



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY
GOVERNOR

NICHOLAS J. TENNYSON
SECRETARY

October 29, 2015

MEMO TO: Jonathan Bivens, Stuart Bourne, Larry Brickey, John Bridge, Chris Byers, Joe Coleman, Judith Corley-Lay, Shannon Douglas, Danny Eudy, Ron Hancock, Bruce Hazle, Brandon Hill, Ryan Ilg, Berry Jenkins, Ben Lanier, Don Lee, Glenn Mumford, Mark Perkins, Ian Scott, Lamar Sylvester, Michael Taylor, Kevin Thomas, Brian Webb, Roger Worthington

FROM: R. A. Garris, PE
Contract Officer

SUBJECT: DOT-AGC Roadway Subcommittee Meeting Minutes

The subject committee met on October 22, 2015 at 10:00 a.m. in the Riverwood Conference Room at the Century Center.

Agenda and Discussion Items:

Steps in Boxes...are they still needed?

Michael Taylor

Currently, precast waffle boxes for storm sewers still require steps even though most maintenance activities use a ladder. The step is 3' to 3.5' up and it may be difficult to get out using the step.

Joel Howerton mentioned that the last he knew was that OSHA required steps for egress should someone fall into the box. Joel will check with DOT Maintenance and Legal to see if there is a still a need and a liability issue with the steps.

Concrete Washout Basins

David Harris

David mentioned that per the EPA Guidance Document, concrete washout needs to be confined in a "leak proof" container. A Concrete Washout Structure provision has been drafted and there is a desire to eliminate the need for a liner if they can get clearance from the regulatory agencies. David mentioned that they are looking into what other states do to contain their washout.

The concern is with the washout water and where it eventually ends up, and making sure there are no regulatory compliance issues. Some contractors stated that there may need to be some education of ready mix drivers as well as smaller contractors who do small improvement projects such as curb and gutter projects, or median placement with turn lanes.

David stated that he will look into it more. Some possibilities may include creating best practices for disposal depending on location, etc. Please send any comments on the provision to Lamar and they will coordinate with David.

Utilities – Adding Back in Fittings (Update)

Lamar Sylvester

Lamar stated that he has been working with Roger Worthington and others to put back in a pay item for fittings based on weight. The break off will be at 12” as this appeared to be when there was a big price difference. It is proposed to have a line item for 12" and below and a separate item for greater than 12" for both water and sewer lines. Roger will bring a copy of the draft SP to a future meeting.

Work Zone Identification Signs

Steve Kite

Steve passed out some examples of sign designs based on discussions with other states and with Berry. Having identification signs would be at the option of the Contractor and be contractor supplied. Such signs would be used on interstate projects and bigger projects such as design – build.

It appeared that most of the Contractors present liked the idea/concept of signs, but may have some additional thoughts such as adding a web site address. Steve will check with FHWA to see if there are any requirements that would prevent using identification signs on projects. The signs that Steve passed out had costs of \$20/ sf and \$10/ lf on the posts. The cost of the signs in the samples Steve passed out ranged from \$1,310 to \$3,140.

Work Zone Traffic Control General Requirements (added item to agenda - update)

Steve Kite

Steve passed out a revised RWZ-1 – Work Zone Traffic Control General Requirements provision. The provision outlines the white lining for stationary work zone signs by the sign installer so that the utility locator will be able to clearly see them. The white lining will be paid for as a separate pay item “Ground Location of Stationary Work Zone Signs” on a sf basis.

Let Steve know if there are any thoughts on the draft provision.

Rock and Broken Pavement Fills and Rock Embankments

Scott Hidden

Scott presented a revision to the GT#1 provision that addresses void filling on rock embankments and filtration geotextiles before fill to avoid migration of the soil into the embankment.

The contractors had questions about the process being incidental with no pay items. They also mentioned that the standard for rock embankments is Class VII stone and quarries are not set up to make Class VII.

Reinforced Soil Slopes (RSS)

Scott Hidden

Scott stated that the Permanent Soil Reinforced Mats (PSRM) are not working and the solution may be the use of geocells or cellular confinement systems. These hold the material on the slope so vegetation can grow on slopes that are 1:1 or steeper. An approved product list and prequalified vendors will be supplied.

For slopes between 1.5:1 and 2:1 the detail showed that you can use Geocells with compost blanket or coir fiber mat with shoulder and slope borrow. The contractors stated that NCDOT needs to spec out which they would like or do a general pay item on a square yard basis.

Scott will look at the options and come up with some ideas to bring back.

Next Meeting

The next meeting is scheduled for December 17, 2015 at 9:30 a.m. in the Riverwood Conference Room at Century Center B.

Cc: David Harris
Steve Kite
Scott Hidden



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SECRETARY

October 20, 2015

MEMO TO: Jonathan Bivens, Stuart Bourne, Larry Brickey, John Bridge, Chris Byers, Joe Coleman, Judith Corley-Lay, Shannon Douglas, Danny Eudy, Ron Hancock, Bruce Hazle, Brandon Hill, Ryan Ilg, Berry Jenkins, Ben Lanier, Don Lee, Glenn Mumford, Mark Perkins, Ian Scott, Lamar Sylvester, Michael Taylor, Kevin Thomas, Brian Webb, Roger Worthington

FROM: R. A. Garriss, PE
Contract Officer

SUBJECT: DOT-AGC Roadway Subcommittee Meeting 10/22/15 Agenda

The next meeting will be held at the Riverwood Conference Room in the NCDOT Century Center Building B at 9:30 a.m. The following is a list of items scheduled for discussion:

- | | |
|--|-----------------|
| 1. Steps in Boxes...are they still needed? | Michael Taylor |
| 2. Concrete Washout Basins | David Harris |
| 3. Utilities – Adding Back in Fittings | Lamar Sylvester |
| 4. Work Zone Identification Signs | Steve Kite |
| 5. Rock and Broken Pavement Fills and Rock Embankments | Scott Hidden |
| 6. Reinforced Soil Slopes (RSS) | Scott Hidden |

CONCRETE WASHOUT STRUCTURE:

Description

Concrete washout structures are enclosures above or below grade to contain concrete waste on construction sites. Concrete waste can include concrete waste water from washing out ready-mix trucks, drums, pumps, or other equipment. Concrete washouts must collect and retain all the concrete washout water and solids in leak proof containment, so that this material does not reach the soil surface and then migrate to surface waters or into the ground water.

The concrete washout structure may include constructed devices above or below ground and or commercially available devices designed specifically to capture concrete waste water.

Materials

Item	Section
Silt Excavation	1630
Borrow Material	1018
Temporary Silt Fence	1605

Safety Fence shall meet the specifications as provided elsewhere in this contract.

