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?
Current, 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 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
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 Lamier, 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 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

<table>
<thead>
<tr>
<th>Item</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silt Excavation</td>
<td>1630</td>
</tr>
<tr>
<td>Borrow Material</td>
<td>1018</td>
</tr>
<tr>
<td>Temporary Silt Fence</td>
<td>1605</td>
</tr>
</tbody>
</table>

*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.
PARDON THE DUST... YOUR "FUEL TAXES" AT WORK

PROJECT ID: TIP X-XXXX
BUILT BY: CONTRACTOR NAME
PHONE: XXX XXX-XXXX

FUNDING BY: FEDERAL HIGHWAY TRUST FUND
(HIGHWAY BILL MAP-21)
NC HIGHWAY TRUST FUND

COMPLETION: SEASON YEAR

EXPRESSWAY/FREeway
EXPRESSWAY/FREEWAY
WORK ZONE TRAFFIC CONTROL GENERAL REQUIREMENTS

TEMPORARY TRAFFIC CONTROL (TTC):
(7-16-13) (Rev. 7-15-14)

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 (SD).
Measurement for *Ground Location of Stationary Work Zone Signs* will be made by the summing of 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:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
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<tr>
<td>Temporary Traffic Control</td>
<td>Lump Sum</td>
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<tr>
<td>Ground Location of Stationary Work Zone Signs</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Work Zone Advance/General Warning Signing</td>
<td>Square Foot</td>
</tr>
</tbody>
</table>
TIP

ROCK EMBANKMENTS:

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Section</th>
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<tbody>
<tr>
<td>Geotextile for Rock Embankments, Type 2</td>
<td>1056</td>
</tr>
<tr>
<td>Rip Rap Materials</td>
<td>1042</td>
</tr>
<tr>
<td>Select Material s</td>
<td>1016</td>
</tr>
</tbody>
</table>

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 embankments. Use Class VII 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
measured along the top of rock embankments and 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 geotextiles.

Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock Embankments</td>
<td>Ton</td>
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<tr>
<td>Rip Rap, Class A</td>
<td>Ton</td>
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<tr>
<td>Rip Rap, Class B</td>
<td>Ton</td>
</tr>
<tr>
<td>#57 Stone</td>
<td>Ton</td>
</tr>
<tr>
<td>Geotextile for Rock Embankments</td>
<td>Square Yard</td>
</tr>
</tbody>
</table>
ROCK AND BROKEN PAVEMENT FILLS:
(7-7-16) 235 SP2 R7

Revise the 2012 Standard Specifications as follows:

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Section</th>
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<tbody>
<tr>
<td>Geotextile for Rock and Broken Pavement Fills, Type 2</td>
<td>1056</td>
</tr>
</tbody>
</table>

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:

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geocells</td>
<td>1056</td>
</tr>
</tbody>
</table>

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
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  Pay Unit
Geocells       Square Yard
### Minimum Required Long-Term Design Strength (LTDS)

(LTDS is based on 100% coverage for primary geogrid. See Note 7 for less than 100% coverage.)

<table>
<thead>
<tr>
<th>Geogrid Type/Direction</th>
<th>H (ft)</th>
<th>0 - &lt; 12</th>
<th>12 - 24</th>
<th>&gt; 24 - 36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Geogrid</td>
<td>SELECT MATERIAL CLASS</td>
<td>1</td>
<td>1.0 H</td>
<td>1</td>
</tr>
<tr>
<td>Secondary Geogrid</td>
<td>1.5 TO 4.5 (in.) R.S.S.</td>
<td>500</td>
<td>500</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>55 TO 60 (in.) R.S.S.</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>55 TO 60 (in.) R.S.S.</td>
<td>500</td>
<td>500</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>55 TO 60 (in.) R.S.S.</td>
<td>85</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### NOTES:

1. See erosion control and roadbed plans and summary sheets for reinforced soil slope (RSS) and slope erosion control locations.
2. For standard reinforced soil slopes, see reinforced soil slopes provision for steel beam summarization section 3 of the standard specifications.
3. For shoulder and slope approach areas, see Article 8.5 of the standard specifications.
4. For geogrids, select geogrid type, select R.S.S. provision, and fill in the required coverage design strength. See erosion control and roadbed plans provision for this fill in the required coverage design strength.
5. Do not use standard R.S.S. if assumed soil parameters are not applicable or groundwater exists above toe of fill.
6. Do not use standard R.S.S. when very loose or soft soil or rock is present.
7. Geogrids are typically approved for ultimate tensile strengths in the existing condition and for standard R.S.S. provision. The use of standard R.S.S. provision for geogrids is beyond the scope of this method. The use of approved geogrids with design strengths is available from the geogrid manufacturer.

#### Geogrid Material Type

- **SELECT MATERIAL CLASS**: 1
- **H (ft)**: 1.0 H
- **K (in.)**

#### Erosion Control

- **R.S.S.**: 1.5 TO 4.5 (in.)
- **K (in.)**: 2.0
- **Fiber Type**: Composite blanket

#### Slope Erosion Control

- **R.S.S.**: 55 TO 60 (in.)
- **K (in.)**: 2.0
- **Fiber Type**: Composite blanket

#### Rockfall Protection

- **R.S.S.**: 55 TO 60 (in.)
- **K (in.)**: 2.0
- **Fiber Type**: Composite blanket

#### Rockfall Protection

- **R.S.S.**: 55 TO 60 (in.)
- **K (in.)**: 2.0
- **Fiber Type**: Composite blanket

---

**L/H Ratio (L > 4 Min)**

(If L ≤ 4, use secondary geogrid instead of primary geogrid.)

<table>
<thead>
<tr>
<th>H (ft)</th>
<th>0 - &lt; 12</th>
<th>12 - 24</th>
<th>&gt; 24 - 36</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT MATERIAL CLASS</td>
<td>1</td>
<td>1.0 H</td>
<td>1</td>
</tr>
<tr>
<td>1.5 TO 4.5 (in.) R.S.S.</td>
<td>125</td>
<td>120</td>
<td>115</td>
</tr>
<tr>
<td>15 TO 60 (in.) R.S.S.</td>
<td>150</td>
<td>100</td>
<td>95</td>
</tr>
<tr>
<td>55 TO 60 (in.) R.S.S.</td>
<td>100</td>
<td>85</td>
<td>80</td>
</tr>
</tbody>
</table>

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**Diagram for Geogrid Placement**

1. Do not place any geogrids until excavation dimensions and in-situ material are approved.
2. For slope erosion control, geogrids or matting on slope faces of R.S.S. as follows:
   - **R.S.S.**: 1.5 TO 4.5 (in.)
   - **K (in.)**: 2.0
   - **Fiber Type**: Composite blanket
3. For shoulder and slope approach areas, see Article 8.5 of the standard specifications.

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**Reinforced Soil Slope (RSS) with High Groundwater**

- **Geotechnical Engineering Unit**
- **North Carolina Department of Transportation**
- **Standard Detail No. 184R**
- **Sheet 2 of 2**