March 15, 2004

INSTRUCTIONAL BULLETIN NO. 2004-10

SUBJECT: Borrow Excavation/Cement Modified Subbase
EFFECTIVE DATE: January 1, 2004
SUPERSEDES: Standard Specifications for Highway Construction Section 203.09
RE: Supplemental Specification, Borrow Excavation dated November 3, 2003 (attached)
Standard Specifications for Highway Construction Section 301, Cement Modified Subbase
S. C. Highway Design Manual Section 35.3.1.4

The new Borrow Excavation Supplemental Specification requires the top 8″ of subgrade to be modified with Portland cement at a specified rate in select counties of the state. The subgrade is defined as the area between lines 18 inches outside the area to be occupied by the pavement structure extending to the outside edge of curb and gutter and sidewalk, where applicable. The selected counties are generally in the Piedmont Region and have experienced a hardship in readily finding satisfactory borrow material. A list of the counties can be found in the attached new Borrow Excavation supplemental specification dated November 3, 2003. This requirement is limited to only those projects where borrow will be used under future pavement. This new borrow excavation supplemental specification is not to be applied to those areas using borrow excavation to construct only sidewalk or other non-roadway applications.

When any section of the roadway is constructed with borrow excavation then the entire length of roadway subgrade will be improved with Cement Modified subbase (8″). Whenever Cement Modified Subbase is specified, it will be measured and paid as described in Section 301 of the Standard Specifications. All projects are potentially affected by this specification with certain limitations. The chart shown below identifies when cement modified subbase (8″) is required in those counties described above.

<table>
<tr><th>Subgrade Area</th><th>Borrow Excavation</th><th>Pavement Design</th><th>Cement Modified Subbase</th></tr>
<tr><td rowspan="4">≥ 8,000 SY Subgrade</td><td rowspan="2">With borrow</td><td>Yes</td><td>Yes</td></tr>
<tr><td>No</td><td>Yes</td></tr>
<tr><td rowspan="2">Without borrow</td><td>Yes</td><td>No</td></tr>
<tr><td>No</td><td>Yes</td></tr>
<tr><td rowspan="4">< 8,000 SY Subgrade</td><td rowspan="2">With borrow</td><td>Yes</td><td rowspan="4">No except where superpave is used</td></tr>
<tr><td>No</td></tr>
<tr><td rowspan="2">Without borrow</td><td>Yes</td></tr>
<tr><td>No</td></tr>
</table>

Any project that is not to have its subbase modified, but has other criteria such as high truck/industrial traffic, known poor soil conditions, special traffic control situations, etc. may warrant cement modified subbase. In these cases, the designer should consult with the Geotechnical Materials Engineer at the Research and Materials Laboratory.

The designer will place the pay items of Cement Modified Subbase (8″ Uniform) and Portland Cement for Cement Modified Subbase on the inclusion sheet with the explanation that the quantities are due to the borrow excavation supplemental specifications. These pay items are Borrow Excavation/Cement Modified Subbase not considered to be part of the pavement design and will not be placed on the typical section sheet. Computations for the Portland cement will use the percentages found in the attached Borrow Excavation supplemental specification. For applicable projects in the effected 18 counties, the designer will use 115 pounds per cubic foot for the weight of soil to determine the estimated quantities as described in the South Carolina Highway Design Manual.

Approved: _____

E. S. Eargle
Road Design Engineer

ESE:afg

Attachment

cc:
Mark C. Lester, Prog. Dev. West
Rocque Kneece, Prog. Dev. East
Doug McClure, Bridge Design Engr.
Clem Watson, Director of CRM Operations
Charles K. Smoak, Hydraulic Engineer
CRM East
CRM West
Al Barwick, CRM Manager
Jim Frick, Contract Document Facilitator

November 3, 2003

BORROW EXCAVATION

Borrow Excavation: Section 203.09, *Borrow Excavation*, of the Standard Specifications shall be deleted and replaced with the following:

"Borrow shall consist of material required for the construction of embankments or for other portions of the work. Borrow may be obtained from widening cuts on the project, from other locations within the right of way limits of the project or from borrow pits located outside of the right of way.