Geomembrane basin liner shall meet the following minimum physical properties for low permeability; it shall consist of a polypropylene or polyethylene 10 mil think geomembrane.

Construction Methods

Above Grade Structures

Assemble high cohesive and low infiltration soil to build an enclosed earthen berm for an above grade concrete washout basin in accordance with the details and as directed. Construct the height, length, and width of the earthen berm according to the detail. Slope the interior and exterior walls of the earthen berm at 1:1 and then compact to provide structural stability and contain concrete washout liquids and solid materials until evaporation, curing, extraction, or final removal.

Prepare the soil base to be free of rocks or other debris that may cause holes or tears in the geomembrane basin lining.

Install temporary silt fence around the perimeter of the berm in accordance with the details and as directed if structure is not located in an area where existing erosion and sedimentation control devices are capable to containing any loss of sediment.

Install safety fence as needed around the perimeter of the concrete washout structures in accordance with the *Safety Fence and Jurisdictional Flagging* special provision.

Post a sign with the words "Concrete Washout" in close proximity of the concrete washout area, so it is clearly visible to site personnel.

Below Grade Structures

Excavate an area for concrete washout in accordance with the details and as directed. Slope the interior walls of the excavated area at 1:1 and then compact to provide structural stability and contain concrete washout liquids and solid materials until evaporation, curing, extraction, or final removal.

Prepare the soil base to be free of rocks or other debris that may cause holes or tears in the geomembrane basin lining.

Install safety fence as needed around the perimeter of the concrete washout structures in accordance with the *Safety Fence and Jurisdictional Flagging* special provision.

Post a sign with the words "Concrete Washout" in close proximity of the concrete washout area, so it is clearly visible to site personnel.

The construction details for the above grade and below grade concrete washout structures can be found on the following web page link:

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/soil_water/details/

Maintenance and Removal

Maintain the concrete washout structure(s) to provide adequate holding capacity plus a minimum freeboard of 12 inches. Remove and dispose of hardened concrete and return the structure to a functional condition after reaching 75% capacity.

Inspect concrete washout structures for damage and maintain for effectiveness.

Remove the concrete washout structures and sign upon project completion. Grade the earth material to match the existing contours and permanently seed and mulch area.

Measurement and Payment

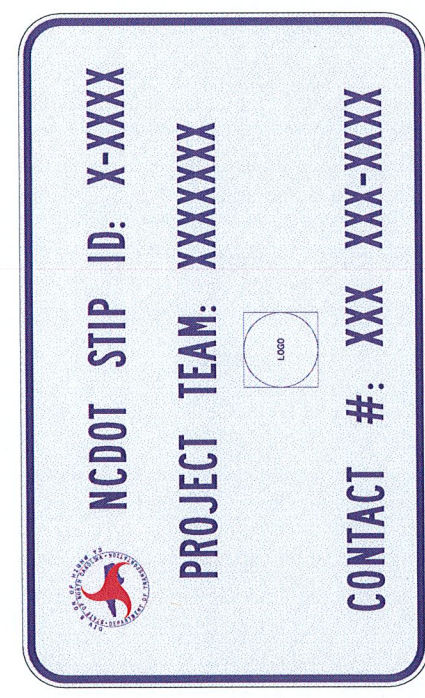
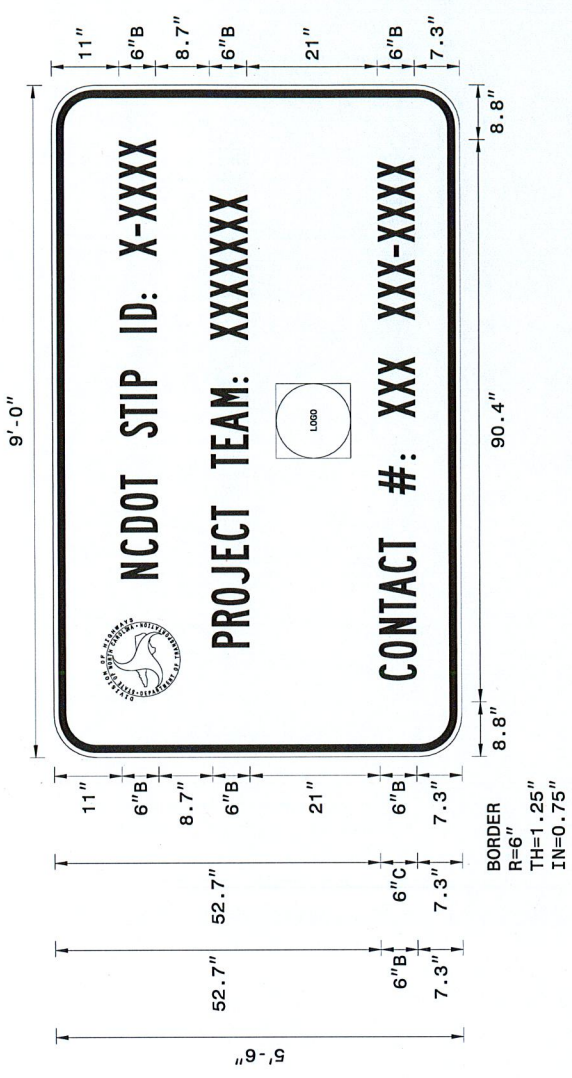
Silt Excavation will be measured and paid for in accordance with Article 1630-4 of the *Standard Specifications*, as calculated from the typical section throughout the length of the concrete washout structure as shown on the final approved plans.

