STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

ROADWAY DESIGN UNIT
MAR 07 2011
BENNETT
STEPHENSON
HAMILTON
SIGNATURE

March 4, 2011

CC:

MEMORANDUM TO: K. J. Kim, P.E.
Eastern Regional Geotechnical Manager

John Pilipchuk, L.G., P.E.
Western Regional Geotechnical Manager

Mohammed Mulla, P.E., C.P.M.
Contracts and Statewide Services Manager

FROM: Njoroge Wainaina, P.E.
State Geotechnical Engineer

SUBJECT: Reinforced Soil Slopes Project Special Provision
Standard Reinforced Soil Slope Drawing

The Technical Support Group of the Support Services Section has completed the development of a new Reinforced Soil Slopes Project Special Provision and Standard Reinforced Soil Slope (RSS) Drawing (Std. Dwg. No. 1803.01). The RSS provision and drawing are effective with the June 21, 2011 letting and are attached for your reference.

The RSS provision is categorized as a "Geotechnical Standard Provision" and the RSS drawing is categorized as a "Geotechnical Standard Drawing". Therefore, do not attach these standards to the Roadway Foundation Design Recommendations; the Central Office will include the standard RSS provision and drawing with the product when checked on the Standards Request Form and the Contract Standards and Development Unit will get the Word file of the provision for the proposal from the GEU website.

The standard RSS provision is used in conjunction with the Roadside Environmental Standard Permanent Soil Reinforcement Mat Provision. This provision is available from the link below and attached for your reference.
www.ncdot.org/doh/operations/dp_chief_eng/roadside/soil_water/pdf/PermanentSoilReinforcementMat.pdf

When recommending the use of the standard RSS provision, send a carbon copy of the roadway recommendations to the Roadside Environmental Soil and Water Engineering Section (Barney Blackburn) so the appropriate provision and quantity for the permanent soil reinforcement mat

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LOCATION:
CENTURY CENTER COMPLEX
ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

GEOTECHNICAL STANDARD DRAWINGS & CELLS LIST

(Continued)

Geotechnical Standard Cells (Continued)

Effective Let Date	Cell Name	Cell Description
12/16/08	Border_STR_DesignDrawing	Structure border for geotechnical design drawings
12/16/08	Border_STR_StandardDrawing	Structure border for geotechnical standard drawings
2/16/10	Border_StandardCell	Border for geotechnical standard cells
9/21/10	Wall_Anchored	Anchored wall - typical
9/21/10	Wall_Anchored_Notes_ReinforcedWeb	Anchored wall notes & reinforced web details
9/21/10	Wall_Barrier_MomentSlab_Panels_Facing	Concrete barrier rail with moment slab details for precast panels and concrete facing
9/21/10	Wall_Barrier_MomentSlab_SRWUnits	Concrete barrier rail with moment slab details for SRW Units
9/21/10	Wall_SoilNail	Soil nail wall - typical & notes
9/21/10	Wall_SoldierPile	Soldier pile wall - typicals & notes
10/19/10	Detail_RockPlating	Rock plating details
10/19/10	Wall_MSE_Panels_Slope	Non-abutment MSE wall with panels and back slope - typical & coping details
10/19/10	Wall_MSE_Panels_Surcharge_Barrier	Non-abutment MSE wall with panels, surcharge and barrier - typical
10/19/10	Wall_MSE_Panels_Surcharge_GR	Non-abutment MSE wall with panels, surcharge and guardrail - typical & coping details
10/19/10	Wall_MSE_SRWUnits_Slope	Non-critical MSE wall with SRW units and back slope - typical & coping details
10/19/10	Wall_MSE_SRWUnits_Surcharge_Barrier	Non-critical MSE wall with SRW units, surcharge and barrier - typical
10/19/10	Wall_MSE_SRWUnits_Surcharge_GR	Non-critical MSE wall with SRW units, surcharge and guardrail - typical & coping details
6/21/11	Detail_ReinforcedSoilSlope_Standard	Standard reinforced soil slope drawing (no. 1803.01)
6/21/11	Wall_CIPGravity_Standard	Standard CIP gravity wall drawing (no. 453.01)
6/21/11	Wall_MSE_Notes_LevelingPad	MSE wall notes & leveling pad step details
6/21/11	Wall_PrecastGravity_Slope	Precacst gravity wall with back slope - typical, notes & footing step detail
6/21/11	Wall_PrecastGravity_Surcharge_GR	Precast gravity wall with surcharge and guardrail - typicals, notes & footing step detail
6/21/11	Wall_SegmentalGravity_GR	Segmental gravity wall with guardrail - typicals & notes
6/21/11	Wall_SegmentalGravity_Slope	Segmental gravity wall with back slope - typicals & notes
6/21/11	Wall_SegmentalGravity_Standard	Standard segmental gravity wall drawing (no. 453.02)
6/21/11	Wall_SegmentalGravity_Standard_Freeze-Thaw	Standard segmental gravity wall with freeze-thaw durable SRW units drawing (no. 453.03)

