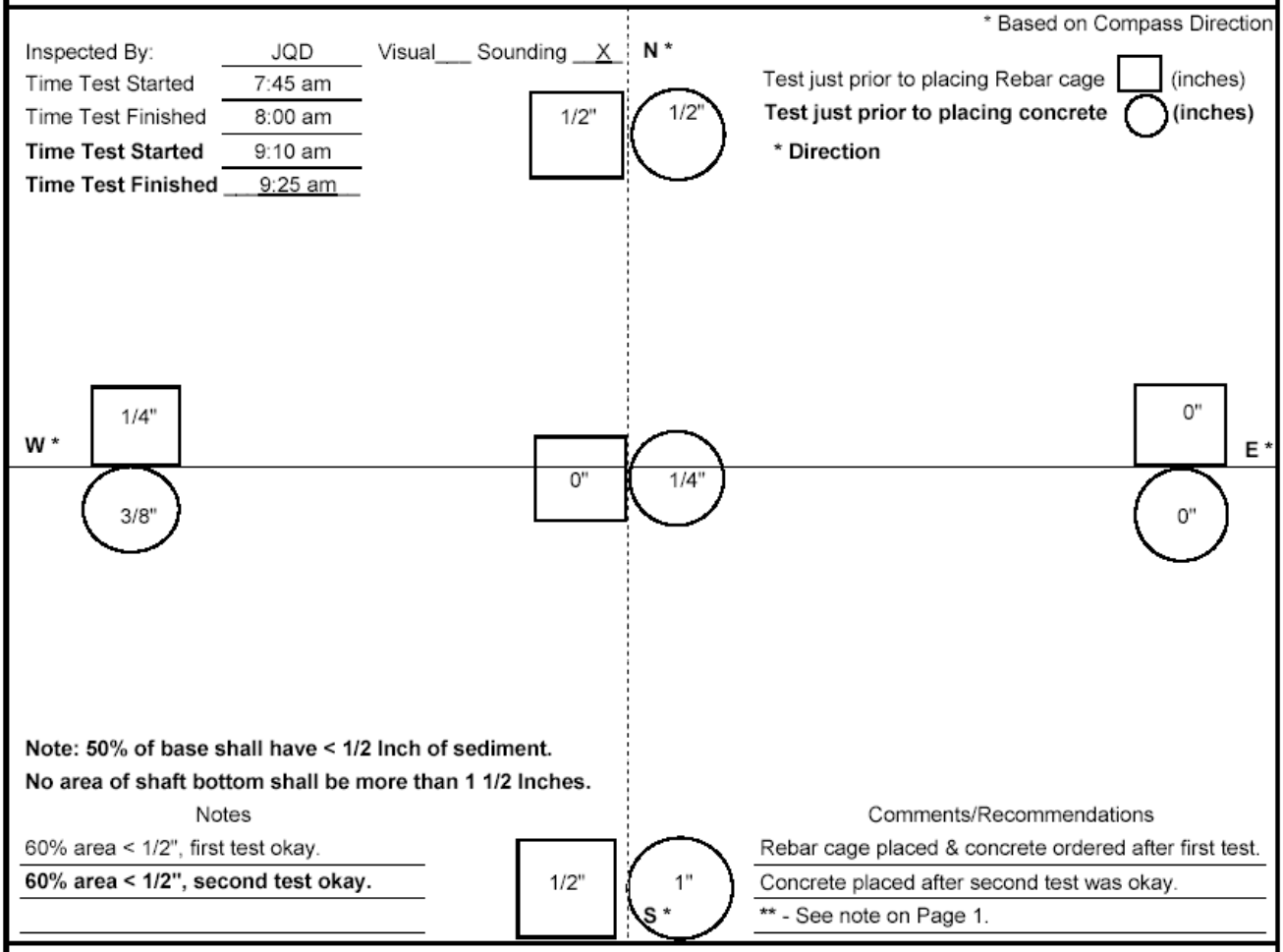
DRILLED SHAFT INSPECTION LOG (REV 06-03-02)
SAMPLE 2 Temporary Casing

Project Name	Replace Bridge over Cooper Creek along US-322			Page	4 of 6
File No.	4.995			Bent No.	6
Contractor	Drilled Shaft, Inc.			Shaft No.	3
Completed By Contractor	DS Foreman - John Q. Doe	Date	06/05/02	Station	508 + 36
Reviewed By SCDOT	Inspector - Jane Smith	Date	06/05/02	Offset	24 FT. Right

Type of Drilling Fluid	Bentonite	Shaft Plumbness Check/4'	1/2 In. per 4 Ft.
DS Location Variance at Top	1" Before Sta. & 4" Left**	Rebar Cage: Proper # Vert. Bars	16 EA # 36 Bars
Bottom Cleanout Method	Airlift	Proper # Horiz. Bars	# 19 W Hoops @ 7 IN.
Time/Date Final Cleanout	7:45 am on 06/05/02	Side Spacers	4 EA every 10 Ft.
Shaft Bottom Elev.	39.0 msl	Bottom Spacers	16 EA @ 6" Length
Est. Shaft Bottom Dia.	42 Inches	Ties & Connections	Checked and okay.

* Based on Compass Direction

Inspected By:	JQD Visual___ Sounding __X__
Time Test Started	7:45 am
Time Test Finished	8:00 am
Time Test Started	9:10 am
Time Test Finished	9:25 am



Test just prior to placing Rebar cage ☐ (inches)
Test just prior to placing concrete ◯ (inches)
*** Direction**

Note: 50% of base shall have < 1/2 Inch of sediment.
No area of shaft bottom shall be more than 1 1/2 Inches.

Notes	Comments/Recommendations
60% area < 1/2", first test okay.	Rebar cage placed & concrete ordered after first test.
60% area < 1/2", second test okay.	Concrete placed after second test was okay.
	** - See note on Page 1.

Results: X Satisfactory DS Foreman John Q Doe
___ Unsatisfactory SCDOT Inspector Jane Smith Time 9:25 am Date 06/05/02

NOTE: **Specification Tolerances - Location Variance at Top = 3 inches Max. Vertical (Plumbness) = 1 inch per 4 Ft. Max.**

EXHIBIT 6 - SUPPLEMENTAL SPECIFICATIONS AND FORMS

DRILLED SHAFT CONCRETE PLACEMENT LOG (REV 06-03-02)

Project Name _____ Page 5 of 6
File No. _____ Bent No. _____
Contractor _____ Shaft No. _____
Completed By Contractor DS Foreman - _____ Date _____ Station _____
Reviewed By SCDOT Inspector - _____ Date _____ Offset _____

Placement Method _____ Tremie
_____ Pumped
De-airing Method _____ Relief Valve
_____ Plug
_____ Cap

Volume in Pump Truck	#	ID	Length	Volume
Pump Truck Lines				
Pump Truck				

Total Volume in Lines + Pump Truck Σ = _____

Reference Elev. _____
Shaft Top Elev. _____
Top of Rock Elev. _____
Shaft Bottom Elev. _____

Time First Truck Batched: _____
Depth of Water Per Hr. Inside Shaft (Dry Hole Check) _____
Rebar Cage Top Elev. At Start - _____ At Finish _____

Truck No.	Concrete Volume	Arrival Time	Start Time	Finish Time	Tremie Depth	Depth To Concrete	Notes

_____ Concrete Volume Delivered

Total Placement Time (Temp. Casing Removed) _____

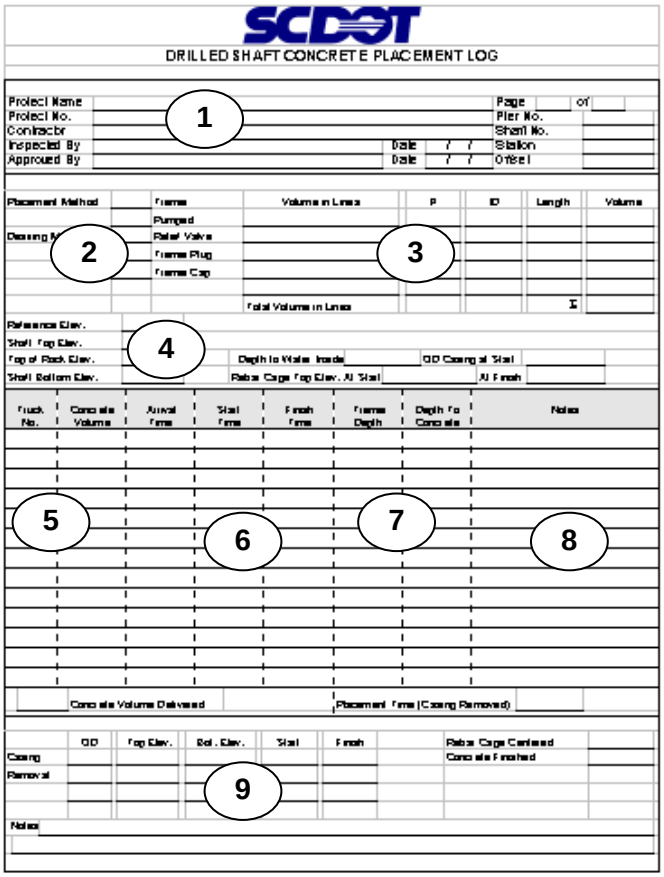
T Casing Removal**	OD	Top Elev.	Bot. Elev.	Start	Finish

YES NO
Rebar Cage Centered* _____
Rebar Cage Re-centered _____

Notes *** If no, then re-center rebar cage. ** If unable to remove temporary casing, then call Bridge Construction Office.**

HOW TO COMPLETE THE

DRILLED SHAFT CONCRETE PLACEMENT LOG



Fill in every blank on the form. If it does not apply put an "N/A" or a long dash.

Use pencil – but never erase. If you need to change something, strike a single line through the item and insert the correct information above it. If there is insufficient room to make a note, footnote the item and go to the bottom of the page, or use a separate page.

1. Heading: -Fill in <u>before</u> drilling starts.
   -Be sure to print your name and the start date of drilling.
   -The Project Resident Engineer or designated representative will sign approval line.
2. Indicate correct "Placement" and "Deairing" method.
3. Compute and fill in Concrete Volumes: $V = (\pi d^2/4) \times L$
4. Fill in as much as possible prior to pour.
5. Record Truck number and amount of concrete.
6. Time: -May be military or standard clock. Be consistent and correct.
   Watch for date changes on late night pours.
7. Depths: -Tremie embedment may be measured by markings on the tremie. Depth to concrete may be measured by weighted tape.
8. Notes: Record any unusual events or items.
9. Casing/Rebar Data: -The rebar cage fabrication will normally be performed on-site. Observe the lifting to make sure deformation or damage does not occur (especially to CSL tubes). Check that the correct cage is being used. Check reinforcing steel diagram against the actual cage to be sure cage is correct. When the cage is being placed, observe the spacing to assure the cage is set to the proper elevation.

SCDOT

DRILLED SHAFT CONCRETE PLACEMENT LOG (REV 06-03-02)

SAMPLE 1 Construction Casing

Project Name	Replace Bridge over Cooper Creek along US-322			Page 5	of 6
File No.	4.995			Bent No.	3
Contractor	Drilled Shaft, Inc.			Shaft No.	3
Completed By Contractor	DS Foreman - John Q. Doe	Date	06/05/02	Station	508 + 36
Reviewed By SCDOT	Inspector - John Smith	Date	06/05/02	Offset	24 FT. Right

Placement Method		Tremie	Volume in Pump Truck	#	ID	Total Length	Volume
	X	Pumped	Pump Truck Lines (6" x 10')	17	6"	170'	1.2 CY
De-airing Method		Relief Valve	Pump Truck				0.2 CY
	X	Plug					
			Total Volume in Lines + Pump Truck			Σ =	1.4 CY

Reference Elev. 101.0 msl
Shaft Top Elev. 101.0 msl
Top of Rock Elev. 49.0 msl
Shaft Bottom Elev. 39.0 msl

Time First Truck Batched: 9:10 am
Depth of Water Per Hr. Inside Shaft (Dry Hole Check): NA - Slurry used.
Rebar Cage Top Elev. At Start - 108.0 msl At Finish - 108.0 msl

Truck No.	Concrete Volume	Arrival Time	Start Time	Finish Time	Tremie/ Pump Lines Total Length	Depth To Concrete from Casing Top	Notes
17	9.0 CY	9:20 am	9:25 am	9:40 am	160 FT	41.0 FT	Removed 10' of pump line.
22	9.0 CY	9:30 am	9:45 am	10:00 am	160 FT	21.7 FT	Removed 20' of pump line.
8	9.0 CY	9:40 am	10:05 am	10:20 am	130 FT	2.4 FT	Removed 20' of pump line.
17	4.0 CY	10:30 am	10:35 am	10:50 am	120 FT	0	Waste 2.0 CY (Removing pump lines and overflow.)

31.0 CY Concrete Volume Delivered

Total Placement Time (Temp. Casing Removed) 100 Min.

	OD	Top Elev.	Bot. Elev.	Start	Finish
T Casing Removal**	NA				

	YES	NO
Rebar Cage Centered*	X	
Rebar Cage Re-centered		

Notes * **If no, then re-center rebar cage. ** If unable to remove temporary casing, then call Bridge Construction Office.**

DRILLED SHAFT CONCRETE PLACEMENT LOG (REV 06-03-02)
SAMPLE 2 Temporary Casing

Project Name	Replace Bridge over Cooper Creek along US-322			Page 5	of 6
File No.	4.995			Bent No.	6
Contractor	Drilled Shaft, Inc.			Shaft No.	3
Completed By Contractor	DS Foreman - John Q. Doe	Date	06/05/02	Station	508 + 36
Reviewed By SCDOT	Inspector - Jane Smith	Date	06/05/02	Offset	24 FT. Right

			Volume in Pump Truck	#	ID	Total Length	Volume
Placement Method		Tremie					
	X	Pumped	Pump Truck Lines (6" x 10')	17	6"	170'	1.2 CY
De-airing Method		Relief Valve	Pump Truck				0.2 CY
	X	Plug					
			Total Volume in Lines + Pump Truck				Σ = 1.4 CY

Reference Elev. 101.0 msl
Shaft Top Elev. 100.0 msl
Top of Rock Elev. 49.0 msl
Shaft Bottom Elev. 39.0 msl

Time First Truck Batched: 9:10 am
Depth of Water Per Hr. Inside Shaft (Dry Hole Check): NA - Slurry used.
Rebar Cage Top Elev. At Start - 108.0 msl At Finish - 108.0 msl

Truck No.	Concrete Volume	Arrival Time	Start Time	Finish Time	Tremie/ Pump Lines Total Length	Depth To Concrete from Casing Top	Notes
17	9.0 CY	9:20 am	9:25 am	9:40 am	160 FT	41.0 FT	Removed 10' of pump line.
22	9.0 CY	9:30 am	9:45 am	10:00 am	160 FT	21.7 FT	Removed 20' of pump line.
8	9.0 CY	9:40 am	10:05 am	10:20 am	130 FT	2.4 FT	Removed 20' of pump line.
17	4.0 CY	10:30 am	10:35 am	10:50 am	120 FT	0	Waste 2.0 CY (Removed the temporary casing, pump lines and concrete overflow.)

31.0 CY Concrete Volume Delivered

Total Placement Time (Temp. Casing Removed) 100 Min.

	OD	Top Elev.	Bot. Elev.	Start	Finish		YES	NO
T Casing Removal**	48"	101.0 msl	85.0 msl	10:25 am	10:35 am	Rebar Cage Centered*		X
						Rebar Cage Re-centered	X	

Notes * **If no, then re-center rebar cage. ** If unable to remove temporary casing, then call Bridge Construction Office.**

EXHIBIT 6 - SUPPLEMENTAL SPECIFICATIONS AND FORMS

DRILLED SHAFT CONCRETE VOLUMES LOG (REV 06-03-02)

Project Name				Page 6 of 6	
File No.				Bent No.	
Contractor				Shaft No.	
Completed By Contractor	DS Foreman -	Date / /		Station	
Reviewed By SCDOT	Inspector -	Date / /		Offset	

Concreting Curve

Depth (ft)

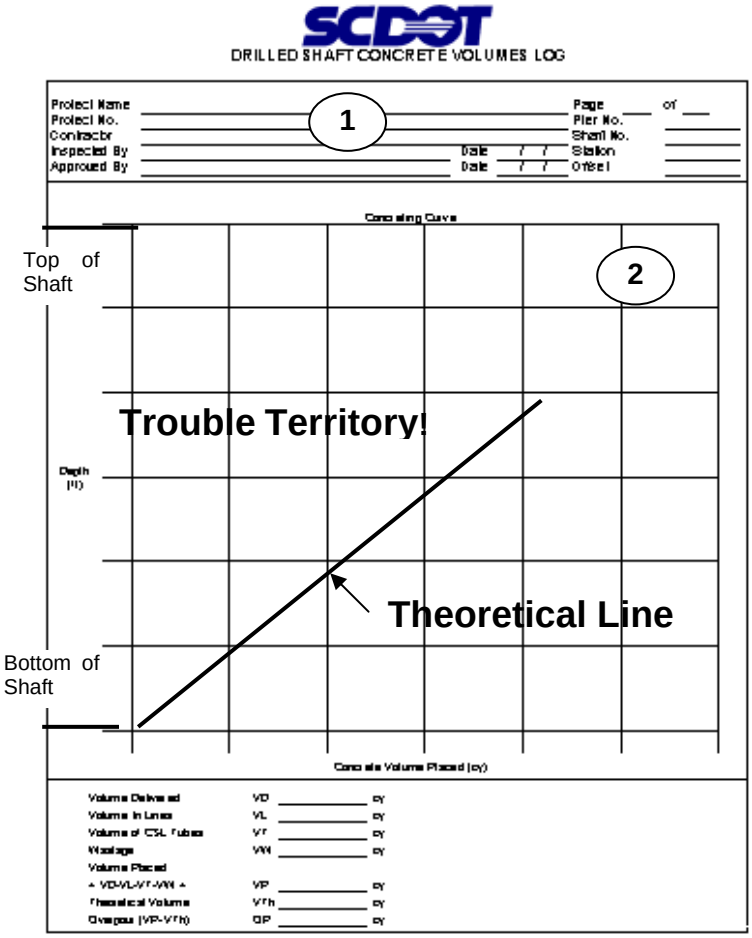
Concrete Volume Placed (cy)

Volume Delivered	VD		cy
Volume In Pump Truck + Lines	VPTL		cy
Volume of CSL Tubes	VCSLT		cy
Wastage	VW		cy
Volume Placed = VD-VPTL-VCSLT-VW =	VP		cy
Theoretical Volume	VTh		cy
Over Pour (VP-VTh =/> 1.00)	OP		cy

Under Pour (VP-VTh < 1.00)	UP	_____ cy

HOW TO COMPLETE THE

DRILLED SHAFT CONCRETE VOLUMES LOG



Fill in every blank on the form. If it does not apply put an "N/A" or a long dash.

Use pencil – but never erase. If you need to change something, strike a single line through the item and insert the correct information above it. If there is insufficient room to make a note, footnote the item and go to the bottom of the page, or use a separate page.

1.	Heading:	-Fill in <u>before</u> drilling starts.
		-Be sure to print your name and the start date of drilling.
		-The Project Resident Engineer or designated representative will sign approval line.
2.	Concrete curve:	-compute Theoretical Volume of Concrete based on shaft size:
		$Vth = (\pi d^2/4) x\ L$
		-locate points based on known cubic yards of concrete placed at measured "bottom" depth.
		-must be plotted during concrete placement.

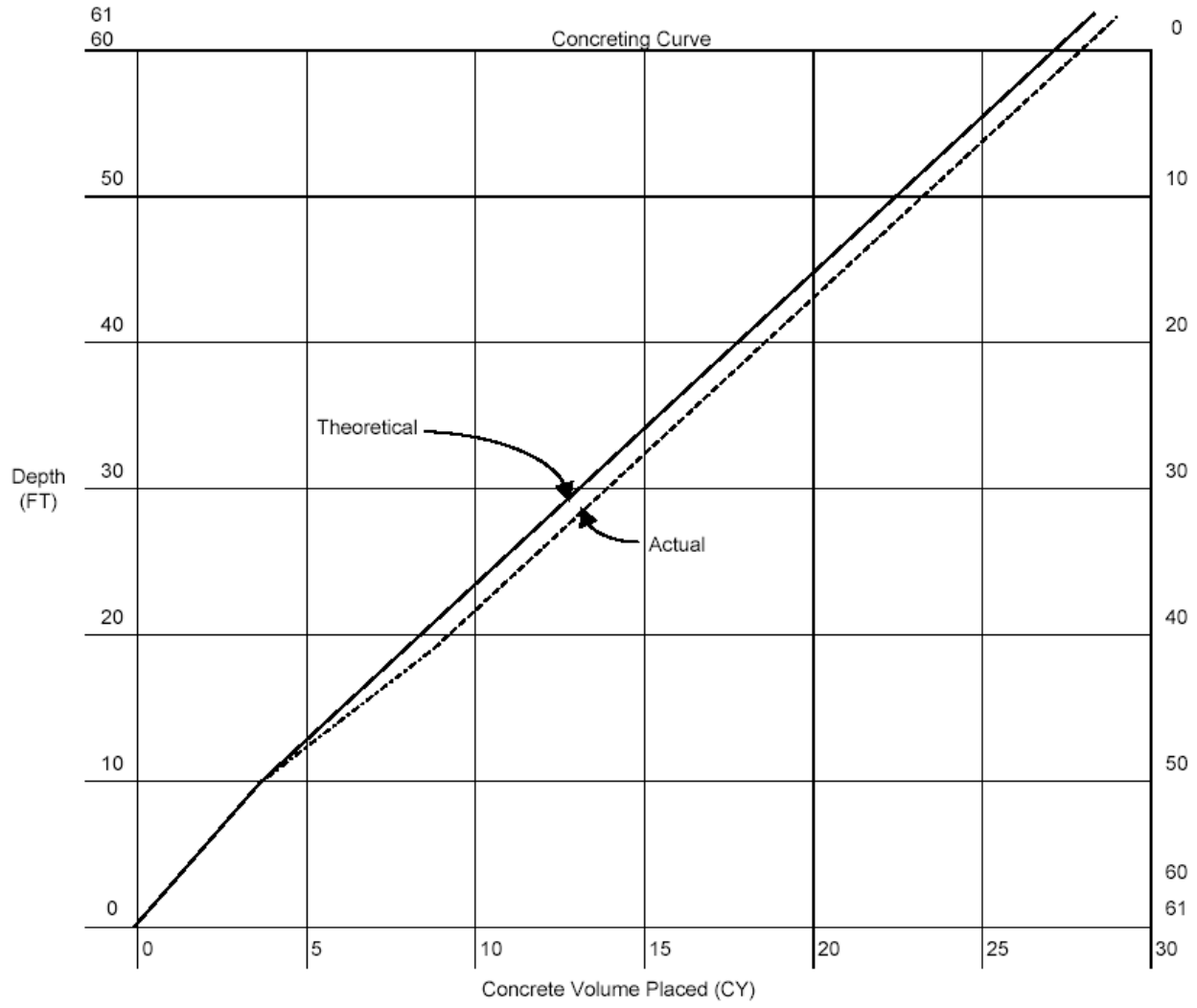
Note: Plotted line should closely parallel Theoretical line.
There is a problem if:

- a point plots way above or below the Theoretical line and/or
- there is a significant rise or fall in an otherwise straight line (change in slope of line).

DRILLED SHAFT CONCRETE VOLUMES LOG (REV 06-03-02)

SAMPLE 1 Construction Casing

Project Name	Replace Bridge over Cooper Creek along US-322			Page	6 of 6
File No.	4.995			Bent No.	3
Contractor	Drilled Shaft, Inc.			Shaft No.	3
Completed By Contractor	DS Foreman - John Q. Doe	Date	06/05/02	Station	508 + 36
Reviewed By SCDOT	Inspector - John Smith	Date	06/05/02	Offset	24 FT. Right



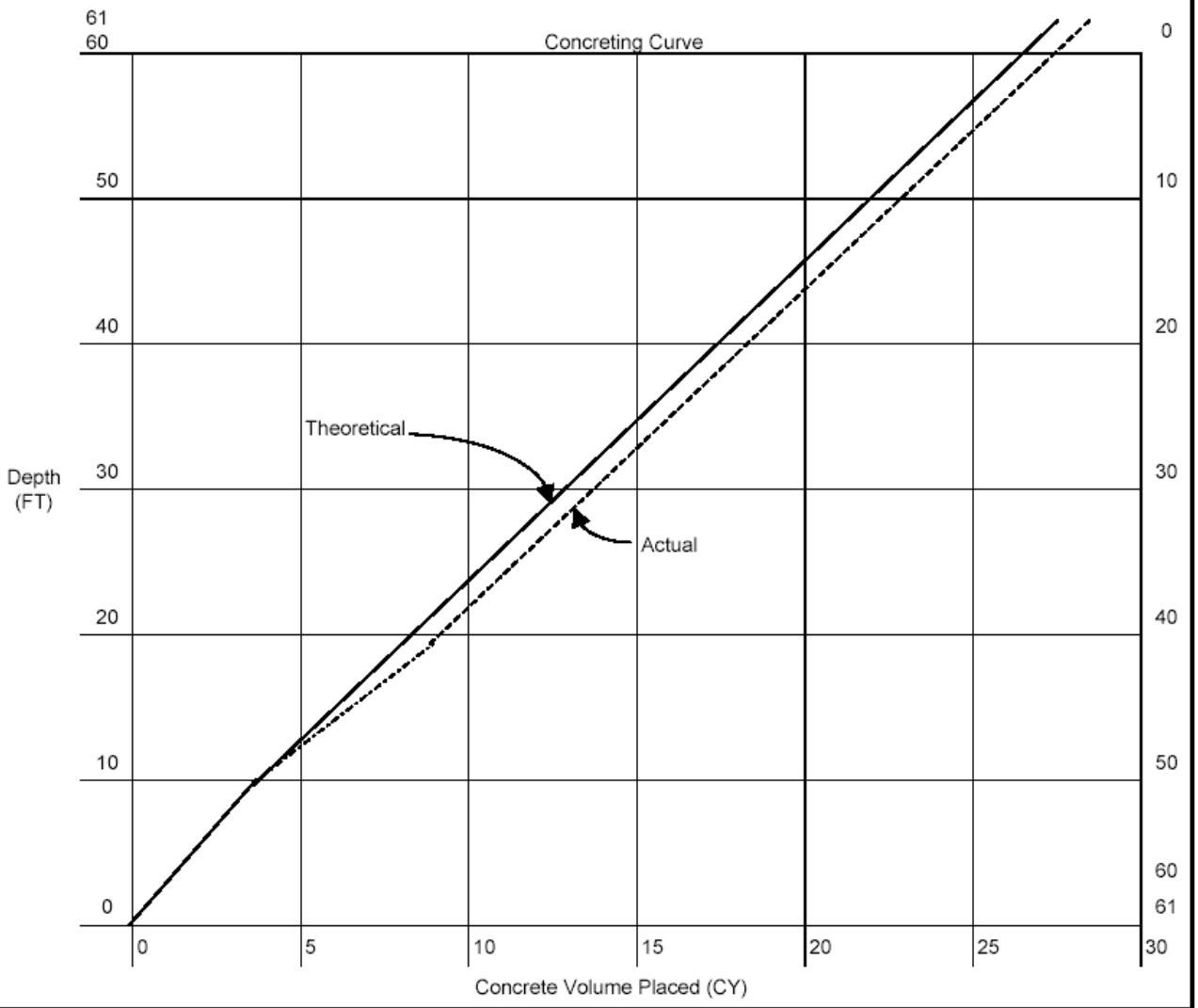
Volume Delivered	VD	31.0	CY
Volume In Pump Truck + Lines	VPTL	-1.4	CY - Volume left in pump truck and lines.
Volume of CSL Tubes	VCSLT	+0.2	CY
Wastage	VW	-2.0	CY - Removed pump lines and concrete overflow.
Volume Placed = VD-VPTL-VCSLT-VW =	VP	27.8	CY
Theoretical Volume	VTh	27.2	CY
Over Pour (VP-VTh =/> 1.00)	OP	0.6	CY
Under Pour (VP-VTh < 1.00)	UP	NA	CY

SCDOT

DRILLED SHAFT CONCRETE VOLUMES LOG (REV 06-03-02)

SAMPLE 2 Temporary Casing

Project Name	Replace Bridge over Cooper Creek along US-322			Page	6 of 6
File No.	4.995			Bent No.	6
Contractor	Drilled Shaft, Inc.			Shaft No.	3
Completed By Contractor	DS Foreman - John Q. Doe	Date	06/05/02	Station	508 + 36
Reviewed By SCDOT	Inspector - Jane Smith	Date	06/05/02	Offset	24 FT. Right



Volume Delivered	VD	31.0	CY
Volume In Pump Truck + Lines	VPTL	-1.4	CY - Volume left in pump truck and lines.
Volume of CSL Tubes	VCSLT	+0.2	CY
Wastage	VW	-2.0	CY - Removed pump lines and concrete overflow.
Volume Placed = VD-VPTL-VCSLT-VW =	VP	27.8	CY
Theoretical Volume	VTh	27.3	CY
Over Pour (VP-VTh =/> 1.00)	OP	0.5	CY
Under Pour (VP-VTh < 1.00)	UP	NA	CY

EXHIBIT 7

FEDERAL-AID PROJECT
SUPPLEMENTAL SPECIFICATIONS

TABLE OF CONTENTS

June 13, 1990

APPLICATION OF DAVIS-BACON AND RELATED ACTS TO INDEPENDENT TRUCK DRIVERS AND MISCELLANEOUS CONSTRUCTION ACTIVITIES

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.

March 1, 2010

REQUIREMENTS FOR FEDERAL AID CONTRACTS WHICH AFFECT SUBCONTRACTORS, DBE HAULERS, MATERIAL SUPPLIERS AND VENDORS

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 11of 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.

January 1, 2014

DISADVANTAGED BUSINESS ENTERPRISE (DBE) SUPPLEMENTAL SPECIFICATION

It is the policy of the South Carolina Department of Transportation (SCDOT) to ensure nondiscrimination in the award and administration of federally assisted contracts and to use Disadvantaged Business Enterprises (DBEs) in all types of contracting and procurement activities according to State and Federal laws. To that end the SCDOT has established a DBE program in accordance with regulations of the United States Department of Transportation (USDOT) found in 49 CFR Part 26.

This document, known as the "DBE Supplemental Specifications" includes two main parts:

Part A. "Instructions to Bidders – Pre-award Requirements"
Part B. "Instructions to Contractors – Post-award Requirements."

PART A. INSTRUCTIONS TO BIDDERS – PRE- AWARD REQUIREMENTS

When incorporated into Design Build and/or Local Public Agency procurements, the terms "bid", "bidder", and "bid letting" shall mean "proposal", "proposer" and "proposal opening."

1. DBE CONTRACT GOAL

A. The DBE participation goal for this contract is set forth in the DBE Special Provisions.

B. The successful bidder shall exercise all necessary and reasonable steps to ensure that DBEs perform services or provide materials on this contract in an amount that meets or exceeds the DBE contract goal and commitment. Submitting the bid, including electronically, shall constitute an agreement by the bidder that if awarded the contract, it will meet or exceed the DBE contract goal and commitment or make good faith efforts to meet the goal or commitment. Failure to meet the contract goal or make good faith efforts to meet the contract goal will result in the the bid being considered irregular and subject to rejection in accordance with Section 102.8(1)(D) of the SCDOT Standard Specification for Highway Construction, resulting in the contract being awarded to the next lowest responsible and responsive bidder.

2. DBE COMMITTAL

A. Each bidder shall enter all the information regarding how it intends to meet the DBE goal in the electronic bid folder found on the electronic bidding service website, *Bid Express*, entitled "DBE List." (See paragraph (D) below for non-electronic bid submissions.) The listing of DBEs shall constitute a commitment by the bidder to utilize the listed DBEs, subject to the replacement requirement set forth below in Section 2 of Part B. A DBE listed on the DBE List or DBE Committal Sheet hereinafter shall be referred to as a "committed DBE."

B. In meeting the DBE contract goal, the bidder shall use only certified DBEs included in the "South Carolina Unified Certification Program DBE Directory" (hereinafter referred to as the "Unified DBE Directory.") The DBE.BIN file used for the electronic bidding contains the names of the certified DBEs in the " Unified DBE Directory." For more information on the use of the DBE.BIN file in electronic bidding, see Section 6 below.

C. Failure to provide all information required in the electronic bid or DBE Committal Sheet will make the bid irregular and subject to rejection, resulting in the contract being awarded to the next lowest responsible and responsive bidder.

D. The DBE.BIN file listed for the letting must be downloaded for each particular letting because it is the data source for the DBEs listed in the "Unified DBE Directory" designated for use in the letting. ALL DBE data such as Name, Company ID, and Address must be selected from drop-down lists provided by the DBE. BIN file. If the DBE.BIN file is not downloaded, no data for the drop-down lists will be available. For non-electronic bidding in Design/Build or Local Public Agency procurements, use the attached DBE Committal Sheet in lieu of the DBE.BIN file.

The following information must be selected or entered in the electronic bid:

A. The names and addresses of certified DBEs whose services or materials will be used in the contract.

B. Work Type and Work Code selected from a drop-down list. When one of these is selected, the other will be filled in automatically. **[Note: Only select the Work Type and Work Code for which the selected DBE firm has been certified to perform].**

C. An Item of work, approximate Quantity of work to be performed or materials to be supplied, Unit (of measurement), Unit Price, and the extended dollar amount of participation by each DBE listed.

(a) Item: The Item is the bid item with which the DBE will be associated and must be selected from the Schedule of (Bid) Items found in the drop-down list. If the proposed work is for only a portion of an Item of work (i.e. hauling of materials, tying of reinforced steel, etc.) an adequate description of this work shall be included in the Note block.

(b) Quantity, Unit, & Unit Price: Initially when an Item is selected, the contract quantity, unit, and the bidder's unit price and extension will appear. If the proposed work is for only a portion of an item as described in (1) above, then the Quantity, Unit Price and /or Extension shall be changed to reflect the actual amount of work committed to the DBE. The Unit (of measurement) cannot be changed.

(4) The bidder must also submit a copy of a signed statement or quote from each of the DBEs listed in the DBE List folder of the electronic bid or DBE committal sheet. The signed statements or quotes should verify the items, quantities, units, unit prices, and dollar values listed in the DBE List folder of the electronic bid or DBE committal sheet. COPIES OF THE SIGNED STATEMENTS MUST BE SUBMITTED TO SCDOT CONTRACT ADMINISTRATION OFFICE WITHIN THREE (3) BUSINESS DAYS OF THE BID LETTING from the apparent low bidder. Should the apparent low bid be rejected for failing to meet the goal, the next apparent low bidder will have three (3) business days from notification to submit the signed quotes. SCDOT will accept facsimiles of the verified statements with the caveat that the bidder must furnish the original document to SCDOT upon request. Signed quotes must be on the DBEs letterhead and contain the following information: date, printed name, address, and phone number of the authorized individual providing the quote, project name and identification number, quote needs to be addressed to contractor from DBE, and identify specific services being performed and/or material being supplied.

3. GOOD FAITH EFFORTS REQUIREMENTS

A. Requirements for Submission for Approval of a Good Faith Effort. If the bidder does not meet the DBE contract goal through the DBE committals submitted with the bid, it is the bidder's responsibility to request, in writing (faxes and emails are acceptable) a good faith effort review by 5:00 pm of the next business day after they submit their bid. Bidder must submit additional information to satisfy to SCDOT that good faith efforts have been made by the bidder in attempting to meet the DBE contract goal. **THIS SUPPORTING INFORMATION/DOCUMENTATION MUST BE FURNISHED TO SCDOT CONTRACT ADMINISTRATION OFFICE IN WRITING WITHIN THREE (3) BUSINESS DAYS OF THE BID LETTING.** One complete set and five (5) copies of this information must be received by Contract Administration no later than 12:00 noon of the third business day following the bid letting. Where the

information submitted includes repetitious solicitation letters, it will be acceptable to submit a sample representative letter along with the list of the firms being solicited. The documented efforts listed in item (C.) below are some of items SCDOT will consider in evaluating the bidder's good faith efforts. The documentation may include written subcontractor quotations, telephone log notations of verbal quotations, or other types of quotation documents.

B. Failure to Submit Required Material. If the bidder fails to provide this information by the deadline, the bid is considered irregular and may be rejected in accordance with Section 102.8(1)(D), SCDOT Standard Specifications for Highway Construction.