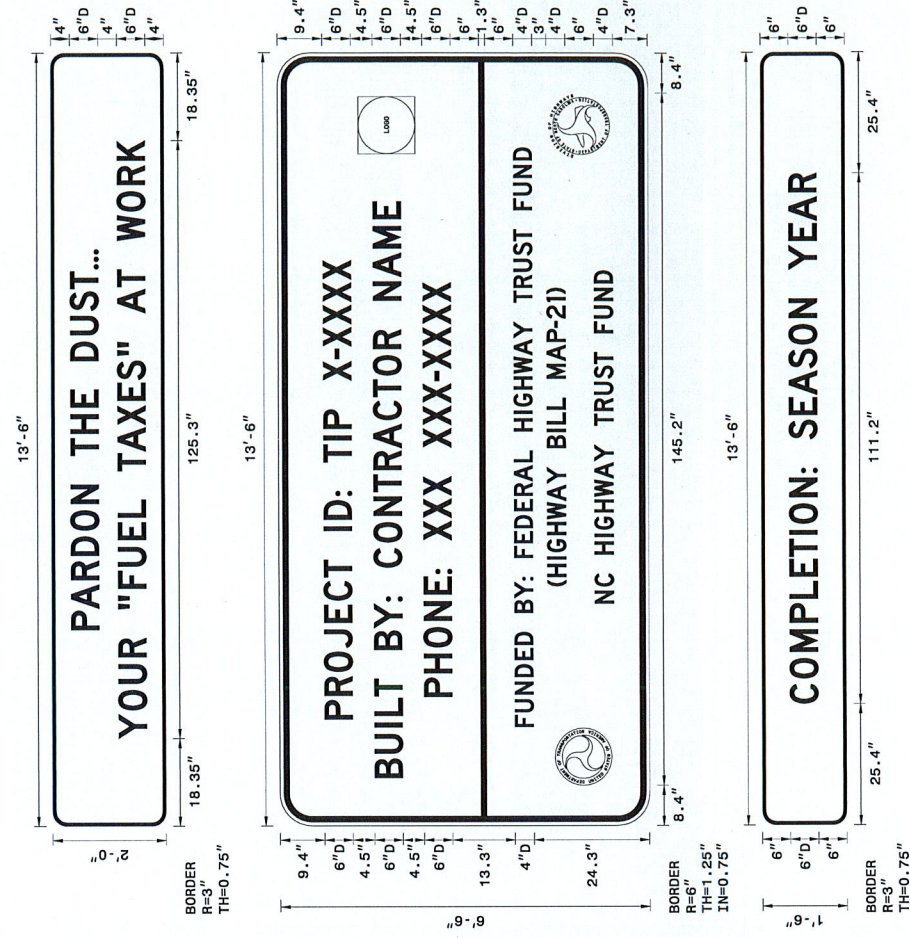
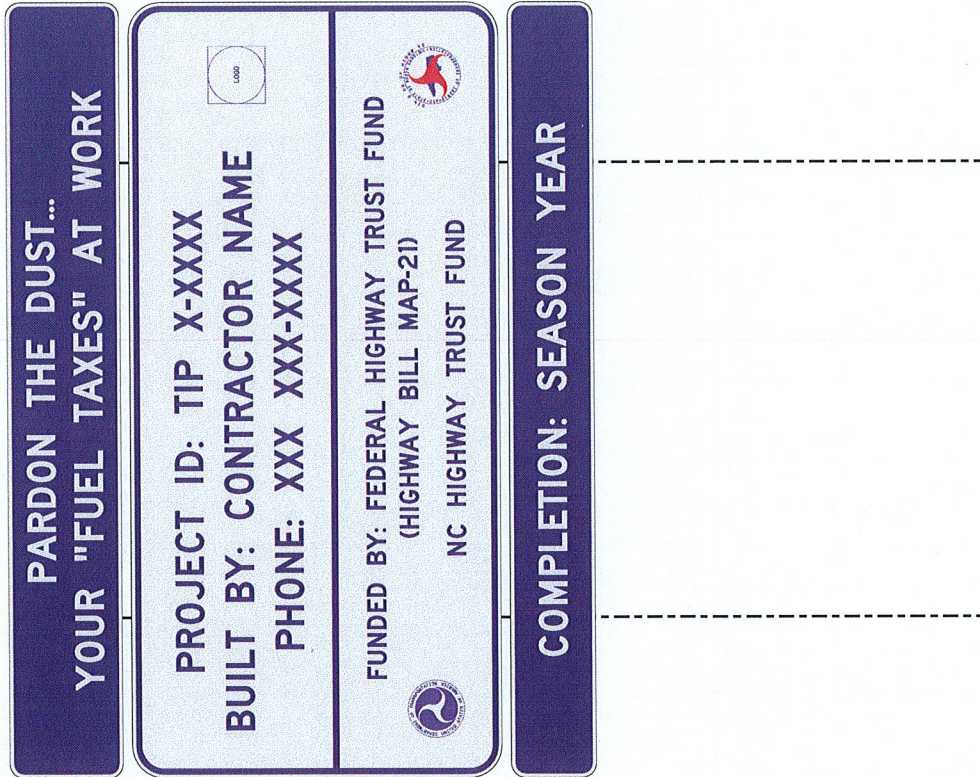
The construction of the earthen dam will be paid for as *Borrow Excavation* as provided in Section 230 of the *Standard Specifications*.

Temporary Silt Fence will be measured and paid for in accordance with Article 1605-5 of the *Standard Specifications*.

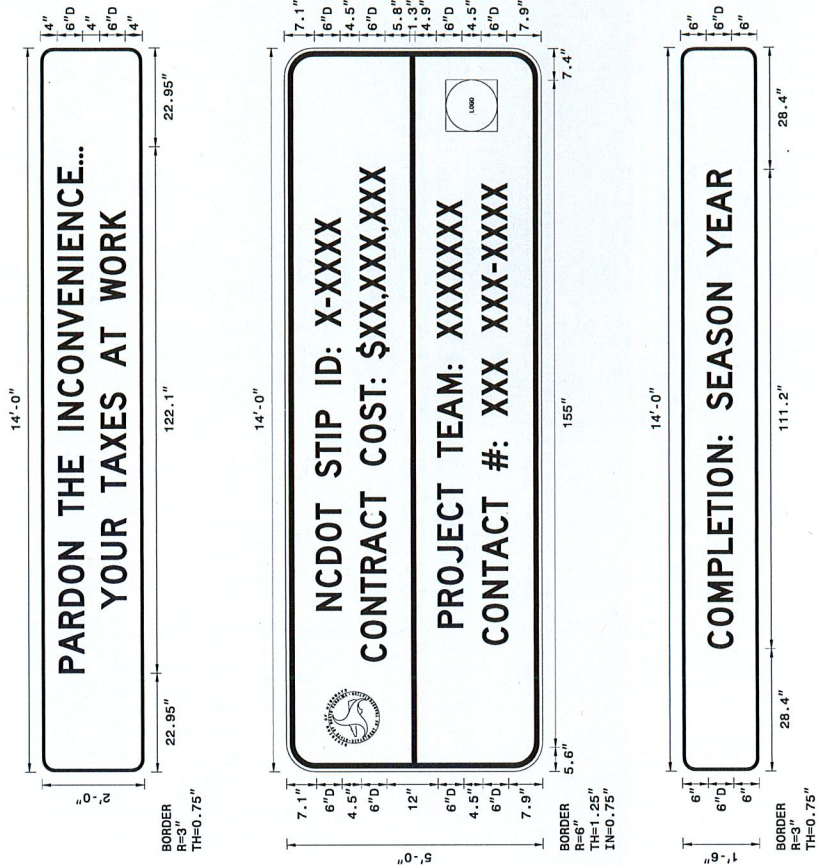
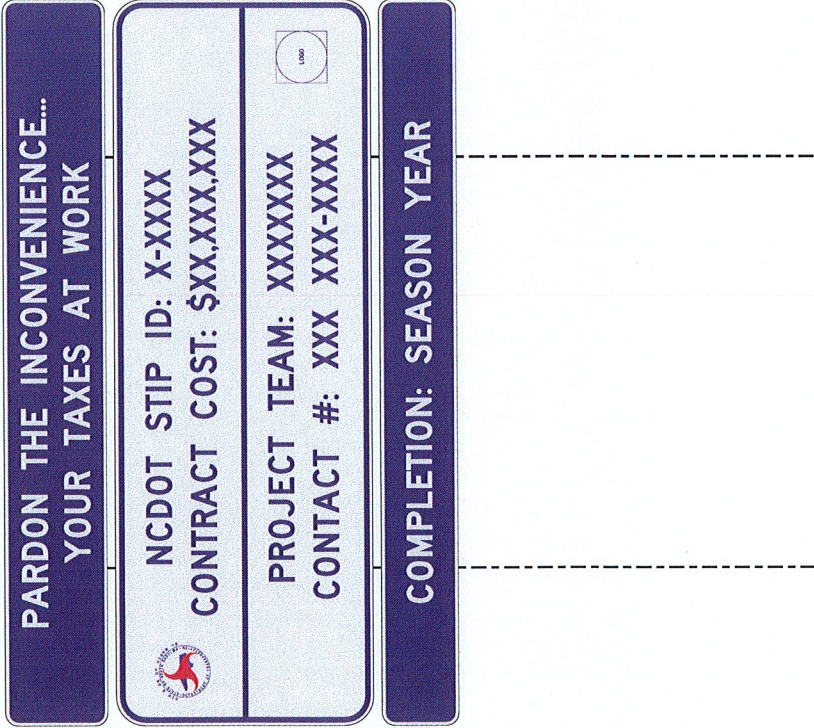
Safety Fence shall be paid for as provided elsewhere in this contract.