GEOTECHNICAL STANDARD DRAWINGS & CELLS LIST

(Revised 3/7/11)

When recommending the *Geotechnical Standard Drawings* listed below, do not attach these drawings to the recommendations. Attach all other recommended drawings including those titled the same as the standard drawings but modified for a specific project. When the use of a *Geotechnical Standard Drawings* is recommended, include the geotechnical standard provisions and drawings request form with the product and the Central Office will include the sealed standard drawing with the product. Electronic files of standard drawings are not stored on the server with the project files.

Geotechnical Standard Drawings (See Geotechnical Engineering Unit's website at http://www.ncdot.org/doh/preconstruct/highway/geotech/formdet/ or the S drive under Shared\Standards\Provisions, Notes, Drawings & Cells\.)

Drawing No.	Effective Let Date	Drawing Title	# of Sheets
453.01	6/21/11	Standard Cast-In-Place (CIP) Gravity Retaining Wall	1
453.02	6/21/11	Standard Segmental Gravity Retaining Wall	1
453.03	6/21/11	Standard Segmental Gravity Retaining Wall with Freeze-Thaw Durable SRW Units	1
1801.01	2/20/07	Standard Temporary Shoring	1
1801.02	2/20/07	Standard Temporary MSE Walls	11
1802.01	10/19/10	Rock Plating Details*	1
1803.01	6/21/11	Standard Reinforced Soil Slope (RSS)	1

*(The Rock Plating Details consist of 4 details that are included in the Geotechnical Engineering and Roadway Design Unit's cell libraries. To use the rock plating details, recommend the use of a detail (Rock Plating Detail Nos. 1 through 4) with the stations including left or right of centerline and an ending slope for each location in the Roadway Foundation Design Recommendations. If any 1 or 2 rock plating details are required, Roadway will include the necessary details and notes on their plans. If any 3 or all 4 rock plating details are required, recommend the use of Geotechnical Standard Drawing No. 1802.01 and the Central Office will delete a detail, if necessary, fill in the riprap type and location information (stations and ending slope) and include the sealed standard drawing with the product.)

Geotechnical Standard Cells for design drawings are available from the cell library, "Geotechnical_Design_English.cel". Geotechnical cell libraries are accessible through the geotechnical workspace.

Geotechnical Standard Cells (See Geotechnical Engineering Unit's website at http://www.ncdot.org/doh/preconstruct/highway/geotech/formdet/ or the S drive under Shared\Standards\Provisions, Notes, Drawings & Cells\.)

Effective Let Date	Cell Name	Cell Description
12/16/08	Border_RDY_DesignDrawing	Roadway border for geotechnical design drawings
12/16/08	Border_RDY_StandardDrawing	Roadway border for geotechnical standard drawings

STANDARD PROVISIONS LIST
(Continued)

Geotechnical Standard Provisions (Continued)

Prov. No.	Effective Let Date	Title	Pay Items[2]
10	9/21/10	Segmental Gravity Retaining Walls (LRFD)	Segmental Gravity Retaining Walls
11	4/15/08	Shotcrete	N/A
12	9/21/10	Soil Nail Retaining Walls (LFD-ASD)	Soil Nail Retaining Walls Soil Nail Verification Tests Soil Nail Proof Tests
13	9/21/10	Soldier Pile Retaining Walls (LRFD)	Soldier Pile Retaining Walls
14	10/19/10	Mechanically Stabilized Earth Retaining Walls (LRFD)	MSE Retaining Walls
15	10/19/10	Geotextile for Pavement Stabilization	Geotextile for Pavement Stabilization
16	10/19/10	Rock Embankments	Rock Embankments #57 Stone Filter Fabric for Rock Embankments
17	10/19/10	Select Granular Material	Select Granular Material, Class III
18	6/21/11	Reinforced Soil Slopes	Reinforced Soil Slopes Permanent Soil Reinforcement Mat[3]

Notes:
[2]Pay items in Structure, Roadway and Geotechnical Standard Provisions calculated by others are not shown in tables above.
[3]Permanent Soil Reinforcement Mat provision is a Roadside Environmental Standard Provision.