C. Evaluation of a Good Faith Effort. SCDOT may consider the following factors in judging whether or not the bidder made adequate and acceptable good faith efforts to meet the DBE contract goal:

(1) Did the bidder attend any pre-bid meetings that were scheduled by SCDOT or Local Public Agency to inform DBEs of subcontracting opportunities?

(2) Did the bidder provide solicitations through all reasonable and available means (e.g. posting a request for quotes from DBE subcontractors on SCDOT Construction Extranet webpage; attendance at pre-bid meetings, advertising and/or written notices at least 10 days prior to the letting; or showing the bidder provided written notice to all DBEs listed in the "Unified DBE Directory" that specialize in the areas of work in which the bidder will be subcontracting).

(3) Did the bidder follow-up initial solicitations of interest by contacting DBEs to determine with certainty whether they were interested or not? If a reasonable amount of DBEs in the area of work do not provide an intent to quote, or there are no DBEs that specialize in the area of work to be subcontracted, did the bidder call SCDOT Office of Business Development & Special Programs to give notification of the bidder's inability to obtain DBE quotes?

(4) Did the bidder select portions of the work to be performed by DBEs in order to increase the likelihood of meeting the contract goal? This includes, where appropriate, breaking out contract items of work into economically feasible units to facilitate DBE participation, even when the bidder might otherwise perform these items of work with its own forces.

(5) Did the bidder provide interested DBEs with adequate and timely information about the plans, specifications, and requirements of the contract?

(6) Did the bidder negotiate in good faith with interested DBEs, or reject them as unqualified without sound reasons based on a thorough investigation of their capabilities? Any rejection should be noted in writing with a description as to why an agreement could not be reached. The fact that the bidder has the ability or desire to perform the work with its own forces will not be considered as sound reason for rejecting a DBEs quote.

(7) Was a quote received from an interested DBE, but rejected as unacceptable because it was not the lowest quote received? The fact that the DBE firm's quotation for the work is not the lowest quotation received will not in and of itself be considered as a sound reason for rejecting the quotation as unacceptable, as long as the quote is not unreasonable.

(8) Did the bidder specifically negotiate with non-DBE subcontractors to assume part of the responsibility to meet the contract goal when the work to be sublet includes potential for DBE participation?

(9) Any other evidence that the bidder submits which demonstrates that the bidder has made reasonable good faith efforts to include DBE participation.

(10) The DBE commitments submitted by all other bidders who were able to meet the DBE contract goal.

(11) Did the bidder contact SCDOT for assistance in locating certified DBEs?

D. Nothing in this provision shall be construed to require the bidder to accept unreasonable quotes in order to satisfy DBE contract goals.

E. SCDOT may give the bidder an opportunity to cure any deficiencies resulting from a minor informality or irregularity in the DBE commitment or waive any such deficiency when it is in the best interest of the State. A minor informality or irregularity is one which is merely a matter of form or is some immaterial variation from the exact requirements of the invitation for bids having no effect or merely a trivial or negligible effect on DBE contract goal, quality, quantity, or delivery of the supplies or performance of the contract, and the correct or waiver of which would not be prejudicial to bidders.

4. DETERMINATION AND RECONSIDERATION PROCEDURES

A. After the letting, SCDOT will determine whether or not the low bidder has met the DBE participation contract goal or made good faith efforts to meet the goal. If SCDOT determines that the apparent low bidder failed to meet the goal and did not demonstrate a good faith effort to meet the goal, or meet the requirements of a commercially useful function, SCDOT will notify the apparent low bidder of its determination by email and by US Mail or hand-delivery. The apparent low bidder may request a reconsideration of this determination.

B. The bidder must make a request for reconsideration in writing within three (3) business days of receipt of the determination. Within six (6) business days of receipt of the determination, the bidder must provide written documentation to SCDOT Director of Construction supporting its position. Only documentation dated within three (3) business days of the bid letting may be used in support of its position. No DBE goal efforts performed after 3 business days of the bid will be allowed as evidence. If the bidder fails to request a reconsideration with three (3) business days, the determination shall be final.

C. To reconsider the bidder's DBE commitment or good faith efforts, the Deputy Secretary for Engineering will designate a panel of three (3) SCDOT employees, who did not take part in the original determination, comprised of: (1) one employee from the District Construction Engineer's (DCE) Office, (2) one employee from the Office of Business Development & Special Programs, and (3) one employee at large (hereinafter referred to as the "Reconsideration Panel"). The DCE Office representative will be appointed chairman of the Reconsideration Panel. A representative from FHWA may be a non-voting member of the Reconsideration Panel. The Reconsideration Panel will contact the bidder and schedule a meeting. The Reconsideration Panel will make reasonable efforts to accommodate the bidder's schedule; however, if the bidder is unavailable or not prepared for a hearing within ten (10) business days of receipt of SCDOT original written determination, the bidder's reconsideration rights will be considered to have been waived.

D. The meeting will be held at SCDOT Headquarters Building, 955 Park Street, Columbia, South Carolina. The bidder will be allowed up to two (2) hours to present written or oral evidence supporting its position.

E. The Reconsideration Panel will issue a written report and recommendation to the Deputy Secretary for Engineering. SCDOT shall not award the contract until the Deputy Secretary for Engineering issues a decision or the bidder waives its reconsideration right either through failure to request reconsideration or failure to be available for the meeting. The Deputy Secretary for Engineering will notify the bidder of the final decision in writing.

5. CONSEQUENCES OF FAILURE TO COMPLY WITH DBE PROVISIONS

A. Failure on the part of the bidder to meet the DBE contract goal or to demonstrate good faith efforts to meet the DBE contract goal will result in the bid being declared irregular and may be rejected resulting in the contract being awarded to the next lowest responsible and responsive bidder. Upon rejection, the award may be made to the next lowest responsible and responsive bidder.

B. After bid letting, but prior to award, SCDOT reserves the right to cancel the project, or any or all bids or proposals may be rejected in whole or part, when it is in the best interest of the State.

6. DIRECTORY OF SOUTH CAROLINA CERTIFIED DISADVANTAGED BUSINESS ENTERPRISES

A. The electronic DBE.BIN file found on the electronic bidding service website, *Bid Express*, contains data from the "Unified DBE Directory" approved for use in each particular letting. **The file must be downloaded for each letting because the directory approved for use in each letting is updated prior to the letting.** The bidder is advised that this directory pertains only to DBE certification and not to qualifications. It is the bidder's responsibility to determine the actual capabilities and/or limitations of the certified DBE firms. For non-electronic bid submissions, the directory can be found at http://www.scdot.org/doing/businessDevelop_SCUnified.aspx.

B. In meeting the DBE participation contract goal, the bidder shall use only DBEs that are included in the "Unified DBE Directory" contained in the DBE.BIN file, or on-line, current for the month the bid is submitted. The bidder may only count toward the DBE goal work in the areas for which the DBE has been certified, unless prior written approval from SCDOT is obtained. The bidder and the DBE must jointly apply to SCDOT's Director of Construction for approval of work in an area of work other than that in which the DBE has been certified. The requested work must be in an area related to the area of work in which the DBE has been certified. Such requests must be submitted in writing to the Director of Construction no later than ten (10) business days prior to the date of the letting. The Director of Construction has the right to approve or disapprove the request. The Director of Construction will give the bidder and the DBE written notice of his decision no later than five (5) business days prior to the date on which bids are received. If approved, a copy of the written approval must accompany the submission of the subcontractor's quote.

C. Certification of a DBE for work in a certain area of work or approval to perform work in a related area shall not constitute a guarantee that the DBE will successfully perform the work or that the work will be performed completely. Such certification or approval shall only imply that the successful completion of the work by the DBE can count toward satisfying the DBE contract goal in accordance with the counting rules set forth in 49 CFR Part 26 (see Section 3 of Part B below.)

D. The bidder may print a copy of the "Unified DBE Directory" from SCDOT web page at http://www.scdot.org/doing/businessDevelop_SCUnified.aspx.

7. ADDITIONAL DBE PARTICIPATION

The bidder is strongly encouraged to obtain the maximum amount of DBE participation feasible on the contract. Any DBE participation in excess of the DBE contract goal shall also be included in the DBE Quarterly Reports.

8. CONTRACTOR'S RESPONSIBILITY TO REPORT BIDDER INFORMATION

The bidder should keep a list of all subcontractors (DBE or non-DBE) who bid or quoted for subcontracts on this project. As a condition to prequalification or renewal of prequalification, Contractors must submit the names and addresses of all firms (DBE and non-DBE) who quoted the Contractor for subcontracts on SCDOT projects throughout the course of the previous year.

PART B. INSTRUCTIONS TO CONTRACTORS – POST-AWARD REQUIREMENTS

1. **CONTRACTOR'S OBLIGATIONS**

A. 49 CFR 26. The Contractor shall carry out the applicable requirements of 49 CFR Part 26 and these DBE Supplemental Specifications in the award and administration of this contract. Failure by the Contractor to carry out these requirements is a material breach of the contract, and may result in the termination of the contract or such other remedy as SCDOT deems appropriate.

B. Meeting both the Goal and Commitment or Making Good Faith Efforts to Meet the Goal and Commitment. It is the Contractor's responsibility to meet or make good faith efforts to meet the DBE contract goal and commitments. Failure to meet the goal or commitments to the specific DBEs listed on the committal sheet or to demonstrate good faith efforts to meet the goal or commitments 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) Assessing sanctions in the amount of the difference in the DBE contract committal and the actual payments made to each certified DBEs;
(4) Disqualifying the Contractor from bidding pursuant to Regulation 63-306, Volume 25A, of the S. C. Code of Laws; and/or
(5) Requiring the Contractor to obtain DBE participation on future contracts to the extent the Contractor failed to meet or use good faith efforts to meet the DBE contract goal.

C. Using the DBEs shown on the Committal Sheet to Perform the Work. The Contractor must utilize the specific DBEs listed on the "DBE Committal Sheet" to perform the work and supply the materials for which each is listed unless the Contractor obtains prior written approval from the Director of Construction to perform the work with other forces or obtain the materials from other sources as set forth in Section 2 below. The Contractor shall not be entitled to any payment for such work or material unless it is performed or supplied by the listed DBE or, with prior written approval of the Director of Construction, by other forces (including those of the Contractor). Failure to meet a commitment to a specific DBE may result in the sanctions listed in Section 1(B) above, unless prior written approval is obtained for replacement of the committed DBE.

When SCDOT makes changes that result in the reduction or elimination of work to be performed by a committed DBE, the Contractor will not be required to seek additional participation. When the SCDOT makes changes that result in additional work to be performed by a DBE based upon the Contrator's commitment, the DBE shall participate in additional work to the same extent as the DBE participated in the original work.

D. Incorporating DBE Supplemental Provisions in Subcontracts. The Contractor shall make available, at the request of SCDOT, a copy of all DBE subcontracts. The Contractor shall ensure that all subcontracts or agreements with DBEs to supply labor or materials require that the subcontract and all lower tier subcontracts be performed in accordance with these DBE Supplemental Specifications. The contractor is advised to insert the following provision in each subcontract or agreement:

> "This contract or agreement shall be performed in accordance with the requirements of the SCDOT DBE Supplemental Specifications dated January 1, 2014."

2. REPLACEMENT OF CERTIFIED DBES

A. Requirement for Replacement. The following shall apply to replacement of a DBE listed on the "DBE Committal Sheet":

(1) *When a DBE listed on the DBE committal sheet (hereafter referred to as a "committed DBE") is unable or unwilling to perform the work in accordance with the subcontract,* the Contractor shall follow the replacement procedures in Section 2(B) below. Failure on the part of the Contractor to comply with this requirement shall constitute a breach of contract and may be cause for the imposition of the sanctions set forth in Section 1(B) above.

(2) *When a committed or non-committed DBE is decertified or removed from the SC Unified DBE Directory after execution of a valid subcontract agreement with the Contractor*:

(a) The Contractor may continue to utilize the decertified DBE on the contract and receive credit toward the DBE contract goal for the DBEs work unless the Contractor is implicated in the DBE decertification. However, the Contractor is encouraged to replace the decertified DBE with a certified DBE where feasible, to assist SCDOT in meeting the overall statewide DBE goal.

(b) If a *committed or non-committed* DBE is removed from the SC Unified DBE Directory due to graduation from the DBE program, the Contractor may continue to utilize the graduated DBE on the contract and receive credit toward the DBE contract goal for the DBEs work.

(3) *When a committed DBE is decertified or removed from the SC Unified DBE Directory prior to execution of a valid subcontract agreement with the Contractor, the* Contractor shall follow the replacement procedures in Section 2(B) below. Failure on the part of the Contractor to comply with this requirement shall constitute a breach of the contract and may be cause for the imposition of the sanctions set forth in Section 1(B) above.

B. Replacement Procedures. In order to replace a *committed* DBE, the Contractor must obtain prior written approval from the Director of Construction. To request such approval, the Contractor shall notify the Director of Construction and the DBE in writing, and provide documentation of the need and reasons for replacement. If the DBE consents to the replacement, the Contractor shall also provide the Director of Construction with the DBEs written consent. If the DBEs consent cannot be obtained, the Contractor shall notify the Director of Construction in writing that the DBEs consent could not be obtained. In no case shall the Contractor's ability to negotiate a more advantageous contract with another subcontractor be considered a valid basis for replacement. If the Contractor obtains the Director of Construction's approval for the replacement, the Contractor shall replace the committed DBE with another certified DBE or make good faith efforts to do so as set forth in Section 2(C) below. Any DBE who is certified at the time of replacement may be used as a replacement. If the Director of Construction does not approve of replacement, the Contractor shall continue to use the *committed* DBE in accordance with the contract. Failure to do so may constitute cause for imposition of any of the sanctions set forth in Section 1(B) above.

C. Good Faith Efforts. After approval for replacement is obtained, if the Contractor is not able to find a replacement DBE, the Contractor shall provide the Director of Construction with documentation of its good faith efforts to find a replacement. This documentation shall include, but is not limited to, the following:

(1) Copies of written notification to certified DBEs that their interest is solicited in subcontracting the work defaulted by the previous certified DBE or in subcontracting other items of work in the contract.

(2) Statement of efforts to negotiate with certified DBEs for specific subbids including at a minimum:

(a) Names, addresses and telephone numbers of certified DBEs who were contacted;
(b) Description of the information provided to certified DBEs regarding the plans and specifications for portions of the work to be performed;
(c) Statement of why additional agreements with certified DBEs were not reached.

(3) For each certified DBE contacted but rejected, the reasons for the Contractor's rejection. Failure to find a replacement DBE at the original price is not in itself evidence of good faith.

(4) Documentation demonstrating that the Contractor contacted SCDOT's DBE Supportive Service Office for assistance in locating certified DBEs willing to take over that portion of work or do other work on the contract.

If SCDOT determines that the Contractor has made good faith efforts to replace the committed DBE with another certified DBE, then the remaining portion of the DBEs work shown on the "DBE Committal Sheet" can be completed by the Contractor's own forces or by a non-DBE subcontractor approved by SCDOT. The Contractor will not be required to make up that part of the DBE goal attributable to the portion of work not completed by the committed DBE, and this shortfall in meeting the DBE goal will be waived by SCDOT.

If SCDOT determines that the Contractor has not made good faith efforts to replace the committed DBE with another certified DBE, such failure may constitute cause for imposition of any of the sanctions set forth in Section 1(B) above.

D. Payment from SCDOT. The Contractor shall not be entitled to payment for work or material committed to a committed DBE unless:

(1) The work is performed by the *committed* DBE; or
(2) The work is performed by another certified DBE after the Director of Construction has given approval to replace the committed DBE as provided above; or
(3) The work is performed by a non-DBE after SCDOT determines that the Contractor has demonstrated good faith efforts to replace the committed DBE as provided above.

3. **COUNTING CERTIFIED DBE PARTICIPATION TOWARD MEETING THE DBE GOAL**

DBE participation shall be measured by the actual, verified payments made to DBEs subject to the following rules (all references to "DBE" herein shall mean "certified DBE"). The Contractor is bound by these rules in regard to receiving and reporting credit toward the DBE contract goal. The Contractor shall report on DBE Quarterly Reports only the amounts properly attributable toward the goal under these rules.

A. General Counting Rules.

(1) The entire amount of that portion of a construction contract (or other contract not covered by paragraph A(2) of this section) that is performed by the DBEs own forces may be counted toward the goal. The cost of supplies and materials obtained by the DBE for the work of the contract, including supplies purchased or equipment leased by the DBE (except supplies and equipment the DBE subcontractor purchases or leases from the prime contractor or its affiliate) can be counted toward the goal.
(2) When a DBE subcontracts part of the work of its contract to another firm, the value of the subcontracted work may be counted toward DBE goals only if the subcontractor is also a

DBE. Work that a DBE subcontracts to a non-DBE firm does not count toward the DBE goals.

(3) The Contractor can count expenditures to a DBE only if the DBE is certified by SCDOT, except as provided in section 2(A)(2) above, in the event a DBE loses eligibility status after a subcontract is signed.

(4) The Contractor can count expenditures to a DBE only after the DBE has actually been paid.

B. Joint Ventures. When a DBE performs as a participant in a joint venture, the portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work of the contract that the DBE performs with its own forces can be counted toward DBE goals. A joint venture must be approved by the Director of Construction prior to start of the contract.

C. Commercially Useful Function. Expenditures to a DBE contractor can be counted toward DBE goals only if the DBE is performing a commercially useful function on that contract:

(1) A DBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the DBE must also be responsible, with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material, and installing (where applicable) and paying for the material itself. To determine whether a DBE is performing a commercially useful function, SCDOT will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the contract is commensurate with the work it is actually performing and the DBE credit claimed for its performance of the work, and other relevant factors.

(2) A DBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of DBE participation. In determining whether a DBE is such an extra participant, SCDOT will examine similar transactions, particularly those in which DBEs do not participate.

(3) If a DBE does not perform or exercise responsibility for at least 30 percent of the total cost of its contract with its own work force, or the DBE subcontracts a greater portion of the work of a contract than would be expected on the basis of normal industry practice for the type of work involved, SCDOT will presume that it is not performing a commercially useful function.

(4) When a DBE is presumed not to be performing a commercially useful function as provided in paragraph (3) of this section, the DBE may present evidence to rebut this presumption. SCDOT may determine that the firm is performing a commercially useful function given the type of work involved and normal industry practices.

(5) SCDOT's decisions on commercially useful function matters are subject to review by the Federal Highway Administration, but are not administratively appealable to the USDOT.

D. Special Rules for Trucking Companies. SCDOT will use the following rules to determine whether a DBE trucking company is performing a commercially useful function and what portion of the DBE work can be counted toward DBE goals:

(1) ***DBE must control all work*.** To be considered as performing a commercially useful function, the DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting DBE goals.

(2) ***DBE must "own" at least one truck***. The DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the project. For purposes of this section, a DBE will be considered to "own" a truck if:

a) the truck is titled in the DBEs name; or,

b) the DBE leases the truck under a valid lease-to-own agreement and the driver of the truck is an employee of the DBE.

The DBE must submit documentation to SCDOT to establish the number of trucks the DBE owns, operates and insures. The DBE must submit the documentation to SCDOT's Office of Business Development & Special Programs at the time of certification, annual reporting on certification requirements, or at any time during the year that the DBE obtains additional trucks.

(3) ***Counting DBE trucking toward DBE goal***. The Contractor can count toward DBE goals the total value of the transportation services the DBE provides using trucks the DBE owns, insures, and operates using drivers the DBE employs.

(4) ***Counting subcontracted DBE trucking toward DBE goal.*** The DBE may subcontract with another DBE firm, including an owner-operator who is certified as a DBE, to provide trucks on a project. In this case, the Contractor may count toward the DBE goal the total value of the transportation services provided by the DBE subcontractor.

(5) ***Counting subcontracted non-DBE trucking toward the goal.*** The DBE may lease trucks from a non-DBE firm, including an owner-operator, to provide trucks on a project. Prior to beginning work, the DBE must provide SCDOT's Resident Construction Engineer with a list identifying all DBE and non-DBE trucks and truck numbers that will be used on the project. In this case, the Contractor may count toward the DBE goal the total value of the transportation services provided in each quarter by the non-DBE trucks, not to exceed the value of the transportation services provided by DBE-owned trucks in that quarter. For example, in a given quarter, if DBE-owned trucks provide transportation services of $50,000, while non-DBE trucks provide transportation services of $75,000, a maximum of $100,000 can be counted toward the DBE goal in that quarter.

For purposes of this paragraph (5), a lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the lease truck. Leased trucks must display a placard with the name and USDOT identification number of the DBE leasing the truck. The placard must be legible and visable when standing at least 15 feet from the driver's side of the truck. It may be affixed to the side of the truck or inside the cab window as long as it does not interfere with the safe operation of the truck. See example below.

Sample placard:

Operated by:

Bell's Trucking,LLC
USDOT 123456

NOTE: DBE firms may not receive credit for DBE participation when leasing non-DBE owned trucks from the Prime contractor with whom the DBE firm is subcontracted as 49 CFR 26.55(a)(1) applies.

E. DBE Manufacturers and Dealers. The Contractor can count expenditures with DBEs for materials or supplies toward DBE goals in accordance with the following rules:

(1) *DBE Manufacturers*. If the materials or supplies are obtained from a DBE manufacturer, the Contractor can count 100 percent of the cost of the materials or supplies toward DBE goals. For purposes of this paragraph, a manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications. The DBE must be listed as a "manufacturer" in the "South Carolina

Unified DBE Directory" to be considered a manufacturer for purposes of these counting rules.

(2) *DBE Dealers*. If the materials or supplies are purchased from a DBE regular dealer, the Contractor can count 60 percent of the cost of the materials or supplies toward DBE goals. For purposes of this section, a regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. The DBE must be listed as a "dealer" in the South Carolina Unified DBE Directory to be considered a dealer for purposes of these counting rules.

(3) *DBE Brokers*. With respect to materials or supplies purchased from a DBE which is neither a manufacturer nor a regular dealer, count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of material or supplies required on a job site, toward DBE goals.

F. Special Rules for Design Build and Local Public Agency Contracts

(1) When the Design Build team changes work that results in the reduction or elimination of work that the Design Build team committed to be performed by a DBE, the Design Build team shall seek additional participation by DBEs equal to the reduced DBE participation cause by the change.

4. **JOINT CHECKS**.

The Director of Construction must approve all requests for a Contractor to issue and use joint checks with a DBE. The following conditions apply:

a) The DBE must submit a request to the Director of Construction which includes a formalized agreement between all parties that specify the conditions under which the arrangement will be permitted;

b) The DBE remains responsible for all other elements of 49 CFR 26.55(c)(1). SCDOT must clearly determine that independence is not threatened because the DBE retains final decision making responsibility;

c) There can be no requirement by the prime contractor that a DBE use a specific supplier nor the prime contractor's negotiated unit price.

5. **REPORTS**

The Contractor shall furnish to the SCDOT the following reports and information. THIS REQUIREMENT APPLIES REGARDLESS OF WHETHER THERE IS A CONTRACT GOAL ASSIGNED TO THE CONTRACT.

A. DBE Quarterly Reports. The Contractor shall provide to the SCDOT, DBE Quarterly Reports showing the dollar amount of payments to each certified DBE. The Contractor and each DBE that received payment must sign the report. The Contractor's and DBE's signature on the Quarterly Report shall constitute certification that the DBE has performed the work and that the Contractor is entitled to credit toward the DBE goal for the amount shown in accordance with the counting rules set forth in Section 3 above. The report shall include the amount paid each DBE for the quarter and the total amount paid to each DBE on the contract. The report must include DBE subcontractors, hauling firms, and suppliers. The report shall be submitted in duplicate to the Resident Construction Engineer by the 15th of

the month after each calendar quarter (January, April, July, and October 15). Failure to submit the quarterly report may result in the withholding of monthly progress and/or final payment. The Quarterly Report must be submitted for each quarter even if no payments have been made to a DBE in that quarter. When no payments have been made to a DBE in a quarter, DBEs are not required to sign the report.

B. Trucker's Reports. All DBE haulers must complete and submit a DBE Trucker's Report along with the DBE quarterly report when the DBE leases trucks from another firm. The DBE hauler must list all trucks leased, payments made to the lessee during the quarter, and identify whether each leased truck is owned by a certified DBE or non-DBE. DBE Haulers must also submit one copy of each lease agreement to the Resident Construction Engineer prior to the start of work for each truck leased. A lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE**.**

C. Other Documents. Upon request of SCDOT, the Contractor and all subcontractors shall furnish documents, including subcontracts, necessary to verify the amount and costs of the materials or services provided by certified DBE suppliers or subcontractors. The Contractor shall keep the documents that verify this information for at least three years from the date of final close-out of the contract. Failure to provide these documents upon request may result in the withholding of monthly progress and/or final payment or disqualifying the Contractor from bidding pursuant to R. 63-306, South Carolina State Regulations.

6. CONTRACT COMPLETION – DETERMINATION OF WHETHER CONTRACTOR HAS MET THE GOAL OR MADE GOOD FAITH EFFORTS

A. Review by SCDOT. After receipt of the final DBE Quarterly Reports, SCDOT will review the necessary contract documentation to determine whether the Contractor has met the DBE commitments and contract goal.

B. Notification of Failure to Meet Goal. If the documentation indicates that the Contractor has not met the DBE commitments and contract goal, the Director of Construction will notify the Contractor in writing and request documentation of the Contractor's good faith efforts to meet the goal.

C. Determination of Good Faith Efforts. The Contractor shall submit documentation demonstrating good faith efforts to meet the contract commitments and goal to the Director of Construction within thirty (30) days of the date of the "Notification of Failure to Meet Goal." The Director of Construction will provide the Contractor with written notice of SCDOT's determination whether good faith efforts have been demonstrated.

D. Request for Reconsideration. If the Contractor disagrees with SCDOT's determination of post construction compliance, the Contractor may request a reconsideration by filing a written request with the Director of Construction within ten (10) business days after receipt of the determination. The Contractor shall submit any additional documentation that it wishes to be considered in support of its position within ten (10) business days of its request for reconsidertation. If the Contractor fails to request a reconsideration within ten (10) days, the determination shall be final. If the Contractor requests reconsideration, the Director of Construction Office will appoint a Reconsideration Official who did not take part in the original determination to review the decision and supporting documentation (hereinafter referred to as the "Reconsideration Official"). FHWA may participate in the review process. The Reconsideration Official will contact the Contractor and schedule a meeting with the Contractor. The meeting will be held at the SCDOT Headquarters Building in Columbia. At the meeting, the Contractor will have an opportunity to present oral and written evidence to demonstrate that good faith efforts were made to meet the DBE commitments and contract goal. The Reconsideration Official may also consider evidence presented by SCDOT at the same meeting. After the meeting, the Reconsideration Official will issue a written report and recommendation to the Director of Construction. The Director of Construction shall make the final decision on the issue. The Director of Construction will notify the Contractor of the final decision in writing.

August 7, 1991

LATE DISCOVERY OF ARCHAEOLOGICAL/HISTORICAL REMAINS ON FEDERAL AID PROJECTS AND APPROVAL OF DESIGNATED BORROW PITS

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.

August 20, 1975
Revised April 1, 2004

SPECIFIC EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES TRAINING SPECIAL PROVISIONS

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 – 12 (at 520 hours each)
Bridge – 11 (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.

FHWA-1273 -- Revised May 1, 2012

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

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 piecework, 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

Timetable	*Goals (percent)*
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, constriction 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).

General Decision Number: SC130044 01/04/2013 SC44

Superseded General Decision Number: SC20100071

State: South Carolina

Construction Type: Highway

Counties: Anderson, Greenville, Laurens, Pickens, Spartanburg and York Counties in South Carolina.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Modification Number	Publication Date
0	01/04/2013

SUSC2011-035 09/15/2011

	Rates	Fringes
CARPENTER (Form Work Only)	$ 14.44	
CEMENT MASON/CONCRETE FINISHER	$ 12.64	
IRONWORKER, REINFORCING	$ 15.02	
LABORER		
Asphalt Includes Asphalt Distributor, Shoveler, and Spreader		
Anderson, Greenville, Laurens, Pickens, Spartanburg	$ 11.54	
York	$ 11.62	
Common or General		
Anderson	$ 9.71	
Greenville, Pickens	$ 9.87	
Laurens	$ 8.89	
Spartanburg	$ 10.05	
York	$ 9.63	
Luteman	$ 10.76	
Mason tender-Cement/Concrete	$ 10.40	
Pipelayer	$ 13.98	
Traffic Control-Cone Setter	$ 11.75	
Traffic Control-Flagger		
Anderson, Spartanburg, York	$ 10.13	
Greenville, Laurens, Pickens	$ 10.62	
POWER EQUIPMENT OPERATOR:		
Backhoe/Excavator/Trackhoe		

Greenville, Laurens,
Pickens.....$ 13.82
Spartanburg, York.....$ 13.92
Bulldozer.....$ 12.95
Crane.....$ 19.73
Grader/Blade
Anderson, Spartanburg,
York.....$ 13.13
Greenville, Laurens,
Pickens.....$ 12.62
Hydroseeder.....$ 11.00
Loader (Front End).....$ 16.80
Mechanic.....$ 17.75
Milling Machine.....$ 11.84
Paver
Anderson, Spartanburg,
York.....$ 12.93
Greenville, Laurens,
Pickens.....$ 13.61
Roller
Anderson, Spartanburg,
York.....$ 12.11
Greenville.....$ 12.59
Laurens, Pickens.....$ 12.16
Scraper.....$ 12.71
Screed.....$ 13.09
Tractor.....$ 13.28

TRUCK DRIVER
Dump Truck
Anderson, Spartanburg,
York.....$ 12.75
Greenville.....$ 13.17
Laurens, Pickens.....$ 12.70
Lowboy Truck
Anderson, Spartanburg,
York.....$ 13.48
Greenville, Laurens,
Pickens.....$ 13.36

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

DISADVANTAGED BUSINESS ENTERPRISES (DBE) COMMITTAL SHEET

Information must be shown on this sheet as required by the supplemental specifications entitled *"Instructions to Bidders - Federal Projects"* and *"Disadvantaged Business Enterprises (DBE) - Federal Projects"* included in this proposal.

FAILURE TO PROVIDE ALL INFORMATION REQUIRED ON THIS FORM MAY RESULT IN THE AWARD BEING MADE TO THE NEXT LOWEST RESPONSIBLE BIDDER.

[1] Name & Address of DBE's (Subcontractor or Supplier)	[2] Percent	[3] Description of Work and Approximate Quantity [6] (show percent when appropriate)				[5] Dollar Value
		Item	Qty.	Unit	[4] Unit Price	

[1] The designation of Firm A and/or B is not considered acceptable. I hereby certify that this company has communicated with and received quotes from the DBE's listed above and that they are willing to perform the work as listed above and that this company is committed to utilizing the above firm(s) on this contract.

[2] Percent - show percent of total contract amount committed to each DBE listed.

[3] All information requested must be included unless item is listed in proposal on a lump sum basis.

[4] Unit Price - show unit price quoted by DBE.

[5] Dollar Value - extended amount based on Quantity and Unit Price.

[6] Applies to lump sum items only.

This form may be reproduced or additional sheets added in order to provide all requested information. (See *Instructions to Bidders - Federal Projects*).

SWORN to before me this _____
day of _____, 20

_____
Company

_____ (Seal)

By: _____

Notary Public for _____

My commission expires: _____

Title: _____

EXHIBIT 8

ENVIRONMENTAL INFORMATION

Project Environmental Commitments

The following special commitments have been agreed to by the SCDOT:

Commitment	EA Reference Page(s)
Input received during the public hearing process and during the environmental document availability period will be carefully evaluated in the future project development. Modifications will be made where appropriate.	Refer to page 30
The final drainage system will be designed to accommodate the volume of stormwater associated with the preferred alternative. Stormwater control measures, both during construction and post-construction, are required for SCDOT projects constructed in the vicinity of 303(d), total maximum daily load (TMDL), outstanding resource waters (ORW), tidal, and other sensitive waters in accordance with the SCDOT's MS4 Permit (p. 65).	Refer to page 65
To minimize impacts to water quality, the contractor will be required to minimize potential impacts through implementation of construction best management practices, reflecting policies contained in 23 CFR 650 B and SCDOT's Supplemental Specifications on Seeding and Erosion Control Measures (January 12, 2009) (p. 66).	Refer to page 66
The Design-Build Construction Team will be responsible for the acquisition of all required environmental permits. The Department will provide applicable oversight and coordination to ensure compliance. The following are the assumed environmental permits required for the construction of the proposed project: a U.S. Army Corps of Engineers (USACE) permit, under Section 404 of the Clean Water Act; a 401 Water Quality Certification from the South Carolina Department of Health and Environmental Control (SCDHEC); a Land Disturbance permit under the SCDHEC National Pollutant Discharge Elimination System (NPDES) Stormwater Program for a construction site exceeding 1.0 acre. These efforts will require evaluation and implementation of various strategies to avoid, minimize, and mitigate the impacts to jurisdictional waters of the U.S. Potential measures would include adjusting fill slopes and implementing erosion control measures, which include seeding of slopes, hay bale emplacement, silt fences, and sediment basins as appropriate, to minimize impact on adjacent wetlands(p. 73).	Refer to page 73
At the appropriate stage of project development, a complete hydraulic study performed to SCDOT guidelines for Hydraulic Design Studies would be conducted to more precisely determine the effects of the project on the base floodplains. If after the completion of the studies it is determined that a conditional letter of map revision (CLOMR) is needed, appropriate coordination with the Federal Emergency Management Agency (FEMA) would take place (p. 76).	Refer to page 76
To minimize construction noise, the contractor will be required to	Refer to page 82

Commitment	EA Reference Page(s)
comply with the SCDOT 2007 Standard Specifications for Highway Construction, which includes specifications regarding nuisance noise avoidance. Other potential minimization strategies would include work-hour limits, equipment muffler requirements, location of haul roads, community rapport, and complaint mechanisms (p. 82).	
As required by 23 CFR 772.117, the Department will provide the local planning officials with the appropriate noise impact data (i.e. noise contours per page 12 of the Noise Impact Assessment) to aid in the planning and minimization of noise impacts on adjacent projects (p. 88).	Refer to page 88
The determination of areas that warrant Phase II Assessment will be conducted upon final right-of-way acquisitions. Any Phase II Assessment will be site specific, based on hydrogeologic conditions, distance from specific environmental concerns, and other relative factors. If avoidance of the contamination area is not a viable alternative, tanks and other hazardous materials would be tested and removed and/or treated in accordance with the U.S. Environmental Protection Agency (USEPA) and SCDHEC requirements (p. 90).	Refer to page 90
The Department will ensure that the existing limits of the Walker Cemetery and located grave sites are delineated and identified in the field with construction barrier fence, or other appropriate measure, prior to construction activity along this area. If construction along Roper Mountain Road impedes in the delineated area, the Department will provide an archaeologist on site to monitor all ground disturbing activities along this area.	Refer to page 91
The Department, and/or the Design-Build Construction Team will acquire all new right-of-way and process these relocations in compliance with the Uniform Relocation Assistance and Real Property Acquisition policies Act of 1970, as amended (42 U.S. C. 4601 *et seq.)* (p. 92).	Refer to page 92
Upon approval of the EA, the Department will conduct a Public Hearing to provide an opportunity to review and comment on the project. The Public Hearing would be appropriately advertised, along with notification of availability of the approved EA, which will be made available for review prior to the Public Hearing at the appropriate Department's Central and District office (p. 112).	Refer to page 112
The Design-Build Construction Team will be responsible for the maintenance of all active monitoring wells along the project corridor. Coordination with the South Carolina Department of Health and Environmental Control (SCHDEC) and the GE Turbine facility will be conducted to ensure compliance with all monitoring plans. This coordination will also determine appropriate action regarding the impacted wells, which may include appropriately abandoning the wells, retro-fitting the wells to meet the new elevations, and/or relocating the wells to the same general areas.	Refer to FONSI Package

CONTRACTOR should be aware that all permitting should be coordinated through SCDOT's Environmental Management Office.

EXHIBIT 9

RAILROAD INFORMATION

EXHIBIT

GE SPECIAL PROVISIONS

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:

"GE" shall mean General Electric Company, its successors and assigns.

"SCDOT" shall mean the South Carolina SCDOT of Transportation.

"AGREEMENT" shall mean the AGREEMENT between GE and SCDOT and the AGREEMENT between the SCDOT and CONTRACTOR.

"CONTRACTOR" shall have the meaning ascribed to such term by the AGREEMENT.