No measurement will be made for other items or for over excavation or stockpiling.





EXPRESSWAY / FREEWAY



EXPRESSWAY / FREEWAY

WORK ZONE TRAFFIC CONTROL GENERAL REQUIREMENTS

TEMPORARY TRAFFIC CONTROL (TTC):

(7-16-13) (Rev. 7-15-14)

RWZ-1

Maintain traffic in accordance with Divisions 10, 11 and 12 of the *2012 Standard Specifications* and the following provisions:

Install Work Zone Advance Warning Signs in accordance with the detail drawing provided in these plans prior to beginning any other work. Use a lane closure or slow moving operation to complete the work, as necessary, unless otherwise indicated. Refer to Standard Drawing No. 1101.02, 1101.11, 1110.01, 1110.02, 1130.01, 1135.01 and 1180.01 of the *2012 Roadway Standard Drawings*. Use a moving operation only if the minimum speed maintained at all times is 3 mph with no stops that narrow or close a lane of travel. If the moving operation is progressing slower than 3 mph at any time, install a lane closure. Maintain the existing traffic pattern at all times, except in the immediate work zone where lane closures are allowed as determined by the Engineer.

Refer to attached details and Standard Drawing No. 1101.02, 1101.03, 1101.04, 1101.05, 1101.11, 1110.01, 1110.02, 1115.01, 1130.01, 1135.01, 1145.01, 1150.01, 1165.01, and 1180.01 of the *2012 Roadway Standard Drawings* when closing a lane of travel in a stationary work zone such as pavement patching resurfacing, or pavement marking removal. Properly ballasted cones and skinny drums may be used instead of drums. However, drums are required for the upstream taper portion of lane closures in all applications. The stationary work zone shall be a maximum of 1 mile in length at any given time on 2 Lane, 2 Way facilities unless otherwise approved by the Engineer. A pilot vehicle operation may be used in conjunction with flaggers and the appropriate pilot vehicle warning signing as directed by the Engineer. During periods of construction inactivity, return the traffic pattern to the existing alignment and remove or cover any work zone signs. When covering work zone signs, use an opaque material that prevents reading of the sign at night by a driver using high beam headlights. Use material, which does not damage the sign sheeting. Replace any obliterated markings as required by other sections of the *2012 Standard Specifications* and the Engineer.

When personnel and/or equipment are working on the shoulder adjacent to and within 5 feet of an open travel lane, close the nearest open travel lane using Standard Drawing No. 1101.02 of the *2012 Roadway Standard Drawings*. When personnel and/or equipment are working within a lane of travel of an undivided facility, close the lane according to the traffic control plans, *2012 Roadway Standard Drawings* or as directed by the Engineer. Conduct the work so that all personnel and/or equipment remain within the closed travel lane. Do not work simultaneously, on both sides of an open travel way, within the same location, on a two-lane, two-way road. Perform work only when weather and visibility conditions allow safe operations as directed by the Engineer.

When utilizing a slow-moving operation for such items as pavement marking and marker placement, as a minimum the slow moving operation caravan shall consist of the vehicles and devices shown on the Moving Operation Caravan Details according to Roadway Standard

Drawing No. 1101.02, sheet 11 of the *2012 Roadway Standard Drawings*. Traffic cones may be used when necessary to provide additional protection of wet pavement markings. Ballast all traffic cones so they will not be blown over by traffic.

TRAFFIC OPERATIONS:

1) Drop-Off Requirements and Time Limitations:

Do not exceed a difference of 2 inches in elevation between open lanes of traffic for nominal lifts of 1.5 inches

During a resurfacing only operation, bring all newly resurfaced lanes to the same elevation within 72 hours for nominal lifts of 1.5 inches or less of asphalt course and by the end of each work day for nominal lifts of greater than 1.5 inches of asphalt course

Backfill at a 6:1 slope up to the edge and elevation of existing pavement in areas adjacent to an open travel lane that has an edge of pavement drop-off as follows:

- (A) Drop-off that exceeds 2 inches on roadways with posted speed limits of 45 mph or greater.
- (B) Drop-off that exceeds 3 inches on roadways with posted speed limits less than 45 mph.

For drop-offs that exceed the above requirements, backfill the unacceptable drop-off with suitable compacted material, as approved by the Engineer. The material, equipment and labor associated with this operation will be at no expense to the Department. This work is not considered part of shoulder reconstruction.