STANDARD PROVISIONS LIST
(Continued)

Roadway Standard Provisions (See Contract Standards and Development's website at http://www.ncdot.org/doh/preconstruct/ps/contracts/sp/2006sp/2006sp.html, Geotechnical Engineering Unit's website at http://www.ncdot.org/doh/preconstruct/highway/geotech/provnote/ or the S drive under Shared\Standards\Provisions, Notes, Drawings & Cells\Roadway\Contract Standards and Development\.)

Prov. No.	Effective Let Date	Title	Pay Items[2]
SP2 R18	10/19/10	Embankments[1]	N/A
SP2 R35	3/16/10	Aggregate Subgrade	Shallow Undercut Class IV Subgrade Stabilization Fabric for Soil Stabilization
SP2 R80	3/16/10	Select Granular Material[1]	Select Granular Material
SP2 R85	10/19/10	Rock Plating	Rock Plating 6" Perforated Subdrain Pipe
SP4 R01	10/19/10	Bridge Approach Fills	N/A
SP5 R01	7/21/09	Fine Grading Subgrade, Shoulders and Ditches[1]	N/A
SP8 R05	7/20/10	Subsurface Drainage[1]	6" Perforated Subdrain Pipe
SP8 R31	5/18/10	Sandbag Headwalls	Sandbag Headwalls
SP10 R40	10/19/10	Engineering Fabrics[1]	N/A
SP11 R02	2/20/07	Temporary Shoring	N/A

[1]Note: Contract Standards and Development automatically includes these provisions in contracts because they are revisions to the Standard Specifications. Therefore, it is not necessary to recommend these provisions in the geotechnical recommendations.

Geotechnical Standard Provisions (See Geotechnical Engineering Unit's website at http://www.ncdot.org/doh/preconstruct/highway/geotech/provnote/ or the S drive under Shared\Standards\Provisions, Notes, Drawings & Cells\.)

Prov. No.	Effective Let Date	Title	Pay Items[2]
2C	9/21/10	Drilled Piers (LRFD)	____ Dia. Drilled Piers Permanent Steel Casing SID Inspection SPT Testing
6	9/21/10	Anchored Retaining Walls (LRFD)	Anchored Retaining Walls
7	9/21/10	Cast-In-Place Gravity Retaining Walls	CIP Gravity Retaining Walls
8	9/21/10	Concrete Barrier Rail with Moment Slab	Concrete Barrier Rail with Moment Slab
9	9/21/10	Precast Gravity Retaining Walls (LRFD)	Precast Gravity Retaining Walls

STANDARD PROVISIONS LIST

(Revised 3/7/11)

When recommending the standard provisions listed below, do not attach these provisions to the recommendations. Attach all other recommended geotechnical provisions including those titled the same as the standard provisions but modified for a specific project. For *Structure Standard Provisions*, Structure Design will include the appropriate provision in the contract. For *Roadway Standard Provisions*, recommend the use of a standard provision in the recommendations with the exception of those provisions noted and Contract Standards and Development will include the provision in the contract. For *Geotechnical Standard Provisions*, recommend the use of a standard provision in the recommendations, include the geotechnical standard provisions and drawings request form with the product and the Central Office will distribute the provision with the product. Electronic files of standard provisions are not stored on the server with the project files. For project specific geotechnical provisions, Contract Standards and Development will request electronic copies through Production Support to assemble the contract.

Structure Standard Provisions (See Geotechnical Engineering Unit's website at http://www.ncdot.org/doh/preconstruct/highway/geotech/provnote/ or the S drive under Shared\Standards\Provisions, Notes, Drawings & Cells\Structures\.)