"WORK" or “PROJECT” shall mean the Design Build PROJECT as described in the AGREEMENT.

I. WORK TO BE PERFORMED IN ACCORDANCE WITH SPECIAL PROVISIONS, SCDOT/GE AGREEMENT, SCDOT AND CONTRACTOR AGREEMENT, AND APPROVED PLANS

CONTRACTOR shall perform all WORK upon or adjacent to GE’S property in accordance with the PROJECT Special Provisions, the AGREEMENT between SCDOT and GE for this PROJECT, the AGREEMENT between SCDOT and the CONTRACTOR, and the approved Plans which are incorporated by reference into the AGREEMENT.

II. AUTHORITY OF GE ENGINEER

The authorized representative of GE ("GE Representative"), who will be identified at the PROJECT’s Partnering Meeting, shall have final authority in all matters affecting the safe maintenance of GE operations and GE property, and his or her approval shall be obtained by the SCDOT’s CONTRACTOR for methods of construction to avoid interference with GE operations and GE property and all other matters contemplated by the AGREEMENT, the Project’s design, and these Special Provisions.

III. INTERFERENCE WITH GE OPERATIONS

A. CONTRACTOR shall invite the following GE Representatives to the PROJECT's Partnering Meeting: GE must be represented at the PROJECT's Partnering Meeting.

David Holliday, (864)254-2829, David.Holliday@GE.com

David Sudbeck, (864)254-4175, David.Sudbeck@GE.com

B. CONTRACTOR shall contact GE forty-five calendar days prior to the initial commencement of WORK on GE's Property. CONTRACTOR shall not WORK on GE's property or allow any of CONTRACTOR's equipment or material to encroach, or to present a risk of encroachment, without first obtaining authority from GE's Chief Engineer or his authorized representative.

C. CONTRACTOR shall, at all times, use reasonable care and diligence and cooperate with GE officials in order to avoid accidents, damages, or delay to, or interference with, GE operations, or damage to GE's property, or to poles, wires, and other facilities of tenants on GE's Property or right-of-way.

D. CONTRACTOR shall arrange and conduct its WORK so that there will be no interference with GE's and Carolina Piedmont Railroad's train operations. Delay of train movement may result in a fine which shall be born solely by the CONTRACTOR. CONTRACTOR shall be responsible for all fines and actual costs incurred by GE as a result of delays of train movement caused by the CONTRACTOR.

E. CONTRACTOR shall store materials so as to prevent trespassers from causing damage to trains, or GE Property. CONTRACTOR must request approval before storing any material or equipment on GE Property. It should be expected that this approval will not be granted.

F. At the PROJECT's initial Partnering Meeting, the CONTRACTOR shall describe to GE all WORK that is likely to affect their operations and property; including, but not limited to; schedules, methods, train protection (portable derails and red board), proposed right-of-way impacts, and proposed utility conflicts. This description of WORK shall include contact information for the CONTRACTOR'S Representative who will manage these activities. This representative will be available to GE to discuss the project as necessary; including, communicating with GE and Carolina Piedmont about train

activity, clearing the tracks as instructed for safe, timely passage of trains, and any unanticipated conditions or situations arising over the course of the project. If additional time is needed to review the Contractor's description of WORK, GE Representatives will review this information and schedule a follow-up meeting, with the CONTRACTOR and SCDOT, within forty-five (45) calendar days of PROJECT's initial Partnering Meeting. During this follow-up meeting, GE will provide any comments and additional instruction necessary for the WORK on GE's property. As time is of the essence, GE will make every effort at this meeting to provide approval for the CONTRACTOR's description of WORK, described in this paragraph.

G. If conditions arising from or in connection with the PROJECT require that immediate and unusual provisions be made to protect train operation or GE's property, CONTRACTOR shall make such provisions. If the GE Representative determines that such provisions are insufficient, GE may, at the expense of the CONTRACTOR, require or provide such provision as may be deemed necessary, or cause the WORK to cease immediately.

IV. NOTICE OF STARTING WORK. CONTRACTOR shall not commence any WORK on GE Property or rights-of-way until it has complied with the following conditions:

A. Notify GE in writing of the date CONTRACTOR intends to commence WORK. Such notice must be received by GE at least forty-five (45) calendar days in advance of the initial date CONTRACTOR proposes to begin WORK on GE's property or right of way. The notice must identify the PROJECT by reference:

SCDOT File No. 23.038111, I-85/I-385 Design Build PROJECT

GE will provide to the CONTRACTOR, to be include in the description of WORK, described in Section III, F, strict instructions for the CONTRACTOR to follow pertaining to plan submittals, reviews, and approval; requirements while on GE's Property; GE Representatives who must be notified; railroad flagging/protection services; and any other instruction GE deems necessary. GE's typical train activity is less than five (5) trains a week. As long as the CONTRACTOR abides by GE's instructions, continuous flagging services and costs for such services will not be required by GE.

B. There will be no charge for GE plan reviews or railroad flagging services associated with the WORK on GE's property, as long as the CONTRACTOR follows the detailed instructions provided and any amendments provided by the managing GE Representative. If GE's instructions are not followed, GE may, at the expense of the CONTRACTOR, cause the WORK to cease immediately. GE Engineers will perform plan reviews. GE will work with the

CONTRACTOR to accommodate the PROJECT's schedule; however, it must be understood that GE will not be liable for delays.

C. Obtain authorization from the GE Representative to begin WORK on GE property, right-of-way, or within fifty (50) feet of their railroad property. Such authorization will include an outline of specific conditions with which CONTRACTOR must comply.

D. Obtain from GE the names, addresses and telephone numbers of GE's personnel who must receive notice; as outlined in the Special Provisions and AGREEMENT. Where more than one individual is designated, the area of responsibility of each shall be specified.

V. UTILITIES and WORK FOR THE BENEFIT OF THE CONTRACTOR

A. If changes to GE's wire lines or other facilities are, or become, necessary for the PROJECT, such changes shall be covered by preparation of a utility agreement with estimate and relocation drawings prepared by GE or GE's Representative. Upon SCDOT's approval of the relocation drawings, utility agreement, and estimate, GE or GE's Representative may proceed with relocation of utilities. All costs associated with changes to GE's wire lines or other facilities as a result of the PROJECT, shall be the responsibility of the CONTRACTOR. The CONTRACTOR shall also be responsible for the relocation of third party utilities, at no cost or expense to GE.

B. Should CONTRACTOR desire any changes in addition to the above, then CONTRACTOR shall make separate arrangements with GE for such changes to be accomplished at the CONTRACTOR's expense.

VI. HAUL ACROSS GE

A. If CONTRACTOR desires access across GE property or tracks other than at an existing, open public road crossing, CONTRACTOR must discuss with GE at the PROJECT's Partnering Meeting, and allow GE forty-five (45) days to review and respond. If GE grants permission, GE shall require the CONTRACTOR to execute a separate AGREEMENT or right of entry satisfactory to GE, wherein CONTRACTOR agrees to bear all costs and liabilities related to such access.

B. If at anytime CONTRACTOR desires to establish and use a temporary at-grade crossing of GE'S tracks, CONTRACTOR shall obtain written permission to do so from GE.

C. CONTRACTOR shall not cross GE'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.

VII. COOPERATION AND DELAYS

A. If necessary, CONTRACTOR shall arrange a schedule with GE for accomplishing staged construction involving WORK by GE. In arranging its schedule, CONTRACTOR shall ascertain, from GE, 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 GE or SCDOT for hindrance or delays caused by GE or Carolina Piedmont Railroad trains, pedestrian or vehicular traffic, WORK performed by or on behalf of GE, delays necessary for safe maintenance of GE facilities, 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 GE does not assume any responsibility for WORK performed by others in connection to the PROJECT. CONTRACTOR further understands and agrees that it shall have no claim whatsoever against GE for any inconvenience, delay or additional cost incurred by CONTRACTOR on account of operations by others.

VIII. STORAGE OF MATERIALS AND EQUIPMENT

CONTRACTOR shall not store its materials or equipment on GE's property or where they may potentially interfere with GE's operations, unless CONTRACTOR has received GE Representative's prior written permission. CONTRACTOR understands and agrees that GE will not be liable for any damage to such materials and equipment from any cause except the negligence, recklessness or intentional wrongdoing of GE, or its agents or employees. GE may move, or require CONTRACTOR to move, such material and equipment, at CONTRACTOR's sole expense. To minimize the possibility of damage to the GE 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. CONTRACTOR will not be allowed to store materials or equipment within twenty (20) feet of the centerline of the tracks.

IX. CONSTRUCTION PROCEDURES

A. General

1. Construction WORK on GE property shall be subject to GE's inspection and approval.

2. Construction WORK on GE property shall be in accord with these Special Provisions.

3. CONTRACTOR shall observe the terms and rules of the GE Safety manual and in accord with any other instructions furnished by GE or GE's Representative.

B. Blasting

1. CONTRACTOR shall obtain the prior written approval of GE Representative's and SCDOT for use of explosives on or adjacent to GE 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 GE. At least 72 hours' advance notice to GE Representative is required to arrange for the presence of an authorized GE representative and any flagging that GE 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 GE's property resulting from the blasting, as directed by GE Representative, without delay to trains.

e. SCDOT and its CONTRACTOR shall not store explosives on GE property.

2. GE 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.

X. MAINTENANCE OF DITCHES ADJACENT TO GE 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.

XI. FLAGGING / INSPECTION SERVICE

A. CONTRACTOR shall utilize GE railroad flagging, watchmen, or other protective measures that are required, in the sole opinion of GE, to promote safety and/or continuity of GE traffic. This requirement will be outlined in the detailed plan and managed as aforementioned in Section III, F. GE has sole authority to determine the need for railroad flagging required to protect its operations and property. In general, railroad 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 GE, or over tracks.

B. CONTRACTOR shall give a minimum of ten (10) days or as otherwise detailed in the detailed instructions, advance notice to GE Representative of initial anticipated need for railroad flagging services. No WORK for which flagging service is required shall be undertaken until the flag person(s) have provided approval. GE shall have the right to assign an individual to the site of the PROJECT to perform inspection service whenever, in the opinion of GE Representative, such inspection may be necessary. Inspection service shall not relieve CONTRACTOR from any liability for its WORK.

C. GE shall render invoices for, and SCDOT shall pay for, the actual pay rate of services required as a result of the CONTRACTOR not following the aforementioned instructions. These costs shall be deducted from the CONTRACTOR's payments.

XII. UTILITY FACILITIES ON GE PROPERTY

CONTRACTOR shall arrange to have any utility facilities on or over GE Property changed as may be necessary to provide clearances for the PROJECT. This utility WORK shall be at no cost to GE. GE has identified a water meter near Garlington Road that may be impacted as a result of the PROJECT. GE has also identified a maintenance road that accesses this water meter that may require relocating as a result of the PROJECT. The GE utilities listed under this section are not intended to be an all- inclusive list of utilities that may be disturbed as a result of the PROJECT.

XIII. CLEAN-UP

CONTRACTOR, upon completion of the PROJECT, shall remove from GE'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 GE Property in neat condition, satisfactory to GE Representative.

XIV. FAILURE TO COMPLY

If CONTRACTOR violates or fail to comply with any of the requirements of these Special Provisions, GE may require CONTRACTOR to vacate GE Property.

XV. INSURANCE PROVISIONS

A. Insurance Policies:

CONTRACTOR shall procure and maintain the following insurance policies:

1. Commercial General Liability 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 GE and Carolina Piedmont Railroad as an additional named insured, with endorsement CG 24 17 10 01 (Contractual Liability - Railroads), and a waiver of subrogation against GE and Carolina Piedmont Railroad and its affiliates.

2. Statutory workers' Compensation and Employers Liability Insurance with limits of not less than $1,000,000, which insurance must contain a waiver of subrogation against GE and its affiliates.

3. Business automobile liability insurance with limits of not less than $500,000 combined single limit for bodily injury and/or property damage per occurrence and such other insurance as GE may reasonably require.

4. Railroad protective liability insurance with limits of not less than $2,000,000 combined single limit for bodily injury and/or property damage per occurrence and an aggregate annual limit of $6,000,000. Such insurance shall satisfy the following additional requirements:

a. The insurer must be financially stable and rated B+ or better in Best's Insurance Reports.

b. The GE Protective Insurance Policy must be on the ISO/RIMA Form of GE Protective Insurance - Insurance Services Office (ISO) Form CG 00 35.

c . The named insured shall read:

General Electric Company
300 Garlington Road
Greenville, SC 29615

Carolina Piedmont Division Railroad
268 E. Main St.
Laurens, SC 29360
Attention: David Pope

d. Name and Address of CONTRACTOR and SCDOT must be shown on the Declarations page.

e. Description of operations must appear on the Declarations page and must match the PROJECT description, including PROJECT or contract identification numbers.

f. Authorized endorsements must include the 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) 30-day Advance 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

(ii) A Punitive or Exemplary Damages Exclusion
(iii) A "Common Policy Conditions" Endorsement
(iv) Any endorsement that is not named in Section 4 (f) or (g) above.
(v) Policies that contain any type of deductible

5. Such additional or different insurance as GE may require.

B. Additional Terms

1. CONTRACTOR must submit its original insurance policies and two copies and all notices and correspondence regarding the insurance policies, together with completed Insurance Approval Request Form (attached) to:

General Electric Company
Attn: David Sudbeck
300 Garlington Road
Greenville, SC 29615

2. CONTRACTOR may not begin WORK on GE's property or right-of-way or within fifty (50) feet of railroad property or which affects a GE railroad bridge or trestle, tracks, roadbeds, tunnel, underpass or crossing until it has received GE's written approval of the required insurance policies.

XVI. CONTRACTOR'S AGREEMENT

Prior to commencement of WORK on GE's property or right-of-way or within fifty (50) feet of railroad property or which affects a GE railroad bridge or trestle, tracks, roadbeds, tunnel, underpass or crossing, CONTRACTOR shall execute and deliver to GE the CONTRACTOR's AGREEMENT (Schedule I to the AGREEMENT).

SCHEDULE I

SCDOT File No. : _____
Roads involved in PROJECT:_____

CONTRACTOR'S AGREEMENT

This CONTRACTOR'S AGREEMENT is made as of _____,by_____ _____ [Insert Name of CONTRACTOR] ("CONTRACTOR"), to and for the benefit of General Electric Company ("GE") and to induce GE to permit CONTRACTOR on or about GE's property, for the purposes of performing WORK in connection with the above referenced PROJECT for South Carolina SCDOT of Transportation.

In consideration of GE's consent to permit CONTRACTOR on or about GE'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. GE Special Provisions. CONTRACTOR agrees to abide by and observe the terms and conditions of the GE 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 GE in accordance with the Special Provisions, satisfactory to GE, prior to commencement of WORK on or about GE's property.

3. Indemnification.

CONTRACTOR further specifically agrees as follows:

(a) CONTRACTOR shall indemnify, defend and save harmless GE and Carolina Piedmont Railroad 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 sub-CONTRACTOR or sub-sub-CONTRACTOR; 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 sub-CONTRACTOR or sub-sub-CONTRACTOR; 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 indemnification 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 GE and Carolina Piedmont Railroad 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, GE's affiliates include General Electric Company and all entities, directly or indirectly, owned or controlled by or under common control of GE and their respective officers, directors, employees and agents.

(d) CONTRACTOR shall notify GE promptly of any loss, damage, injury or death arising out of or in connection with the PROJECT WORK.

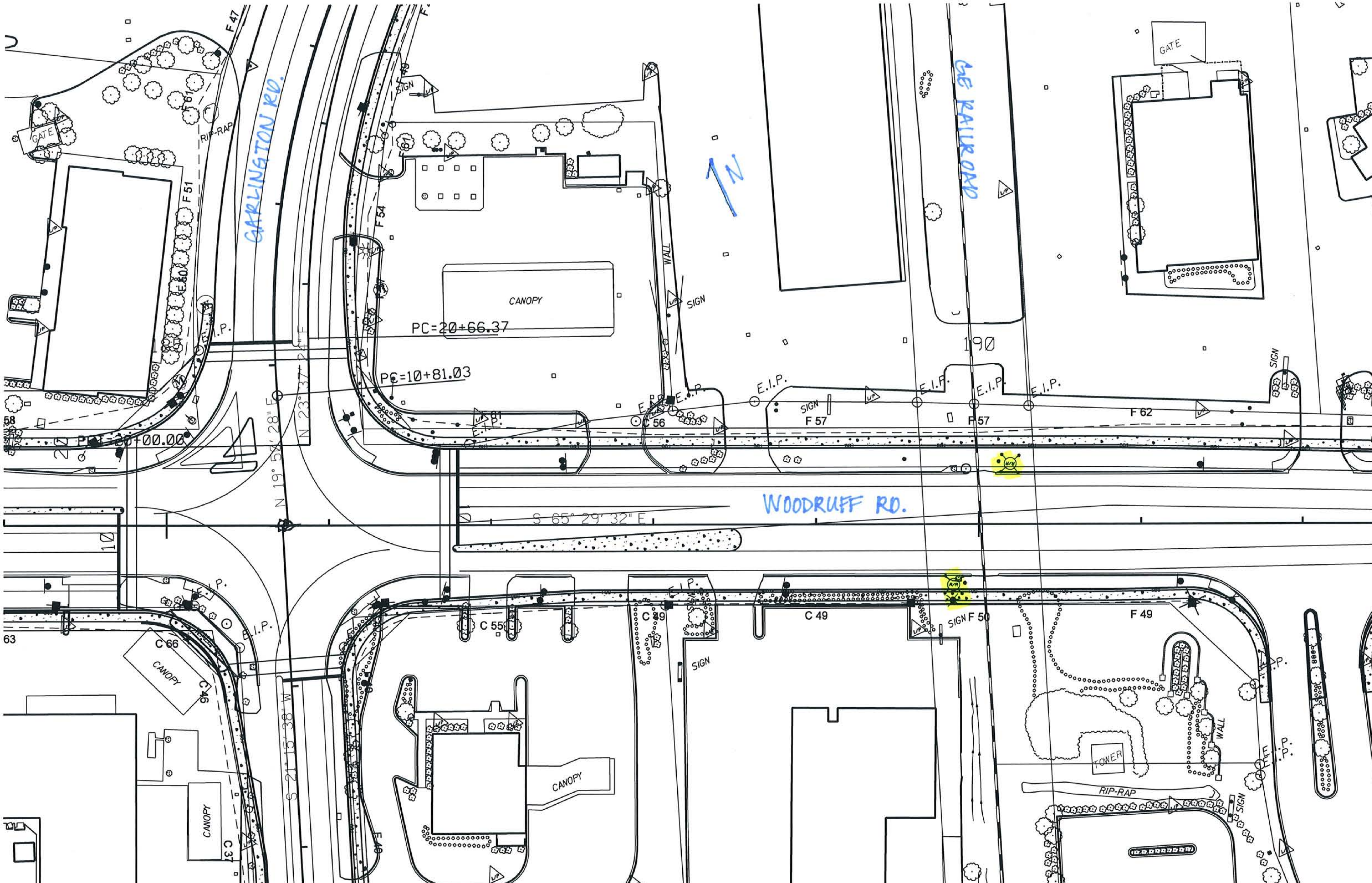
(e) The provisions of this AGREEMENT shall survive the termination or expiration of the AGREEMENT.

IN WITNESS WHEREOF, CONTRACTOR has executed and delivered this AGREEMENT as of the date set forth below.

CONTRACTOR

_____

By: _____
Print: _____
Date: _____ Title: _____


GARLINGTON RD.
WOODRUFF RD.
GE RAILROAD
N
GATE
RIP-RAP
F 47
F 61
F 51
E 50
F 54
SIGN
CANOPY
WALL
PC=20+66.37
PC=10+81.03
30+00.00
E.I.P.
N 19° 50' 28" E
N 23° 37' 24" E
S 65° 29' 32" E
S 21° 15' 38" W
190
F 57
F 62
C 56
58
20
10
63
C 66
C 46
C 37
C 55
C 49
SIGN F 50
F 49
TOWER
U/P
R/R

Project: Design Build I 85/I 385 Interchange and
SC 146 Improvements
Greenville Counties, SC,
DOT No.: 640375D, RRMP AKJ 584.51
RAILROAD File:_____
SCDOT File 23.038111

RAILROAD ENGINEERING REQUIREMENTS TO BE INCLUDED INTO DESIGN BUILD PROJECT BID PACKAGE

The Request for Railroad Engineering Requirements for Inclusion into Design-build Project Bid Package Agreement dated _____, 2013 included a Scope of Work which outlines ten (10) "Engineering Requirements" to be provided by the RAILROAD. Each scope item is copied below and is followed by a response and/or detailed RAILROAD requirements in bold type font.

1.1.1. Visit project site to identify existing or potential issues or conflicts, including, but not limited to: utilities, crossing signals, etc., based on project information provided by SCDOT

A site investigation was performed on October 2, 2013 and the following comments are a result of that site visit.

Utilities – Any utility conflicts, as a result of the roadway construction or warning device and crossing surface installation, shall be the responsibility of the SCDOT or the state's contractor to relocate or remove. Once a final design has been submitted by the roadway contractor, the railroad will identify utility obstructions to be resolved. Per information gathered during October 2 site visit, overhead utility lines running parallel to and on the South side of SC146 (Woodruff Road) may present an obstruction to proposed roadway warning devices. Underground sanitary sewer pipe running parallel to and on the Northern side of SC146 (Woodruff Road) may present an obstruction to the placement of the roadway warning devices.

Right of way – the RAILROAD right of way and General Electric right of way shall be verified by the SCDOT for accuracy by legal survey or deed search (whichever is necessary and/or appropriate). The right of way shown on the conceptual exhibits are in accordance with RAILROAD valuation maps, which are not guaranteed to be 100% accurate.

1.1.2. Provide a val map establishing RAILROAD ROW width

Valuation Map "v.4/8" (Appendix A) are included with this submittal. RAILROAD right-of-way is 70 feet wide (35 feet each side of the centerline of tracks) in a tangent corridor at the project location.

1.1.3. Provide additional track and/or service road requirements, location of such, and spacing requirements

A service road shall be provided from Woodruff Road to the railroad signal house location and in the opposing quadrant of the crossing (see conceptual H01). Refer to SCDOT Engineering Directive Memorandum – Driveway Entrances (dated 03/30/2009) (Appendix B).

1.1.4. Provide train counts and define whether or not this an Amtrak line

This is not an Amtrak line and there are no passenger trains operating on this segment of track. There are currently four scheduled freight trains per month utilizing the subject spur line. Maximum authorized speed is 10 miles per hour.

1.1.5. Provide the Right-of-Entry requirements for surveying, soil borings, etc. (RAILROAD web-site and path is acceptable)

Each contractor and sub-contractors shall be required to complete a right of entry application and have the appropriate RAILROAD Protective Liability (RPL) Insurance prior to entering or performing work on RAILROAD property or within 50' of an active track. The primary contractor shall be permitted to include sub-contractors within their right of entry application and RPL Insurance. However, in doing so, the primary contractor takes full responsibility and liability for the sub-contractors included in these documents.

Flaggers will be required for each contractor, sub-contractor, and/or work group in the following conditions:

1. **When, in the sole opinion of RAILROAD, protection is necessary to safeguard RAILROAD'S trains, engines, facilities and property.**
2. **When work is performed, in any way, over, under, or in close proximity to tracks or any RAILROAD facilities.**
3. **When work in any way interferes with the operation of trains at usual speeds or threatens, damages, or endangers track or RAILROAD facilities.**
4. **When any hazard is presented RAILROAD communications, signal, electrical, or other facilities due to persons, material, equipment, or blasting in the vicinity.**
5. **When and where material is being hauled across tracks. Provided, however, special clearance must be obtained from RAILROAD before moving heavy or cumbersome objects and equipment which might result in making the track impassable for any period of time.**

All contractors and sub-contractors working on RAILROAD right of way must have and display at all times a G&W Roadway Worker Training (RWT) certificate. Instructions for accessing the online RWT training are included in this document (Appendix C). The online RWT training is for individuals only; group training would need to be coordinated at a later time.

Right-of-Entry application(s) for boring, surveying, and other access to property prior to obtaining an executed Construction Agreement can be found at the RAILROAD website at the following URL:
http://www.gwrr.com/real_estate/accessing_property

1.1.6. Provide RAILROAD current standards, clearances, construction criteria, insurance requirements etc. (RAILROAD web-site and path is acceptable)

Current Standards (Appendix D):

- **ES1021.2 – Signal Placement Specifications (dated 07/03/2013)**
- **ES1023.0 – DOT Number Plate Specification (dated 07/03/2013)**
- **ES1024.0 – Emergency Sign Specifications (dated 07/03/2013)**
- **ES6007.1 – Transition ties specifications (dated 07/03/2013)**
- **Es8037.1 – RCP Installation Specification (dated 07/03/2013)**
- **ES8049.1 – CMP Installations Specification (dated 07/03/2013)**
- **ES8050.1 – Track Anchor and Spiking Patterns (dated 07/03/2013)**
- **ES8051.1 – Mainline Track Specifications (dated 05/29/2013)**
- **ES8090.2 – Overhead Wire Line Crossing Specification (dated 07/03/2013)**
- **ES8090.4 – Directional Bore Specification (dated 07/03/2013)**
- **ES8090.5 – Jack and Bore Specification – carrier pipe not under pressure (dated 07/03/2013)**
- **ES8090.6 – Jack and Bore Specification – carrier pipe under pressure (dated 07/03/2013)**
- **General Specifications for Sub-grade and Above Grade Utility Crossings of Railroad's Right of Way (dated 03/07/2013)**

These standards are updated from time to time and represent the current minimum standard. Additional requirements, restriction, and/or limitations may be imposed by the RAILROAD based on PE review of the design plans. Railroad standards and specifications can be found at the RAILROAD website at the following URL: http://www.gwrr.com/real_estate/utility_occupancies

Construction Criteria – When developing the construction drawings for review the contractor's engineer should also be familiar with the AREMA (American Railway Engineering and Maintenance-of-Way Association) Manual for Railway Engineering.

Insurance Requirements – Find the attached RAILROAD requirement for $2M & $6M RPL Insurance and typical RAILROAD Project Construction Agreement, which includes current standard insurance requirements. RAILROAD insurance requirements can also be found at the RAILROAD website at the following URL:
http://www.gwrr.com/real_estate/insurance_requirements

1.1.7. Provide any additional information/requirements specific to the project site, such as MSE and/or crash wall requirements, etc.

The RAILROAD expects that MSE walls and Crashwalls will not be used for this project given the existing terrain and 70 feet right-of-way width. Traffic light pre-emption from intersection of SC146 (Woodruff Road) and SC 564 (Garlington Road) may be required. There will be no structures or facilities placed on the RAILROAD right-of-way, only the roadway through the RAILROAD property corridor. All drawings and calculations for MSE walls and crashwalls located on or adjacent RAILROAD property shall be submitted to the RAILROAD for review.

1.1.8. Provide an estimated cost for the preliminary engineering review of the project's plans

The estimate of actual RAILROAD expenses relating to PE review of the design materials will depend on the complexities of the project, duration of review, number of design submittals, and other variables. For projects requiring two reviews of preliminary design plans plus one review of the final design plans, where the projects are not put on hold or otherwise delayed, the estimated expenses are between $10,000 and $20,000. The estimate will include:

- **One site assessment**
- **Two reviews of preliminary roadway plans with supporting calculations (minimum 60% and 90% submittals)**
- **One review of final roadway plans with supporting calculations (minimum 100% plans)**
- **Development of a cost estimate for construction engineering and inspection services (CE&I)**
- **Routing of the construction agreement**
- **Ongoing project administration and coordination**
- **Distribution of a Notice to Proceed to mobilize railroad forces to support construction activities.**

If the aforementioned conditions are satisfied, we expect that a PE review for this type of construction project will cost approximately $20,000. On an order of magnitude, cost per additional PE review can be estimated at between $2,000 and $4,000. Additional PE reviews are required whenever project plans are revised and resubmitted or scope changes. Other engineering fees will apply for continuing Project Management, Construction Engineering and Inspection, Administrative, etc., which will be included in the Order of Magnitude estimate. This estimate provided will in no way be considered a final quote or detail the final cost of the project due to the unknown aspects and possible changes in the project plans or scope.

1.1.9. Provide a brief description of the typical required RAILROAD services, with a schedule of typical project expenditures, which are required during project design and construction. This schedule is for informational purposes only to identify typical

project expenditures and understood not to be all inclusive or to infer actual Preliminary and/or Construction costs

Preliminary Engineering – PE scope and cost estimate are described in item section 1.1.8 above. A 45 day PE review timeline is generally allotted for each design review. Additional reviews may be necessary depending on the complexity of the project, design changes made following prior reviews and/or adherence to RAILROAD standards and requirements.

Construction Plan Submission Review – Roadway construction plans shall comply with and incorporate all applicable RAILROAD standards.

- **Roadway plans to be submitted for review at 30%, 60%, 90%, and final completion. However every effort will be made to complete them sooner.**
- **Review to take up to 30 to 45 days. If an expedited review (20 days) is required, it must be requested upon drawing submission.**

Agreements and Approvals – The RAILROAD and the SCDOT shall enter into the Preliminary Engineering and Construction Agreement for the at-grade public crossing project. The length of time for agreement preparation and execution can be between three and six months, depending on project complexity.

Construction, Administrative, & Engineering Services – Upon completion of the Legal Agreements and Approvals phase, the following will take place. An example estimate of railroad materials and services is provided in Exhibit A. All railroad work associated with the project; including but not limited to railroad signals and crossing surface, will be at project cost. There will be no cost to the RAILROAD. RAILROAD vendors will require appropriate time to design railroad signals and crossing surface, order materials, and schedule crews to perform installations.

- **RAILROAD shall competitively bid the RAILROAD portion of the project and award the project to the most cost effective vendor.**
- **Once project construction agreements are fully executed, the crossing installation will begin in accordance with the overall project construction schedule.**
- **Administration and engineering service will take place as needed.**
- **Duration of this process will be determined by the SCDOT Roadway vendor's construction schedule.**

CE&I Expenses - Construction CE&I will be provided by the RAILROAD Representative (Xorail) on behalf of the RAILROAD. All applicable construction design and plan submissions must be reviewed and approved by the RAILROAD Representative before work related to those submissions is allowed to commence on the RAILROAD right-of-way. The reviews can take up to 30 days, however every effort will be made to complete them sooner. The

RAILROAD representative will also be on site at various times during construction to verify that all work is being completed according to all requirements and standards and in accordance with the approved construction drawings and submissions criteria. Order of magnitude costs (for informational purposes only) for expenses that the RAILROAD expects to incur as a result of providing construction engineering and inspection services in support of a typical roadway improvement project follow. These expenses are shown in the example estimate (Appendix E).

<u>RAILROAD Flagging Protection</u> – Flagging protection is required for each day that each contractor, subcontractor, and/or work group is working on the RAILROAD right-of-way.

- **Flagging to be scheduled thirty (30) days in advance.**
- **Notification to terminate flagging to take place six (6) days in advance.**
- **Flagging costs are $600.00 per scheduled day (8 hour day)**
- **Overtime hourly rate is $112.50.**

1.1.10. Engineering may also include office reviews, field reviews, attendance at meetings, and preparation of correspondence, reports, and other documentation in connection with the Project. Nothing contained in this Agreement shall oblige the RAILROAD to perform work which, in the RAILROAD's opinion, is not relevant to the RAILROAD's participation in the Project

If it is found that additional work by the RAILROAD is necessary following execution of a Preliminary Engineering Agreement, the Agency or its contractor shall submit written or email request(s) to the RAILROAD requesting or authorizing additional services. The RAILROAD will provide additional field reviews, attend design and coordination meetings, prepare correspondence and reports, or generate other documentation needed to assist in facilitation of project design and schedule. If those additional services will cause the approved budget to be overrun, a revised cost estimate will be provided to the Agency for approval of an amended PE budget and scope. The cost for such work shall be charged at the hourly allowable rate under RAILROAD or contractor representatives attending such meetings. Estimates will include expected costs only.

Other items of note relating to construction and installation of new roadway warning devices:

Existing foundations must be removed in their entirety by the RAILROAD vendor.

SCDOT is welcome to request additional clarification and information relating to design-build bid package deliverables as well as design and construction submittals. Should these requests for additional information cause the current

budget authority to be exceeded, additional authority will be required and a detailed estimate will be provided in support of such a request.

During construction, any shop drawings or calculations not previously reviewed or approved shall be submitted for RAILROAD approval.

Depending on the alignment of the proposed roadway and roadway warning devices, a permanent easement may be required. Any new or adjusted permanent easement must be obtained separately from the RAILROAD Real Estate Department and/or General Electric Real Estate Department.

Railroad warning devices are designed and installed by the Railroad's contractor. Installation requires careful coordination. Unless approved by the SCDOT and FHWA, the road cannot be opened without warning devices in place.

Railroad concrete crossing surface is installed by a railroad contractor (different than signal contractor) and will also require careful coordination.

In order for the roadway to remain open to vehicular traffic during the installation of the railroad crossing surface, maintenance of traffic and phased road closures will be required.

Enclosures:

Appendix A

- Valuation Maps "v.4/8"

Appendix B

- SCDOT Engineering Memorandum – Driveway Entrances (dated 03/30/2009)

Appendix C

- Roadway Worker Protection Training – Compliance to G&W Policies & Procedures
- G&W RWT Registration Instructions

Appendix D

- ES1021.2 – Signal Placement Specifications (dated 07/03/2013)
- ES1023.0 – DOT Number Plate Specification (dated 07/03/2013)
- ES1024.0 – Emergency Sign Specifications (dated 07/03/2013)
- ES6007.1 – Transition ties specifications (dated 07/03/2013)
- ES8037.1 – RCP Installation Specification (dated 07/03/2013)
- ES8049.1 – CMP Installations Specification (dated 07/03/2013)
- ES8050.1 – Track Anchor and Spiking Patterns (dated 07/03/2013)
- ES8051.1 – Mainline Track Specifications (dated 05/29/2013)
- ES8090.2 – Overhead Wire Line Crossing Specification (dated 07/03/2013)
- ES8090.4 – Directional Bore Specification (dated 07/03/2013)

- ES8090.5 – Jack and Bore Specification – carrier pipe not under pressure (dated 07/03/2013)
- ES8090.6 – Jack and Bore Specification – carrier pipe under pressure (dated 07/03/2013)
- General Specifications for Sub-grade and Above Grade Utility Crossings of Railroad's Right of Way (dated 06/27/2011)

Appendix E

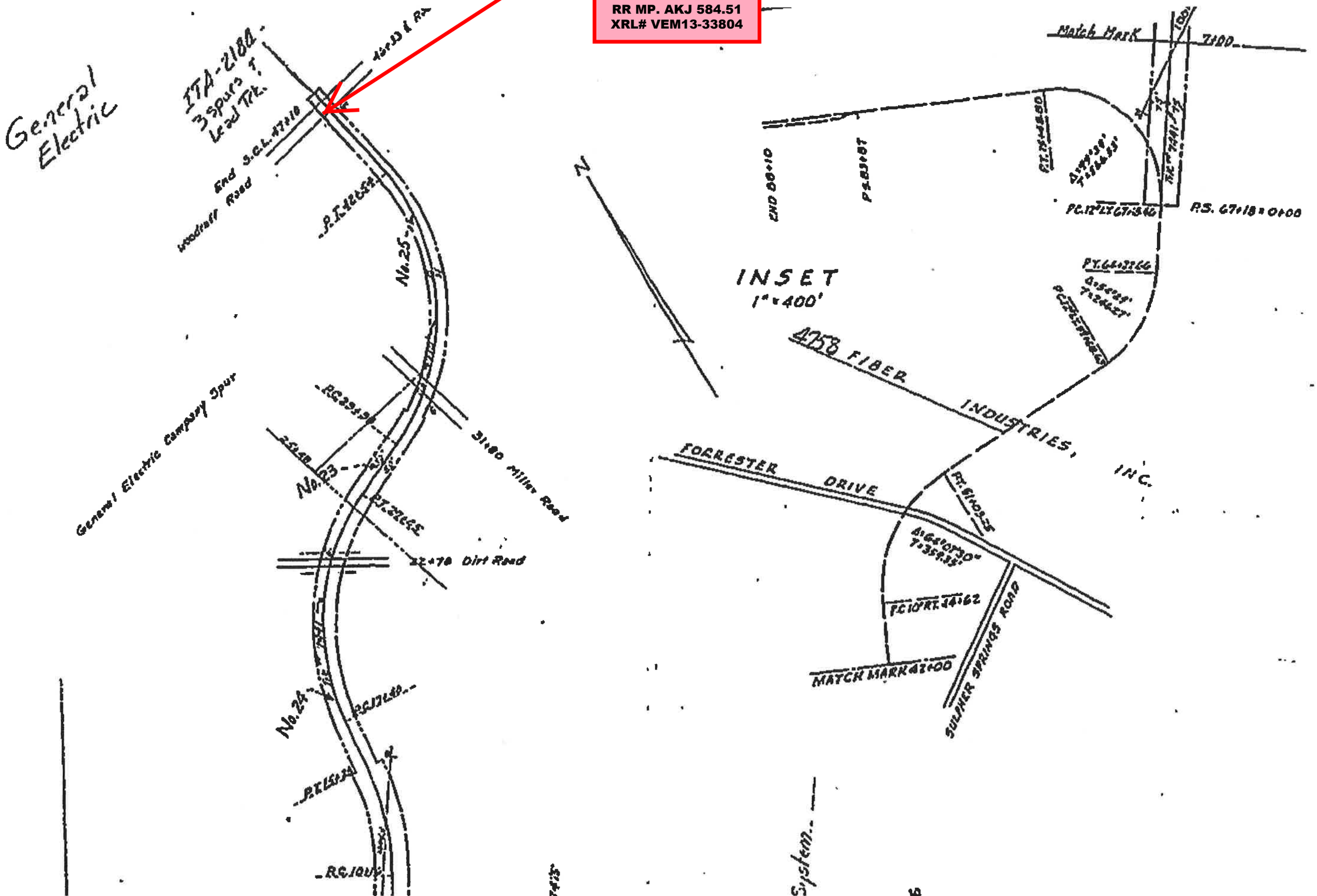
- Example Estimate of Railroad Materials and Services

Appendix F

- Exhibit crossing drawings

Greenville,
(Greenville), SC
SC 146 (Woodruff Rd)
DOT# 640375D
RR MP. AKJ 584.51
XRL# VEM13-33804

APPENDIX A



APPENDIX B

South Carolina Department of Transportation
Engineering Directive Memorandum

Number: 16

Primary Department: Maintenance

Referrals: South Carolina Code of Law 57-5-1140
Engineering Directive Memorandum (EDM) 24
SCDOT Access and Roadside Management Standards (ARMS) – 2008 Edition
SCDOT 2007 Standard Specifications for Highway Construction

Subject: Driveway Entrances

1. INSTALLATION OF RESIDENTIAL ENTRANCES – The Department shall construct, at its expense, the portion within the right-of-way of entrances and aprons to state highways at any point necessary to render adequate ingress and egress to the abutting property at locations where the driveways will not constitute hazardous conditions. The driveway must be of access to existing developed property or property that is being developed for the personal use of the owner and not for speculative or resale purposes. The driveway shall be a maximum of 16 feet wide (paved portion). If pipe culvert is necessary for drainage, the Department shall install the amount necessary, up to 30-inch pipe. Should driveway installation require pipe larger than 30 inches, the Department may install the pipe and charge the homeowner for the difference in cost between 30-inch pipe and the larger diameter pipe required. Driveways requiring drainage structures other than pipe must be brought to the attention of the director of maintenance. Entrances to be constructed as outlined in this section shall include base and surfacing as necessary to provide all-weather driveway entrances. If wider entrances or additional entrances are requested and approved, construction may be performed by the Department at the owner's expense. The district engineering administrator is authorized to approve installation of a residential driveway at DOT expense when a present driveway exists, if the land use of the property has changed significantly.