2) Project Requirements:

Failure to comply with the following requirements will result in a suspension of all other operations:

1. Before working on ANY MAP, the Contractor shall submit a written construction sequence for traffic control and construction lighting for ALL MAPS to the Engineer at the first pre-construction meeting and the sequence must be approved before closing a lane of traffic. The Contractor and Engineer will coordinate with the Traffic Management Unit at 919-773-2800 or Traffic Services for additional traffic control guidance, as necessary.
2. Obtain written approval of the Engineer before working in more than one location or setting up additional lane closures. The maximum length of any one lane closure is 1 mile unless otherwise directed by the Engineer.
3. Contractor shall mill and pave lanes in an order such that water shall not accumulate.
4. Traffic Control for the milling and/or paving of ramps is to be done according to Standard Drawing Number 1101.02, Sheets 9 & 10 unless otherwise approved to be

- closed by the Engineer. If approved, Contractor will provide plans and devices for the detour at no additional cost to the department.
5. If lane closure restrictions apply, see Special Provision, "Intermediate Contract Times and Liquidated Damages".
 6. If milled areas are not paved back within 72 hours, the Contractor is to furnish and install the following portable signs to warn drivers of the conditions. These are to include, but not limited to "Rough Road" (W8-8), "Uneven Lanes" (W8-11), and "Grooved Pavement" (W8-15) w/ Motorcycle Plaque mounted below. These are to be dual indicated on Multi-Lane Roadways with speed limits 45 mph and greater where lateral clearance can be obtained within the median areas. These portable signs are incidental to the other items of work included in the temporary traffic control (Lump Sum) pay item.

3) Work Zone Signing:

Description

Install advance/general warning work zone signs according to the Detail Drawing provided in these plans prior to beginning of work. Install and maintain signing in accordance with the attached drawings and Divisions 11 and 12 of the *2012 Standard Specifications*.

(A) Installation

All stationary Advance/General warning work zone signs require notification to existing Utility owners per Article 105-8 of the *2012 Standard Specifications* and Special Provision SP1 G115 within 3 to 12 full working days prior to installation. *However, in order to prevent unnecessary delays with the utility location process, we are recommending the Contractor notify the sign installers a minimum of 14 calendar days prior to beginning work.*

In addition, each stationary Advance/General warning work zone sign shall be ground located (i.e. white lined) by the sign installer. These sign locations shall be identified by spraying white paint in a location the utility locator will be able to clearly distinguish them. This ground location activity shall be a coordinated effort between the sign installer and the Department.

Install all Advance/General warning work zone signs before beginning work on a particular map. If signs are installed more than seven (7) calendar days prior to the beginning of work on a particular map, cover the signs until the work begins. Install each work zone Advance/General warning sign separately and not on the same post or stand with any other sign except where an advisory speed plate or directional arrow is used.

All stationary signing is to be installed as shown on the detail drawing(s) unless otherwise directed by the Engineer. All sign locations to be verified by the Engineer prior to installation. Once the signs have been installed and accepted, any sign relocations requested by the Department will be compensated in accordance with Article 104-7. Any additional signs other than the ones shown in the drawing will be compensated in accordance with Article 104-7.

No stationary -Y- Line advance warning signage is required unless there's more than 1,000 feet of resurfacing along the -Y- line. Whenever work proceeds through an intersection, portable signs shall be used for traffic control. There will be no direct compensation for any portable signing.

If there is a period of construction inactivity longer than 14 calendar days, remove or cover advance/general warning work zone signs. Uncover advance/general warning work zone signs no more than 7 calendar days before work resumes. All other operations may be suspended upon failure to comply with the above requirements. Such suspended operations would not be resumed until the above requirements are fulfilled.

(B) Sign Removal

All stationary work zone signs shall be removed once the project is substantially complete. The project is substantially complete when the resurfacing operations are completed and the shoulders are brought up to the same elevation as the proposed pavement and when pavement markings are installed. The pavement marking doesn't have to be the final marking material to be considered substantially complete. Any remaining punch list items are to be completed with portable work zone signing. There will be no compensation for any portable signing. Sign removal is a condition of final project acceptance.

(C) Lane Closure Work Zone Signs

Install any required lane closure signing needed during the life of the project in accordance with the Standard Drawing No. 1101.02, 1101.11 and 1110.02 of the *2012 Roadway Standard Drawings*. Any required portable signs for lane closures are compensated in the contract pay item for *Temporary Traffic Control*.

4) Measurement and Payment:

Temporary traffic control work, including, but not limited to installation and removal of portable signs, cones, drums, skinny drums, flaggers, AFAD's, changeable message boards, truck mounted attenuators, flashing arrow boards, and pilot vehicles will be paid at the contract lump sum price for *Temporary Traffic Control*. The *Temporary Traffic Control* pay item does not include work zone advance or general warning signs. Partial payments for *Temporary Traffic Control* will be made as follows: The cumulative total of the lump sum price for temporary traffic control will be equal to the percent complete (project) as calculated for each partial pay estimate. Additional flashing arrow boards and message boards beyond those shown in the contract, detail drawings or *Roadway Standard Drawings* required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *Standard Specifications*.

The work of ground locating (i.e. whitelining) stationary work zone signs including labor, equipment and materials will be measured and paid at the contract price for *Ground Location of Stationary Work Zone Signs (SF)*.

Measurement for *Ground Location of Stationary Work Zone Signs* will be made by the summing the total square footage of installed stationary work zone signs. Payment for *Ground Location of Stationary Work Zone Signs* will be made after the sign installer and DOT have completed all ground location activities.

The work of satisfactorily installing and removing work zone advance and/or general warning signs, including, but not limited to, furnishing, locating, installing, covering, uncovering and removing stationary signs will be measured for each required sign and paid at the contract price for *Work Zone Advance/General Warning Signing (SF)*.

Payment for *Work Zone Advance/General Warning Signing* will be limited to a maximum of 90% of the total installed quantity. The remaining 10% will be paid once all signs have been removed.

The Lump Sum price for *Temporary Traffic Control* will include the work of four (4) flaggers per operation per map being utilized at the same time on any day. If a pilot vehicle is used for an operation, the Lump Sum Price for *Temporary Traffic Control* will include the work of five (5) flaggers. The operator of a pilot vehicle will be considered one of the five flaggers.

Any additional flagging beyond the "included" amount covered in the *Temporary Traffic Control* pay item will be considered supplemental flagging and compensated at a rate of \$20.00 per hour for each additional flagger as approved by the Engineer.

Payment will be made under:

Pay Item	Pay Unit
Temporary Traffic Control	Lump Sum
Ground Location of Stationary Work Zone Signs	Square Foot
Work Zone Advance/General Warning Signing	Square Foot

ROCK EMBANKMENTS:

(21-247-162)

Description

Construct rock embankments in accordance with the contract. Use core material as necessary or required where piles will be driven through rock embankments and as shown in the plans. Rock embankments are required to construct embankments in water at locations shown in the plans and as directed.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Geotextile for Rock Embankments, Type 2	1056
<u>Rip Rap Materials</u>	<u>1042</u>
Select Materials	1016

Provide Type 2 geotextile for filtration geotextiles. Use Class VII select material for rock embankments. Use Class VI select material (standard size No. 57) for core material and Class A and B rip rap and No. 57 stone to fill voids in rock embankment ~~over Class VII.~~ Obtain aggregates from sources participating in the Department's Aggregate QC/QA Program in accordance with Section 1006 of the *Standard Specifications* or use similar size onsite material approved by the engineer.