Prov. No.	Effective Let Date	Title	Pay Items[2]
1	11/17/06	Crosshole Sonic Logging	Crosshole Sonic Logging
2A & 2B	11/17/06 & 3/6/09	Drilled Piers (LFD-ASD & LRFD)	____ Dia. Drilled Piers Not in Soil Permanent Steel Casing SID Inspection SPT Testing
3	7/18/06	Pile Excavation (LFD-ASD)	Pile Excavation in Soil Pile Excavation Not in Soil
4	11/17/06	Pile Driving Analyzer (LFD-ASD)	PDA Testing PDA Assistance
5A	8/4/09	Piles (LFD-ASD)	Steel Pile Points Pipe Pile Plates Pile Redrives
5B	3/5/10	Piles (LRFD)	Steel Pile Points Pipe Pile Plates Predrilling for Piles Pile Redrives Pile Excavation in Soil Pile Excavation not in Soil PDA Testing PDA Assistance
29	1/27/10	Submittal of Working Drawings	N/A
42	7/12/07	Grout for Structures	N/A

would prevent the mat from lying in direct contact with the soil surface. Areas where the mat is to be placed will not need to be mulched.

Measurement and Payment

Permanent Soil Reinforcement Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which Permanent Soil Reinforcement Mat is installed and accepted. Overlaps will not be included in the measurement, and will be considered as incidental to the work. Such payment shall be full compensation for furnishing and installing the mat, including overlaps, and for all required maintenance.

Payment will be made under:

Pay Item	**Pay Unit**
Permanent Soil Reinforcement Mat	Square Yard

PERMANENT SOIL REINFORCEMENT MAT:

Description

This work consists of furnishing and placing *Permanent Soil Reinforcement Mat*, of the type specified, over previously prepared areas as directed.

Materials

The product shall be a permanent erosion control reinforcement mat and shall be constructed of synthetic or a combination of coconut and synthetic fibers evenly distributed throughout the mat between a bottom UV stabilized netting and a heavy duty UV stabilized top net. The matting shall be stitched together with UV stabilized polypropylene thread to form a permanent three-dimensional structure. The mat shall have the following minimum physical properties:

Property	Test Method	Value	Unit
Light Penetration	ASTM D6567	9	%
Thickness	ASTM D6525	0.40	in
Mass Per Unit Area	ASTM D6566	0.55	lb/sy
Tensile Strength	ASTM D6818	385	lb/ft
Elongation (Maximum)	ASTM D6818	49	%
Resiliency	ASTM D1777	>70	%
UV Stability *	ASTM D4355	≥80	%
Porosity (Permanent Net)	ECTC Guidelines	≥85	%
Maximum Permissible Shear Stress (Vegetated)	Performance Bench Test	≥8.0	lb/ft^2
Maximum Allowable Velocity (Vegetated)	Performance Bench Test	≥16.0	ft/s

*ASTM D1682 Tensile Strength and % strength retention of material after 1000 hours of exposure.

Submit a certification (Type 1, 2, or 3) from the manufacturer showing:

(A) the chemical and physical properties of the mat used, and
(B) conformance of the mat with this specification.

Construction Methods

Matting shall be installed in accordance with Subarticle 1631-3(B) of the *Standard Specifications*.

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660 of the *Standard Specifications*. The surface of the soil shall be smooth, firm, stable and free of rocks, clods, roots or other obstructions that

Define "slope plating material" as material that meets Article 560-2 of the *Standard Specifications*. Plate slope faces of RSS with at least 6" of slope plating material except when select material in the reinforced zone is slope plating material. When this occurs, no plating is necessary.

Install erosion control mat facing in accordance with the *Permanent Soil Reinforcement Mat* provision to minimize sloughing of RSS until vegetation is established. Seed slope faces and install erosion control mat facing as soon as possible to prevent erosion damage to slope faces of RSS. If damage occurs, repair RSS at no additional cost to the Department.

MEASUREMENT AND PAYMENT

Reinforced Soil Slopes will be measured and paid in square yards. RSS will be measured along the slope faces of RSS before installing erosion control mat facing and no additional payment will be made for overlapping geogrids. The contract unit price for *Reinforced Soil Slopes* will be full compensation for furnishing, transporting and placing geogrids and select material, plating slope faces, compacting material and providing any labor, tools, equipment and materials to complete the work except for erosion control mat facing. The contract unit price for *Reinforced Soil Slopes* will also be full compensation for excavating existing slopes to install RSS.

Erosion control mat facing will be measured and paid in accordance with the *Permanent Soil Reinforcement Mat* provision.