2. DRIVEWAY MAINTENANCE – Maintenance of residential and commercial driveway entrances within the right-of-way may be performed by the Department as deemed necessary. The Department shall address any hazardous conditions that may exist within the limits of the roadway shoulder, including the sideline pipe.

3. DRIVEWAY CONSTRUCTION – Pipe culvert should be selected according to EDM-24. Pipe culvert shall be placed and backfill compacted according to EDM-24. Pipe diameters less than 12 inches are not permitted. The pipe culvert should, where possible, be placed in the center of the ditch and fit the alignment and slope of the ditch. Pipe shall be of a sufficient length to extend to the toe of the backfilled slope. Driveways should have a 2-foot wide shoulder at a 4:1 slope and shall have no greater than a 3:1 slope for the remainder of

the driveway's front slope. The shoulder and slope shall be grassed to prevent erosion. The surface should be an all-weather concrete or asphalt surface. Asphalt surfacing should be a minimum of 2 inches thick with a compacted 6-inch base. If the concrete option is used, concrete driveways should be constructed in accordance with the SCDOT 2007 Standard Specifications for Highway Construction. The driveway's alignment with the existing road, approach grade, and radii should be constructed in accordance with the SCDOT ARMS manual, 2008 Edition.

Submitted by: _____*James J. Feda, Jr.*
Director of Maintenance

Recommended by: _____*J. C. Watson*
Chief Engineer for Operations

Approved by: _____*Tony L. Chapman*
Deputy Secretary for Engineering

Effective Date: _____*March 30, 2009*

Original signed by Deputy Secretary for Engineering Tony L. Chapman, P.E. March 30, 2009. All original engineering directives maintained by the Office of the Deputy Secretary for Engineering.

APPENDIX C

GENESEE & WYOMING INC.
Engineering Department
Mr. Larry Romaine
AVP – Engineering Design
13901 Sutton Park Drive South, Suite 330
Jacksonville, FL 32224
Office: 904.900.6247
E-Mail: larry.romaine@gwrr.com

FROM THE OFFICE OF: Larry Romaine
AVP – Engineering Design

SUBJECT: ROADWAY WORKER TRAINING – Compliance to G&W Policies and Procedures

To All Authorized Contractors,

As you are aware, RailAmerica and its system properties have been acquired by Genesee & Wyoming (G&W) as of January 3, 2013 as approved by the Surface Transportation Board (STB). As we progress through the transition and integration of current work authorized under RailAmerica, your Company's current Contracts, Agreements, standards, and requirements will remain in full force and effect under the terms of your existing continuing Construction Agreement in-place with RailAmerica.

As we proceed to transition and integrate the current and future work under the direction of G&W, there will be necessary changes required to conform to G&W standards and system policies.

The attached document provides the instruction and requirements for Roadway Worker Training for Contractors that is REQUIRED for any work performed on G&W properties (including former RailAmerica properties). G&W has contracted with Roadway Worker Training, Inc. to provide an online Training Course to be compliant with G&W procedures and policies. This online training is **REQUIRED FOR ALL CONTRACTORS, AND SUBCONTRACTORS EMPLOYEES THAT WILL ENTER ANY G&W PROPERTIES TO PERFORM WORK**.

Your Company employees and all Subcontractor employees that will enter any G&W properties to perform work will be required to complete this training within the next 30 days, and provide documentation to verify that your Company and Subcontractors have complied with this G&W requirement. This documentation should be submitted to the following:

Genesee & Wyoming, Inc.
Mr. Larry Romaine
AVP – Engineering Design
13901 Sutton Park Drive South, Suite 330
Jacksonville, FL 32224

It will be the Contractors responsibility to ensure that all employees are properly trained under this G&W approved training program, and that all employees that will enter any G&W properties maintain this certified training to be compliant with G&W policies and procedures. Each employee will be issued an ID card that certifies they have completed the training authorized by G&W, and employees must have this ID Card with them at all times when on G&W Properties.

The Roadway Worker Training course is REQUIRED, and there is a **$39.00** fee for each employee who registers and completes the training. You may contact Roadway Worker Training, Inc. at (904) 296-8088 to discuss the possibility of group or onsite training that may be available.

G&W appreciates your cooperation and prompt compliance with this training, and we look forward to continuing to work together for the Safety of your employees.

Should you need to further discuss this matter or have any questions or comments, I can be reached at (904) 900-6247.

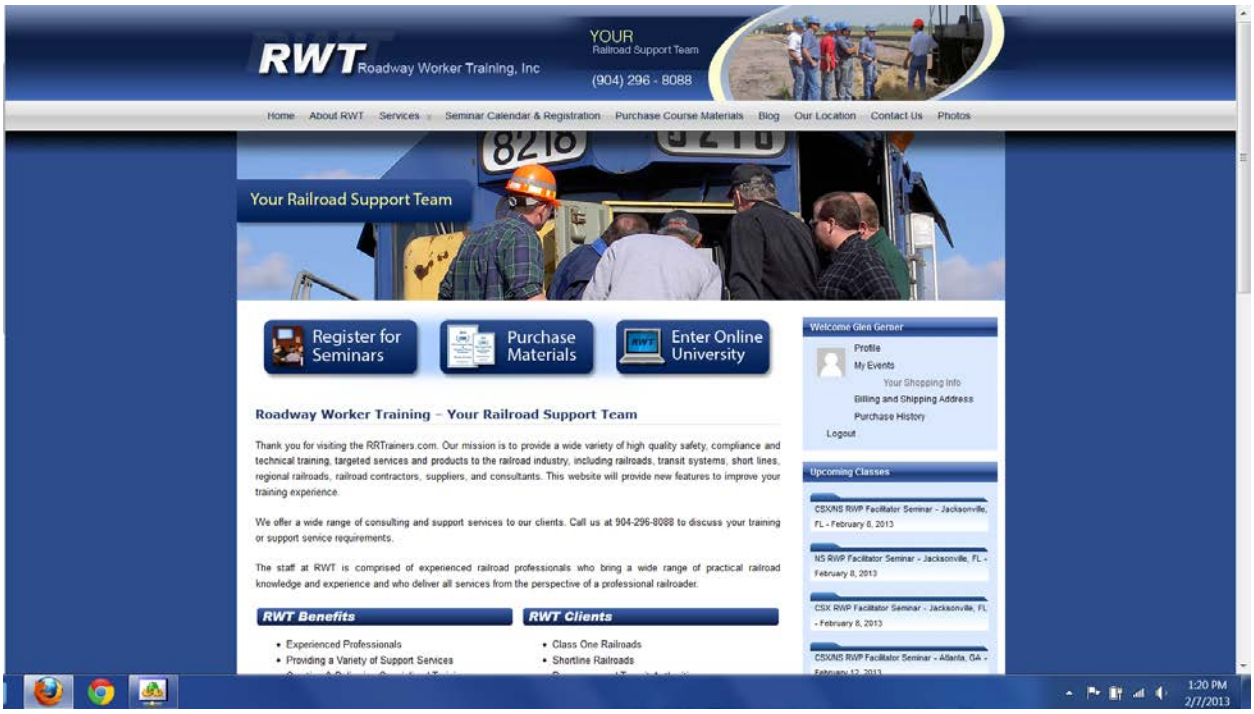
Sincerely,

Lawrence Romaine
AVP – Engineering Design
Genesee & Wyoming, Inc.

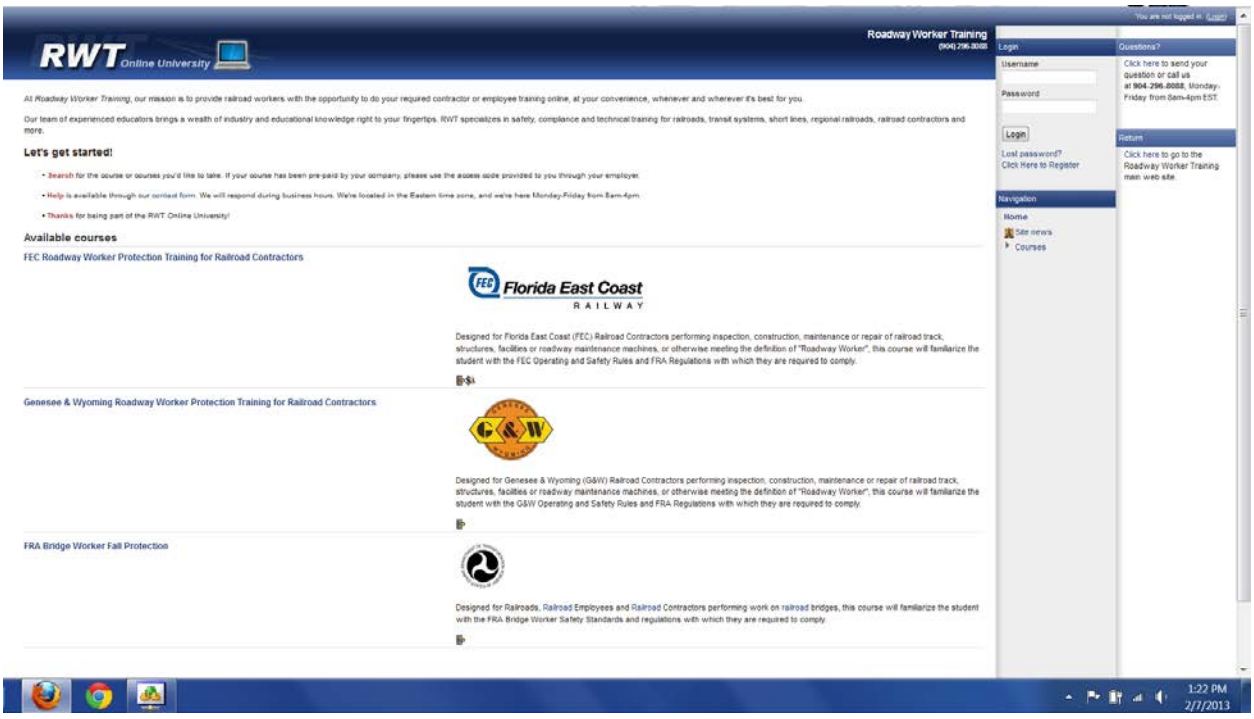
Enclosures: G&W RWP Registration Instructions

Genesee & Wyoming Roadway Worker Protection for Railroad Contractors
Registration Instructions

Step 1: Access the RWT Website at www.rrtrainers.com:

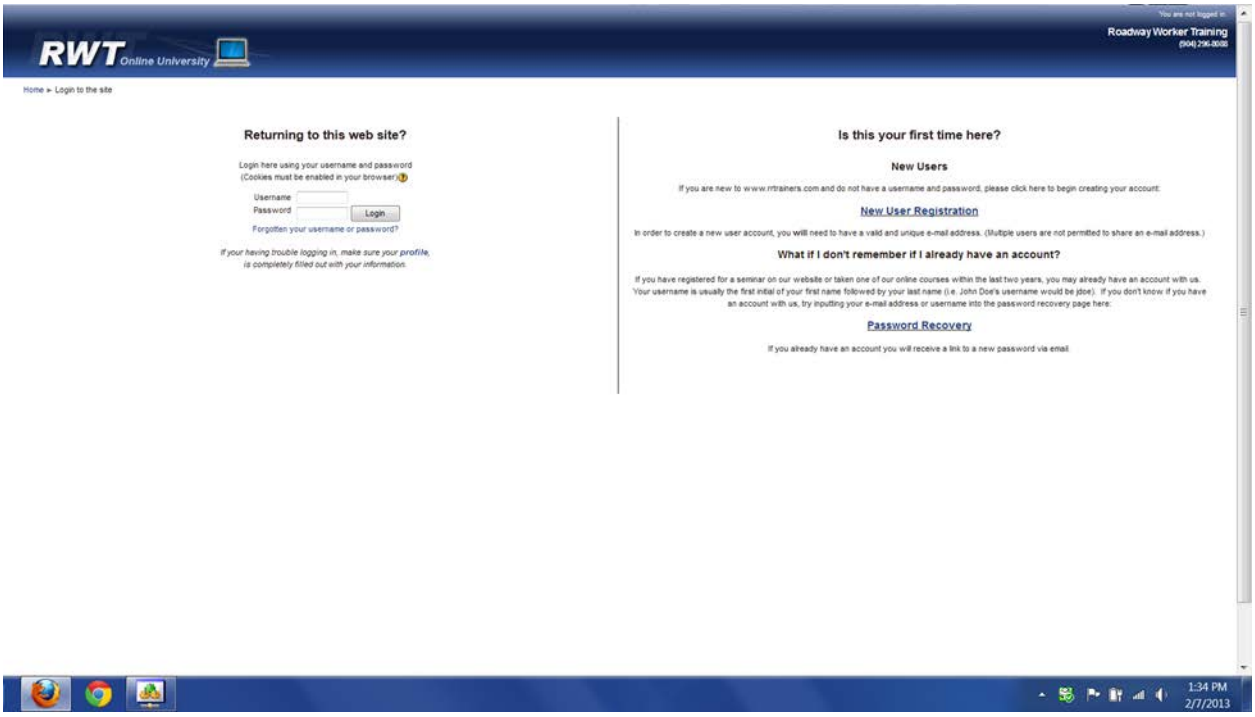


Step 2: Click on the "Enter Online University" button at the top of the page:



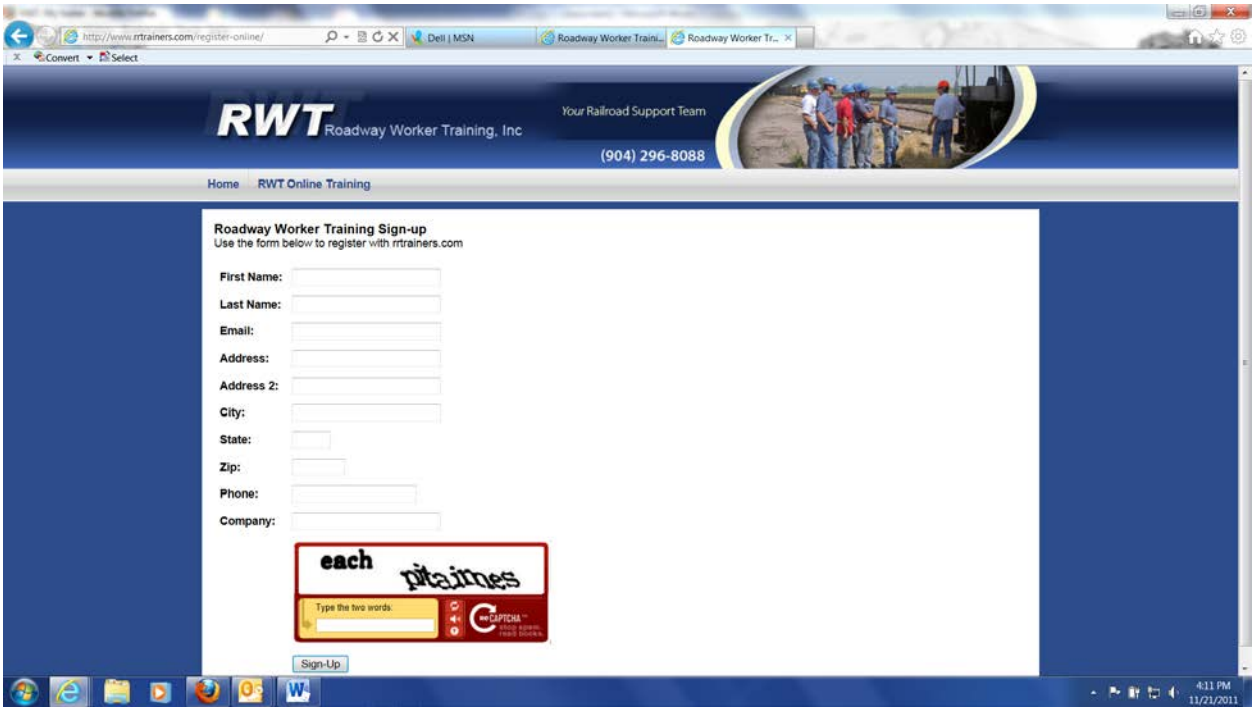
Step 3: Select the course name, "Genesee & Wyoming Roadway Worker Protection Training for Railroad Contractors" to the left of the course description.

Genesee & Wyoming Roadway Worker Protection for Railroad Contractors
Registration Instructions

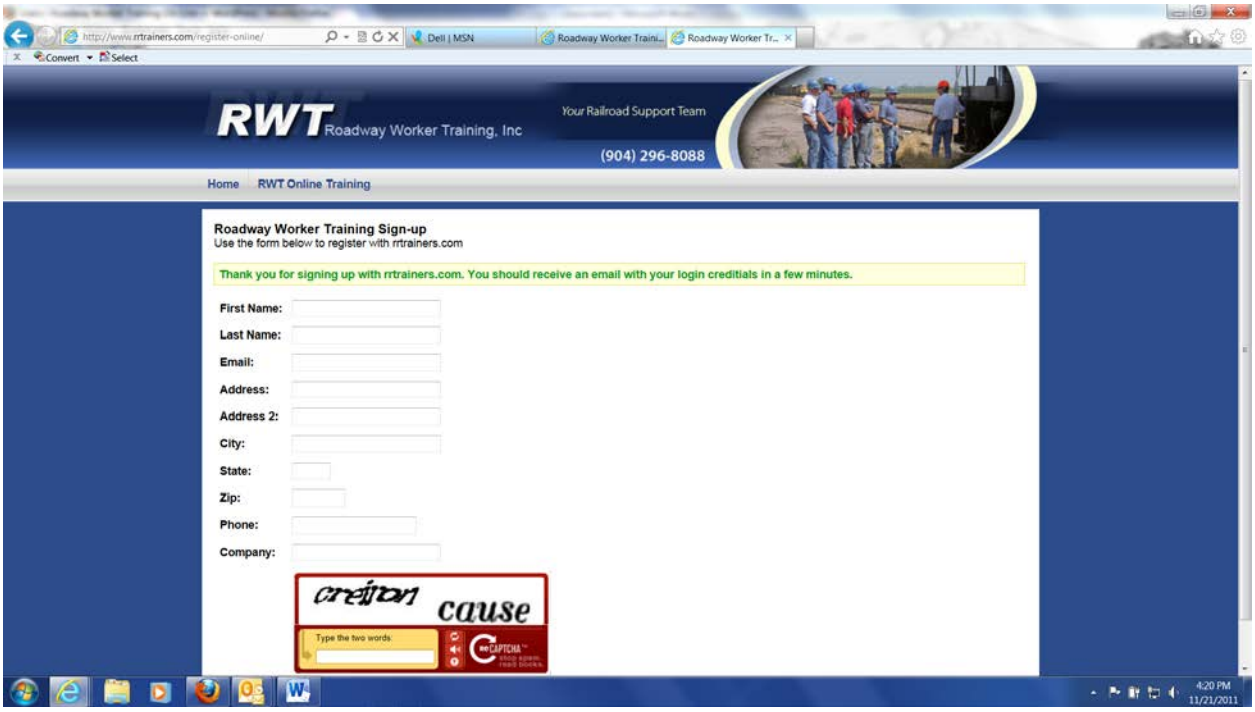


Step 4: New (previously unregistered) students should select the “New User Registration” link on the right side of the page. Existing (previously registered) students may log in using the Username and Password fields on the left side of the page.

Genesee & Wyoming Roadway Worker Protection for Railroad Contractors
Registration Instructions

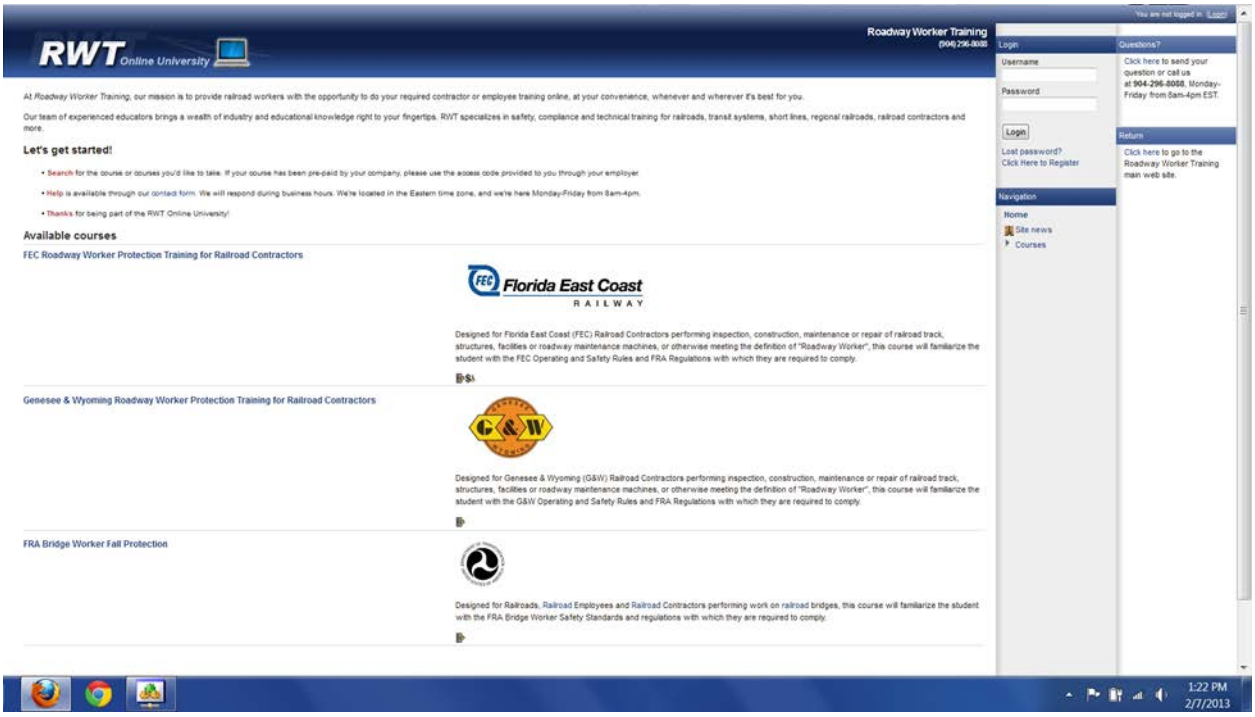


Step 5: New students must fill in the form completely, complete the anti-spam CAPTCHA box and then select the “Sign-Up” button.



Step 6: You will receive a Thank You message followed by an email with your login credentials

Genesee & Wyoming Roadway Worker Protection for Railroad Contractors
Registration Instructions

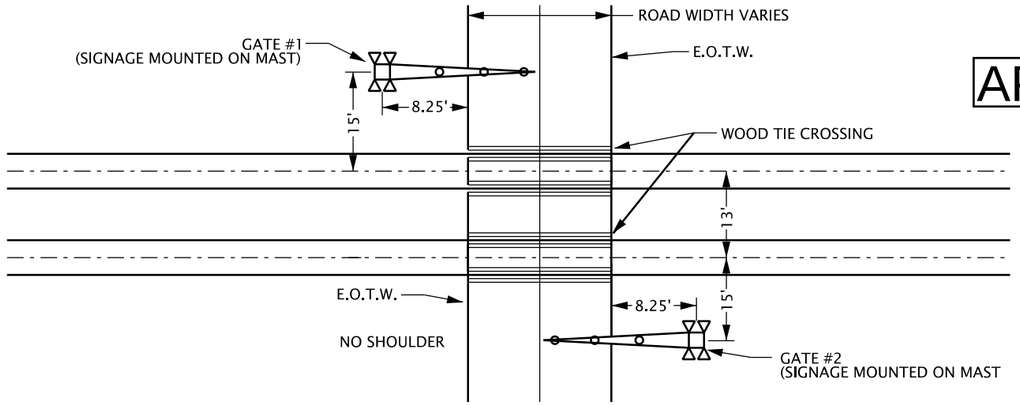


Step 7: Return to the Online University page and use your new credentials to log in to the online training site using the login box on the upper right and select the G&W course. Complete the enrollment and payment process:

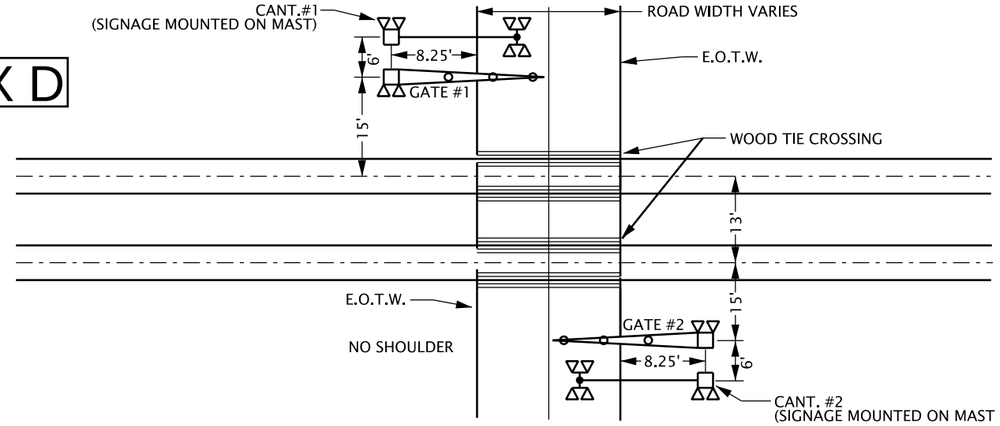
You can now begin the course. You can navigate thru the course using either the links in the Topic Outline or the links in the Navigation pane on the right. Note that some parts of the course must be completed in order to proceed further.

FILE
ES1021.2
REVISIONS
07-03-2013 | XRL/GRC

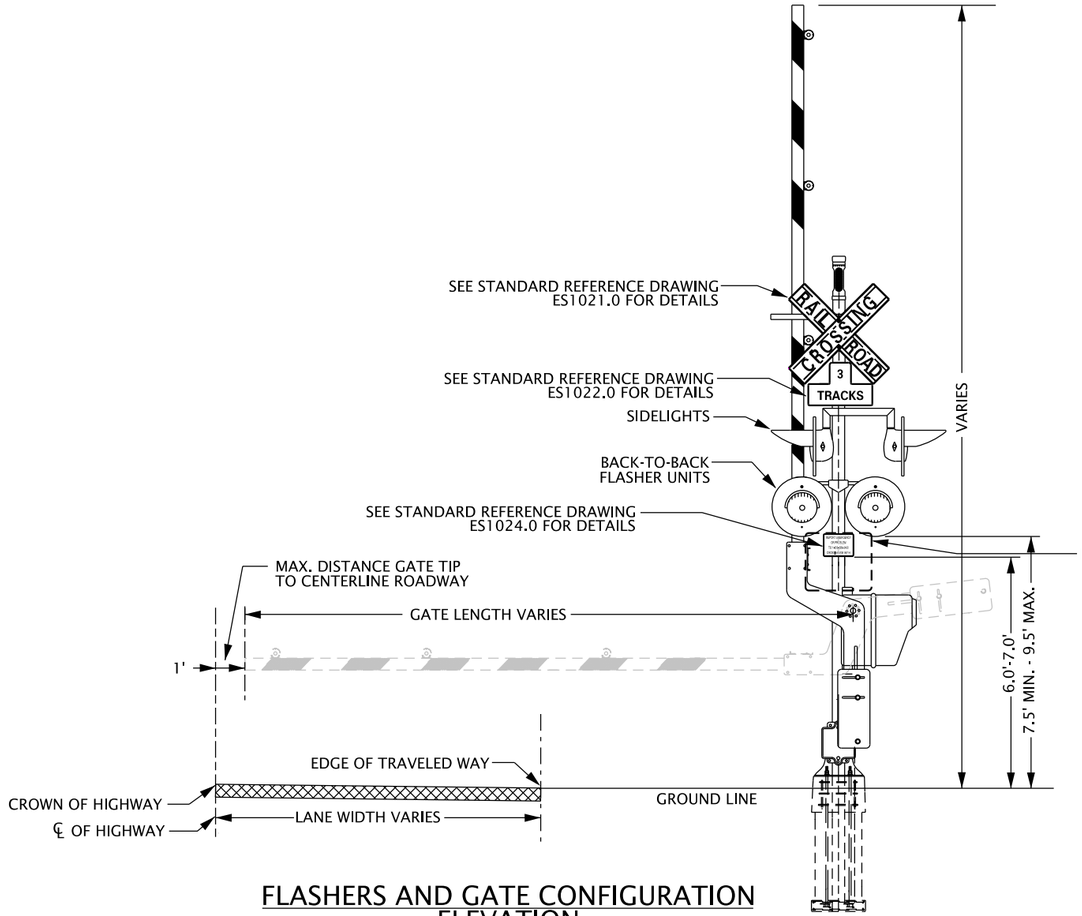
APPENDIX D



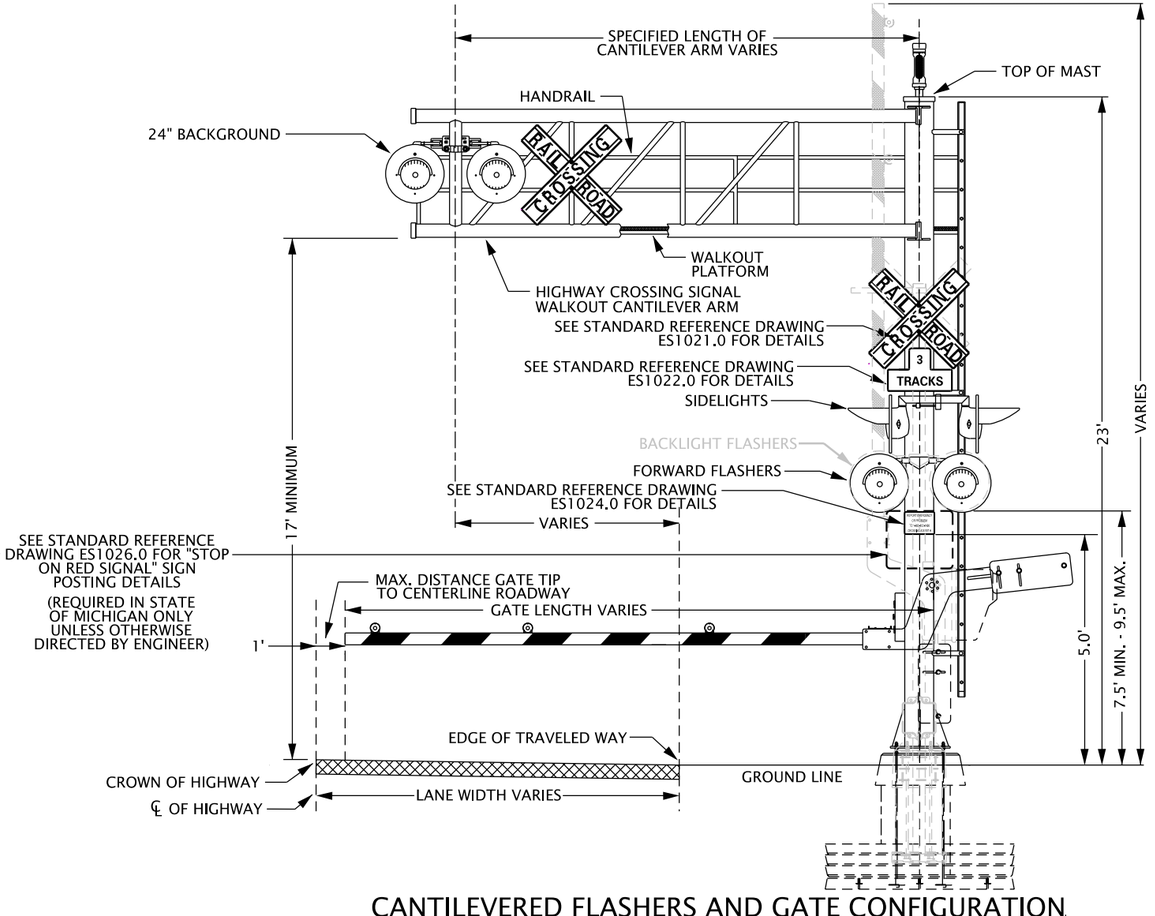
FLASHERS AND GATE CONFIGURATION
PLAN VIEW



CANTILEVERED FLASHERS AND GATE CONFIGURATION
PLAN VIEW



FLASHERS AND GATE CONFIGURATION
ELEVATION



CANTILEVERED FLASHERS AND GATE CONFIGURATION
ELEVATION

GENESEE & WYOMING
ENGINEERING DESIGN
STANDARDS REFERENCE MANUAL

Issue Date: 09-26-2011 | Revised Date: 07-03-2013

Authorized: Laurence S. Ronaime
AVP-Engineering Design

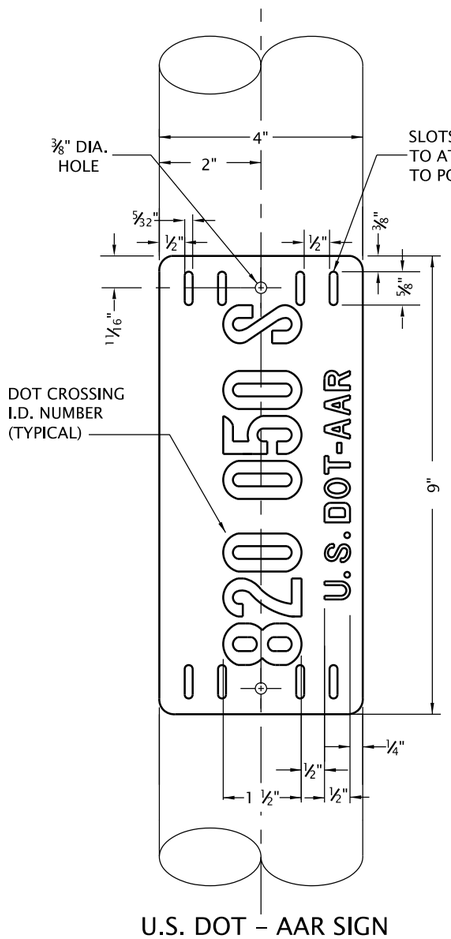
The material and equipment shown herein must meet or exceed all quality requirements. Any deviation from these standards must be submitted in writing and approved by the Regional V.P. of Engineering and A.V.P. Engineering Design prior to use.

