

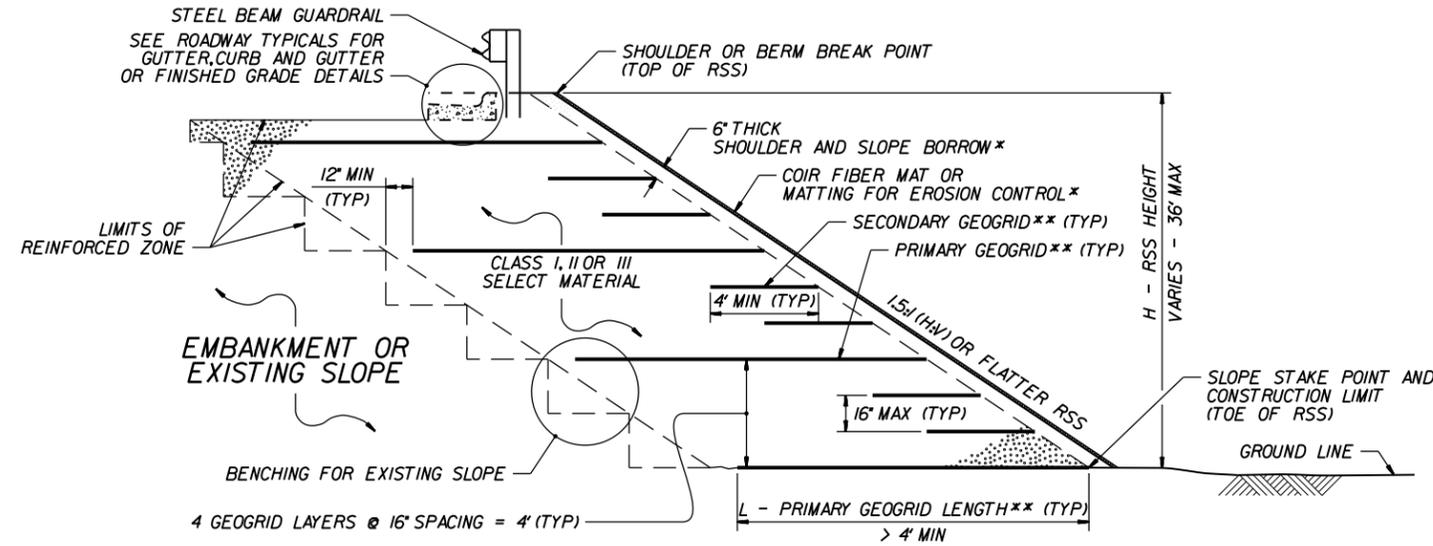
GEOTECHNICAL ENGINEER



ENGINEER

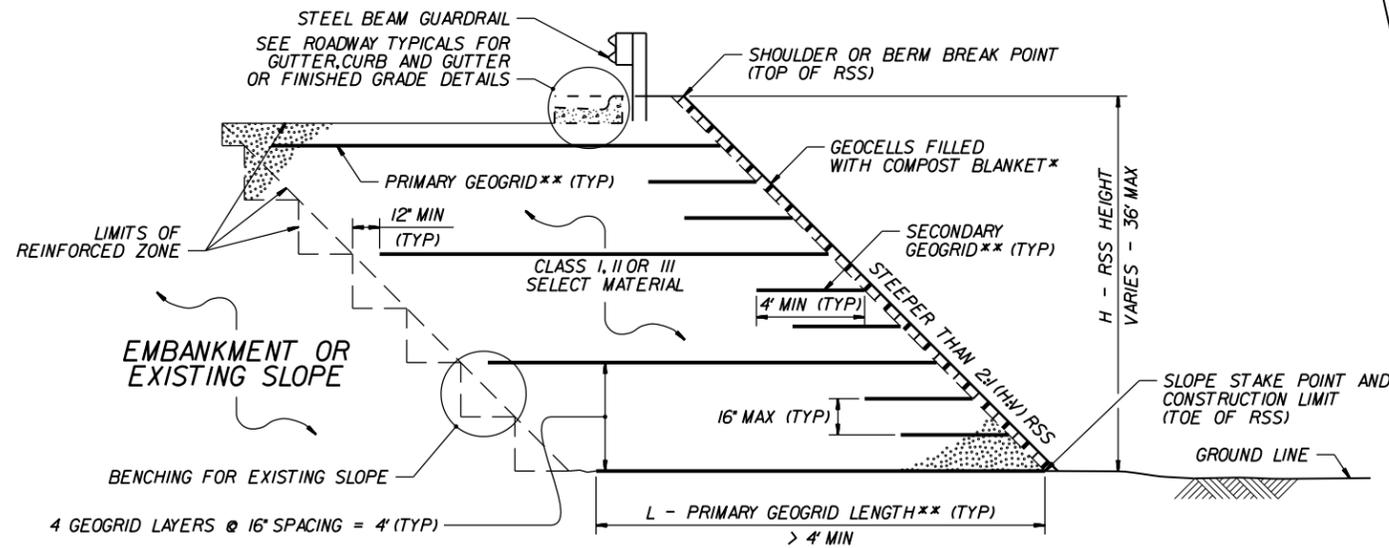
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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