Payment will be made under:

Pay Item	**Pay Unit**
Reinforced Soil Slopes	Square Yard

Before starting RSS construction, a preconstruction meeting may be required to discuss the construction and inspection of the RSS. Schedule this meeting after all material certifications have been accepted. The Resident or District Engineer, Roadway Construction Engineer, Geotechnical Operations Engineer and Contractor will attend this preconstruction meeting.

Control drainage during construction in the vicinity of RSS. Direct run off away from RSS, select material and backfill. Contain and maintain select material and backfill and protect material from erosion.

Clear and grub RSS sites in accordance with Section 200 of the *Standard Specifications*. Excavate as necessary for RSS as shown on the plans. A horizontal clearance of at least 12" is required between the ends of geogrids and limits of select material as shown on the plans. When excavating existing slopes, bench slopes in accordance with Subarticle 235-4(A) of the *Standard Specifications*. Notify the Engineer when excavation is complete. Do not place first primary geogrid layer until excavation dimensions and in-situ material are approved.

Construct RSS with dimensions shown on the plans. Contact the Engineer when unanticipated obstructions such as foundations, guardrail, pavements, pipes, inlets or utilities will interfere with geogrids. If necessary, the top geogrid layer may be lowered up to 9" to avoid obstructions. Extend geogrids to slope faces. Install primary and secondary geogrids with the orientations, dimensions and number of layers shown on the plans. Place geogrids within 2" of locations shown on the plans and in slight tension free of kinks, folds, wrinkles or creases. Hold geogrids in place with wire staples or anchor pins until covered.

Install primary geogrids with the MD perpendicular to the embankment centerline. The MD is the direction of the length or long dimension of the roll. Unless shown otherwise on the plans, do not splice or overlap primary geogrids in the MD so that splices or overlaps are parallel to the toe of slope. Unless shown otherwise on the plans and except for clearances at the ends of primary geogrids, completely cover select material at each primary geogrid layer with primary geogrids so that geogrids are adjacent to each other in the CD, i.e., perpendicular to the MD. The CD is the direction of the width or short dimension of the roll.

Install secondary geogrids with MD parallel to the toe of RSS. Secondary geogrids should be continuous for each secondary geogrid layer. However, if secondary geogrid roll length is too short, overlap ends of secondary geogrid rolls at least 12" in the MD. Overlap geogrids in the direction that select material will be placed to prevent lifting the edge of the top geogrid.

Place select material in the reinforced zone in 8 to 10 inch thick lifts. Compact embankments in accordance with Subarticle 235-4(C) of the *Standard Specifications*. For RSS steeper than 1.5:1 (H:V), compact slope faces with an approved method. Do not displace or damage geogrids when placing and compacting material. Do not operate heavy equipment on geogrids until they are covered with at least 6" of select material. To prevent damaging geogrids, minimize turning and avoid sudden braking and sharp turns with compaction equipment. Replace any damaged geogrids to the satisfaction of the Engineer. Construct remaining portions of embankments behind RSS in accordance with Section 235 of the *Standard Specifications*.

REINFORCED SOIL SLOPES: (6-21-11)

DESCRIPTION

A reinforced soil slope consists of select material and geogrid reinforcements in the reinforced zone with erosion control mat facing and is typically constructed in accordance with the standard reinforced soil slope drawing (Standard Drawing No. 1803.01). Construct reinforced soil slopes (RSS) in accordance with the contract. RSS are required to reinforce embankments and stabilize slopes at locations shown on the plans and as directed.

MATERIALS

Refer to Division 10 of the *Standard Specifications*:

Item	Section
Select Material	1016
Anchor Pins	1056
Wire Staples	1060-8(D)

Unless required otherwise on the plans, use Class I, II or III Select Material in the reinforced zone for RSS flatter than 1.5:1 (H:V). For RSS steeper than 1.5:1 (H:V), use Class I Select Material in the reinforced zone that meets Article 560-2 of the *Standard Specifications* except for select material that meets AASHTO M 145 for soil classifications A-4 and A-5. Do not use A-4 or A-5 soil or Class II or III Select Material for RSS steeper than 1.5:1 (H:V).

Use erosion control mat facing on slope faces of RSS in accordance with the *Permanent Soil Reinforcement Mat* provision.

Identify, store and handle geogrids in accordance with ASTM D4873. Geogrids with defects, flaws, deterioration or damage will be rejected. Do not unwrap geogrids until just before installation. Do not leave geogrids exposed for more than 7 days before covering with select material.