Right of Way Signs
SERIES 1000

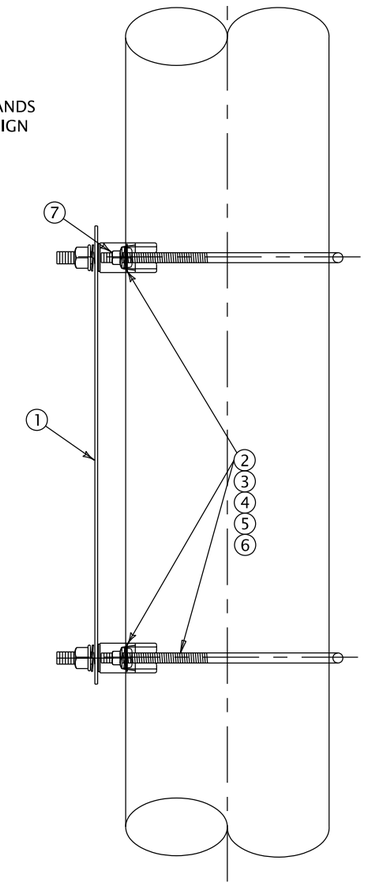
SIGNAGE PLACEMENT
(ACTIVE CROSSINGS ON ALUMINUM MAST)

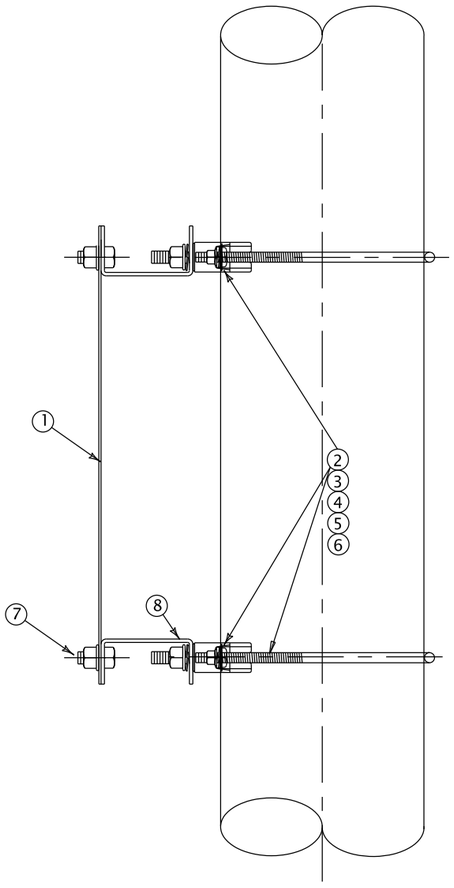
ES1021.2
SH. 1 OF 1

FILE
ES1023.0
REVISIONS
07-03-2013 XRL/GRC



U.S. DOT – AAR SIGN





SPECIFICATIONS:

CHARACTERS COMPRESSED COMMERCIAL LETTERS AND NUMBERS TO BE STAMPED INTO 22 GAUGE (3.0313") ALUMINUM

NOTES:

1. ORDER MOUNTING BRACKET ASSEMBLIES SEPARATELY. SEE REF. NO 2, 3, 4, 5, 6, AND 7 ABOVE

BILL OF MATERIALS

REF.	SIGN PANEL	ITEM NUMBER
1	U.S. DOT – AAR SIGN	
	HARDWARE	
2	4" & 5" MAST MOUNTING ASSY. COMPLETE WITH U–BOLT, 5/16" STUD BOLT & HARDWARE	
3	6" MAST MOUNTING ASSY. COMPLETE WITH U–BOLT, 5/16" STUD BOLT & HARDWARE	
4	8" MAST MOUNTING ASSY. COMPLETE WITH U–BOLT, 5/16" STUD BOLT & HARDWARE	
5	10" MAST MOUNTING ASSY. COMPLETE WITH U–BOLT, 5/16" STUD BOLT & HARDWARE	
6	12" MAST MOUNTING ASSY. COMPLETE WITH U–BOLT, 5/16" STUD BOLT & HARDWARE	
7	BOLT ASSY, 5/16"–11 x 1" LG., HEX HD., SS CAP SCREW W/ SS HEX NUT, SS FLAT WASHERS & SS LOCK WASHERS	
8	ARM, SHORT EXTENSION	

GENESEE & WYOMING
ENGINEERING DESIGN
STANDARDS REFERENCE MANUAL

Issue Date: 03-01-2009 | Revised Date: 07-03-2013

Authorized: Laurence L. Romaine
AVP-Engineering Design

The material and equipment shown herein must meet or exceed all quality requirements. Any deviation from these standards must be submitted in writing and approved by the Regional V.P. of Engineering and A.V.P. Engineering Design prior to use.

Right of Way Signs
SERIES 1000

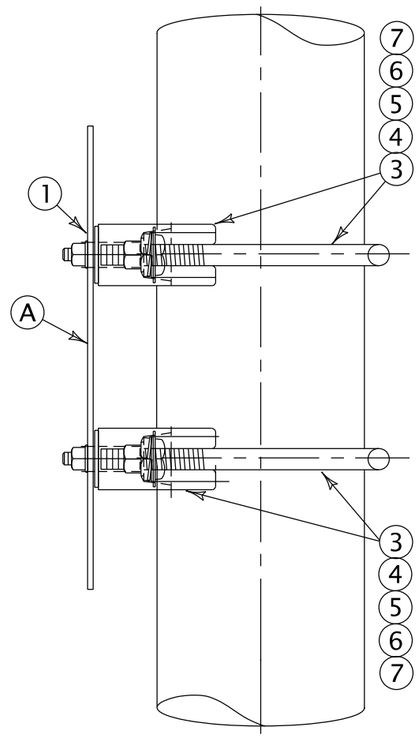
DOT NUMBER PLATE

ES1023.0
SH. 1 OF 1

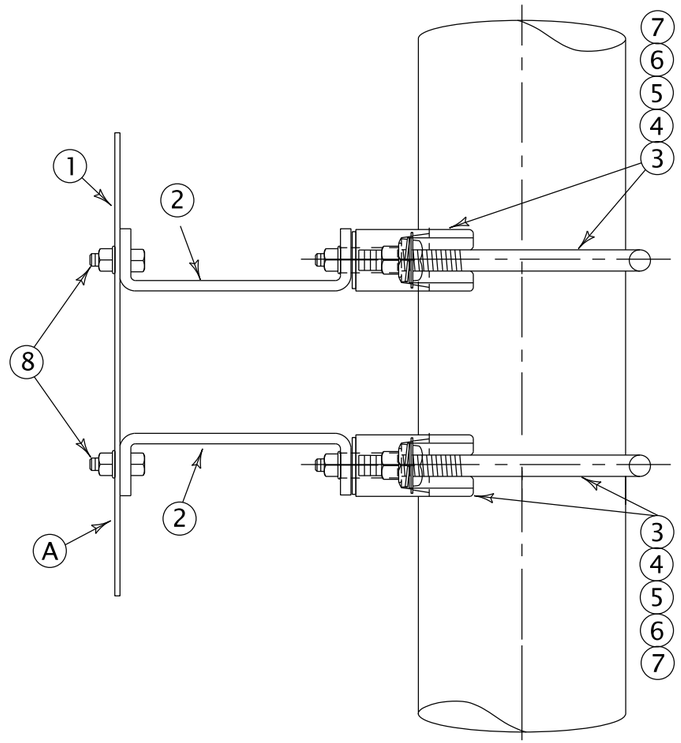
FILE	
ES1024.0	
REVISIONS	
09-26-2011	XRL/TJF
07-03-2013	XRL/GRC

Emergency Notification Sign (ENS)

FRONT VIEW



SIDE VIEW
(W/O EXTENSION BRACKET)
FOR FLASHING LIGHT SIGNAL MAST
ALSO FOR MAIN MAST OF CANTILEVER



SIDE VIEW
(WITH EXTENSION BRACKET)
FOR AUTOMATIC CROSSING GATE MAST

FOR PLACEMENT, SEE ES1021.1 & ES1021.2

NOTE: IF INSTALLED AT PASSIVE CROSSING ON WOOD POST USE 1/2"X6" GALVANIZED HEX BOLT FOR MOUNTING.

MATERIALS		
REF. NO.	DESCRIPTION	ITEM NUMBER
—	SIGN, VANDAL RESISTANT 1/4"x3/4" EXTRUDED ALUMINUM	
1	SIGN, EMERGENCY NOTIFICATION (ENS)	
2	ARM EXTENSION (AS REQUIRED-SEE ES1024 SH.2)	
3	4" & 5" MAST MOUNTING ASSY. COMPLETE WITH U-BOLT, 5/16" STUD BOLT & HARDWARE	
4	6" MAST MOUNTING ASSY. COMPLETE WITH U-BOLT, 5/16" STUD BOLT & HARDWARE	
5	8" MAST MOUNTING ASSY. COMPLETE WITH U-BOLT, 5/16" STUD BOLT & HARDWARE	
6	10" MAST MOUNTING ASSY. COMPLETE WITH U-BOLT, 5/16" STUD BOLT & HARDWARE	
7	12" MAST MOUNTING ASSY. COMPLETE WITH U-BOLT, 5/16" STUD BOLT & HARDWARE	
8	BOLT ASSY, 5/16"-11 x 1" LG., HEX HD., SS CAP SCREW W/ SS HEX NUT, SS FLAT WASHERS & SS LOCK WASHERS	

SPECIFICATIONS:

Ⓐ Sign Blade: 0.080" Thick Specifications 6061-T6 or 5062-H38. Holes to be 7/16" dia., to be degreased and etched prior to the application of reflective sheeting. Refer to AREMA Signal Manual 3.2.75-2.

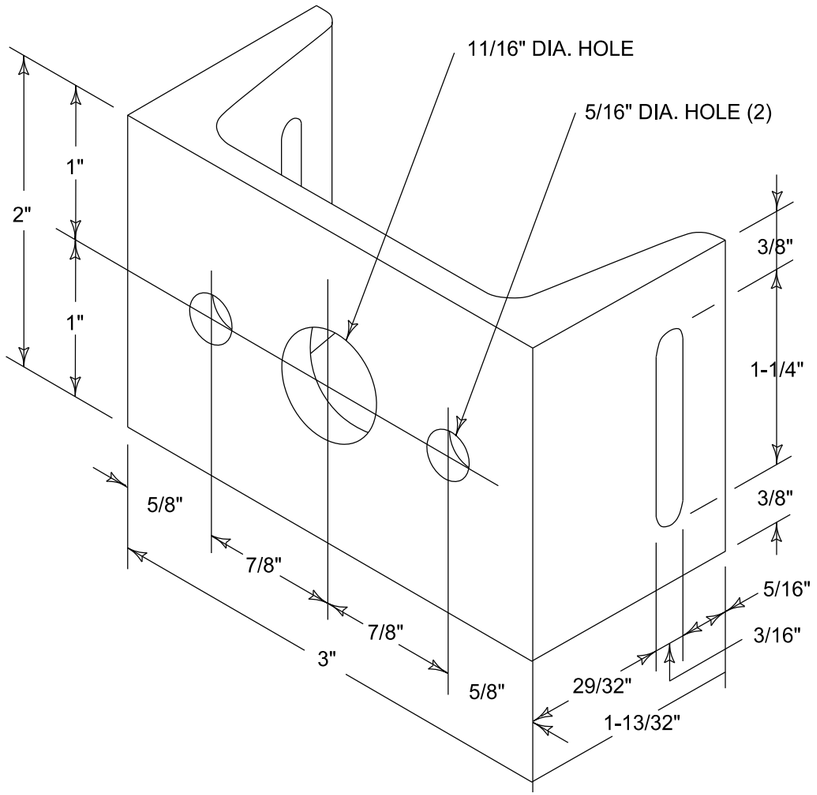
Ⓑ Facing: Blue, Engineering grade High-Intensity retro-reflective sheeting in compliance with the latest edition of Federal Specification #L-S-300C.

Ⓒ Letters: White silkscreen, Scotchcal or equal, U.S. Department of Transportation Series D Alphabet.

NOTES:

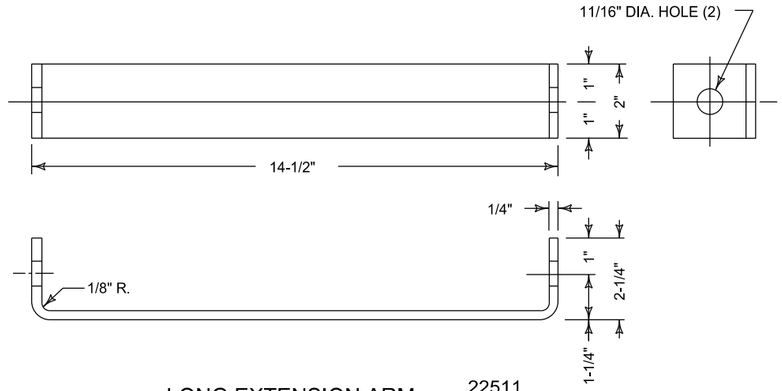
1 - Order mounting bracket assemblies separately see Ref. No. 3,4,5,6,7, and 8 above.
2 - See Sheet 2 for detailed installation and maintenance instructions.
3 - This sign is to be installed in lieu of standard metal crossing US.DOT/AAR sign for all highway crossing signals.
4 - This sign is to be installed in lieu of DOT Inventory Mast Plate or house mounted sticker/decal for all highway crossing signals.

FILE	
ES1024X.0	
REVISIONS	
09-26-2011	XRL/TJF
07-03-2013	XRL/GRC



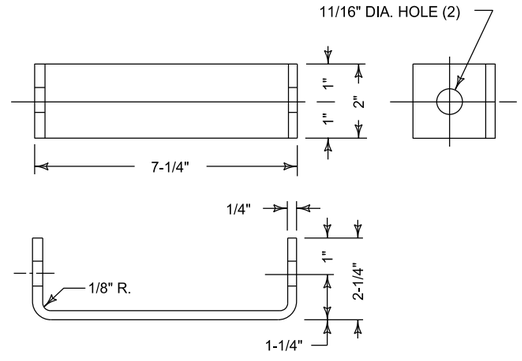
UNIVERSAL CHANNEL ADAPTER 22510 / 020.0052385.1

3"x1-13/32"x2" LG.
ALUMINUM 6061-T6



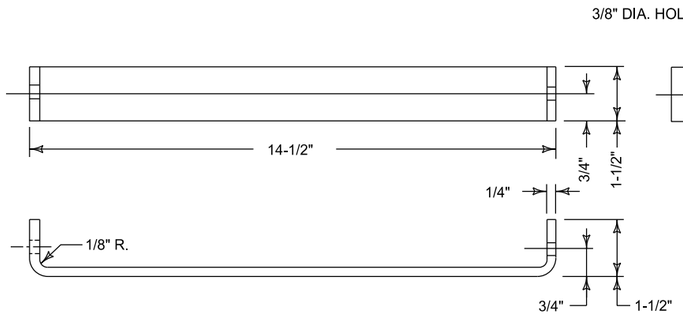
LONG EXTENSION ARM 22511 / 020.0052480.1

ALUMINUM 6061-T6



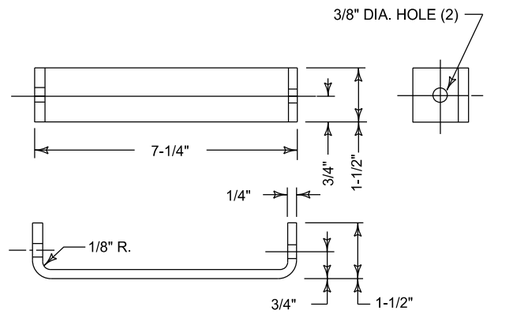
SHORT EXTENSION ARM 22512 / 020.0052470.1

ALUMINUM 6061-T6



LONG EXTENSION ARM 22513 / 020.0052476.1

ALUMINUM 6061-T6



SHORT EXTENSION ARM 22514 / 020.0052475.1

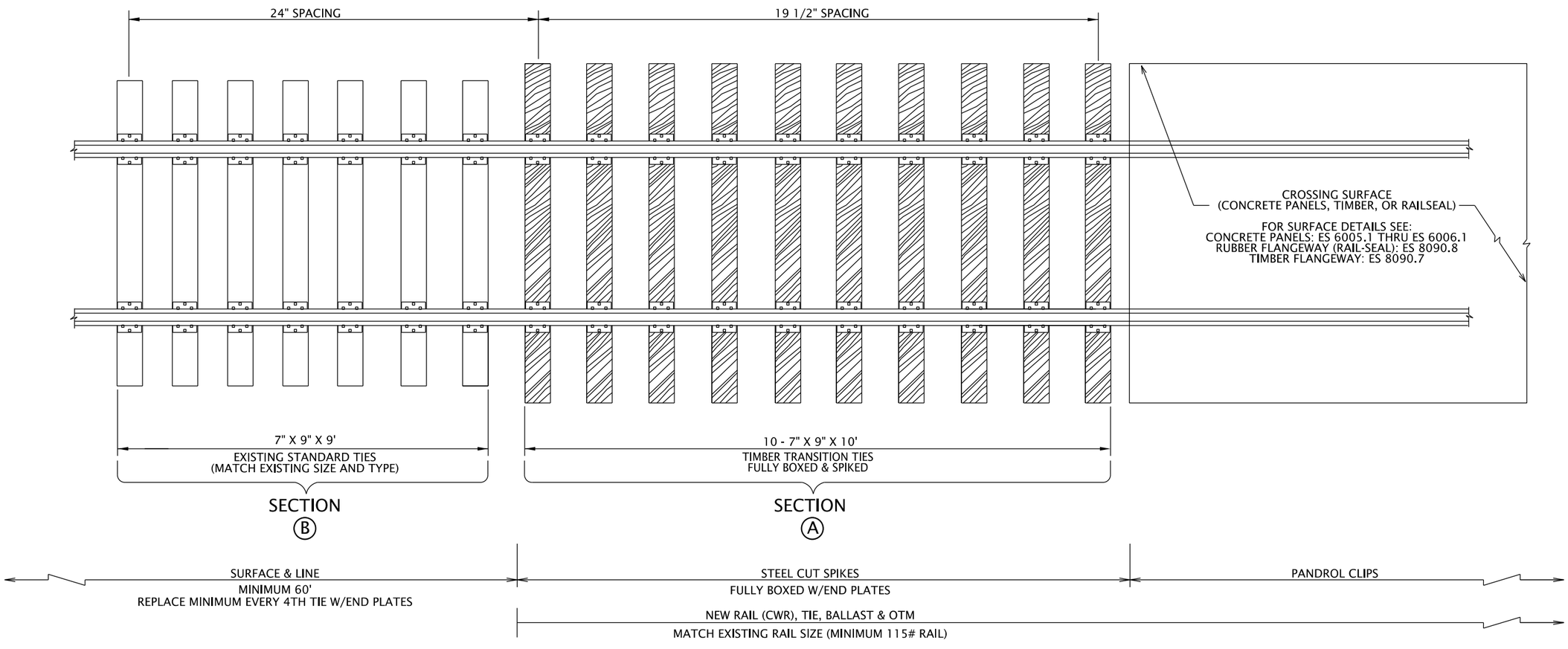
ALUMINUM 6061-T6

FASTENINGS FOR SIGNS	
BAND-IT CO. NO.	DESCRIPTION
C206	BAND, 3/4" STAINLESS STEEL (ORDER BY FT., 100 FT. ROLL MIN.)
C256	BUCKLE, 3/4" STAINLESS STEEL (100/BOX, MIN.)
C726 *	BUCKLE, 3/4" STAINLESS STEEL - SCRU-LOCK
C001	TOOL, BAND-IT APPLICATION (WITH SPINNING GRIPS)

*USE ONLY WHEN SPACE LIMITS THE APPLICATION OF TOOL APPLIED BUCKELS (NO.C256)

FILE
ES6007.1

REVISIONS	
02-18-2011	XRL/TJF
06-28-2011	XRL/TJF
07-03-2013	XRL/GRC



DETAIL PLAN

SEE ES8050.1 FOR ANCHOR AND SPIKING REQUIREMENTS

GENESEE & WYOMING
ENGINEERING DESIGN
STANDARDS REFERENCE MANUAL

Issue Date: 03-01-2009 | Revised Date: 07-03-2013

Authorized: James E. Ronaine
AVP-Engineering Design

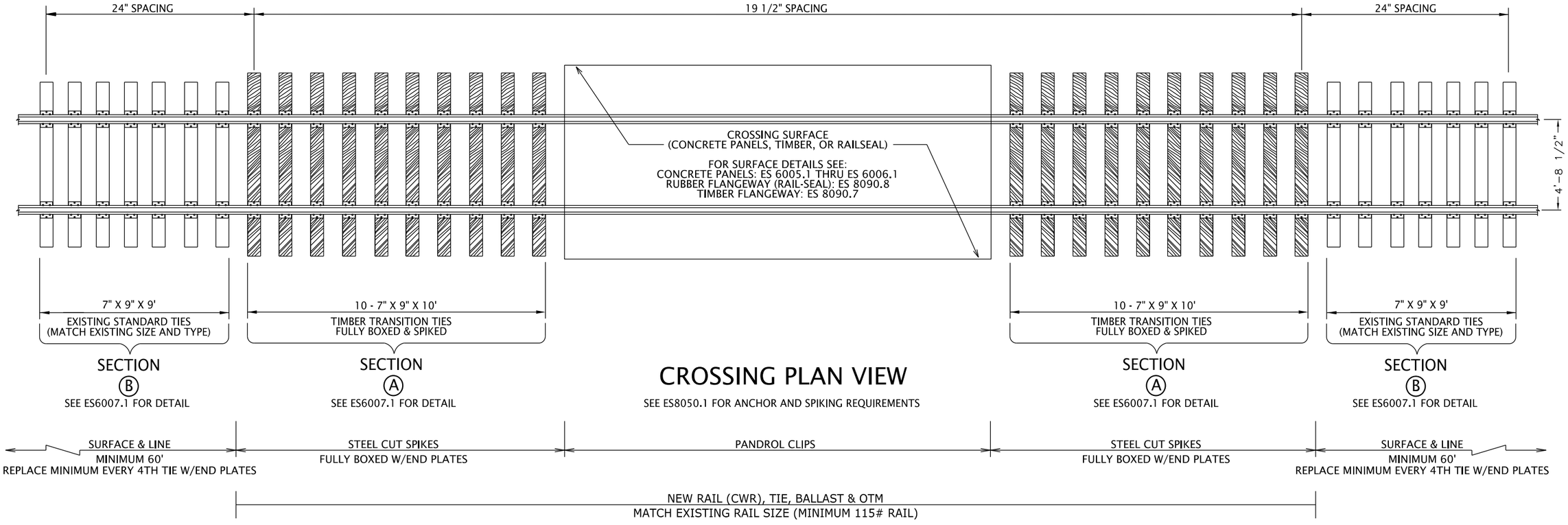
The material and equipment shown herein must meet or exceed all quality requirements. Any deviation from these standards must be submitted in writing and approved by the Regional V.P. of Engineering and A.V.P. Engineering Design prior to use.

Ties & Road Crossing
SERIES 6000

TRANSITION ZONE FROM GRADE
CROSSING TO EXISTING TIES (DETAIL)

ES6007.1

FILE
ES6007.1
REVISIONS
05/27/2010
02-18-2011 XRL/TJF
06-28-2011 XRL/TJF
07-03-2013 XRL/GRC



GENESEE & WYOMING
ENGINEERING DESIGN
STANDARDS REFERENCE MANUAL

Issue Date: 03-01-2009 | Revised Date: 07-03-2013

Authorized: AVP-Engineering Design

The material and equipment shown herein must meet or exceed all quality requirements. Any deviation from these standards must be submitted in writing and approved by the Regional V.P. of Engineering and A.V.P. Engineering Design prior to use.

Ties & Road Crossing

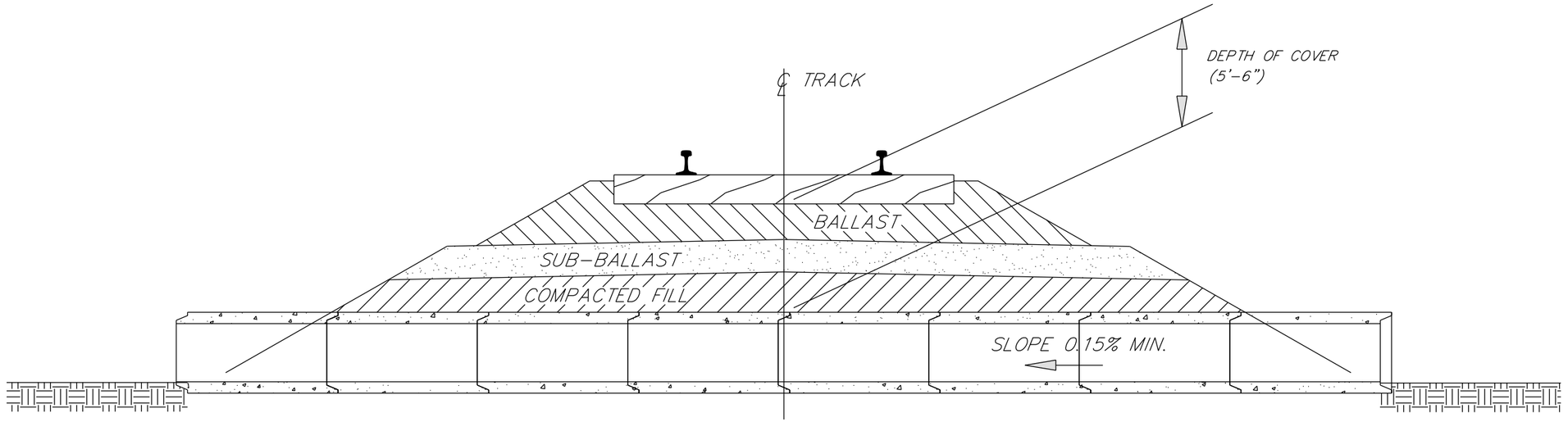
SERIES 6000

TRANSITION ZONE FROM GRADE CROSSING TO EXISTING TIES (PLAN)

ES6007.1

SH. 2 OF 2

FILE
ES8037.1
REVISIONS
07-27-2010 XRL/TJF
07-03-2013 XRL/GRC



TYPICAL SECTION RCP

SCALE: NONE

DEPTH OF COVER	PIPE SIZE ø	CLASS
MIN. TO 25'-0"	24"ø TO 72"ø	V

DEPTH OF COVER-ROUND RCP (MINIMUM):
24"ø TO 72"ø MINIMUM AS SHOWN ABOVE.

NOTES:

1. REINFORCED CONCRETE PIPE (RCP) DESIGN, MATERIAL AND FABRICATION TO BE IN ACCORDANCE WITH ASTM DESIGNATION C-76.
2. RCP INSTALLATION TO BE DESIGNED TO MEET COOPER E-80 LOADING.
3. CLASS AND WALL DESIGN TO BE AS NOTED.
4. JOINTS AND LIFT HOLES TO BE MORTARED.
5. BEDDING TO BE CLASS "B" OR BETTER.
6. PIPE ENDS SHALL EXTEND EQUAL DISTANCE BEYOND TRACK C/L.
7. OTHER THAN ROUND SECTION PIPE, SECTION TYPE TO BE APPROVED BY RAILWAY'S ENGINEERING DEPARTMENT.
8. RCP LESS THAN 24"ø TO BE AVOIDED.
9. OVER 72"ø INSTALLATION TO BE APPROVED BY ENGINEERING DEPARTMENT.
10. MIN. DEPTH OF COVER SHOWN ABOVE REQUIRED. ANY REDUCTION OF MIN. DEPTH OF COVER MUST BE APPROVED BY RAILWAY'S ENGINEERING DEPARTMENT.

GENESEE & WYOMING
ENGINEERING DESIGN
STANDARDS REFERENCE MANUAL

Issue Date: 06-12-1998 | Revised Date: 07-03-2013

Authorized: Laurence S. Ronaime
AVP-Engineering Design

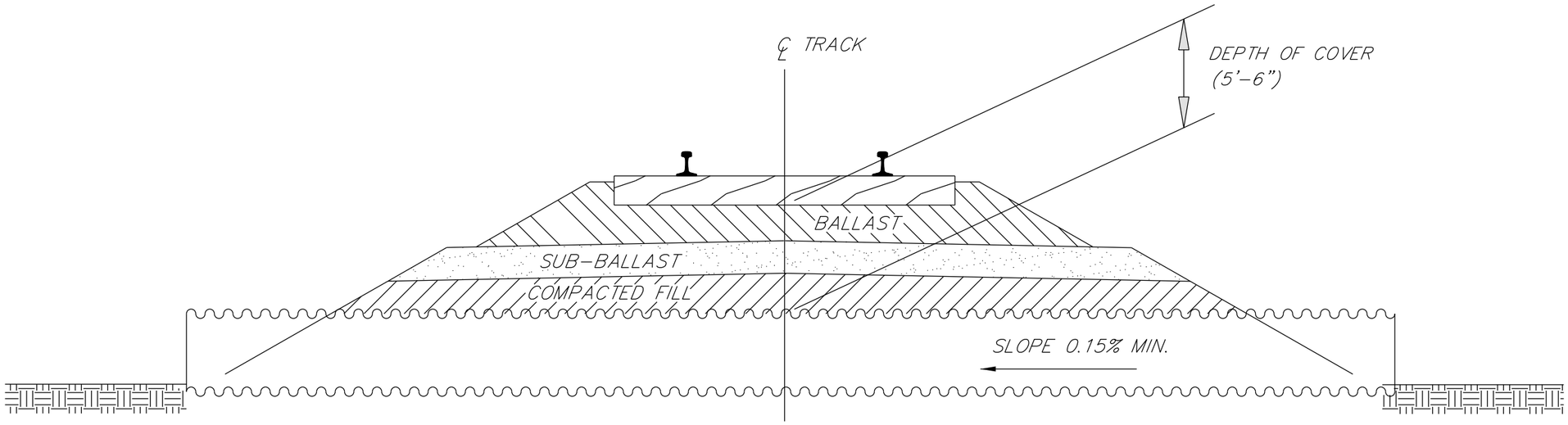
The material and equipment shown herein must meet or exceed all quality requirements. Any deviation from these standards must be submitted in writing and approved by the Regional V.P. of Engineering and A.V.P. Engineering Design prior to use.

MISCELLANEOUS
SERIES 8000

DESIGN & INSTALLATION OF RCP

ES8037.1
SH. 1 OF 1

FILE	
ES8090.3	
REVISIONS	
07-27-2010	XRL/TJF
07-03-2013	XRL/GRC



TYPICAL SECTION CMP

SCALE: NONE

NOTES:

1. CORRUGATED METAL PIPE (CMP) DESIGN, MATERIAL AND FABRICATION TO BE IN ACCORDANCE WITH A.R.E.M.A. CHAPTER 1, PART 4 FOR CLASS I AND CLASS II.
2. CMP INSTALLATION TO BE DESIGNED TO MEET COOPER E-80 LOADING
3. CMP TO BE GALVANIZED, FIBER-BONDED AND BITUMINOUS COATED.
4. JOINTS BY STANDARD COUPLING BAND.
5. BEDDING TO BE CLASS B OR BETTER.
6. CENTER PIPE ON C/L OF TRACK, NO JOINTS UNDER TRACK.
7. BITUMINOUS PAVING ONLY IF WARRANTED BY ABRASIVE FLOW.
8. OTHER THAN ROUND SECTION TO BE APPROVED BY RAILWAY'S ENGINEERING DEPARTMENT.
9. CMP LESS THAN 24"ø TO BE AVOIDED.
10. OVER 60"ø INSTALLATION TO BE APPROVED BY RAILWAY'S ENGINEERING DEPARTMENT.
11. MIN. DEPTH OF COVER SHOWN ABOVE REQUIRED. ANY REDUCTION OF MIN. DEPTH OF COVER MUST BE APPROVED BY RAILWAY'S ENGINEERING DEPARTMENT.

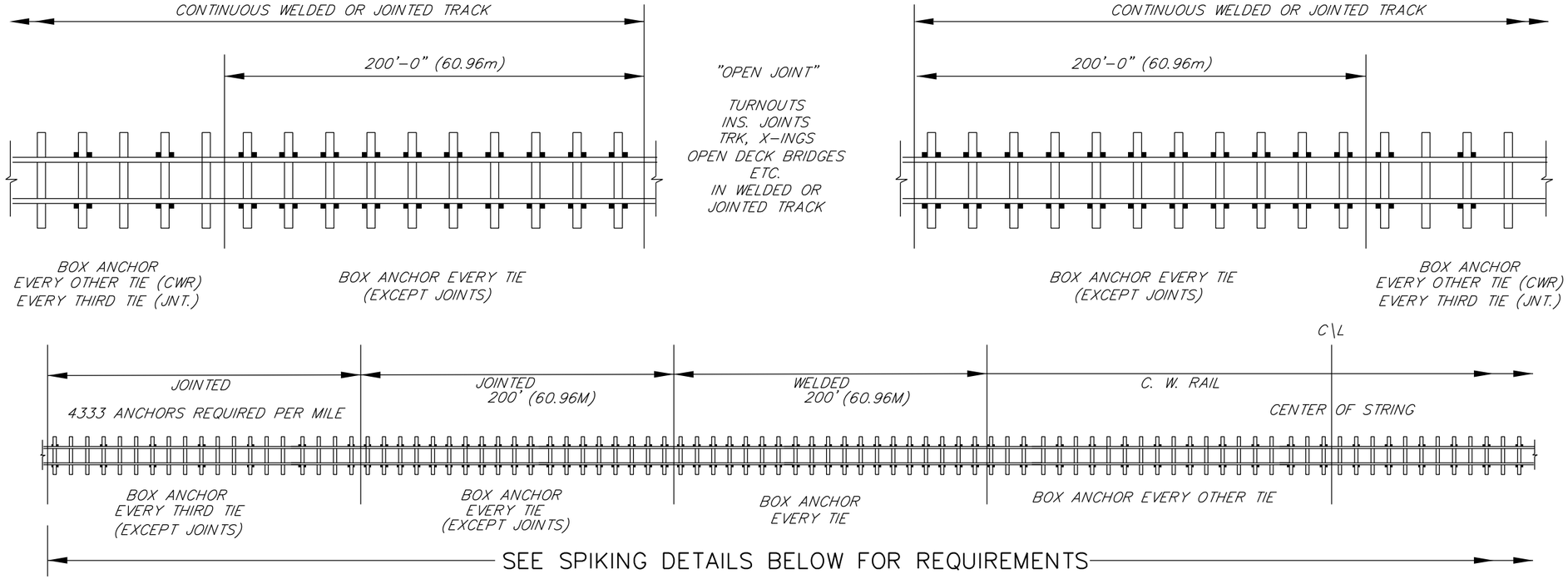
DEPTH OF COVER	PIPE SIZE ø	MIN. GAUGE
MIN. TO 20'-0"	24"ø TO 60"ø	8

DEPTH OF COVER-ROUND CMP (MINIMUM):

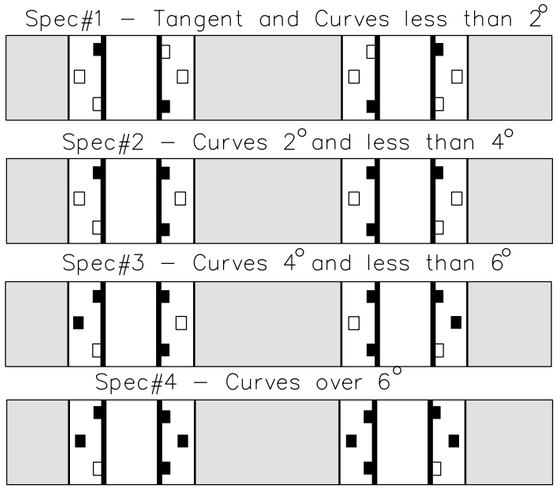
24"ø TO 60"ø MINIMUM AS SHOWN ABOVE.