When using borrow excavation to construct embankments, a maximum of 25% by weight of recycled glass aggregate may be mixed with these materials to obtain the quantities needed. The recycled glass aggregate shall conform to the requirements of Subsection **206.02B**. Requirements for incorporating recycled glass aggregate in embankment work are contained in Subsection **206.02B**.

Material from borrow pits furnished by the Department will include necessary rights of way for haul roads along the shortest practicable route without cost to the Contractor. Borrow excavation obtained from pits furnished by the Department from locations within the right of way limits or by widening cuts on the project will be paid for at the contract price for Unclassified Excavation with Overhaul as applicable.

When the Contractor is required to furnish the borrow material, an item of Borrow Excavation will be included in the proposal, and no allowance will be made for haul, clearing and grubbing pits, securing necessary permits, haul roads, or other incidental related cost. The Contractor will also be responsible for the restoration of pits and haul roads to a condition satisfactory to property owners and in compliance with the *South Carolina Mining Act*.

In order to accurately determine by cross-section the quantity of borrow excavation furnished by the Contractor, the Contractor shall designate to the Department the exact location and bounds of the borrow pit or section of pit if material from pit is being furnished to projects other than those included in this contract. The Contractor shall be responsible for reserving and protecting the designated area(s) against its use for any purpose other than furnishing the required borrow excavation for completing this project.

Unless otherwise approved, borrow material to be used in the top 5 feet of any embankment shall have a maximum dry density not less than 100 lbs./cu.ft. at optimum moisture when tested in accordance with AASHTO T 99 or SC-T-29. The optimum moisture for any soil used for embankment shall not exceed 25% when tested in accordance with AASHTO T 99 or SC-T-29. Any materials not meeting either of these density and/or moisture requirements must be approved in writing by the Engineer prior to use on a project. Samples of material being considered for use for embankment or subgrade will be tested for maximum density and optimum moisture prior to use, and checked routinely during construction.

In addition to compaction tests, each layer of embankment material must be proofrolled in the presence of a certified earthwork inspector to demonstrate the stability of the lift prior to placement of the next lift of material. The equipment used for proofrolling shall be pneumatic tired equipment such as a fully loaded tandem axle dump truck or water truck of a size and weight approved by the Engineer.

Soils that are acceptable for use in embankment and as subgrade vary by county. Soil will be tested in accordance with SC-T-34 and classified in accordance with AASHTO M 145 to determine suitability when required. Acceptable borrow material for embankment and subgrade is shown in Table 1. The acceptability of the material, as outlined in the Table, will be based on the county in which the project is located, regardless of the location of the borrow pit. Grading operations shall be done in such a manner and sequence with selective grading and cross-hauling that the best available soils shall be reserved for the top portions of the embankments.

The top eight inches of the subgrade for all projects constructed in counties located in the Piedmont Region will be modified with Portland cement at the rate shown in Table 2. Construction procedures for this modification shall conform to the requirements given in **Section 301** of the *Standard Specifications for Highway Construction Edition of 2000* with the exception that the cement spread rate is given in Table 2 rather than determined by the Research and Materials Laboratory as given in Subsection 301.10.

Samples for approval of borrow material will be taken from the roadway after any mixing and shaping has occurred but prior to initial compaction. The minimum sampling frequency for borrow material is one sample per day for each source used that day. The minimum sampling frequency for borrow material to be used in the top 18 inches of the embankment is one sample per 1000 linear feet.

County	Acceptable Materials for use as Borrow Excavation
• Abbeville • Anderson • Cherokee • Chester • Edgefield • Fairfield • Greenville • Greenwood • Lancaster • Laurens • McCormick • Newberry • Oconee • Pickens • Saluda • Spartanburg • Union • York	Below the top 5 feet of embankment, any soil that does not meet the description of muck may be used to form embankments as long as it is stable when compacted to the required density. In the top 5 feet of embankments, material which has a maximum dry density greater than or equal to 100 pounds per cubic foot when tested according to AASHTO T99 or SC-T-29 and that has an optimum moisture content less than or equal to 25% may be used. The top eight inches of the subgrade will be modified with Portland cement at a rate specified in Table 2.
• Aiken • Allendale • Bamberg • Barnwell • Beaufort • Berkeley • Calhoun • Charleston • Chesterfield • Clarendon • Colleton • Darlington • Dillon • Dorchester • Florence • Georgetown • Hampton • Horry • Jasper • Kershaw • Lee • Lexington • Marion • Marlboro • Orangeburg • Richland • Sumter • Williamsburg	Placed within the top 18 inches of the embankment: • A-1 • A-2-4 • A-2-5 • A-3 • A-4(0) • A-2-6(0) Placed below the top 18 inches of the embankment: • A-1 • A-2 • A-3 • A-4 • A-5 A-6 may also be placed below the top 5 feet of the embankment.