Use primary geogrids that have been evaluated by the National Transportation Product Evaluation Program (NTPEP). A Type 1 Certified Mill Test Report in accordance with Article 106-3 of the *Standard Specifications* is required for geogrids. Define "minimum average roll value" (MARV) in accordance with ASTM D4439. Provide certifications with MARV for geogrid properties. For testing geogrids, define a "lot" as a single day's production.

Use geogrids shown on the plans or an approved equal. Define "machine direction" (MD) and "cross-machine direction" (CD) in accordance with ASTM D4439. Use secondary geogrids with a roll width of at least 4 ft.

CONSTRUCTION METHODS

(PSRM) for the RSS is included in the contract. Since the PSRM and RSS are both measured in square yards of slope face, the quantity of PSRM is equal to the quantity of RSS.

The Standard Provisions List and Geotechnical Standard Drawings & Cells List have been updated to reflect these new standards and are attached for your reference. If there are any questions, please contact Scott Hidden, P.E. at (919) 250-4088.

Attachments: Reinforced Soil Slopes Project Special Provision
Permanent Soil Reinforcement Mat Project Special Provision
Standard Provisions List
Geotechnical Standard Drawings & Cells List
Standard Reinforced Soil Slope Drawing

cc: Jay Bennett, P.E., State Roadway Design Engineer
Barney Blackburn, P.E., C.P.E.S.C., C.P.S.W.Q., Soil & Water Engineering Supervisor
Dave Henderson, P.E., State Hydraulics Engineer
Rodger Rochelle, P.E., Transportation Program Management Director
Randy Garris, P.E., State Contract Officer
Lamar Sylvester, P.E., State Roadway Construction Engineer

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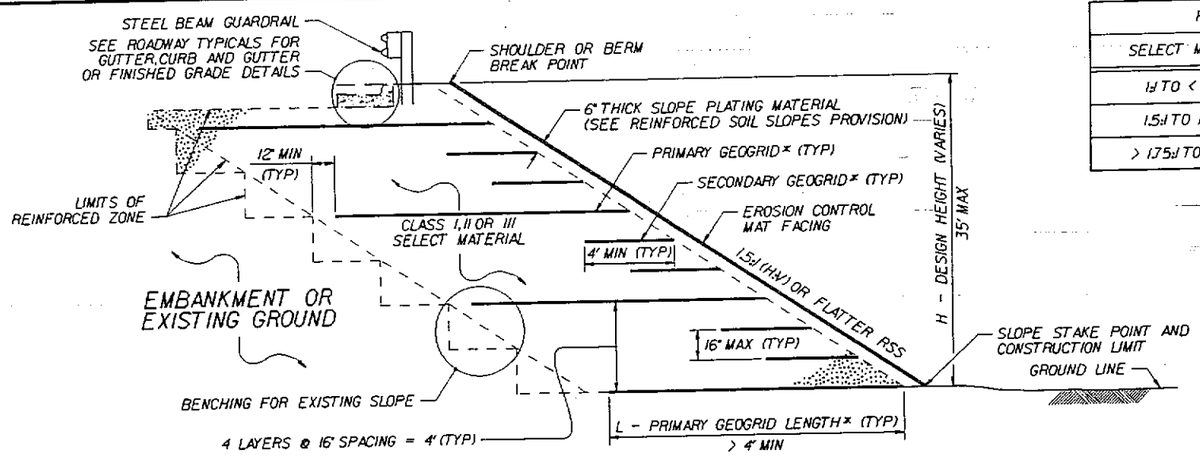
LOCATION:
CENTURY CENTER COMPLEX
ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