FILE
ES8050.1

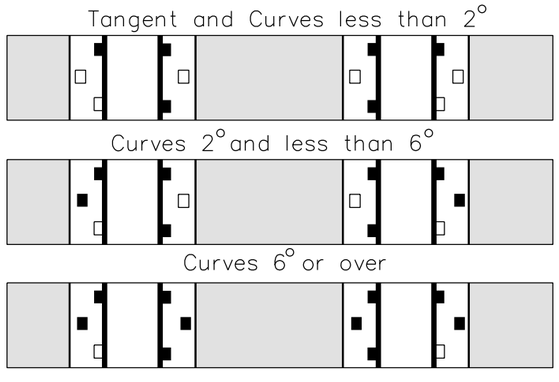
REVISIONS	
11-15-2010	TJF/XRL
06-28-2011	TJF/XRL
07-03-2013	XRL/GRC



SPIKING PATTERNS – JOINTED TRACK



SPIKING PATTERNS – CWR



NOTES:

ON JOINTED RAIL ABUTTING A COMPLETED LENGTH OF CONTINOUS WELDED RAIL, 200' IN EACH DIRECTION MUST BE FULLY BOX ANCHORED (EXCEPT JOINT TIES) AND THEREAFTER EVERY THIRD TIE MUST BE BOX ANCHORED.
OTHER REQUIREMENTS MAY APPLY (PROJECT SPECIFIC).
REQUIRED TIE SPACING IS 19 1/2" (.495m).
FOR BALLAST AND SUB-GRADE REQUIREMENTS SEE ES 8051.1.
80' JOINTED RAIL LENGTHS WILL BE ANCHORED PER CWR STANDARD.

( )=METRIC CONVERSION

GENESEE & WYOMING
ENGINEERING DESIGN
STANDARDS REFERENCE MANUAL

Issue Date: 06-29-2009 | Revised Date: 07-03-2013

Authorized: Jeannette L. Ronaime
AVP-Engineering Design

The material and equipment shown herein must meet or exceed all quality requirements. Any deviation from these standards must be submitted in writing and approved by the Regional V.P. of Engineering and A.V.P. Engineering Design prior to use.

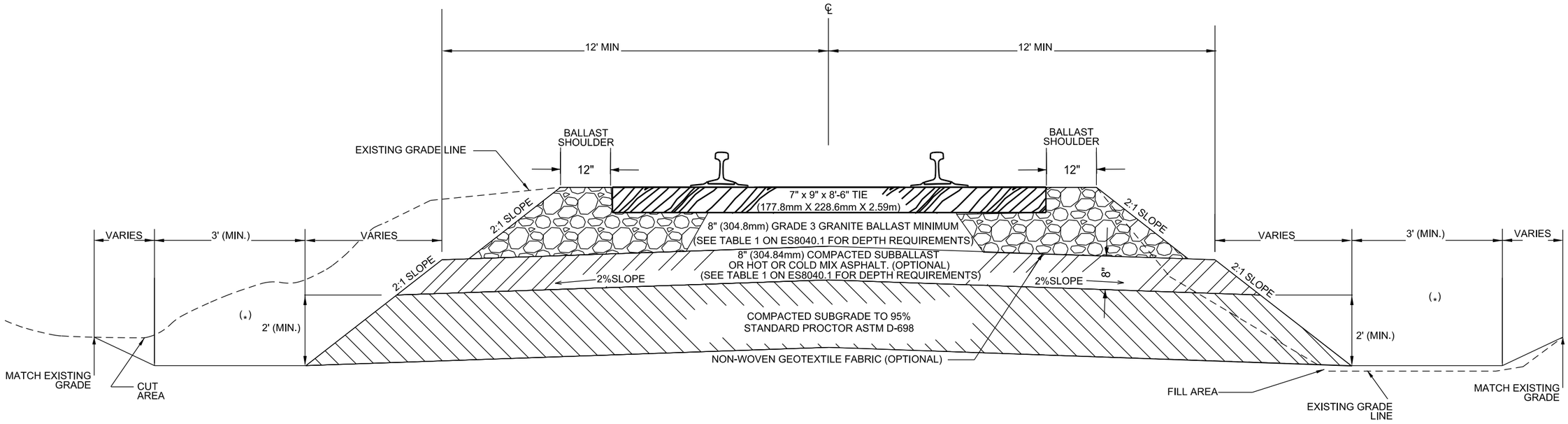
MISCELLANEOUS
SERIES 8000

TYPICAL TRACK ANCHOR AND SPIKING PATTERN FOR CONTINUOS WELDED & JOINTED TRACK

ES8050.1
SH. 1 OF 1

FILE
ES8051.1

REVISIONS	
11-15-2010	TJF/XRL
04-13-2011	TJF/XRL
06-28-2011	TJF/XRL
5-29-2013	GRC/XRL



NOTES:

1. OTHER REQUIREMENTS MAY APPLY (PROJECT SPECIFIC).
2. TOTAL ROADBED WIDTH = 24' MIN (30' PREFERRED)
3. BALLAST SHOULDER WIDTH = 12"
4. SIDE SLOPES MAY BE INCREASED TO 1-½ :1
   IF GEOTECHNICAL CONDITIONS ALLOW
5. GRANITE BALLAST IS PREFERRED
   LIMESTONE OR OTHER MEETING AREMA
   SPECIFICATIONS MAY BE SUBSTITUTED WITH
   APPROVAL OF THE REGIONAL V.P. OF ENGINEERING.

(*) = DITCH REQUIREMENT MAY BE NECESSARY ON EITHER OR BOTH SIDES OF TRACK AS DETERMINED BY DRAINAGE DESIGN. REQUIREMENTS MUST BE BASED ON 100 YEAR STORM EVENT.

GENESEE & WYOMING
ENGINEERING DESIGN
STANDARDS REFERENCE MANUAL

Issue Date: 06-29-2009 | Revised Date: 05-29-2013

Authorized: Laurence J. Ronan

AVP- ENGINEERING DESIGN

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MISCELLANEOUS

SERIES 8000

MAINLINE TYPICAL TRACK CROSS SECTION AND SUBGRADE REQUIREMENTS FOR NEW CONSTRUCTION

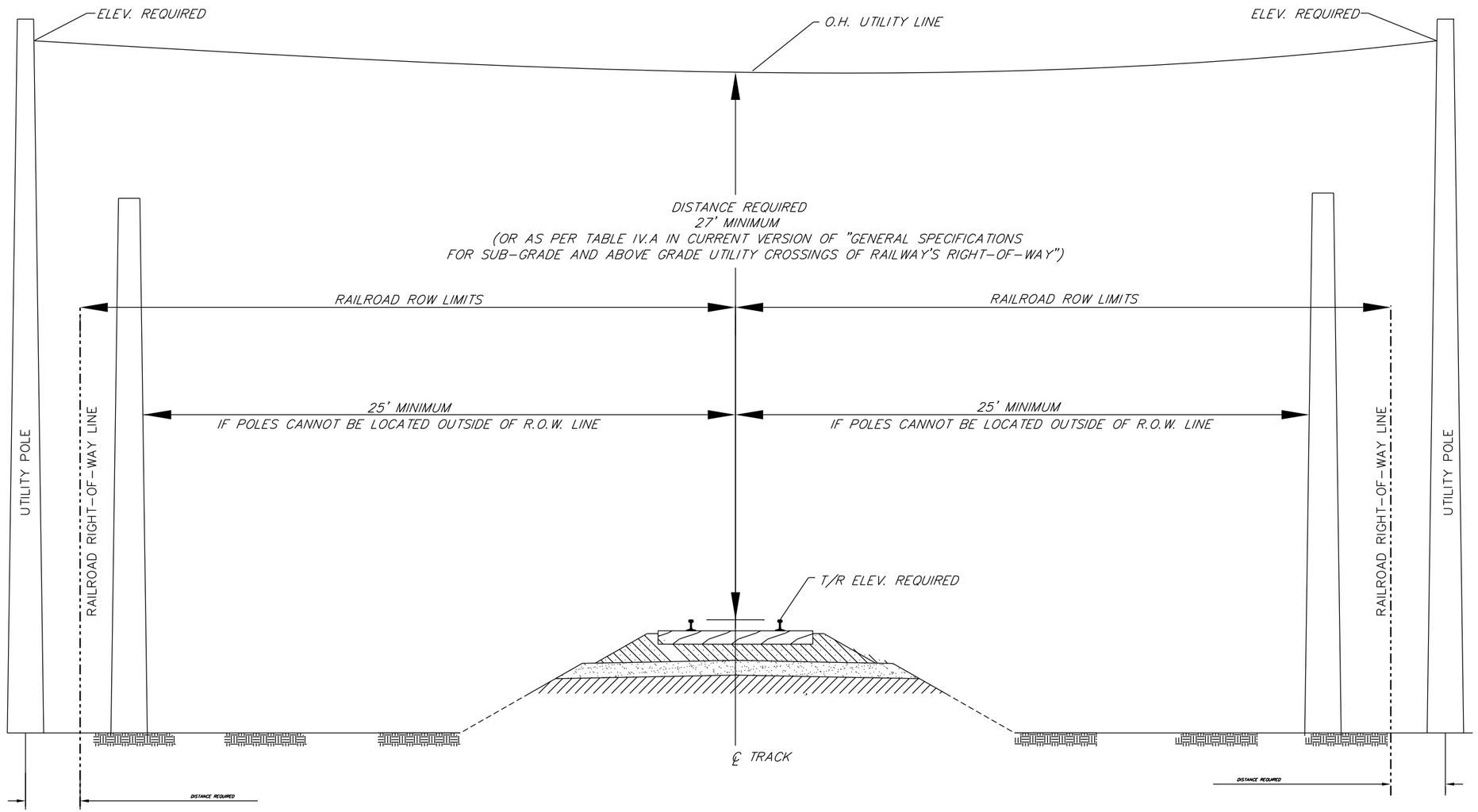
ES8051.1

SCALE: NTS

SH. 1 OF 1

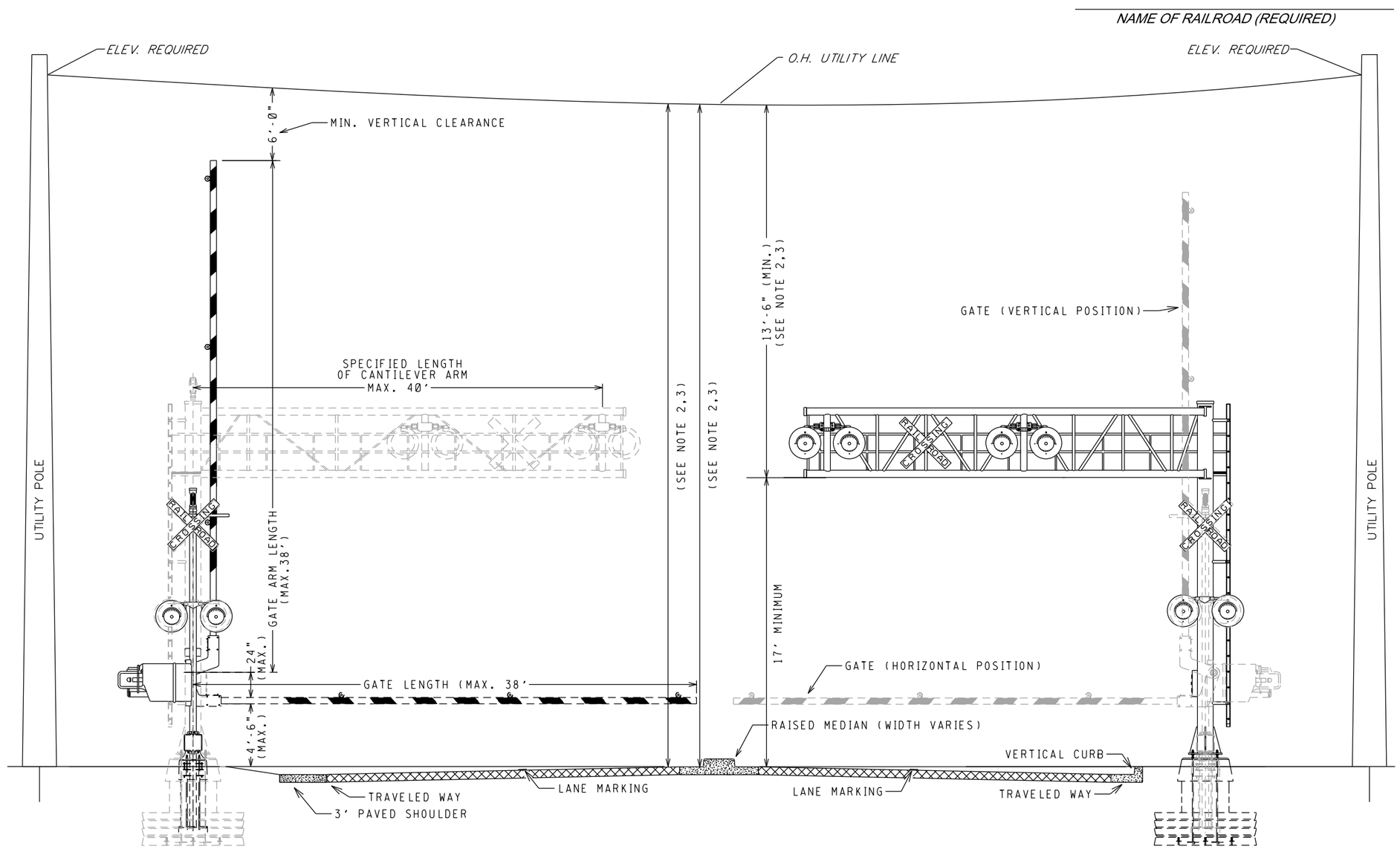
FILE
ES8090.2
REVISIONS
06-28-2011 | TJF/XRL

NAME OF RAILROAD (REQUIRED)



NOTE: 1. POLES NOT ALLOWED WITHIN RIGHT-OF-WAY (25' MIN. FROM C/L IF NOT POSSIBLE TO LOCATE OUTSIDE OF R.O.W.)
2. MINIMUM VERTICAL DISTANCE TO LOW WIRE MAY NEED TO BE INCREASED DEPENDING ON LENGTH OF SIGNAL ARMS REQUIRED TO PROTECT WIDE ROADWAYS. (SEE ES8090.2, SH.2)
3. NO WORK WILL BE PERMITTED ON RAILROAD RIGHT-OF-WAY WITHOUT A FLAGMAN.
4. SEE ES8090.2 SH. 2 FOR CLEARANCE REQUIREMENTS AT RAIL-HIGHWAY GRADE CROSSINGS.
5. SEE ALSO "GENERAL SPECIFICATIONS FOR SUB-GRADE AND ABOVE GRADE UTILITY CROSSINGS OF RAILROAD'S RIGHT-OF-WAY" FOR ADDITIONAL DETAILS AND REQUIREMENTS.

FILE
ES8090.2
REVISIONS
06-28-2011 | TJF/XRL



NOTE:
1. POLES NOT ALLOWED WITHIN RIGHT-OF-WAY (25' MIN. FROM C/L IF NOT POSSIBLE TO BE LOCATED OUTSIDE OF R.O.W.)
2. MINIMUM VERTICAL DISTANCE TO LOW WIRE MAY NEED TO BE INCREASED DEPENDING ON LENGTH OF SIGNAL ARMS REQUIRED TO PROTECT WIDE ROADWAYS.
3. AT ROADWAY GRADE CROSSINGS, PROVIDE SAFE CLEARANCES BETWEEN WARNING DEVICE AND ELECTRICAL TRANSMISSION, DISTRIBUTION CABLES (INCLUDING MESSENGER AND NEUTRAL WIRES), AND ALL COMMUNICATION LINES. ALL OVERHEAD UTILITY CROSSINGS SHALL PROVIDE THE MINIMUM VERTICAL CLEARANCE FROM TOP OF RAIL (T/R) OF HIGHEST TRACK PLUS ADDITIONAL CLEARANCES NECESSARY TO OBTAIN OPERATIONAL CLEARANCES FROM CROSSING WARNING DEVICE ASSEMBLIES AS FOLLOWS:
   A. 27' OR 6'0" VERTICAL CLEARANCE FROM GATE TIP IN VERTICAL POSITION OR STRUCTURE MAST (WHICHEVER IS GREATER).
   B. 27' OR 13'6" VERTICAL CLEARANCE FROM CANTILEVER ARM OR STRUCTURE MAST (WHICHEVER IS GREATER).
4. NO WORK WILL BE PERMITTED ON RAILROAD RIGHT-OF-WAY WITHOUT A FLAGMAN.
5. SEE ES8090.2 SH. 1 FOR CLEARANCE REQUIREMENTS AT TRACK.
6. SEE ALSO "GENERAL SPECIFICATIONS FOR SUB-GRADE AND ABOVE GRADE UTILITY CROSSINGS OF RAILROAD'S RIGHT-OF-WAY" FOR ADDITIONAL DETAILS AND REQUIREMENTS.

GENESEE & WYOMING
ENGINEERING DESIGN
STANDARDS REFERENCE MANUAL

Issue Date: 09-15-2008 | Revised Date: 07-03-2013

Authorized: _____
AVP-Engineering Design

The material and equipment shown herein must meet or exceed all quality requirements. Any deviation from these standards must be submitted in writing and approved by the Regional V.P. of Engineering and A.V.P. Engineering Design prior to use.

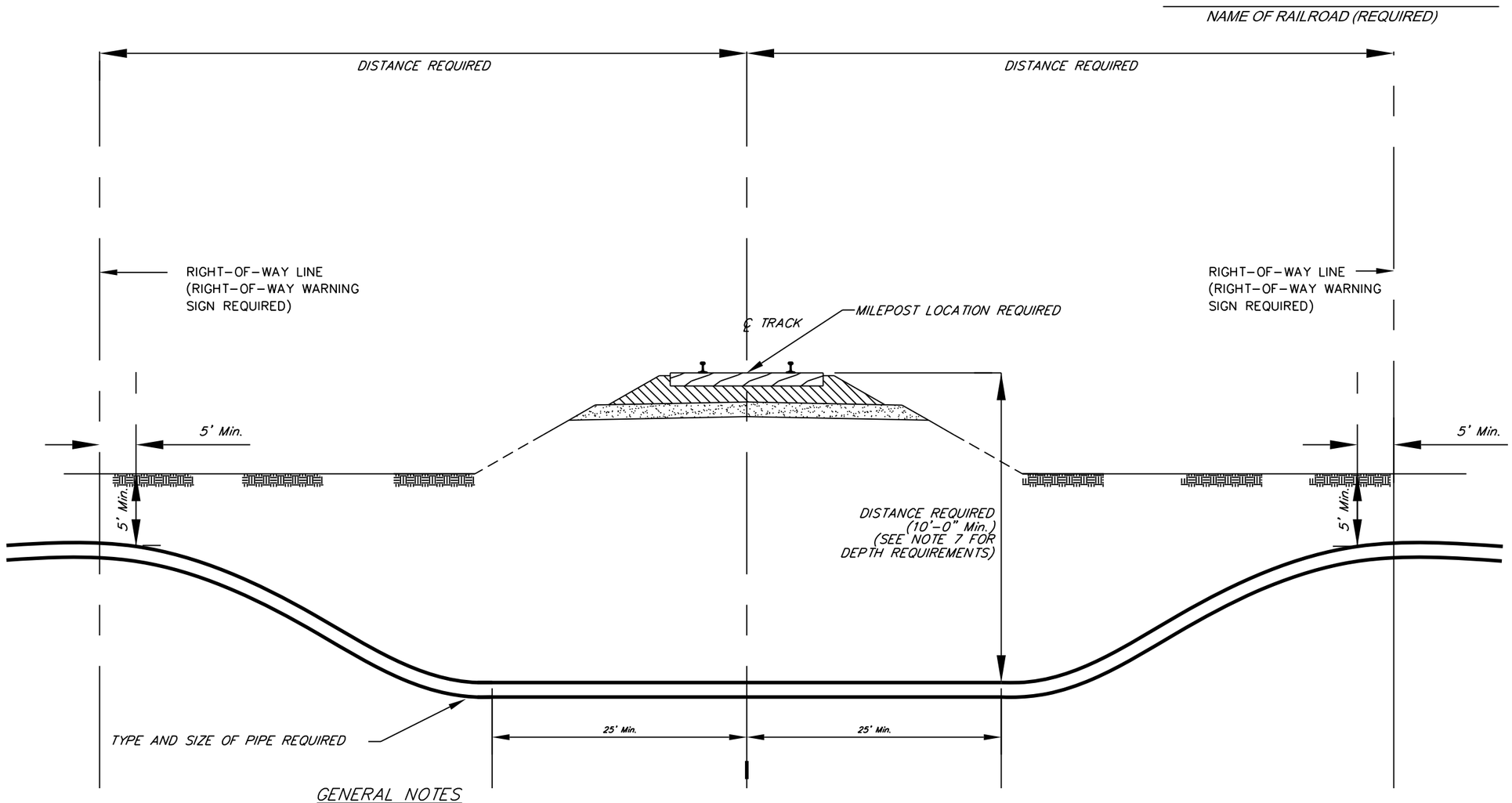
MISCELLANEOUS
SERIES 8000

OVERHEAD WIRE LINE PERMIT INFORMATION AT GRADE CROSSING

ES8090.2
SH. 2 OF 2

TYP DWG

FILE
ES8090.4
REVISIONS
06-28-2011 TJF/XRL
07-03-2013 XRL/GRC



GENERAL NOTES

1. DIRECTIONAL BORES, 10' BELOW BASE OF RAIL MAY BE HDPE SCH. 80 CASING (OR GREATER).
2. NO PVC PERMITTED. CARRIER PIPE MUST BE STEEL FOR GAS OR LIQUIDS.
3. JACKING PIT LOCATIONS MUST BE OUTSIDE OF RAILROAD RIGHT-OF-WAY LINES.
   NO OPEN CUT LATERAL CROSSING WILL BE ALLOWED. THE PIT WILL BE PROTECTED
   WITH ADEQUATE SHEETING, BULKHEADS AND BARRICADES TO PROTECT THE RAILROAD'S ROADBED.
   PROPER BARRICADES AND LIGHTS, IF NECESSARY, WILL BE SET AROUND THE PIT FOR POSITIVE PROTECTION.
4. NO WORK WILL BE PERMITTED ON RAILROAD RIGHT-OF-WAY WITHOUT A FLAGMAN.
5. CARRIER PIPE, UNDER PRESSURE, WILL REQUIRE CASING .
6. GAS PIPELINES WITH STEEL CARRIER DO NOT REQUIRE CASING.
7. THE FOLLOWING DEPTHS ARE REQUIRED FOR MIN. COVER (AS MEASURED FROM BOTTOM OF TIE TO TOP OF CASING OR UTILITY, IF NO CASING REQUIRED):
   - WIRE OR COMMUNICATION UTILITIES (NON-LIQUID OR GAS):
     10' MIN. DEPTH - 6" DIA. OR LESS.
     15' MIN. DEPTH - OVER 6" DIA.
   - GAS OR LIQUID WITH STEEL CARRIER PIPE:
     10' MIN. DEPTH - 6" DIA. OR LESS.
     25' MIN. DEPTH - OVER 6" DIA.

GENESEE & WYOMING
ENGINEERING DESIGN
STANDARDS REFERENCE MANUAL

Issue Date: 10-14-2008 | Revised Date: 07-03-2013

Authorized: Laurence S. Romaine
AVP-Engineering Design

The material and equipment shown herein must meet or exceed all quality requirements. Any deviation from these standards must be submitted in writing and approved by the Regional V.P. of Engineering and A.V.P. Engineering Design prior to use.

MISCELLANEOUS
SERIES 8000

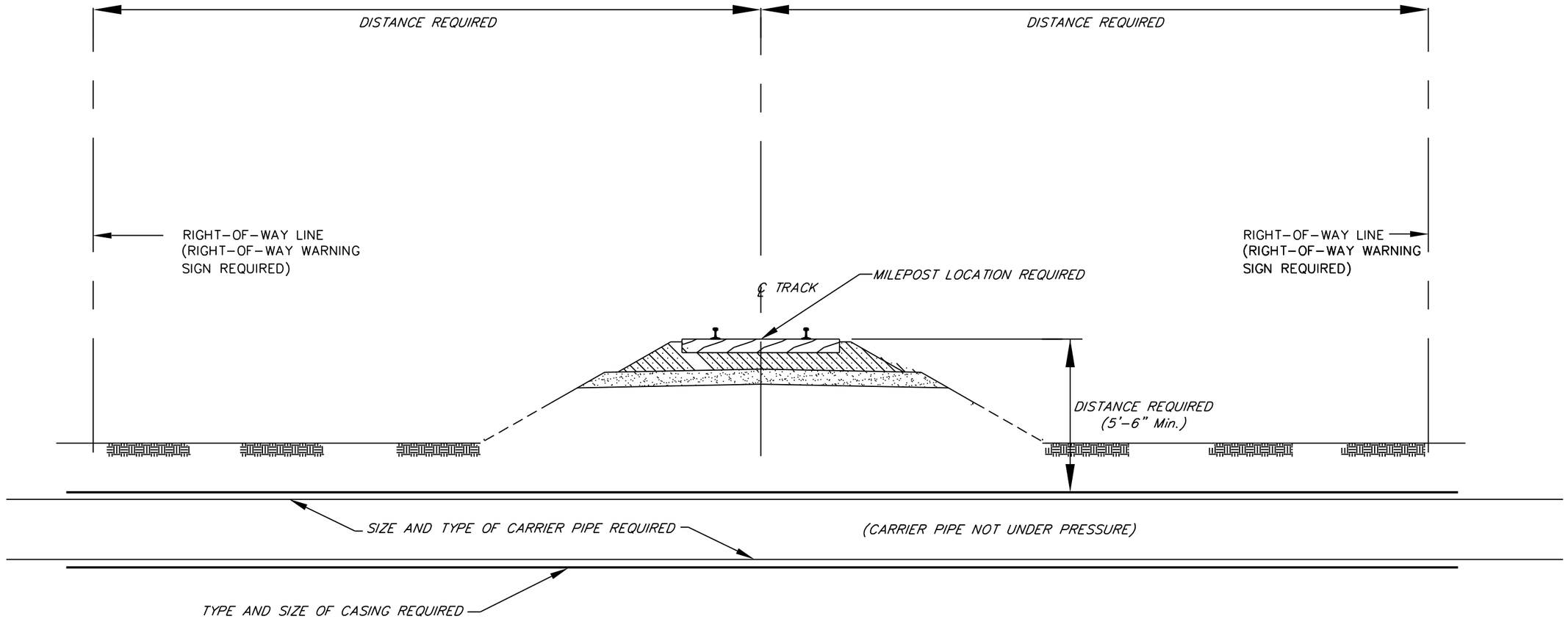
INFORMATION REQUIRED FOR TYPICAL DIRECTIONAL BORE (HDP)

ES8090.4
SH. 1 OF 1

TYP DWG

FILE
ES8090.5
REVISIONS
07-03-2013 | XRL/GRC

NAME OF RAILROAD (REQUIRED)



GENERAL NOTES

1. PVC WILL NOT BE PERMITTED AS CASING OR CARRIER PIPE ON RAILROAD RIGHT-OF-WAY
2. CITY, COUNTY, STATE AND RAILROAD MILEPOST LOCATION REQUIRED.
3. IF HDPE PIPE IS USED, IT MUST BE SCHEDULE 80 (OR GREATER) AND MAY ONLY BE USED FOR DIRECTIONAL BORE. A DISTANCE OF 10' MEASURED FROM BASE OF RAIL TO TOP OF PIPE IS REQUIRED.
4. NO WORK WILL BE PERMITTED ON RAILROAD RIGHT-OF-WAY WITHOUT A FLAGMAN.

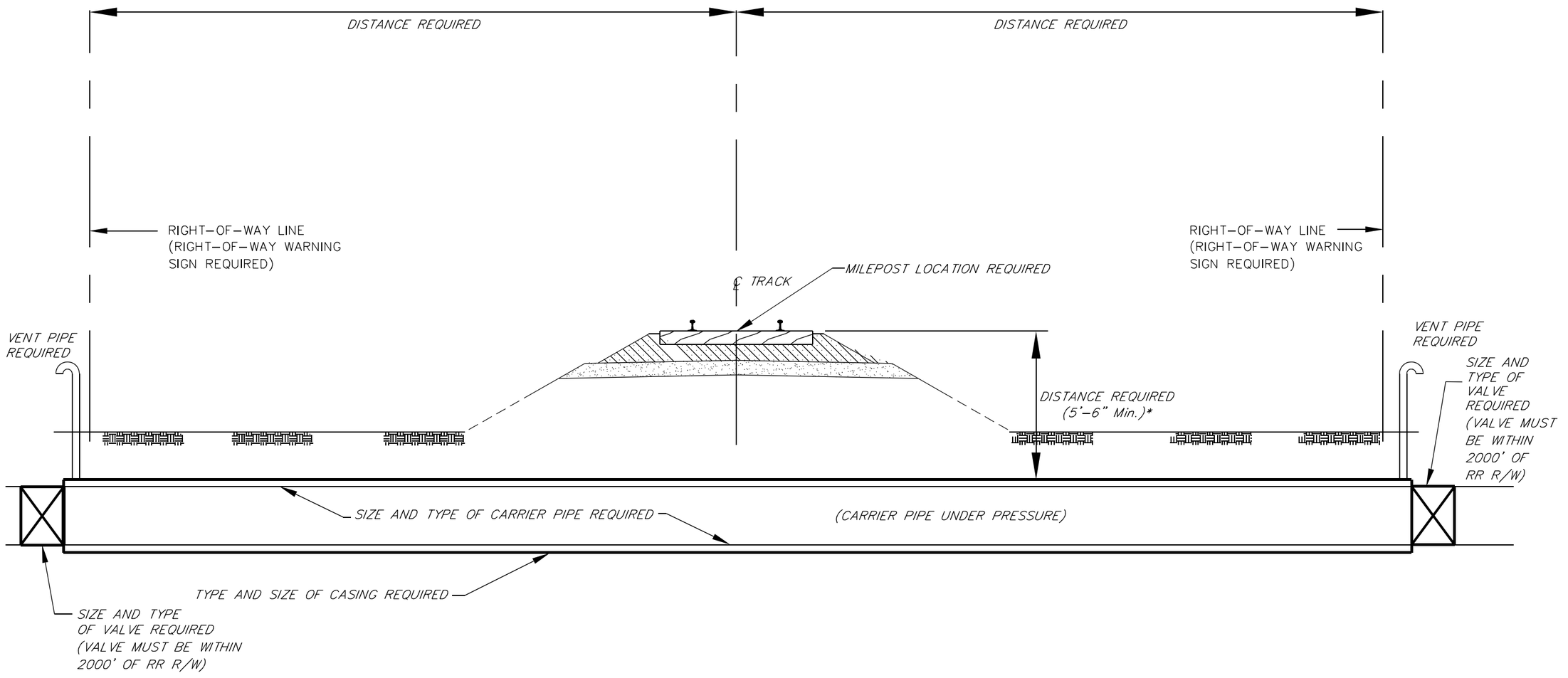
GENESEE & WYOMING ENGINEERING DESIGN STANDARDS REFERENCE MANUAL	Issue Date: 09-12-2008 | Revised Date: 07-03-2013 Authorized: Laurence S. Ronaine AVP-Engineering Design	The material and equipment shown herein must meet or exceed all quality requirements. Any deviation from these standards must be submitted in writing and approved by the Regional V.P. of Engineering and A.V.P. Engineering Design prior to use.	**MISCELLANEOUS** SERIES 8000	**INFORMATION REQUIRED FOR TYPICAL JACK & BORE (CARRIER PIPE NOT UNDER PRESSURE)**	**ES8090.5** SH. 1 OF 1

TYP DWG

FILE
ES8090.6

REVISIONS	
06-28-2011	TJF/XRL
07-03-2013	XRL/GRC
07-13-2013	XRL/BDR

NAME OF RAILROAD (REQUIRED)



GENERAL NOTES

1. PVC WILL NOT BE PERMITTED AS CASING OR CARRIER PIPE ON RAILROAD RIGHT-OF-WAY
2. CITY, COUNTY, STATE AND RAILROAD MILEPOST LOCATION REQUIRED.
3. IF HDPE PIPE IS USED, IT MUST BE SCHEDULE 80 (OR GREATER) AND MAY ONLY BE USED FOR DIRECTIONAL BORE. A DISTANCE OF 10' MEASURED FROM BASE OF RAIL TO TOP OF PIPE IS REQUIRED.
4. NO WORK WILL BE PERMITTED ON RAILROAD RIGHT-OF-WAY WITHOUT A FLAGMAN.

*=10' FOR UNCASED GAS. (STEEL CARRIER REQUIRED)

GENESEE & WYOMING
ENGINEERING DESIGN
STANDARDS REFERENCE MANUAL

Issue Date: 09-12-2008 | Revised Date: 07-03-2013

Authorized: Laurence L. Rooney
AVP-Engineering Design

The material and equipment shown herein must meet or exceed all quality requirements. Any deviation from these standards must be submitted in writing and approved by the Regional V.P. of Engineering and A.V.P. Engineering Design prior to use.

MISCELLANEOUS
SERIES 8000

INFORMATION REQUIRED FOR TYPICAL JACK & BORE (CARRIER PIPE UNDER PRESSURE)

ES8090.6
SH. 1 OF 1

TYP DWG

OFFICE OF ASSISTANT VICE PRESIDENT – ENGINEERING DESIGN

General Specifications for
Sub-grade and Above Grade Utility Crossings of
Railroad's Right-of-Way

I. General Provisions

A. **Plan and cross-section (profile of crossing) drawings** (see example drawing ES 8090.2 and ES 8090.4) containing all pertinent details for the proposed crossing shall be submitted to the Engineering Department for approval prior to the preparation of any agreement. Plans shall illustrate the profile in relation to actual ground, track, and other facilities at the project site. All crossings (above grade/sub-grade) shall be substantially perpendicular to the Railroad Main Line and shall not be placed within a culvert or under bridges. The location of crossing shall be limited to crossing as few tracks as possible.

B. The plan will show all information for the proposed crossing installation with reference to the nearest railroad mile post or centerline of nearest street intersection.

C. The method of construction **will be detailed in the application.** Measurements should be made perpendicular to the track.

D. Request for installation shall be accompanied with a letter signed by the owner, company officer, or government agent.

E. The railroad will make the sole determination when flagmen are required and when railroad construction inspection may be required. Costs for these services are at the sole expense of the lessee. Advanced payment for the estimated costs of these services may be required.

F. The lessee will be responsible for any and all costs of repairs or maintenance of the Railroad's property and structures disturbed or damaged due to the installation or construction aftereffects.

G. The lessee of an installation approved by agreement will be required to provide proof of protective insurance for and during construction.

H. All power and communication lines constructed over, under or parallel to the railroad shall meet or exceed the requirements of the National Electric Safety Code (Canadian Standards Association in Canada), latest revision and all applicable state/province and local codes.

I. Where laws or orders of public authority prescribe a higher degree of protection than specified herein, then the higher degree of protection shall be deemed a part of these specifications.

II. Sub-grade Pipelines and Cables

A. General

1. **Plan and cross-section (profile of pipe) drawings** for pipeline crossings shall include the following information: (see example drawing ES 8090.4)
   - Distance from nearest mile post or road crossing
   - Distance from base of rail to top of outer most pipe
   - Minimum distance from natural ground or ditch line to top of outer most pipe
   - Casing length as dimensioned from the center of main track
   - Angle of crossing
   - Railroad right-of-way boundaries including distances from centerline of main track
   - Bore pit locations (including distances from the nearest track)
   - Carrier and casing pipe dimensions
   - Right of way warning sign locations
   - Vent pipe locations
   - Shut-off valve locations
   - GPS Coordinates

2. The method of installation **will be detailed in the application,** including the location of jacking pits and receiving pits as measured from centerline of nearest track. Measurements should be made perpendicular to the track.