Construction Methods

Construct rock embankments in accordance with the slopes, dimensions and elevations shown in the plans and Section 235 of the *Standard Specifications*. If piles will be installed through rock embankments, place Class VII so there will be at least 5 ft between rock and piles. Place Class VII so smaller rocks are uniformly distributed throughout rock embankments. Provide a uniform surface free of obstructions, debris and groups of large rocks that could cause voids in embankments. When placing Class VII in lifts, place core material to top of the current lift before placing the next lift of Class VII.

Before placing embankment fill material or filtration geotextiles over rock embankments, fill voids in the top of rock embankments with rip rap and No. 57 stone. Place and compact Class B rip rap first followed by Class A rip rap. Then, fill any remaining voids with No. 57 stone so geotextiles are not torn, ripped or otherwise damaged when installed and covered. Compact rip rap and No. 57 stone with tracked equipment or other approved methods. ~~Place and compact a layer of No. 57 stone at least 12" thick over rock embankments and core material.~~ Install filtration geotextiles on top of Class VII, rip rap and No. 57 stone in accordance with Article 270-3 of the *Standard Specifications* before placing embankment fill material.

Measurement and Payment

Rock Embankments, Rip Rap, Class A and B and #57 Stone will be measured and paid in tons. Select material and rip rap will be measured by weighing material and rip rap in trucks in accordance with Article 106-7 of the *Standard Specifications*. The contract unit prices for Rock Embankments, Rip Rap, Class A and B and #57 Stone will be full compensation for providing, hauling, handling, placing, compacting and maintaining select material and rip rap.

Geotextile for Rock Embankments will be measured and paid in square yards. Geotextiles will be

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measured along the top of rock embankments ~~the No. 57 stone layer~~ as the square yards of exposed geotextiles before placing embankment fill material. No measurement will be made for overlapping geotextiles. The contract unit price for *Geotextile for Rock Embankments* will be full compensation for providing, transporting and installing ~~placing~~ geotextiles.

Payment will be made under:

Pay Item

Rock Embankments

Rip Rap, Class A

Rip Rap, Class B

#57 Stone

Geotextile for Rock Embankments

Pay Unit

Ton

Ton

Ton

Ton

Square Yard



DRAFT

ROCK AND BROKEN PAVEMENT FILLS:

(?-?-16)

235

SP2 R?

Revise the *2012 Standard Specifications* as follows:

Page 2-22, Article 235-2 MATERIALS, add the following after line 19:

Item	Section
Geotextile for Rock and Broken Pavement Fills, Type 2	1056

Provide Type 2 geotextile for filtration geotextiles. Use rip rap and No. 57 stone from either a quarry or onsite material to fill voids in rock and broken pavement fills. Provide small and large size rip rap with stone sizes that meet Class A and B in accordance with Table 1042-1 and No. 57 stone with a gradation that meets Table 1005-1 or use similar size onsite material approved by the Engineer.

Page 2-23, Subarticle 235-3(B) Embankment Formation, lines 18-19, delete the third sentence in the seventh paragraph.

Page 2-23, Subarticle 235-3(B) Embankment Formation, lines 21-23, replace the eighth paragraph with the following:

Before placing embankment fill material or filtration geotextiles over rock and broken pavement, fill voids in the top of rock and broken pavement fill with rip rap and No. 57 stone. Place and compact larger rip rap first followed by smaller rip rap. Then, fill any remaining voids with No. 57 stone so geotextiles are not torn, ripped or otherwise damaged when installed and covered. Compact rip rap and No. 57 stone with tracked equipment or other approved methods. Install filtration geotextiles on top of rock, broken pavement, rip rap and No. 57 stone in accordance with Article 270-3 before placing remaining embankment fill material.

Remove any rocks, debris or pavement pieces from the roadbed larger than 2" within 12" of the subgrade or finished grade, whichever is lower.

Page 2-24, Article 235-5 MEASUREMENT AND PAYMENT, line 13, add the following to the end of the first paragraph:

Payment for rip rap, No. 57 stone and geotextiles to construct embankments with rock and broken pavement fills will be considered incidental to the work in Sections 225, 226, 230 and 240.

CELLULAR CONFINEMENT SYSTEMS:

(??-16)

Description

Install cellular confinement systems, i.e., geocells on slope faces and fill geocells with seeded compost in accordance with the contract. Geocells are required or an option for slope erosion control to establish vegetation at locations shown in the plans and as directed.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item

Geocells

Section

1056

Provide geocell accessories (e.g., stakes, pins, clips, staples, rings, tendons, anchors, deadmen, etc.) recommended by the Geocell Manufacturer/Vendor. Use seeded compost blankets that meet the *Compost Blanket* provision.

Preconstruction Requirements

For geocell designs, submit 6 copies of working drawings and 2 copies of design calculations and a PDF copy of each at least 30 days before the preconstruction meeting. Do not start geocell installation until a design submittal is accepted. Provide designs sealed by an engineer licensed in the State of North Carolina and approved by the Geocell Manufacturer/Vendor.

Submit working drawings and design calculations for acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing typical cross sections, plan views with geocell layout, details of the cellular confinement system including all accessories and a detailed installation procedure. If necessary, include details of slope and crest anchorage systems and tendon locations and types. Design cellular confinement systems in accordance with the plans and for a minimum factor of safety of 1.4. Submit stability calculations for each cross section with different surcharge loads, geometry or material parameters. At least one analysis is required for each slope angle with the tallest slope.

Before beginning geocell installation, the Engineer may require a preconstruction meeting to discuss the construction and inspection of the cellular confinement systems. If required, schedule this meeting after all geocell submittals have been accepted. The Resident or District Engineer, Roadway Construction Engineer, Geotechnical Operations Engineer, Contractor and Geocell Installer Superintendent will attend this preconstruction meeting. If geocells are required for reinforced soil slopes (RSS), the RSS preconstruction meeting may also serve as the geocell preconstruction meeting provided all geocell submittals have been accepted before the meeting and the Geocell Installer Superintendent attends the meeting.

Construction Methods

Control drainage during construction in the vicinity of RSS and embankments with cellular confinement systems. Direct run off away from slopes and protect slope faces from erosion. Compact slope faces in accordance with the contract. A smooth firm surface free of rocks, clods or debris is required before placing geocells on slopes.