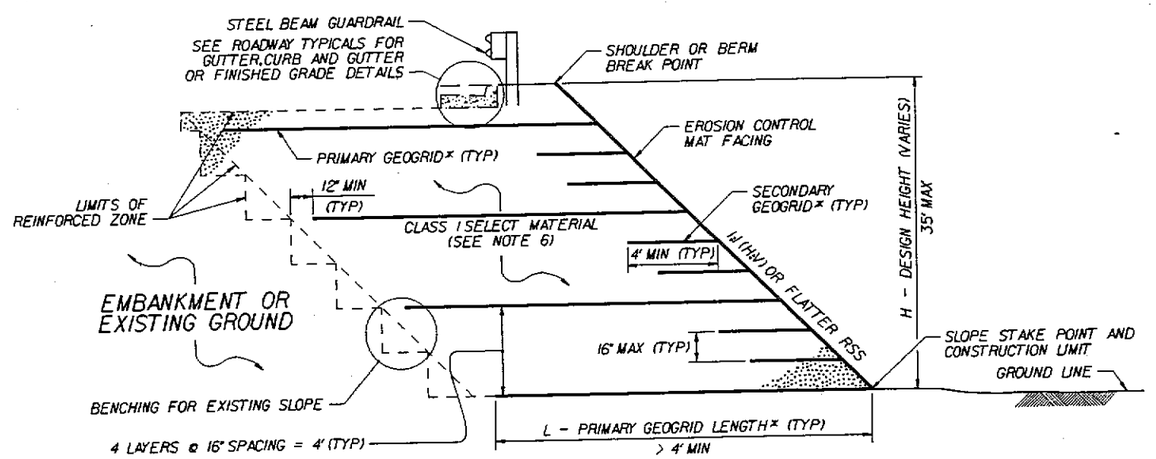
PROJECT REFERENCE NO.	SHEET

GEOTECHNICAL ENGINEER	ENGINEER
SIGNATURE DATE	SIGNATURE DATE



STANDARD RSS WITH SELECT MATERIAL THAT DOES NOT MEET ARTICLE 560-2 OF THE STANDARD SPECIFICATIONS

*SEE TABLES AND GEOGRID LAYOUT DETAILS.



STANDARD RSS WITH SELECT MATERIAL THAT MEETS ARTICLE 560-2 OF THE STANDARD SPECIFICATIONS

*SEE TABLES AND GEOGRID LAYOUT DETAILS.

H (FT)	0 - < 10		10 - 20		> 20 - 35	
SELECT MATERIAL CLASS	I	II OR III	I	II OR III	I	II OR III
1:1 TO < 1.5:1 (H:V) RSS	1.20	SEE NOTE 6	1.10	SEE NOTE 6	1.00	SEE NOTE 6
1.5:1 TO 1.75:1 (H:V) RSS	1.15	1.00	1.05	0.95	0.95	0.90
> 1.75:1 TO < 2:1 (H:V) RSS	1.10	0.75	1.00	0.70	0.90	0.65

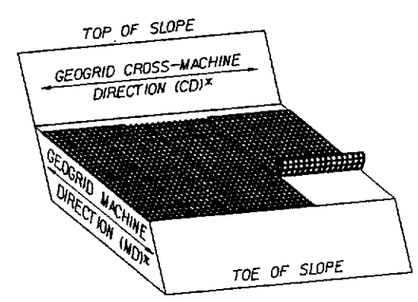
L/H RATIO (L > 4' MIN)

IF L ≤ 4', USE SECONDARY GEOGRID INSTEAD OF PRIMARY GEOGRID.

	H (FT)	0 - < 10		10 - 20		> 20 - 35	
	SELECT MATERIAL CLASS	I	II OR III	I	II OR III	I	II OR III
PRIMARY GEOGRID (SUBSTITUTE SECONDARY GEOGRID FOR PRIMARY GEOGRID FOR > 2:1 (H:V) RSS)	1:1 TO < 1.5:1 (H:V) RSS	2XT	SEE NOTE 6	3XT	SEE NOTE 6	5XT	SEE NOTE 6
		SG150		SG200		SG350	
		SF20		SF35		SF55	
		UX1100HS		UX1400HS		UX1500HS	
	1.5:1 TO 1.75:1 (H:V) RSS	2XT	2XT	3XT	2XT	3XT	2XT
		SG150	SG150	SG200	SG150	SG200	SG150
		SF20	SF20	SF35	SF20	SF35	SF20
		UX1100HS	UX1100HS	UX1400HS	UX1100HS	UX1400HS	UX1100HS
	> 1.75:1 TO < 2:1 (H:V) RSS	2XT	2XT	2XT	2XT	2XT	2XT
		SG150	SG150	SG150	SG150	SG150	SG150
		SF20	SF20	SF20	SF20	SF20	SF20
		UX1100HS	UX1100HS	UX1100HS	UX1100HS	UX1100HS	UX1100HS
SECONDARY GEOGRID	1:1 (H:V) OR FLATTER RSS	2XT					
		SG150					
		SF11					
		BX1100					