Table 1 – Acceptable Materials for Borrow by County.

Counties		Percentage of Portland cement to be used to modify the top eight inches of the subgrade.
• Abbeville • Chester • Edgefield	• Fairfield • Saluda • Union	5%
• Greenville • Laurens • McCormick	• Newberry • Oconee • Pickens	6%
• Anderson • Cherokee • Greenwood	• Lancaster • Spartanburg • York	7%

Table 2 – Percentage of Portland Cement to be Used to Modify the Top Eight Inches of the Subgrade.

Hauled In Construction Material: Section 206.02, Subsection B. shall be deleted and replaced with the following:

"When using hauled-in material to construct the embankment, the types of materials furnished by the contractor and used in constructing this work shall be submitted to the Engineer for review before being used. Samples for approval of hauled in material will be taken from the roadway after any mixing and shaping has occurred but prior to initial compaction. Any samples submitted to the Research and Materials Laboratory that were obtained at a borrow pit will be tested and the results will be furnished to the Contractor for the Contractor's use in evaluating the material. The Department will not accept any borrow material based on samples obtained from pits. The responsibility for locating and obtaining suitable soils for hauled in material shall rest solely upon the Contractor.

Unless otherwise approved, borrow material to be used in the top 5 feet of any embankment shall have a maximum dry density not less than 100 lbs./cu.ft. at optimum moisture when tested in accordance with AASHTO T 99 or SC-T-29. The optimum moisture for any soil used for embankment shall not exceed 25% when tested in accordance with AASHTO T 99 or SC-T-29. Any materials not meeting either of these density and/or moisture requirements must be approved in writing by the Engineer prior to use on a project. Samples of material being considered for use for embankment or subgrade will be tested for maximum density and optimum moisture prior to use, and checked routinely during construction.

In addition to compaction tests, each layer of embankment material must be proofrolled in the presence of a certified earthwork inspector to demonstrate the stability of the lift prior to placement of the next lift of material. The equipment used for proofrolling shall be pneumatic tired equipment such as a fully loaded tandem axle dump truck or water truck of a size and weight approved by the Engineer.

Soils that are acceptable for use in embankment and as subgrade vary by county. Soil will be tested in accordance with SC-T-34 and classified in accordance with AASHTO M 145 to determine suitability when required. Acceptable borrow material for embankment and subgrade is shown in Table 1. The acceptability of the material, as outlined in the Table, will be based on the county in which the project is located, regardless of the location of the borrow pit. Grading operations shall be done in such a manner and sequence with selective grading and cross-hauling that the best available soils shall be reserved for the top portions of the embankments.

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Table 2 – Percentage of Portland Cement to be Used to Modify the Top Eight Inches of the Subgrade.

Samples for approval of hauled in material will be taken from the roadway after any mixing and shaping has occurred but prior to initial compaction. The minimum sampling frequency for hauled in material is one sample per day for each source used that day. The minimum sampling frequency for hauled in material to be used in the top 18 inches of the embankment is one sample per 1000 linear feet.

A maximum of 25% by weight of recycled glass aggregate may be mixed with these materials in constructing the embankment. The recycled glass shall be free of organic and toxic materials, hypodermic needles and any hazardous materials, and must meet South Carolina DHEC regulations as a non-hazardous material. The maximum particle size for recycled glass aggregate shall be 1/2 inch. The lead content for the glass aggregate shall not exceed 5 ppm, and the silver content shall not exceed 5 ppm. The aggregate shall also meet the limits established by the EPA for the primary and secondary drinking water standards. Before any glass is placed on projects, the glass supplier shall furnish the Department certified test results showing that the glass meets the requirements listed herein. These test results shall be no more that one year old at the time it is furnished to the Department. The glass aggregate shall contain not more that one percent by weight of the non-glassy material and shall not contain any portion from mirror glass.

Recycled glass shall not be used in the top 18 inches of embankments.