3. All sub-grade carrier pipelines conveying liquids and wirelines shall be installed within a casing pipe (See exception for HDPE housing fiber-optic and other communication lines – Paragraph 7 below). Gas pipelines may be installed without casing provided that installation is 10 feet (3.05 m) or more below the base of rail to the top of pipe at its closest point and steel carrier pipe is used (see section II D below and see Table 1). The casing pipe may be omitted for non-pressure sewer or drainage crossing, where installation can be made by open cut (not normally allowed) or where reinforced concrete pipe can be jacked under the railroad.

4. Bore pit locations must be outside of Railroad right-of-way lines. Normally no open-cut crossings will be allowed. The pit will be protected with adequate sheeting, bulkheads, and sidewalls to protect the Railroad's roadbed. Proper barricades and lights, if necessary will be set around the pit for positive protection.

5. **All pipelines** (except those in streets) shall be prominently marked at right-of-way lines (on both sides of track for crossings) by durable, weatherproof signs located over the centerline of the pipe. Signs shall show the following:

   Name and address of owner
   Contents of pipe
   Pressure in pipe
   Pipe depth below graded at point of a sign
   Emergency telephone number in event of pipeline rupture

   Location of signs must be shown on both the plan and cross-section (profile of pipe) drawings.

6. Owner must maintain all signs on Railroad's right-of-way as long as the occupational agreement is in effect.

7. **Schedule 80 HDPE pipe** (SDR11 pipe is acceptable for pipes 2" in (50.8 mm) diameter or greater) is acceptable (with no casing pipe) for use when housing fiber optic or other communication lines. A metallic ribbon or wire must be included in the pipe to allow for radio locating at a later date.

8. At no time will construction interfere with the normal and safe operation of the Railroad. No construction, manpower, or equipment will enter or operate on the right-of-way within a safety clearance of 25.0 feet (7.6 m) from the centerline of near track. A railroad flagman must be present during any work on the railroad right-of-way. For pipes greater than 48 inches in diameter the following requirements apply:

9. All casing or pipe installations where the diameter is greater than 72 inches (1.83) will require a pre-construction conference with all parties, at the project location.

10. Pre-construction arrangements will be made with the Railroad at least one week prior to construction. A Railroad inspector must be present during the entire installation of the casing pipe. The inspector will have complete authority over the project on the Railroad's right-of-way.

11. All Construction Inspection Costs will be borne by the lessee.

12. Pipelines shall, where practicable, cross the railroad where tracks are carried on an embankment.

13. Pipeline shall not be placed within the limits of a turnout (switch) when crossing the track. The limits of the turnout extend from the point of switch to 15 feet (4.6 m) beyond the last long timber.

14. Pipeline shall not be placed within 50 feet (15.25 m) of a railroad bridge, building or other important structure.

B. Pipeline Casing Requirements:

1. All casing pipes will extend from right-of-way line to right-of-way line protecting the entire R/W crossing.

2. The Railroad will not permit casing installation by open-cut method through the track(s) roadbed.

3. The casing pipe may be omitted for non-pressure sewer or drainage crossings where class V, reinforced concrete pipe can be jacked under the railroad.

4. All electrical wirelines and gas pipelines (less than 10 feet (3.05 m) below base of rail) shall be encased with steel pipe.

5. The casing pipe must be installed at least 5.5 feet (1.7 m) below base of rail or a minimum of 3 feet (0.91 m) from natural ground grade or bottom of ditches (whichever is greater)(see Table 1).

6. Steel casing pipe: For carrier pipe less than 6 inches (168.3 mm) in diameter, the inside diameter of the casing pipe shall be at least 2 inches (50.8 mm) greater than the largest outside diameter of the carrier pipe joints or couplings. For carrier pipe 6 inches or greater in diameter, the inside diameter of the casing pipe shall be at least 4 inches (101.6 mm) greater than the largest outside diameter of the carrier pipe joints or couplings. Steel pipe shall have a specified minimum yield strength, SMYS, of at least 35,000 psi (241 Mpa). The ASTM or API specification and grade for the pipe are to be shown on the application form.

7. All joints or couplings, supports, insulators or centering devices for the carrier pipe shall be considered in the selection of the casing diameter.

8. Casing pipe shall have a **minimum** wall thickness as shown in the table provided below, unless computations indicate that a thicker wall is required (see paragraph 9). When casing is installed without benefit of a protective coating or said casing is not cathodically protected, the wall thickness shall be increased to the nearest standard size which is a minimum of 0.063 inches greater than the thickness required except for diameters under 12-3/4 inches. Wall thickness designations for steel casing pipe for Cooper E-80 loading including impact are as follows:

Nominal Diameter (inches)	Min. Thickness for Coated (inches)	Non Coated (inches)
12-3/4 and under (324 mm)	0.188 (4.77 mm)	0.188 (4.77 mm)
14 (356 mm)	0.188 (4.77 mm)	0.250 (6.35 mm)
16 (406 mm)	0.219 (5.59 mm)	0.281 (7.14 mm)
18 (457 mm)	0.250 (6.35 mm)	0.312 (7.92 mm)
20 and 22 (508 & 559 mm)	0.281 (7.14 mm)	0.344 (8.74 mm)
24 (610 mm)	0.312 (7.92 mm)	0.375 (9.53 mm)
26 (660 mm)	0.344 (8.74 mm)	0.406 (10.31 mm)
28 (711 mm)	0.375 (9.53 mm)	0.438 (11.13 mm)
30 (762 mm)	0.406 (10.31 mm)	0.469 (11.91 mm)
32 (813 mm)	0.438 (11.13 mm)	0.500 (12.70 mm)
34 and 36 (864 & 914 mm)	0.469 (11.91 mm)	0.531 (13.49 mm)
38 (965 mm)	0.500 (12.70 mm)	0.563 (14.27 mm)
40 (1016 mm)	0.531 (13.49 mm)	0.594 (15.09 mm)
42 (1067mm)	0.563 (14.27 mm)	0.625 (15.88 mm)
44 and 46 (1118 & 1168 mm)	0.594 (15.09 mm)	0.656 (16.66 mm)
48 (1219 mm)	0.625 (15.88 mm)	0.688 (17.48 mm)
50 (1270 mm)	0.656 (16.66 mm)	0.719 (18.26 mm)
52 (1321 mm)	0.688 (17.48 mm)	0.750 (19.05 mm)
54 (1372 mm)	0.719 (18.26 mm)	0.781 (19.84 mm)
56 and 58 (1422 & 1473 mm)	0.750 (19.05 mm)	0.813 (20.62 mm)
60 (1524 mm)	0.718 (19.84 mm)	0.844 (24.61 mm)
62 (1575 mm)	0.813 (20.62 mm)	0.875 (22.23 mm)
64 (1626 mm)	0.844 (21.44 mm)	0.906 (23.01 mm)

66 and 68 (1676 & 1727 mm)	0.875 (22.23 mm)	0.938 (23.83 mm)
70 (1778 mm)	0.906 (23.01 mm)	0.969 (24.61 mm)
72 (1829 mm)	0.938 (23.83 mm)	1.000 (25.40 mm)

(*) = Casing Pipe diameters exceeding 72 inches require review and approval from Railroad AVP - Design prior to use.

9. If casing pipe wall thickness deviates from the table in Subsection B.8, all casing thickness determinations will be based on Cooper E-80 Railroad Loading, using applicable formulas and computations performed by a registered professional engineer, registration must be in the project State. The (Signed/Sealed) computation results will accompany the plans for review by the Engineering Department.

10. All casing pipe joints will be welded in accordance with AISC Specifications, Section 1-7-2. All joint welds will be full penetration.

11. The inside diameter of the casing pipe shall be such as to allow the carrier pipe to be removed subsequently without disturbing the casing or the roadbed.

12. Casing Pipe Vents - All casing pipes, with the exception of electrical, communication or sewer lines, shall be properly vented. Vent pipes shall be of sufficient diameter, but in no case less than two (2) inches in diameter and shall be attached near each end of casing, projecting through ground surface and located a minimum of 45 feet from the centerline of the nearest track but preferably outside of Railroad property limits. Vent pipes shall extend not less than four (4) feet above ground surface. Top of vent pipes shall be fitted with a down-turned elbow, properly screened; or a relief valve installed.

13. All Casing pipe ends that are below ground level shall be constructed as to prevent leakage of any substance from the casing throughout its length. Each end of the casing shall require a sufficient seal to prevent the potential for leakage of any substance from the casing pipe. Grout fill is an acceptable method installed by pressure grouting. If used, the grout material should consist of non-shrink sand cement slurry or Railroad approved equivalent, and sufficiently seal the casing pipe ends to the satisfaction of the Railroad. If deemed necessary, and at the sole discretion of the AVP - Design, the entire void between the carrier pipe and casing pipe throughout the entire length of the casing pipe may be required to be filled upon notification from the Railroad. In this case vent pipes are not required.

C. Carrier Pipeline Specifications:

1. Reinforced concrete pipe:

   - Materials: Modified bell and spigot or tongue and groove in accordance with current ASTM Specification C76 Class V for Railroad strength pipe or current specification for pre-stressed concrete pipe.

   - Joints: Rubber and steel joint for pre-stressed pipe in accordance with current Lock Joint Pipe Company Specification on SP5, or equivalent. Joints for bell and spigot and tongue and groove pipe to be in accordance with current standard practice. Joints may be made using confined continuous rubber gasket.

2. Cast iron pipe:

- Materials: Pipe must conform to current ASTM Specification A142 for "Standard Pipe."

- Joints: Bell and spigot, caulked with lead and oakum, or approved mechanical type joint.

3. Plastic Pipe: The use of plastic carrier pipe for sewer, water, natural gas and other liquids is acceptable under specific circumstances per AREMA. The use of plastic pipe is satisfactory if the pipe is designed to meet all applicable federal and state codes, and if the carrier pipe is encased within a steel casing pipe per AREMA standards. The casing must extend the full width of the right-of-way. Plastic pipe material shall be resistant to the chemicals with which contact can be anticipated. Plastic carrier pipe shall not be utilized where there is potential for contact with petroleum contaminated soils or other non-polar organic compounds that may be present in surrounding soils.

4. Polyethylene pipe (HDPE): Pipe must conform to the current ASTM Specifications D2104, Schedule 40, for standard pipe when encased with steel casing.

5. Steel pipe:

    - Materials: Pipe must conform to current ASTM Specification A120.

    - Joints: All joints must be welded or of an approved mechanical type.

        - Steel pipe shall not be used to convey sewage, storm water or other liquids which could cause corrosion.

6. Carrier Pipe Shut-Off Valves - Carrier pipe under pressure shall have a sufficient shut-off valve(s) at each end outside of Railroad's right-of-way limits. Accessible emergency shut-off valves shall be installed within effective distances (normally within 2000 feet) each side of the railway as mutually agreed to by the engineer and the pipeline company. These valves should be marked with signs for identification. Where pipelines are provided with automatic control stations at locations and within distances approved by the engineer, no additional valves shall be required.

D. Uncased Gas Pipelines

1. Carrier line pipe under railroad tracks must be a **minimum 10 feet below base of rail** to top of pipe at its closest point. At all other locations on the rights-of-way the minimum ground cover must be 6 feet (see Table 1). Where it is not possible to secure the above depths, casings as specified in section II, B will be required.

2. Carrier pipe must be steel and conform to the requirements of ANSI B 31.8 Gas Transmission and Piping Systems, and other applicable ANSI Codes. All steel carrier pipes must be coated and cathodically protected to industry standards.

3. Joints for the carrier line pipe must be of an approved welded type. Steel pipe must have a specified minimum yield strength (SMYS), of at least 35,000 psi. The nominal wall thickness for the steel carrier pipe, SMYS, maximum allowable operating pressure (MAOP), and outside pipe diameter (D), are given in Appendix A.

4. Uncased gas pipelines shall be installed by boring or jacking or horizontal directional drilling (HDD).

E. Longitudinal Pipelines

1. Pipelines laid longitudinally on the Railroad's right-of-way shall be located as far as practicable from any tracks or other important structures and as close to the property line as possible. Longitudinal pipelines must not be located in earth embankments or within ditches located on the right-of-way. They must not be within 25 feet of any track and must have a minimum of 6 feet ground cover for flammable substances and 4 feet for non-flammable substances over the pipeline up to 50 feet, measured from the track centerline. Where pipeline is laid more than 50 feet from centerline of track, minimum cover shall be at least 5 feet for flammable substances and 3 feet for non-flammable substances. Longitudinal carrier pipeline shall be steel. Plastic carrier pipe may be utilized for longitudinal installation with approval by the engineer, but shall be encased within the limits of the right-of-way. Casing may be omitted with approval of the engineer, provided that minimum burial depth is increased to comply with the most conservative requirements of either: the engineer's instructions, current ANSI specifications, current OSHA regulations, or local regulatory agency specifications.

2. Allowable hoop stresses must comply with AREMA requirements and all applicable federal, state and local codes.

3. If Horizontal Directional Drilling (HDD) is used as the method of installation for the longitudinal occupancy, the minimum required depths in paragraph 1 above are increased by 2 feet.

4. For pipelines running longitudinally on the Railroad's property, signs shall be placed over the pipe (or offset and appropriately marked) at all changes in direction of the pipeline. Such signs should also be located so that when standing at one sign the next adjacent marker in either direction is visible. In no event shall they be placed more than 500 feet apart. Right of way warning signs must be shown on the plan view drawing.

F. Tunnel Liner Requirements:

1. All applicable preceding sections will govern tunnel liner usage.

2. Tunnel liner plate will be 12-gauge, galvanized, and all bolts and nuts will be galvanized.

3. Live load will be based on Cooper E-80 Railroad Loading, using applicable formulas and computations performed by a registered professional engineer, registration must be in the Project State. The (signed/Sealed) computation results will accompany the plans for review by the Engineering Department.

4. Grout holes, if required will be provided at 10-foot intervals along the roof and sides.

5. The tunnel liner-jacking shield will protect 180 degrees of the upper section and material removed to allow for a minimum 1:1 slope, with a minimum 2.0 feet of undisturbed soil supporting the overburden.

6. The tunnel liner installation will progress with sufficient manpower and supervision for around-the-clock construction until the liner is completed, through the limits of the right-of-way.

G. Abandoned Facilities

1. The owner of all pipe crossings proposed for abandonment shall notify the Railroad, in writing, of the intention to abandon.

2. Abandoned pipelines (carrier or casings) with an outer diameter greater than 2 inches shall be completely filled with cement grout, compacted sand, or other methods, as approved by the Railroad.

3. Abandoned manholes and other structures shall be removed to a minimum depth of 2 feet below finished grade and completely filled with cement grout, compacted sand, or other methods as approved by the Railroad.

4. The location of abandoned facilities shall be recorded and records maintained by the pipeline owner.

H. Guidelines for Horizontal Directional Drilling (HDD) Under Tracks

1. For pipelines conveying gas or liquid substances, steel pipe only may be installed under track(s) and/or right-of-way utilizing horizontal directional drilling.

2. For outermost pipe diameters 6 inches or less, the depth below natural ground or railroad ditch will be 1 ft greater than that allowed using the jack and bore method for each commodity. For outermost pipe diameters greater than 6 inches, the depth below natural ground or railroad ditch will be 2 ft greater than that allow using the jack and bore method for each commodity (see Table 1). For longitudinal occupancies, see E.3 above for the required depths.

3. For wireline installations, including fiber optic cable, HDPE Sch 80 or stronger pipe may be installed as the outermost pipe. Bundling is prohibited. All innerducts must have an outer casing pipe.

4. Minimum cover for all pipelines with outside diameter of 6 inches or less, regardless of product, shall be 10 feet minimum below base of rail. For all liquid or gas installations regardless of product, with nominal pipe sizes exceeding 6 inches outside diameter, minimum cover (measured from base of rail to top of pipe) shall be a minimum of 25 feet. For fiber optics or electrical installations, with casing/conduit nominal size exceeding 6 inches, minimum cover shall be 15 feet (see Table 1).

5. Applicant submittal shall include actual planned depth of pipe under each railroad track. The plan and profile views must show the entire bore, including the sending and receiving pits, regardless of the right-of-way limits.

6. Applicant must provide pipe specifications for casing and carrier pipes. Pipe must satisfy all applicable government and industry regulations.

7. Applicant must provide qualifications of drilling contractor, including specific instances of previous successful experience in drilling under railroad and other sensitive surface facilities.

8. Prior to commencement of drilling:

   a. The contractor must submit a Boring Plan that describes the anticipated rig capacity, the proposed equipment and the method for advancing the bore hole through expected soil conditions, angles, depth and exact location of the exit ditch, the pilot hole diameter, the proposed reaming plan, including the diameter of the pre-reams/back-reams and diameter of the final reamed bore hole, and the contingency equipment and plans for dealing with soil conditions that a soils engineer could reasonably expect to be encountered at the proposed HDD installation site. The Boring Plan should also address the anticipated hours of operation during the HDD bore hole drilling and installation process, the minimum number of personnel and their responsibilities on-duty and on-site during all HDD drilling operations. Consideration for working hours must be given to minimize risk to railroad operations during drilling operations. See "Additional Guidelines" (Item 10) for additional bore guidelines.

   b. The contractor must provide a detailed Fracture Mitigation (frac-out) Plan, including method of monitoring quantity and capturing the return of drilling fluids with particular attention to variation from proposed plan (i.e. volumes, pressure, or consistency).

   c. The contractor must establish a Survey Grid Line and provide a program of monitoring and documenting the actual location of the bore hole during drilling operations.

9. An engineering inspector is required to monitor the ground and track for movement during drilling, reaming, and pullback processes. The engineering inspector shall be provided by the applicant at their sole cost and expense. The installation process and all train movement must be immediately stopped if ground or track movement is detected. The damaged area must be immediately repaired. The installation process must be reviewed and modified as required before the installation can proceed. Applicant must pay all expenses for review and inspection.

10. Bore Plan Additional Requirements
    In addition to all the requirements outlined in the above guidelines, the bore plan should include the following:

    - Pre-bore survey grid line with angles and depths defined
    - Statement that once the bore enters railroad property, the work will be continuous until the drilling is complete and the pipe is pulled into place.
    - Statement that the bore will be tracked constantly, with the location and depth marked every 10 feet.
    - If the commodity to be conveyed permits the use of HDPE pipe, it must be schedule 80 (SDR11 pipe is acceptable for pipes 2" in (50.8 mm) diameter or greater) or better (thicker wall).
    - The maximum size of the bore hole may not exceed Outside Diameter (OD) X 1.5 if OD is 10 inches or less. If the OD is greater than 10 inches, the bore hole may not exceed OD X 1.3.
    - A defined slurry recovery method. Disposal on railroad property or within railroad ditches and facilities is prohibited.

- The launching and receiving pits must be situated at minimum outside the railroad right-of-way. In cases where the slope of the railroad grade extends beyond the right-of-way, pits must be located beyond the toe of the slope so as not to compromise the railroad grade.
- Statement of expected soil conditions and statement of all drill heads on site for expected and unexpected soil conditions.
- Specifications and capacities of the bore machine. This includes:
  - Maximum capacities
  - Intended capacities
  - Maximum drilling RPM
  - Intended drilling RPM
  - Maximum drilling PSI
  - Intended drilling PSI
  - Maximum GPM
  - Intended GPM

Table 1. UNDERGROUND PIPE DEPTH REQUIREMENTS

REQUIRED DEPTHS FROM BASE OF RAIL TO TOP OF PIPE

Commodity	Jack and Bore		Horizontal Direction Drill	
	Outermost Dia 6 Inch or less	Outermost Dia Greater than 6 Inch	Outermost Dia 6 Inch or less	Outermost Dia Greater than 6 Inch
Electrical	5.5 ft (1.68 m)	5.5 ft (1.68 m)	10 ft (3.05 m)	15 ft (4.57 m)
Fiber Optic	5.5 ft (1.68 m)	5.5 ft (1.68 m)	10 ft (3.05 m)	15 ft (4.57 m)
Non-Pressurized Liquid	5.5 ft (1.68 m)	5.5 ft (1.68 m)	10 ft (3.05 m)	25 ft (7.62 m)
Pressurized Liquid	5.5 ft (1.68 m)	5.5 ft (1.68 m)	10 ft (3.05 m)	25 ft (7.62 m)
Gas	5.5 ft (1.68 m) or 10 ft (3.05 m) if uncased	5.5 ft (1.68 m) or 10 ft (3.05 m) if uncased	10 ft (3.05 m)	25 ft (7.62 m)
Oil	5.5 ft (1.68 m)	5.5 ft (1.68 m)	10 ft (3.05 m)	25 ft (7.62 m)

REQUIRED DEPTHS FROM NATURAL GROUND OR BOTTOM OF DITCH TO TOP OF PIPE

Commodity	Jack and Bore		Horizontal Direction Drill	
	Outermost Dia 6 Inch or less	Outermost Dia Greater than 6 Inch	Outermost Dia 6 Inch or less	Outermost Dia Greater than 6 Inch
Electrical	3 ft (0.92 m)	3 ft (0.92 m)	4 ft (1.22 m)	5 ft (1.52 m)
Fiber Optic	3 ft (0.92 m)	3 ft (0.92 m)	4 ft (1.22 m)	5 ft (1.52 m)
Non-Pressurized Liquid	3 ft (0.92 m)	3 ft (0.92 m)	4 ft (1.22 m)	5 ft (1.52 m)
Pressurized Liquid	3 ft (0.92 m)	3 ft (0.92 m)	4 ft (1.22 m)	5 ft (1.52 m)
Gas	3 ft (0.92 m) or 6 ft (1.83 m) if uncased	3 ft (0.92 m) or 6 ft (1.83 m) if uncased	4 ft (1.22 m) or 7 ft (2.13 m) if uncased	5 ft (1.52 m) or 8 ft (2.44 m) if uncased
Oil	3 ft (0.92 m)	3 ft (0.92 m)	4 ft (1.22 m)	5 ft (1.52 m)

III. Above Grade Structures (Please see Genesee and Wyoming, Inc. Public Projects Manual for all highway overpasses and other public projects)

A. Standard overhead clearances for fixed structures, such as bridges and other overhead fixed structures shall provide a minimum of 23 feet vertical clearance above top of rail (T/R).

B. The bridge or other structure shall completely span the railroad right-of-way. Piers, columns or other structures must be located off the right-of-way.

C. Pre-design conference with the Engineering Department will set forth horizontal clearance of subgrade, grade, and above grade construction and structural limits.

D. The railroad shall be furnished as-built drawings showing the actual clearances as constructed.

E. Crashwalls, per AREMA Specifications, Chapter 8, Article 2.1.5, are required when the face of pier is closer than 25' 0" from the centerline of track, measured perpendicular to the track.

F. Drainage from the bridge shall be preferably collected with drain pipes and drained away from the railroad's right-of-way. Scuppers from the bridge must not drain on to railroad right-of-way.

G. Projects involving stormwater systems shall be designed for a 100 year storm event as a minimum.

H. All highway structures shall have a protective barrier fence that extends at least 8'-0" from the top of sidewalk or driving surface adjacent to the barrier wall. The fence may be placed on top of barrier wall and should also include anti-climb shields or be of a configuration to minimize the likelihood of climbing on the outside of the protective fencing.

I. For guidelines and specifications for progressing project such as highway overpasses, please see Public Projects Manual available at www.GWRR.com

IV. Above Grade Wirelines

A. All installations of aerial lines and cables will provide a minimum clearance above top of rail (T/R) of highest track. Standard overhead clearance for all aerial line crossings, both power and non-power line crossings, shall provide the following clearances (Clearances are based upon the maximum sag conditions, whether sag is created by thermal or physical conditions. refer to drawing ES 8090.2):

Nominal Voltage	Overhead Clearance
0 – 750	27' – 0"
To 15,000	28' – 0"
To 50,000	30' – 0"
69,000	30' – 8"
115,000	32' – 2"
138,000	33' – 0"
345,000	39' – 10"
500,000	45' – 0"
745,000	53' – 2"
765,000	53' – 10"

Nominal Voltage	Canadian Clearance
0 – 750	7.3 m (7.6 m)
To 22,000	7.6 m (7.9 m)
To 50,000	8.1 m (8.4 m)
90,000	8.4 m (8.7 m)
120,000	8.7 m (9.0 m)
150,000	9.0 m (9.3 m)
200,000	9.5 m (9.8 m)
220,000	9.7 m (10.0 m)
318,000	10.7 m (11.0 m)
442,000	11.9 m (12.2 m)

B. At Roadway Grade Crossings, provide safe clearances between warning devices and electrical transmission, distribution cables (including messenger and neutral wires), and all communication lines. All overhead utility crossings shall provide the minimum vertical clearance from top of rail (T/R) of highest track as shown in Subsection A above plus additional clearances necessary to obtain operational clearances from crossing warning device assemblies

1. 6'0" (1.8 m) vertical clearance from Gate tips in vertical position or structure mast (whichever is greater).
2. 13'-6" vertical clearance from Cantilever arm or structure mast (whichever is greater).
3. The minimum clearance from crossing gate tips, cantilever structures, signal masts, signal and other bridges, etc. shall conform to the National Electric Safety Code, section 23, rule 234, but in no case shall the overhead clearances shown in the table above or the additional clearances as outlined in 1 and 2 above be reduced.
4. For Canadian railroads, an additional 0.3 m of vertical clearance above rails shall be provided to account for rail lift per CSA 5.3.1.1 paragraph C.

C. The poles or towers supporting the crossing span should be located outside the railroad's right-of-way. If locating poles or towers outside the right-of-way is not possible, the side clearance of poles and towers from the nearest track shall be not less than 25 feet.

D. Wireline crossings not to be installed within 500 feet of the end of any railroad bridge or 300 feet from the centerline of any culvert or turnout (switch).

E. Wires and cables running longitudinally along the railroad's right-of-way shall be constructed as close to the property lines as possible, except in cases where doing so will interfere with Railroad operations, surface drainage or soil stability.

F. Poles and towers near public road crossings shall be located so as to not interfere with the sight-distance along the railroad from motorists on the public roadway.

G. Should the Railroad add or modify existing crossing warning devices or facilities at any highway grade crossings, existing wire lines or cables shall be raised or relocated immediately on notice from Railroad to lessee and at the sole cost and expense of the lessee.

V. Miscellaneous

A. Cathodic protection of pipelines, cables, or casings:

1. When cathodic protection is provided, it shall be installed so as not to induce currents, which will interfere with the signal apparatus of the Railroad. Any change required in the manner, method, or location of such cathodic protection shall be made at the sole cost and expense of the lessee and to the satisfaction of the Engineering Department of the Railroad.

2. Cathodic protection shall be applied to all pipelines carrying flammable substances on the Railroad's right-of-way.

B. Proposed structures must maintain a minimum 10-foot horizontal clearance to the face of any signal, post, crossing gate or other above grade obstruction.

VI. Standard Drawings

A. The following Standard Reference drawings in reference to these written specifications are available upon request:

1. **ES8049.1** – Mainline Design & Installation of CMP
2. **ES8090.2** – Information Required for Utility Crossing Applications (Overhead)
3. **ES8090.3** – Overhead Bridge Permit Information
4. **ES8090.4** – Information Required for Utility Crossing Applications (Underground)

Minimum Nominal Wall Thickness (in.) for Uncased Carrier Pipe (Continued)

D (in.)	SMYS (psi)					SMYS (psi)				
	35000	42000	52000	60000	70000	35000	42000	52000	60000	70000
	MAOP ≤ 900 psi - Continued					MAOP ≤ 1000 psi - Continued				
22.0	0.562	0.469	0.375	0.312	0.281	0.625	0.500	0.406	0.344	0.281
24.0	0.625	0.500	0.406	0.344	0.312	0.688	0.562	0.438	0.375	0.312
26.0	0.656	0.562	0.438	0.375	0.312	0.750	0.594	0.469	0.406	0.344
28.0	0.719	0.594	0.469	0.406	0.344	0.750	0.656	0.531	0.438	0.375
30.0	0.750	0.625	0.500	0.438	0.375	0.812	0.688	0.562	0.469	0.406
32.0	0.812	0.688	0.562	0.469	0.406	0.875	0.719	0.594	0.531	0.438
34.0	0.875	0.719	0.594	0.500	0.438	0.938	0.781	0.625	0.562	0.469
36.0	0.906	0.781	0.625	0.531	0.469	1.000	0.812	0.688	0.594	0.500
38.0	0.969	0.812	0.656	0.562	0.500	1.062	0.875	0.719	0.625	0.531
40.0	1.031	0.875	0.688	0.625	0.531	1.125	0.906	0.750	0.656	0.562
42.0	1.062	0.906	0.750	0.656	0.562	1.188	0.969	0.781	0.688	0.594
	MAOP ≤ 1100 psi					MAOP ≤ 1200 psi				
≤ 5.563	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188
6.625	0.188	0.188	0.188	0.188	0.188	0.203	0.188	0.188	0.188	0.188
8.625	0.250	0.203	0.188	0.188	0.188	0.277	0.219	0.188	0.188	0.188
10.75	0.307	0.250	0.203	0.188	0.188	0.344	0.277	0.219	0.188	0.188
12.75	0.375	0.312	0.250	0.219	0.188	0.406	0.330	0.281	0.226	0.188
14.0	0.406	0.344	0.281	0.226	0.219	0.438	0.375	0.312	0.250	0.219
16.0	0.469	0.406	0.312	0.281	0.219	0.500	0.406	0.344	0.281	0.250
18.0	0.531	0.438	0.344	0.312	0.250	0.562	0.469	0.375	0.344	0.281
20.0	0.594	0.500	0.406	0.344	0.281	0.625	0.531	0.438	0.375	0.312
22.0	0.625	0.531	0.438	0.375	0.312	0.688	0.562	0.469	0.406	0.344
24.0	0.688	0.594	0.469	0.406	0.344	0.750	0.625	0.500	0.438	0.375
26.0	0.750	0.625	0.500	0.438	0.375	0.812	0.688	0.562	0.469	0.406
28.0	0.812	0.688	0.562	0.469	0.406	0.875	0.719	0.594	0.500	0.438
30.0	0.875	0.750	0.594	0.531	0.438	0.938	0.812	0.625	0.562	0.469
32.0	0.938	0.781	0.625	0.562	0.469	1.000	0.875	0.688	0.594	0.500
34.0	1.000	0.844	0.688	0.594	0.500	1.062	0.875	0.719	0.625	0.531
36.0	1.062	0.875	0.719	0.625	0.531	1.125	0.938	0.750	0.656	0.562
38.0	1.125	0.938	0.750	0.656	0.562	1.188	1.000	0.812	0.719	0.594
40.0	1.156	0.969	0.812	0.688	0.594	1.250	1.031	0.844	0.750	0.625

Appendix A

Minimum Nominal Wall Thickness (in.) for Uncased Carrier Pipe (Continued)

D (in.)	SMYS (psi)					SMYS (psi)				
	35000	42000	52000	60000	70000	35000	42000	52000	60000	70000
	MAOP ≤ 1100 psi - Continued					MAOP ≤ 1200 psi - Continued				
42.0	1.250	1.031	0.844	0.750	0.625	1.312	1.094	0.906	0.781	0.656
	MAOP ≤ 1300 psi					MAOP ≤ 1400 psi				
≤ 5.563	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188
6.625	0.219	0.188	0.188	0.188	0.188	0.250	0.188	0.188	0.188	0.188
8.625	0.277	0.250	0.188	0.188	0.188	0.312	0.250	0.219	0.188	0.188
10.75	0.344	0.307	0.250	0.203	0.188	0.365	0.307	0.250	0.219	0.219
12.75	0.438	0.344	0.281	0.256	0.219	0.438	0.375	0.312	0.256	0.250
14.0	0.469	0.375	0.312	0.279	0.226	0.500	0.406	0.344	0.281	0.281
16.0	0.531	0.438	0.375	0.312	0.281	0.562	0.469	0.375	0.344	0.312
18.0	0.594	0.500	0.406	0.344	0.312	0.625	0.531	0.438	0.375	0.344
20.0	0.656	0.562	0.438	0.375	0.344	0.688	0.594	0.469	0.406	0.375
22.0	0.719	0.594	0.500	0.438	0.406	0.750	0.656	0.531	0.469	0.375
24.0	0.812	0.656	0.531	0.469	0.406	0.844	0.688	0.562	0.500	0.438
26.0	0.844	0.719	0.594	0.500	0.438	0.906	0.750	0.625	0.531	0.469
28.0	0.906	0.781	0.625	0.531	0.469	0.969	0.812	0.656	0.594	0.500
30.0	0.969	0.812	0.688	0.594	0.500	1.031	0.875	0.719	0.625	0.531
32.0	1.031	0.875	0.719	0.625	0.531	1.094	0.938	0.750	0.656	0.562
34.0	1.125	0.938	0.750	0.656	0.562	1.156	1.000	0.812	0.719	0.594
36.0	1.188	1.000	0.812	0.719	0.625	1.250	1.062	0.875	0.750	0.656
38.0	1.250	1.062	0.844	0.750	0.656	1.312	1.094	0.906	0.781	0.688
40.0	1.312	1.094	0.906	0.781	0.688	1.375	1.156	0.938	0.844	0.719
42.0	1.375	1.156	0.938	0.844	0.719	1.469	1.219	1.000	0.875	0.750
	MAOP ≤ 1500 psi					MAOP ≤ 1600 psi				
≤ 4.5	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188
5.563	0.219	0.188	0.188	0.188	0.188	0.219	0.188	0.188	0.188	0.188
6.625	0.250	0.203	0.188	0.188	0.188	0.280	0.219	0.188	0.188	0.188
8.625	0.312	0.277	0.219	0.188	0.188	0.344	0.277	0.250	0.219	0.188
10.75	0.406	0.344	0.279	0.226	0.219	0.438	0.344	0.279	0.250	0.219
12.75	0.469	0.406	0.312	0.281	0.250	0.500	0.406	0.344	0.312	0.250
14.0	0.500	0.438	0.344	0.312	0.250	0.562	0.469	0.375	0.312	0.281
16.0	0.594	0.500	0.406	0.344	0.312	0.625	0.531	0.438	0.375	0.312

Minimum Nominal Wall Thickness (in.) for Uncased Carrier Pipe (Continued)

D (in.)	SMYS (psi)					SMYS (psi)				
	35000	42000	52000	60000	70000	35000	42000	52000	60000	70000
	MAOP ≤ 1500 psi - Continued					MAOP ≤ 1600 psi - Continued				
18.0	0.656	0.562	0.469	0.406	0.344	0.688	0.594	0.469	0.406	0.344
20.0	0.719	0.625	0.494	0.438	0.375	0.781	0.656	0.531	0.469	0.406
22.0	0.812	0.688	0.562	0.469	0.406	0.844	0.719	0.594	0.500	0.438
24.0	0.875	0.750	0.594	0.531	0.438	0.938	0.781	0.625	0.562	0.469
26.0	0.938	0.812	0.656	0.562	0.500	1.000	0.844	0.688	0.594	0.500
28.0	1.031	0.875	0.688	0.625	0.531	1.062	0.906	0.750	0.656	0.562
30.0	1.094	0.938	0.750	0.656	0.562	1.156	0.969	0.781	0.688	0.594
32.0	1.156	0.969	0.812	0.688	0.594	1.219	1.031	0.844	0.719	0.625
34.0	1.250	1.031	0.844	0.750	0.625	1.312	1.094	0.906	0.781	0.656
36.0	1.312	1.094	0.906	0.781	0.688	1.375	1.156	0.938	0.812	0.719
38.0	1.375	1.156	0.938	0.844	0.719	1.469	1.219	1.000	0.875	0.750
40.0	1.438	1.219	1.000	0.875	0.750	1.531	1.281	1.062	0.906	0.781
42.0	1.531	1.281	1.062	0.938	0.781	—	1.344	1.094	0.969	0.844
	MAOP ≤ 1700 psi					MAOP ≤ 1800 psi				
≤ 4.0	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188
4.5	0.188	0.188	0.188	0.188	0.188	0.203	0.188	0.188	0.188	0.188
5.563	0.258	0.188	0.188	0.188	0.188	0.258	0.219	0.188	0.188	0.188
6.625	0.280	0.250	0.188	0.188	0.188	0.312	0.250	0.219	0.188	0.188
8.625	0.375	0.312	0.250	0.219	0.188	0.375	0.312	0.250	0.219	0.188
10.75	0.438	0.365	0.312	0.256	0.219	0.469	0.406	0.312	0.279	0.250
12.75	0.531	0.438	0.375	0.312	0.281	0.562	0.469	0.375	0.344	0.281
14.0	0.594	0.500	0.406	0.344	0.312	0.625	0.500	0.406	0.375	0.312
16.0	0.656	0.562	0.438	0.406	0.344	0.688	0.594	0.469	0.406	0.344
18.0	0.750	0.625	0.500	0.438	0.375	0.781	0.656	0.531	0.469	0.406
20.0	0.812	0.688	0.562	0.500	0.406	0.875	0.719	0.594	0.500	0.438
22.0	0.906	0.750	0.625	0.531	0.469	0.969	0.781	0.656	0.562	0.500
24.0	1.000	0.812	0.656	0.594	0.500	1.031	0.875	0.719	0.625	0.531
26.0	1.062	0.906	0.719	0.625	0.531	1.125	0.938	0.750	0.656	0.562
28.0	1.156	0.969	0.781	0.688	0.594	1.219	1.000	0.812	0.719	0.625
30.0	1.219	1.031	0.844	0.719	0.625	1.312	1.094	0.875	0.750	0.656
32.0	1.312	1.094	0.875	0.781	0.656	1.375	1.156	0.938	0.812	0.688

Minimum Nominal Wall Thickness (in.) for Uncased Carrier Pipe (Continued)

D (in.)	SMYS (psi)					SMYS (psi)				
	35000	42000	52000	60000	70000	35000	42000	52000	60000	70000
	MAOP ≤ 1700 psi - Continued					MAOP ≤ 1800 psi - Continued				
34.0	1.375	1.156	0.938	0.812	0.688	1.500	1.219	1.000	0.875	0.750
36.0	1.469	1.219	1.000	0.875	0.750	1.562	1.312	1.062	0.906	0.781
38.0	1.562	1.312	1.062	0.906	0.781	—	1.375	1.125	0.969	0.844
40.0	—	1.375	1.094	0.969	0.844	—	1.438	1.156	1.000	0.875
42.0	—	1.438	1.156	1.000	0.875	—	1.500	1.219	1.062	0.906
	MAOP ≤ 1900 psi					MAOP ≤ 2000 psi				
≤ 3.5	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188
4.0	0.188	0.188	0.188	0.188	0.188	0.219	0.188	0.188	0.188	0.188
4.5	0.219	0.188	0.188	0.188	0.188	0.219	0.188	0.188	0.188	0.188
5.563	0.258	0.219	0.188	0.188	0.188	0.281	0.250	0.188	0.188	0.188
6.625	0.312	0.250	0.219	0.188	0.188	0.344	0.280	0.219	0.188	0.188
8.625	0.406	0.344	0.281	0.277	0.219	0.438	0.344	0.281	0.250	0.219
10.75	0.500	0.406	0.344	0.312	0.250	0.531	0.438	0.375	0.312	0.256
12.75	0.594	0.500	0.406	0.344	0.312	0.625	0.531	0.438	0.375	0.312
14.0	0.656	0.531	0.438	0.375	0.344	0.688	0.562	0.469	0.406	0.344
16.0	0.750	0.625	0.500	0.438	0.375	0.781	0.656	0.531	0.469	0.406
18.0	0.812	0.688	0.562	0.500	0.438	0.875	0.719	0.594	0.500	0.438
20.0	0.906	0.781	0.625	0.531	0.469	0.969	0.812	0.656	0.562	0.500
22.0	1.000	0.844	0.688	0.594	0.500	1.062	0.875	0.719	0.625	0.531
24.0	1.094	0.906	0.750	0.656	0.562	1.156	0.969	0.781	0.688	0.594
26.0	1.188	1.000	0.812	0.688	0.594	1.250	1.062	0.844	0.750	0.625
28.0	1.312	1.062	0.875	0.750	0.656	1.344	1.125	0.906	0.781	0.688
30.0	1.375	1.156	0.938	0.812	0.688	1.438	1.219	0.969	0.844	0.719
32.0	1.469	1.219	1.000	0.844	0.750	1.531	1.281	1.031	0.906	0.781
34.0	1.562	1.312	1.062	0.906	0.781	—	1.375	1.094	0.969	0.812
36.0	—	1.375	1.125	0.969	0.844	—	1.438	1.156	1.000	0.875
38.0	—	1.438	1.188	1.031	0.875	—	1.531	1.219	1.062	0.906
40.0	—	1.531	1.219	1.062	0.906	—	—	1.312	1.125	0.969
42.0	—	—	1.281	1.125	0.969	—	—	1.375	1.188	1.000

Allowable Hoop Stress Due to Internal Pressure

The maximum allowable hoop stress due to internal pressure shall be sixty percent of SMYS or per ANSI Code if lower allowable percentage of hoop stress applies.