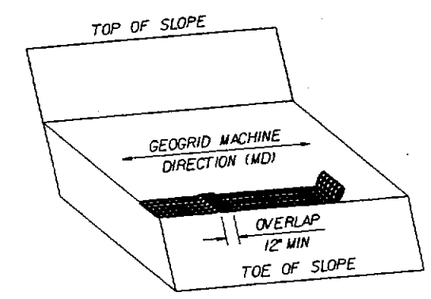
PRIMARY AND SECONDARY GEOGRIDS

#XT REFERS TO MIRAFI SERIES GEOGRID.
SG### REFERS TO STRATAGRID SERIES GEOGRID.
SF## REFERS TO SYNTEEN SERIES GEOGRID.
UX####HS AND BX#### REFER TO TENSAR SERIES GEOGRID.



PRIMARY GEOGRID LAYOUT

*SEE NOTES 7 AND 8.



SECONDARY GEOGRID LAYOUT

GEOGRID LAYOUT DETAILS

NOTES:

1. SEE ROADWAY PLANS FOR REINFORCED SOIL SLOPE (RSS) LOCATIONS.
2. FOR STANDARD REINFORCED SOIL SLOPES, SEE REINFORCED SOIL SLOPES PROVISION. FOR EROSION CONTROL MAT FACING, SEE PERMANENT SOIL REINFORCEMENT MAT PROVISION.
3. STANDARD RSS ARE BASED ON THE FOLLOWING IN-SITU ASSUMED SOIL PARAMETERS:
   UNIT WEIGHT, γ = 120 PCF
   FRICTION ANGLE, ϕ = 30 DEGREES
   COHESION, c = 0 PSF
4. DO NOT USE STANDARD RSS IF THE ASSUMED SOIL PARAMETERS ARE NOT APPLICABLE OR GROUNDWATER IS ABOVE EXISTING GROUND OR TOE OF SLOPE.
5. DO NOT USE STANDARD RSS WHEN VERY LOOSE OR SOFT SOIL OR MUCK IS BELOW RSS.
6. FOR 1:1 TO < 1.5:1 (H:V) RSS, USE CLASS I SELECT MATERIAL IN THE REINFORCED ZONE THAT MEETS ARTICLE 560-2 OF THE STANDARD SPECIFICATIONS EXCEPT FOR SELECT MATERIAL THAT MEETS AASHTO M 145 FOR SOIL CLASSIFICATIONS A-4 AND A-5. DO NOT USE A-4 OR A-5 SOIL OR CLASS II OR III SELECT MATERIAL FOR 1:1 TO < 1.5:1 (H:V) RSS.
7. EXCEPT FOR TENSAR UX GEOGRIDS, DO NOT SPLICE OR OVERLAP PRIMARY GEOGRIDS IN THE MACHINE DIRECTION (MD) SO THAT SPLICES OR OVERLAPS ARE PARALLEL TO THE TOE OF SLOPE. TENSAR UX GEOGRIDS MAY BE SPLICED ONCE PER PRIMARY GEOGRID LENGTH IN ACCORDANCE WITH TENSAR'S RECOMMENDED CONNECTION DETAIL. A LENGTH OF AT LEAST 4' IS REQUIRED FOR EACH TENSAR UX GEOGRID PIECE.
8. EXCEPT FOR TENSAR UX GEOGRIDS, PLACE PRIMARY GEOGRIDS SO THAT GEOGRIDS ARE ADJACENT TO EACH OTHER IN THE CROSS-MACHINE DIRECTION (CD). TENSAR UX GEOGRIDS MAY BE PLACED WITH A MAXIMUM SPACING BETWEEN GEOGRIDS OF 1.64' IN THE CD. STAGGER TENSAR UX GEOGRIDS SO THAT GEOGRIDS ARE CENTERED OVER GAPS IN THE PRIMARY GEOGRID LAYER BELOW.
9. DO NOT PLACE FIRST PRIMARY GEOGRID LAYER UNTIL EXCAVATION DIMENSIONS AND IN-SITU MATERIAL ARE APPROVED.

GEOTECHNICAL ENGINEERING UNIT

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH

STANDARD DRAWING NO. 1803.01

STANDARD REINFORCED SOIL SLOPE (RSS)

DATE: 8-21-11