Submit documentation that the Geocell Installer is prequalified by the Geocell Manufacturer/Vendor and has successfully completed at least 2 geocell projects within the last 3 years. Each project should comprise at least 1,000 sy of geocells installed on slopes with angles

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and heights similar to those for this project.

If the Geocell Installer does not have the required experience, a Geocell Manufacturer/Vendor representative is required to assist and guide the Geocell Installer on-site for at least 8 hours when the first geocells are placed. If problems are encountered during construction, the Engineer may require the manufacturer/vendor representative to return to the site for a time period determined by the Engineer.

Install cellular confinement systems in accordance with the accepted submittals. Follow installation procedures in accepted submittals for geocells and all accessories including anchors, tendons and deadmen.

Place seeded compost blankets in accordance with the *Compost Blanket* provision except fill expanded geocells in place with seeded compost to a depth sufficient to cover the geocells. Keep geocells filled and covered with compost and maintain and repair compost blankets per the provision to establish and support vegetation.

Measurement and Payment

Geocells will be measured and paid in square yards. Cellular confinement systems will be measured along slope faces as the square yards of expanded geocells in place. The contract unit price for *Geocells* will be full compensation for providing designs, submittals, labor, tools and equipment, supplying and installing cellular confinement systems and all accessories including anchors, tendons and deadmen and any incidentals necessary for geocell installation.


Seeded compost blankets will be measured and paid in accordance with the *Compost Blanket* provision.

Payment will be made under:

Pay Item
Geocells

Pay Unit
Square Yard



		ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED		

GEOTEXTILE TYPE/DIRECTION	H (FT)	0 - < 12			12 - 24			> 24 - 36		
		I	II	III	I	II	III	I	II	III
PRIMARY GEOTEXTILE (SUBSTITUTE FOR SECONDARY GEOTEXTILE FOR PRIMARY GEOTEXTILE CONTROL BLANKET OR FLATTER RSS)	1/4 TO < 1/2 (H/W) RSS	900	500	500	1200	900	500	1800	1200	1000
SECONDARY GEOTEXTILE (SUBSTITUTE FOR FLATTER RSS)	1/4 TO 1/2 (H/W) RSS	500	500	500	500	500	500	500	500	500
FLATTER RSS	> 1/2 TO < 2 (H/W) RSS	500	500	500	500	500	500	500	500	500
FLATTER RSS	1/4 (H/W) OR FLATTER RSS									

LTDs - MINIMUM REQUIRED LONG-TERM DESIGN STRENGTH (LB/FT)

(LTDs IS BASED ON 100% COVERAGE FOR PRIMARY GEOTEXTILE
SEE NOTE 9 FOR LESS THAN 100% COVERAGE.)

NOTES:

- SEE EROSION CONTROL AND ROADWAY PLANS AND SUMMARY SHEETS FOR REINFORCED SOIL SLOPE (RSS).
- FOR STANDARD REINFORCED SOIL SLOPES, SEE REINFORCED SOIL SLOPES PROVISION FOR STEEL BEAM GUARDRAIL. SEE SECTION 862 OF THE STANDARD SPECIFICATIONS.
- FOR SHOULDER AND SLOPE BORROW, SEE ARTICLE 109-2 OF THE STANDARD SPECIFICATIONS. FOR GEOTEXTILES, SEE CELLULAR CONFINEMENT SYSTEMS PROVISION FOR COAR FIBER MAT. WAITING FOR EROSION CONTROL AND COMPOST BLANKET. SEE EROSION CONTROL PROVISIONS, SECTION 163.01 OF THE STANDARD SPECIFICATIONS AND ROADWAY STANDARD DRAWING 163.01.
- STANDARD RSS ARE BASED ON THE FOLLOWING IN-SITU ASSUMED SOIL PARAMETERS:
UNIT WEIGHT, $\gamma = 120 \text{ LB/FT}^3$
INTERNAL ANGLE, $\phi = 30^\circ$
COHESION, $c = 0 \text{ LB/FT}^2$
- DO NOT USE STANDARD RSS IF ASSUMED SOIL PARAMETERS ARE NOT APPLICABLE OR GROUNDWATERS ABOVE TOE OF RSS.
- DO NOT USE STANDARD RSS WHEN VERY LOOSE OR SOFT SOIL OR MUCK IS BELOW RSS.
- GEOTEXTILES ARE TYPICALLY APPROVED FOR ULTIMATE TENSILE STRENGTHS IN THE MACHINE DIRECTION (MD) AND CROSS-MACHINE DIRECTION (CD) OR LONG-TERM DESIGN STRENGTHS FOR A 75-YEAR DESIGN LIFE IN THE MD BASED ON MATERIAL TYPE. THE LIST OF APPROVED GEOTEXTILES WITH DESIGN STRENGTHS IS AVAILABLE FROM:
www.geotextiles.com/resources/Manuals/Design/SoilReinforcement
DEFINE MATERIAL TYPE FROM THE WEBSITE ABOVE FOR SELECT MATERIAL AS FOLLOWS:

MATERIAL TYPE	SELECT MATERIAL
BORROW	CLASS I SELECT MATERIAL
FINE AGGREGATE	CLASS II OR III SELECT MATERIAL

- IF THE WEBSITE DOES NOT LIST A LONG-TERM DESIGN STRENGTH FOR AN APPROVED GEOTEXTILE IN THE DESIGN STRENGTH FOR AN APPROVED GEOTEXTILE, THE WEBSITE DOES NOT LIST LONG-TERM DESIGN STRENGTH FOR AN APPROVED GEOTEXTILE. IN THE CLAUSE A LONG-TERM DESIGN STRENGTH EQUAL TO THE ULTIMATE TENSILE STRENGTH DIVIDED BY 1.75 FOR THE SECONDARY GEOTEXTILE.
- DO NOT OVERLAP PRIMARY GEOTEXTILES IN THE MD SO OVERLAPS ARE PARALLEL TO THE TOE OF RSS. POLYESTER, POLYPROPYLENE OR PP GEOTEXTILES MAY BE SPUNCE ONCE PER PRIMARY GEOTEXTILE LENGTH IN ACCORDANCE WITH THE GEOTEXTILE MANUFACTURER'S INSTRUCTIONS. USE POLYESTER GEOTEXTILE PIECES AT LEAST 4' LONG. DO NOT SPICE POLYESTER TYPE GEOTEXTILES.
- FOR PRIMARY GEOTEXTILES WITH 100% COVERAGE, PLACE PRIMARY GEOTEXTILES SO GEOTEXTILES ARE ADJACENT TO EACH OTHER IN THE CD FOR PRIMARY GEOTEXTILES WITH 75% TO LESS THAN 100% COVERAGE.
- MINIMUM REQUIRED LONG-TERM DESIGN STRENGTH = $LTDs \text{ BASED ON } 100\% \text{ COVERAGE} \times (W + S) / W$
- SEE TABLE FOR LTDs BASED ON 100% COVERAGE AND GEOTEXTILE PLACEMENT DETAILS FOR PRIMARY GEOTEXTILE WITH MD AND SPACING CD. FOR PRIMARY GEOTEXTILES WITH LESS THAN 100% COVERAGE, STAGGER PRIMARY GEOTEXTILES SO GEOTEXTILES ARE CENTERED OVER GAPS IN THE PRIMARY GEOTEXTILE LAYER BELOW. DO NOT USE LESS THAN 75% COVERAGE FOR PRIMARY GEOTEXTILES.
- DO NOT PLACE ANY GEOTEXTILES UNTIL EXCAVATION DIMENSIONS AND IN-SITU MATERIAL ARE APPROVED.
- FOR SLOPE EROSION CONTROL, USE GEOCELLS OR MATING ON SLOPE FACES OF RSS AS FOLLOWS:

RSS ANGLE	SLOPE EROSION CONTROL
1/4 TO < 1/2 (H/W)	GEOCELLS WITH COMPOST BLANKET
1/4 TO < 2 (H/W)	GEOCELLS WITH COMPOST BLANKET OR COAR FIBER MAT WITH SHOULDER AND SLOPE BORROW
2 (H/W) OR FLATTER	MATING FOR EROSION CONTROL WITH SHOULDER AND SLOPE BORROW

H (FT)	0 - < 12			12 - 24			> 24 - 36		
SELECT MATERIAL CLASS	I	II	III	I	II	III	I	II	III
1/4 TO < 1/2 (H/W) RSS	125	120	105	100	100	100	100	100	100
1/4 TO 1/2 (H/W) RSS	100	100	0.95	0.90	0.90	0.90	0.90	0.90	0.90
> 1/2 TO < 2 (H/W) RSS	100	0.85	0.80	0.75	0.75	0.75	0.75	0.75	0.70

$\frac{L}{H}$ RATIO ($L > 4'$ MIN)
(IF $L \leq 4'$, USE SECONDARY GEOTEXTILE
INSTEAD OF PRIMARY GEOTEXTILE.)

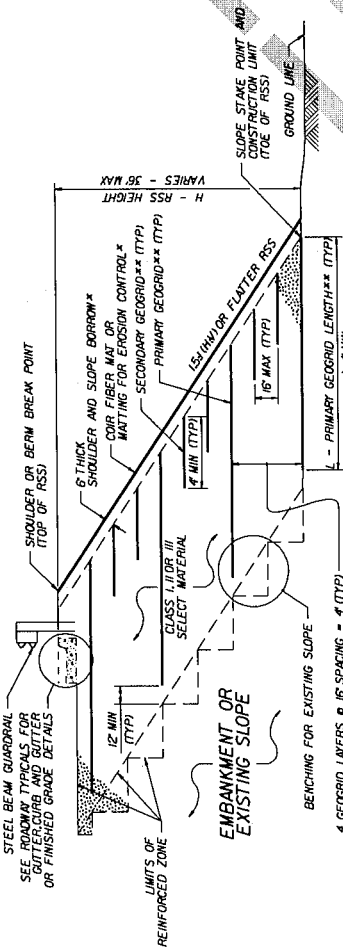


NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
**GEOTECHNICAL
ENGINEERING UNIT**

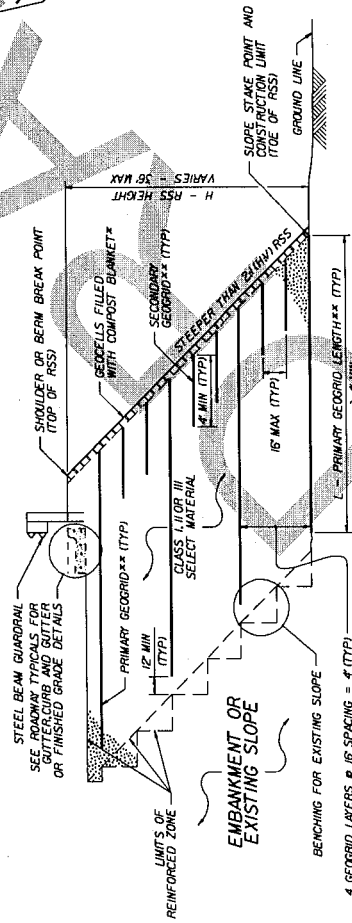
STANDARD DETAIL NO. 1803.01

STANDARD
REINFORCED SOIL SLOPE (RSS)
WITH HIGH GROUNDWATER
SHEET 2 OF 2

PROJECT REFERENCE NO.	SHEET NO.
<div style="display: flex; justify-content: space-between;"> <div> <p>ENGINEER</p> <p>GEOTECHNICAL ENGINEER</p> <p>SEAL</p> </div> <div> <p>DATE</p> <p>REVISIONS</p> <p>UNLESS ALL SIGNATURES COMPLETED</p> </div> </div>	

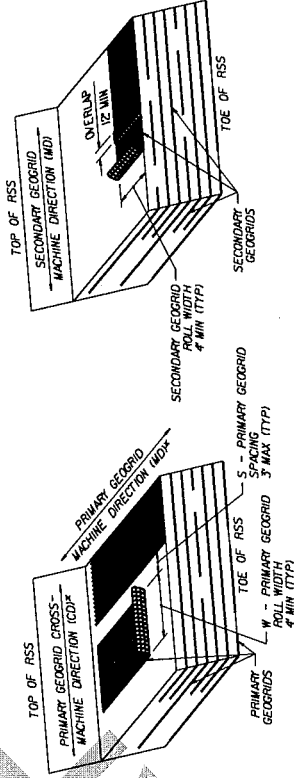


MATTING WITH SHOULDER AND SLOPE BORROW
 *SEE NOTES 3 AND 11 ON SHEET 2.



GEOCELLS WITH COMPOST BLANKET
 *SEE NOTES 3 AND 11 ON SHEET 2.

STANDARD REINFORCED SOIL SLOPE (RSS)
 **SEE TABLES ON SHEET 2 AND
 GEOGRID PLACEMENT DETAILS.



GEOGRID PLACEMENT DETAILS
 (% COVERAGE = $\frac{W}{W+S} \times 100 \geq 75\%$)
 *SEE NOTES 8 AND 9 ON SHEET 2.

<p>STANDARD REINFORCED SOIL SLOPE (RSS) WITH HIGH GROUNDWATER</p> <p>SHEET 1 OF 2</p>	<p>DATE: 7-2-16</p>
<p>NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS</p> <p>GEOTECHNICAL ENGINEERING UNIT</p>	<p>STANDARD DETAIL NO. 1803.01</p>