APPENDIX E

EXAMPLE ESTIMATE OF RAILROAD MATERIALS AND SERVICES

EXAMPLE ONLY - NOT INTENDED TO REPRESENT THE ACTUAL ESTIMATE FOR SCDOT PROJECT 23.03811

Summary

CROSSING WARNING SYSTEM		**$401,041.42**
(Includes all design, requisition, labor, materials, shop wiring, and installation)		
Phase I	**$141,593.29**	
Phase II	**$64,315.11**	
Phase III	**$40,773.74**	
Phase IV	**$67,654.35**	
Phase V	**$86,704.95**	
CROSSING SURFACE/RESURFACE		**$183,590.00**
(Includes all design, requisition, labor, materials, and installation for 110' tub style crossing surface)		
TRACK GRADE AND REHABILITATION		**$0.00**
(Includes all design, requisition, labor, materials, and installation)		
PRELIMINARY ENGINEERING (Phase 1)		**$8,000.00**
(Includes CONTRACT Labor for all Engineering, Agency Coordination, and Project Management)		
AGREEMENTS & APPROVALS (Phase 2)		**$7,000.00**
(Includes CONTRACT Labor for all Engineering, Agency Coordination, and Project Management)		
CONSTRUCTION ENGINEERING (Phase 3)		**$25,000.00**
(Includes CONTRACT Labor for all Engineering, Agency Coordination, and Project Management)		
CONSTRUCTION ENGINEERING INSPECTION		**$12,000.00**
(Estimated Construction Engineering Inspection cost based on 8 days @ $1500 per day)		
UTILITY CROSSING		**$0.00**
(0 new utiltiy crossings @ $4000 per crossing, includes application, engineering review, and right of entry)		
RIGHT OF ENTRY FEE		**$3,000.00**
(Right of Entry Fee of $1,500 is valid for 60 days, after 60 days, additional fees of $750 per 30 days are required.)		
FLAGGING SERVICES		**$60,000.00**
(Estimated Flagging Services cost based on 100 days @ $600 per day)		
AC POWER SERVICE		**$5,000.00**
(Includes all Power Service Charges not included in other costs)		
OTHER (Description Required)		**$0.00**
TOTAL ESTIMATE COST		**$704,631.42 (USD)**

DATE: 10/11/2013

RESPONSIBLE PARTY:
Name: **SCDOT**
Number: **TBD**
Contact: **Sherri Devereaux**

NOTE : This Estimate has been prepared based on site conditions, anticipated work duration periods, material prices, labor rates, manpower, resource availability, and other factors known as of the date prepared. The actual cost for Railroad work may differ based upon the agency's requirements, their contractors work procedures, and/or other conditions that become apparent once construction commences or during the progress of the work. If any extended time elapses from the date of this Estimate, the Railroad will reserve the right to update the estimate to current price values, and require agency's approval before any work by Railroad will commence.

APPENDIX F

RR NORTH TO END OF TRACK

618 FT. — 105 FT. — STA. 48+33 ℄ — 105 FT. — 618 FT.

RR SOUTH TO LAURENS

PARKING LOT (ASPHALT)

EXISTING EOTW

GRASS

SIDEWALK

EOTW

SC 146 (WOODRUFF ROAD) DOT #640375D

RAISED MEDIAN

2.3'

HIGH VOLTAGE TRANSMISSION TOWER AND LINES V.O.H.C. = 46' (ROUGHLY 10' FROM POWERLINES)

EOTW

EXISTING EOTW

GRASS

SIDEWALK

50'

GE R.O.W.

RR R.O.W.

10.25'

4.75'

6'

18.6'

CENTERLINE OF PROPOSED ROAD

RAILROAD ACCESS DRIVE

6' X6' HOUSE

SHRUBS

RR R.O.W.

35'

EXISTING 24.4' PRESSED ASPHALT CROSSING SURFACE TO REMAIN

A

GE R.O.W.

RR R.O.W.

19.7'

15'

12'

REMOVE EXISTING CONCRETE CROSSING SURFACE AND INSTALL NEW 110' CONCRETE TUB STYLE PANEL CROSSING SURFACE

86°

25'

C

DITCH

MAINLINE

110'

100# RE (JTD)

24.4'

77'

12'

15'

17.4'

DITCH

35'

INSTALL NEW 115# CWR THROUGH CROSSING TO ELIMINATE JOINTS FOR CONTINUITY OF CROSSING CIRCUITRY (APPROX. 240' RAIL PANEL)

STORM DRAIN INLET

U.G. GAS LINE

RCP INLET (UNDER ROADWAY)

6'

4.75'

10.25'

D

GE R.O.W.

RR R.O.W.

B

20" WATER MAIN

RR R.O.W.

COMMUNICATIONS BOX

U.G. GAS LINE

U.G. GAS LINE

RAISED MEDIAN

PARKING LOT (ASPHALT)

MANHOLE

STORM DRAIN INLET

U.G.F.O. MARKER (TELECOM)

PARKING LOT (ASPHALT)

CENTERLINE OF EXISTING ROAD

SIDEWALK

GRASS

EXISTING EOTW

EOTW

GRASS

2.3'

SIDEWALK

EOTW

EXISTING EOTW

BY RR CONTRACTOR:

- INSTALL NEW STANDARD ROADWAY FLASHERS AND GATES W/ 12" LED AND BELLS.
- REMOVE OUT OF SERVICE POLELINE AND POLES RENDERED OBSOLETE DUE TO UPGRADES. (SEE SEE 258257.H04 FOR LIMITS OF REMOVAL.)
- INSTALL NEW U.G. CABLE TO DISTANT SIGNAL 416 DUE TO REMOVAL OF OBSOLETE POLELINE.
- INSTALL NEW METER SERVICE AT SUMMERFIELD ROAD (1221' SOUTH) DUE TO REMOVAL OF OBSOLETE POLELINE.

BY ROADWAY CONTRACTOR:

- RELOCATE STOP BARS AS NECESSARY.

LEGEND

= NEW WORK BY RAILROAD FORCES
= NEW WORK BY ROADWAY FORCES
= TO BE REMOVED
= OVERHEAD UTILITY LINE
= UNDERGROUND UTILITY LINE

FEET 0 10 20

FOR REFERENCE ONLY
ACTUAL CONDITIONS & DESIGN PARAMETERS ARE RESPONSIBILITY OF THE DESIGN/ BUILD VENDORS

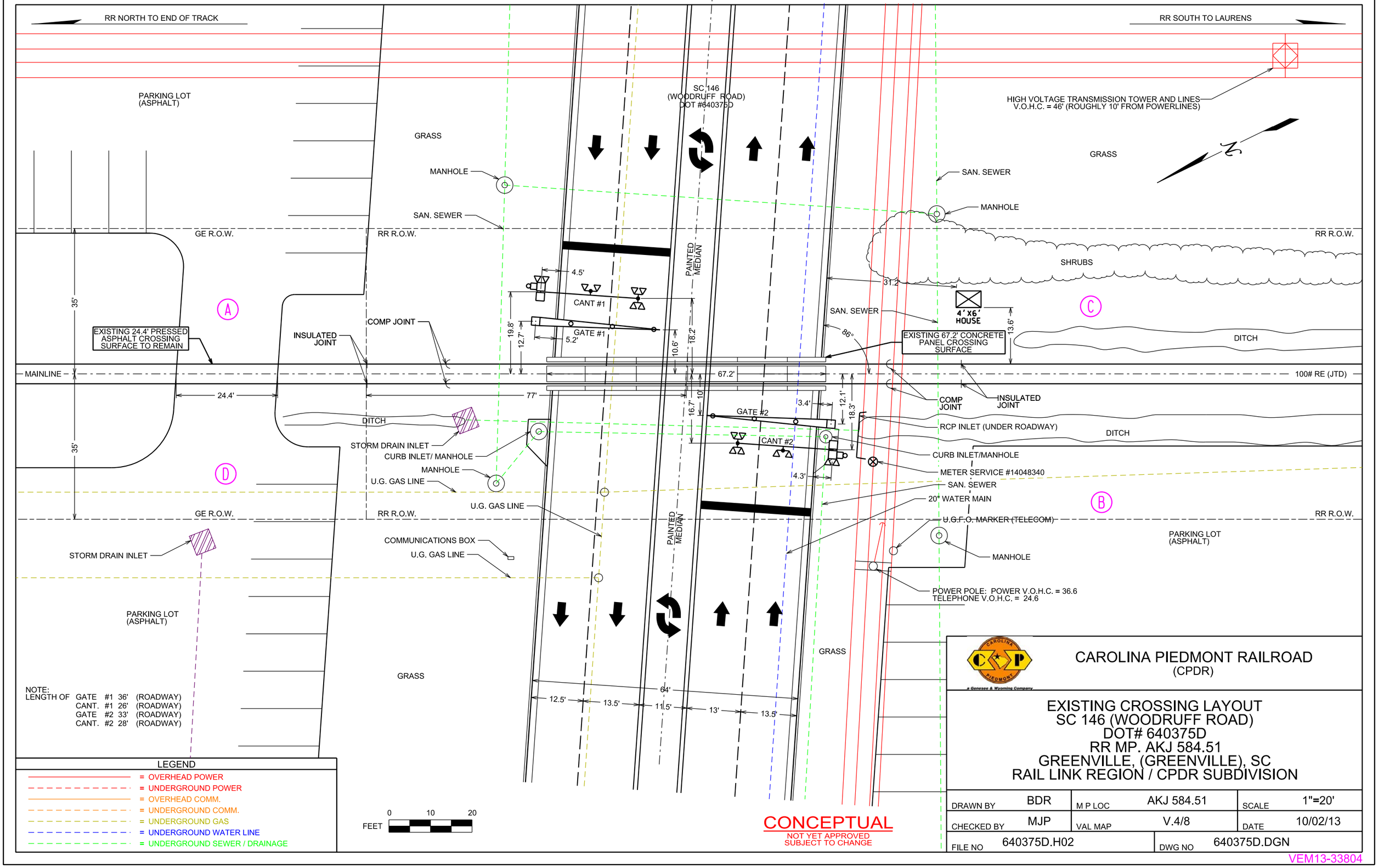
CONCEPTUAL
NOT YET APPROVED SUBJECT TO CHANGE

CAROLINA PIEDMONT RAILROAD
(CPDR)

PROPOSED CROSSING LAYOUT
SC 146 (WOODRUFF ROAD)
DOT# 640375D
RR MP. AKJ 584.51
GREENVILLE, (GREENVILLE), SC
RAIL LINK REGION / XXX SUBDIVISION

DRAWN BY	BDR	M P LOC	AKJ 584.51	SCALE	1"=20'
CHECKED BY	MJP	VAL MAP	V.4/8	DATE	XX/XX/XX
FILE NO	640375D.H01			DWG NO	640375D.DGN

VEM13-33804



NOTE:
LENGTH OF GATE #1 36' (ROADWAY)
CANT. #1 26' (ROADWAY)
GATE #2 33' (ROADWAY)
CANT. #2 28' (ROADWAY)

LEGEND

- = OVERHEAD POWER
- = UNDERGROUND POWER
- = OVERHEAD COMM.
- = UNDERGROUND COMM.
- = UNDERGROUND GAS
- = UNDERGROUND WATER LINE
- = UNDERGROUND SEWER / DRAINAGE

0 10 20
FEET

CONCEPTUAL
NOT YET APPROVED
SUBJECT TO CHANGE

CAROLINA PIEDMONT RAILROAD
(CPDR)

EXISTING CROSSING LAYOUT
SC 146 (WOODRUFF ROAD)
DOT# 640375D
RR MP. AKJ 584.51
GREENVILLE, (GREENVILLE), SC
RAIL LINK REGION / CPDR SUBDIVISION

DRAWN BY	BDR	M P LOC	AKJ 584.51	SCALE	1"=20'
CHECKED BY	MJP	VAL MAP	V.4/8	DATE	10/02/13
FILE NO	640375D.H02			DWG NO	640375D.DGN

VEM13-33804

RR NORTH TO END OF TRACKS

RR SOUTH TO LAURENS

SBS
SC 146 (WOODRUFF ROAD)

NBS
SC 146 (WOODRUFF ROAD)

SBS
SC 564 (MILLER ROAD)

OHH I-385 NB

OHH I-385 SB

PRIVATE XING XB

PRIVATE XING XB

SC 146 (WOODRUFF ROAD) MP 584.51 DOT #640378Y CFG STYLE "C" NO RECORDER DWG 9605062 SH. 1-5

4'X6' HOUSE

M/L

100#RE 115#RE

115#RE 100#RE

100# RE (JTD)

END OF SURVEY 1000'

NB OHH I-385 1159'

SB OHH I-385 987'

MECHANICAL JOINT (WITHIN ASPHALT CROSSING SURFACE) 532'

PRIVATE CROSSING 526'

IJ 503'

RING 10 490'

MECHANICAL JOINT 115'

PRIVATE CROSSING 113'

IJ/ISL 77'

CJ 58'

0'

METER 47'
CJ 48'

IJ 66'

4X6 HOUSE 69'

RING 10 480'

IJ 488'

GR 674'

IGR 874'

IJ 970'

RING 10 982'

END OF SURVEY 1000'

FOR REFERENCE ONLY
ACTUAL CONDITIONS & DESIGN PARAMETERS ARE RESPONSIBILITY OF THE DESIGN/ BUILD VENDORS

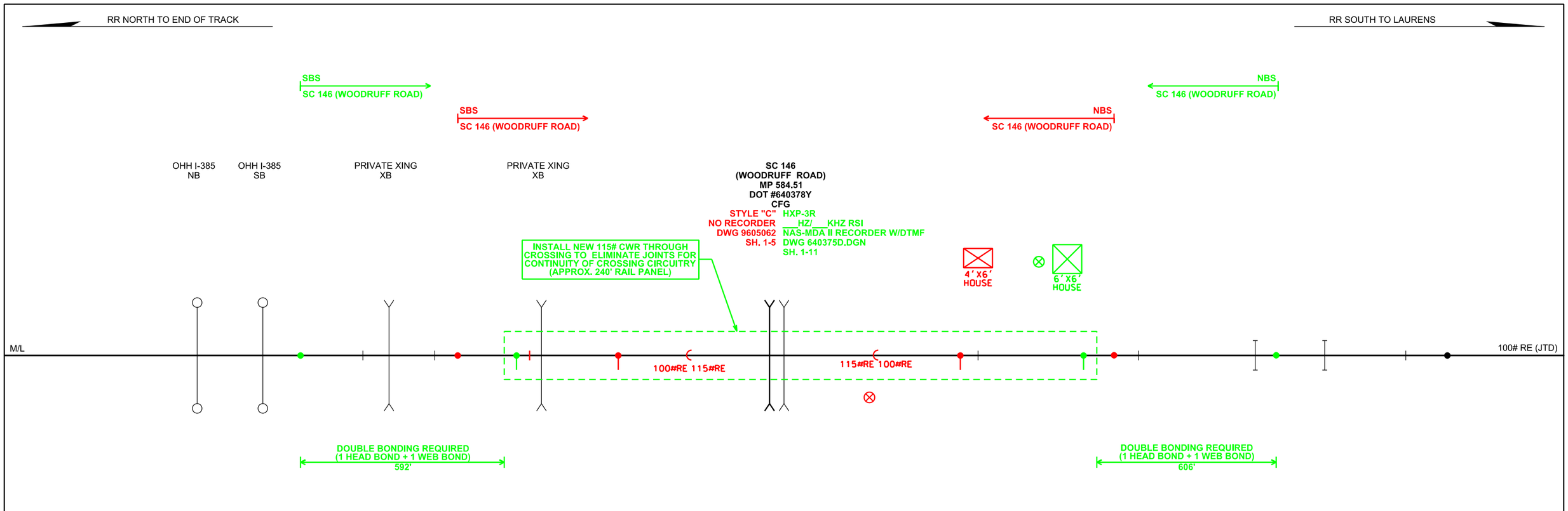
CONCEPTUAL
NOT YET APPROVED SUBJECT TO CHANGE

CAROLINA PIEDMONT RAILROAD
(CPDR)

EXISTING TRACK LAYOUT
SC 146 (WOODRUFF ROAD)
DOT# 640375D
RR MP. AKJ 584.51
GREENVILLE, (GREENVILLE), SC
RAIL LINK REGION / CPDR SUBDIVISION

DRAWN BY	BDR	M P LOC	AKJ 584.51	SCALE	NONE
CHECKED BY	MJP	VAL MAP	V.4/8	DATE	10/02/13
FILE NO	640375D.H03			DWG NO	640375D.DGN

VEM13-33804



BY RR CONTRACTOR:

- UPGRADE WARNING DEVICES AND CONTROL EQUIPMENT AT IDA WEST ROAD. NOTE THAT IORY FIELD FORCES REQUEST USE OF HXP-3R EQUIPMENT.
- REMOVE OUT OF SERVICE POLELINE AND POLES RENDERED OBSOLETE BY UPGRADES.
- INSTALL NEW UNDERGROUND POWER CABLE TO DISTANT SIGNAL 416 DUE TO REMOVAL OF OBSOLETE POLELINE.
- INSTALL NEW METER SERVICE AT SUMMERFIELD ROAD DUR TO REMOVAL OF OBSOLETE POLELINE.

= NEW WORK BY RAILROAD

= TO BE REMOVED

FOR REFERENCE ONLY
ACTUAL CONDITIONS & DESIGN PARAMETERS ARE RESPONSIBILITY OF THE DESIGN/ BUILD VENDORS

CONCEPTUAL
NOT YET APPROVED SUBJECT TO CHANGE

CAROLINA PIEDMONT RAILROAD
(CPDR)

PROPOSED TRACK LAYOUT
SC 146 (WOODRUFF ROAD)
DOT# 640375D
RR MP. AKJ 584.51
GREENVILLE, (GREENVILLE), SC
RAIL LINK REGION / XXX SUBDIVISION

DRAWN BY	BDR	M P LOC	AKJ 584.51
SCALE	NONE		
CHECKED BY	MJP	VAL MAP	
DATE			
FILE NO	640375D.H04	DWG NO	640375D.DGN

VEM13-33804

EXHIBIT 10

ESCROW PROPOSAL DOCUMENTS

ESCROW AGREEMENT
FOR
CONTRACT BID DOCUMENTS

THIS AGREEMENT is made and entered into this ____day of_____, 20___, by and among the South Carolina Department of Transportation, an agency of the State of South Carolina, hereinafter called the "DEPARTMENT", and Name of Contractor, hereinafter called the "CONTRACTOR", and US Bank - Corporate Trust Group, hereinafter called the "ESCROW AGENT".

WHEREAS, the DEPARTMENT and the CONTRACTOR desire to enter into a Construction Contract for work in SC File No(s). SC File No.(s), hereinafter called the "CONTRACT", pursuant to which the CONTRACTOR shall cause the work therein to be constructed; and

WHEREAS, the DEPARTMENT and CONTRACTOR desire to enter into an Escrow Agreement, to provide for specific contingencies governing the escrow and control of Contract bid documentation; hereinafter called "BID DOCUMENTS"; and

WHEREAS, the DEPARTMENT and CONTRACTOR desire the ESCROW AGENT to hold the BID DOCUMENTS of the CONTRACTOR;

NOW, THEREFORE, for and in consideration of the mutual covenants contained herein, it is agreed by and between the parties hereto that:

ARTICLE I
ESCROW OF THE CONTRACT BID DOCUMENTATION

The parties hereto agree to the establishment of Escrow of the BID DOCUMENTS for the CONTRACT pursuant to the DEPARTMENT'S Standard Specifications for Highway Construction (Edition of 2007), and Supplemental Specifications or Special Provisions pertaining to construction under the CONTRACT. It is the understanding of the parties hereto that the DEPARTMENT shall pay the ESCROW AGENT, as determined by separate Agreement, for the escrow of the BID DOCUMENTS submitted to the ESCROW AGENT under the terms of this Agreement.

ARTICLE II
ACKNOWLEDGEMENT

By its signature below, the ESCROW AGENT hereby acknowledges receipt from the DEPARTMENT and CONTRACTOR of a sealed container bearing the CONTRACTOR's name, address, and CONTRACT File Number(s) assigned by the DEPARTMENT and containing the CONTRACT BID DOCUMENTS.

ARTICLE III
DEPOSIT OF BID DOCUMENTS

The CONTRACT BID DOCUMENTS shall remain on deposit with the ESCROW AGENT until those conditions of release, as specified in ARTICLE IV "RELEASE FROM ESCROW", are met. As long as the BID DOCUMENTS remain in escrow with the ESCROW AGENT, the ESCROW AGENT shall not allow any person access, to gain possession, or in any way to interfere with the sealed BID DOCUMENT container.

ARTICLE IV
RELEASE FROM ESCROW

Upon being presented with documentation from the DEPARTMENT, signed by the Contract Administrator, that the Final Estimate for the CONTRACT has been paid to the CONTRACTOR, the ESCROW AGENT shall deliver to the CONTRACTOR the sealed container bearing the CONTRACTOR's name and address and File Number(s) on it. The ESCROW AGENT is also authorized to release the CONTRACT BID DOCUMENT sealed container to the DEPARTMENT without the CONTRACTOR's signed consent subject to written documentation, signed by the DEPARTMENT's Contract Administrator, that one or both of the following conditions have occurred:

1. The CONTRACTOR has filed a claim against the DEPARTMENT related to the project.

2. The CONTRACTOR has initiated litigation against the DEPARTMENT relating to the CONTRACT.

Prior to any release from escrow to the DEPARTMENT, the ESCROW AGENT shall provide written notice to the CONTRACTOR of the ESCROW AGENT's intention to release the CONTRACT BID DOCUMENTS sealed container to the DEPARTMENT. Such written notice from the ESCROW AGENT shall be sent by certified mail no less than ten (10) calendar days prior to release of the CONTRACT BID DOCUMENTS sealed container to the DEPARTMENT. Upon any release from escrow of the CONTRACT BID DOCUMENT sealed container, the party receiving the sealed container shall sign Exhibit A, ESCROW RELEASE FOR CONTRACT BID DOCUMENTS, as attached hereto and incorporated herein as if fully contained, by the party receiving the BID DOCUMENT container.

ARTICLE V
INDEMNITY

The CONTRACTOR agrees to indemnify and hold the ESCROW AGENT harmless against any loss, claim, damage, liability or expenses incurred in connection with any action, suit, proceeding, claim or alleged liability arising from this Escrow Agreement, provided, however, that the ESCROW AGENT shall not be so indemnified or held harmless for its negligence or acts of bad faith by it or any of its agents or employees.

ARTICLE VI
NOTICES

All notices and other communication shall be in writing and shall be deemed to have been duly given and delivered if mailed by certified mail, return receipt requested, postage prepaid to the addresses stated herein:

DEPARTMENT:

Contract Administration Engineer, Room No.:330
South Carolina Department of Transportation
955 Park Street
Columbia, SC 29201

CONTRACTOR:

Name of Contractor
Street Address
City/Town, State Zip Code

ESCROW AGENT:

US Bank - Corporate Trust Group
1441 Main Street, Suite 775
Columbia, SC 29201

ARTICLE VII
DUTIES OF ESCROW AGENT

The duties and responsibilities of the ESCROW AGENT shall be limited to those expressly set forth herein and the ESCROW AGENT shall act only in accordance with this ESCROW Agreement. Notwithstanding specific provisions hereunder, the ESCROW AGENT shall at all times act upon and in accordance with the joint written instructions of the DEPARTMENT and CONTRACTOR.

ARTICLE VIII
LAWS

This Escrow Agreement shall be deemed to have been executed in RICHLAND County, South Carolina and the laws of the State of South Carolina shall apply.

ARTICLE IX
ASSIGNMENT

This Escrow Agreement shall not be assigned without the written consent of all the parties hereto.

ARTICLE X
SURVIVAL OF CONTRACT

Except as may be expressly modified, all terms and conditions of this Escrow Agreement remain in full force and effect. The establishment of this Escrow Agreement is limited solely by the contingency of release of the CONTRACT BID DOCUMENTS sealed container by the CONTRACTOR to the DEPARTMENT, as established by ARTICLE IV, RELEASE FROM ESCROW. Nothing contained herein shall alter the rights of the parties hereto.

The covenants herein contained shall, except as otherwise provided, accrue to the benefit of and be binding upon the successors and assigns of the parties hereto.

IN WITNESS WHEREOF, the parties have hereunto set their hands and seals the day above first written.

CONTRACTOR
Name of Contractor
Name of Representative

By: _____
Representative's Signature

_____
Witness's Signature

ESCROW AGENT
US Bank - Corporate Trust Group
Natalie McNair

By: _____
Trust Officer's Signature

_____
Witness's Signature

DEPARTMENT
J. O. Elliott

By: _____
Contract Administration Engineer

_____
Witness's Signature

Exhibit A

ESCROW RELEASE
FOR
CONTRACT BID DOCUMENTS

This is to certify that on this Day ____of _____, _____, the sealed container holding the BID DOCUMENTS for the following CONTRACT was release from escrow:

SC File No(s).: SC File No(s).

CONTRACTOR: Name of Contractor

Address: Street Address
City/Town, State Zip Code

Date BID DOCUMENTS put into Escrow: Month Day, Year

The Representative for the Escrow Agent identified below, personally transferred the sealed container holding the bid documents to the Representative for the contractor or the department.

ACKNOWLEDGMENT OF RELEASE:

_____
(Print Name)

_____
Signature of Representative for Escrow Agent

The individual named below acknowledges receipt of the sealed container holding the bid documents.

ACKNOWLEDGMENT OF RECEIPT:

_____
(Print Name)

_____
Signature of Representative for _____
Company Name

If the CONTRACTOR receives the sealed container holding the BID DOCUMENTS, the ESCROW AGENT will send a signed copy of this document to the DEPARTMENT.

PROCEDURE TO ESCROW BID DOCUMENTATION BY DELIVERY SERVICE

The following is the procedure by which a Contractor may elect to use a delivery service to escrow bid documentation as required by the contract special provision in SCDOT contracts entitled: Escrow Bid Documentation, dated July 17, 1995. To successfully carry out this procedure, it is extremely important that each step be followed precisely. To preserve the chain of custody of the sealed bid documents, a delivery service with a tracking system such as Fed Ex, UPS, or DHL must be used. The person who signs the escrow agreement must be a person that has the authority to sign an agreement on behalf of the Contractor.

1. To initiate the process, SCDOT Contract Administration Engineer will:
    a. Prepare and send to the Contractor, three (3) copies of the escrow agreement and one (1) copy of the affidavit.
    b. Inform the Contractor and the US Bank - Corporate Trust Group that the escrow process has been initiated.

2. Upon receipt of the three (3) copies of the escrow agreement and copy of the affidavit, the Contractor shall:
    a. Fill in the date the bid document container is sealed on the page 1 and page 4 of each of the three (3) copies of the escrow agreement.
    b. At the bottom of page 3 of the escrow agreement, print the signers name, sign, and witness all three (3) copies of the agreement.
    c. Complete, sign, and notarize the affidavit.
    d. Make two copies of the notarized affidavit, one for the Contractor and one to send with the three (3) agreements.
    e. After making any copies of the contract bid documents and the affidavit, place the contract bid documents and the original of the affidavit in a suitable document container, such as a tear-resistant Tyvek envelope.
    f. Contractor may elect to submit bid documents by CDs or DVDs instead of sending hard copies. If submitted by CD OR DVD, the following apply:
        1) CD or DVD should be of archival quality
        2) The preferred formats are XML for born-digital records, PDF/A for text documents, and TIFF for images.
        3) Migration decisions should consider the possibility of metadata loss or alteration;
        4) Include the name and version of the software application for each file (e.g., Microsoft Word 2002) on your detailed inventory and ensure that operating systems and software that supports file formats are identified;
        5) Place CD/DVDs in archival CD/DVD cases or Tyvek envelopes inside acid-free CD/DVD boxes. CD/DVD cases should be of inert polyester that does not

release potentially harmful chemicals. Whether in cases or boxes, store the CD/DVDs vertically.

6) Do not write directly on CD/DVDs unless using an archival soft tip pen and then write only on the clear center hub of the top side. Do not apply labels to the CD/DVDs. Alternatively, identifying information may be written on the Tyvek envelope fold-over tab, using an archival soft tip pen.

7) Contractor is responsible for the content of the CD/DVDs.

8) All risk associated with damage, corruption, viruses, loss of information, inability to access, formation problems, temperature damage, or any other direct or indirect causes that may interfere with or cause harm to the CD/DVDs is the responsibility of the Contractor.

9) Contractor agrees that loss of information or in access to information on a CD or DVD bars Contractor from introducing the bid documents during a claim.

g. **DO NOT** put a three-ring binder or any other metal binding devises in the bid document container.

h. On the front of the bid document container, print the following information:

Contractor's Name

SC File No(s).

Date that the bid document container was sealed

i. Seal the contract bid document container by wrapping clear tape in a continuous line at least once lengthwise and once widthwise around the container. Sign your name across each line of tape, so that part of the signature is partially on the tape and partially on the container. Use a ballpoint pen to sign because ink from other types of pens can generally be wiped off of the tape.

j. Place the sealed contract bid document container, the three (3) signed agreements, and a copy of the affidavit into a second outer container labeled with the following instructions prominently visible:

ESCROW DOCUMENTS
TO BE OPENED ONLY BY
NATALIE MCNAIR
US BANK - CORPORATE TRUST GROUP

k. Place the second outer container into a delivery service shipping container

l. Send the shipping container via delivery service, such as Fed Ex, UPS, or DHL, addressed as follows:

Natalie McNair - ESCROW DOCUMENTS
US Bank - Corporate Trust Group
1441 Main Street, Suite 775
Columbia, SC 29201
Phone (803)212-7905

m. Immediately after the package is given to the delivery service, call the Contract Administration Engineer (803) 737-1253 and provide the tracking number.

3. After accepting delivery of the package containing the three (3) copies of the escrow agreement, original copy of the affidavit, and sealed bid document container the Escrow Agent, Natalie McNairof US Bank - Corporate Trust Group will:
    a. Take procession of the sealed bid document container and sign across the sealing tape.
    b. Sign and witness the three (3) copies of the escrow agreement.
    c. Send the three (3) copies of the agreement and the copy of the affidavit to the SCDOT Contract Administration Engineer in the headquarters building in Columbia.

4. Upon receipt of the three (3) copies of the escrow agreement and the copy of the affidavit, the Contract Administration Engineer will:
    a. Sign and witness the three (3) escrow agreements.
    b. Send a fully executed copy escrow agreement to the Contractor.
    c. Send fully executed copy escrow agreement to the Escrow Agent

If you have any questions about the steps in this procedure, please call the Contract Administration Engineer at (803) 737-1253. It is extremely IMPORTANT to follow the steps prescribed above.

J. O. Elliott
Contract Administration Engineer

STATE OF SOUTH CAROLINA
COUNTY OF RICHLAND

AFFIDAVIT FOR ESCROW AGREEMENT

In accordance with the Supplemental Specification "Escrow of Bid Documentation" dated July 17, 1995, in the Contract for SC File No(s). _____, hereinafter "PROJECT", and awarded on Date of Award to Name of Contractor, hereinafter "CONTRACTOR", the undersigned, Name of Contractor's Representative, as authorized representative for the CONTRACTOR, personally came before me, who being duly sworn, deposes and states as follows:

1. I am a representative of the Contractor and have the authority to execute and complete the requirements of the supplemental specification for the escrow of bid documents;

2. I have personally examined the documents, and they are the documents used by the Contractor to determine the bid for the Project;

3. If the bid documentation is submitted on CDs or DVDs, I as the representative of the Contractor accept all responsibility for the content of the CD/DVDs; assume all risk associated with damage, corruption, viruses, loss of information, inability to access, formation problems, temperature damage, or any other direct or indirect causes that may interfere with or cause harm to the CD/DVDs is the responsibility of the Contractor; and agrees that loss of information or in access to information on a CD/DVDs bars the Contractor from introducing the bid documents during a claim.

FURTHER AFFIANT SAYETH NOT.

_____
Authorized Representative of Contractor

SWORN to before me this ____ day of _____, 20__

_____
(Print) Notary's Name

_____
Notary's Signature
Notary Public for _____
My Commission expires: _____
(*Seal*)