MATTING WITH SHOULDER AND SLOPE BORROW

*SEE NOTES 3 AND 11 ON SHEET 2.

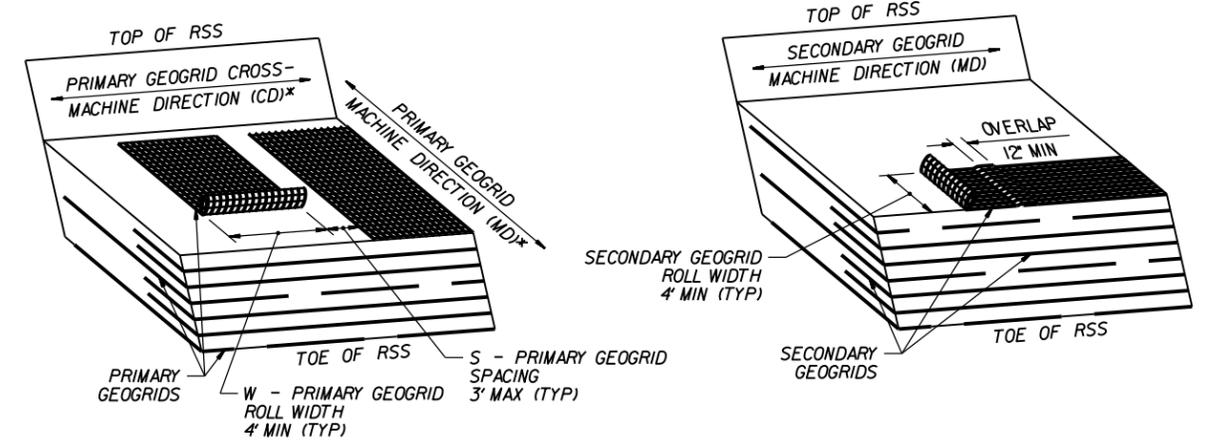


GEOCELLS WITH COMPOST BLANKET

*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

$$(\% \text{ COVERAGE}) = \frac{W}{W+S} \times 100 \geq 75\%$$

*SEE NOTES 8 AND 9 ON SHEET 2.



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 1 OF 2

| GEOGRID TYPE, DIRECTION | H (FT) | 0 - < 12 | | 12 - 24 | | > 24 - 36 | |
|--|----------------------------|----------|-----------|---------|-----------|-----------|-----------|
| | SELECT MATERIAL CLASS | I | II OR III | I | II OR III | I | II OR III |
| PRIMARY GEOGRID, MD (SUBSTITUTE SECONDARY GEOGRID FOR PRIMARY GEOGRID FOR 2:1 (HV) OR FLATTER RSS) | 1:1 TO < 1.5:1 (HV) RSS | 900 | 500 | 1200 | 900 | 1800 | 1200 |
| | 1.5:1 TO 1.75:1 (HV) RSS | 500 | 500 | 900 | 500 | 1400 | 1000 |
| | > 1.75:1 TO < 2:1 (HV) RSS | 500 | 500 | 600 | 500 | 1000 | 800 |
| SECONDARY GEOGRID, CD | 1:1 (HV) OR FLATTER RSS | 185 | | | | | |

| | |
|---|----------------------------|
|  GEOTECHNICAL ENGINEER SEAL PE # ENGINEER SEAL NAME | ENGINEER |
| SIGNATURE _____ DATE _____ | SIGNATURE _____ DATE _____ |
| DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED | |

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

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

NOTES:

- SEE EROSION CONTROL AND ROADWAY PLANS AND SUMMARY SHEETS FOR REINFORCED SOIL SLOPE (RSS) AND SLOPE EROSION CONTROL LOCATIONS.
- 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 1019-2 OF THE STANDARD SPECIFICATIONS. FOR GEOCELLS, SEE CELLULAR CONFINEMENT SYSTEMS PROVISION. FOR COIR FIBER MAT, MATTING FOR EROSION CONTROL AND COMPOST BLANKET, SEE EROSION CONTROL PROVISIONS, SECTION 1631 OF THE STANDARD SPECIFICATIONS AND ROADWAY STANDARD DRAWING NO. 1633.01.
- STANDARD RSS ARE BASED ON THE FOLLOWING IN-SITU ASSUMED SOIL PARAMETERS:
UNIT WEIGHT, $\gamma = 120$ LB/CF
FRICTION ANGLE, $\phi = 30$ DEGREES
COHESION, $c = 0$ LB/SF
- DO NOT USE STANDARD RSS IF ASSUMED SOIL PARAMETERS ARE NOT APPLICABLE OR GROUNDWATER IS ABOVE TOE OF RSS.
- DO NOT USE STANDARD RSS WHEN VERY LOOSE OR SOFT SOIL OR MUCK IS BELOW RSS.
- GEOGRIDS 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 GEOGRIDS WITH DESIGN STRENGTHS IS AVAILABLE FROM:
connect.ncdot.gov/resources/Materials/Pages/SoilsLaboratory.aspx
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 GEOGRID IN THE MD, DO NOT USE THE GEOGRID FOR PRIMARY GEOGRID. IF THE WEBSITE DOES NOT LIST A LONG-TERM DESIGN STRENGTH FOR AN APPROVED GEOGRID IN THE CD, USE A LONG-TERM DESIGN STRENGTH EQUAL TO THE ULTIMATE TENSILE STRENGTH DIVIDED BY 7 FOR THE SECONDARY GEOGRID.
- DO NOT OVERLAP PRIMARY GEOGRIDS IN THE MD SO OVERLAPS ARE PARALLEL TO THE TOE OF RSS. POLYOLEFIN (e.g., HDPE OR PP) GEOGRIDS MAY BE SPLICED ONCE PER PRIMARY GEOGRID LENGTH IN ACCORDANCE WITH THE GEOGRID MANUFACTURER'S INSTRUCTIONS. USE POLYOLEFIN GEOGRID PIECES AT LEAST 4' LONG. DO NOT SPLICE POLYESTER TYPE (PET) GEOGRIDS.
 - FOR PRIMARY GEOGRIDS WITH 100% COVERAGE, PLACE PRIMARY GEOGRIDS SO GEOGRIDS ARE ADJACENT TO EACH OTHER IN THE CD. FOR PRIMARY GEOGRIDS WITH 75% TO LESS THAN 100% COVERAGE,

$$\text{MINIMUM REQUIRED LONG-TERM DESIGN STRENGTH} = \text{LTDS BASED ON 100\% COVERAGE} \times (W + S) / W$$
 SEE TABLE FOR LTDS BASED ON 100% COVERAGE AND GEOGRID PLACEMENT DETAILS FOR PRIMARY GEOGRID ROLL WIDTH (W) AND SPACING (S). FOR PRIMARY GEOGRIDS WITH LESS THAN 100% COVERAGE, STAGGER PRIMARY GEOGRIDS SO GEOGRIDS ARE CENTERED OVER GAPS IN THE PRIMARY GEOGRID LAYER BELOW. DO NOT USE LESS THAN 75% COVERAGE FOR PRIMARY GEOGRIDS.
 - DO NOT PLACE ANY GEOGRIDS UNTIL EXCAVATION DIMENSIONS AND IN-SITU MATERIAL ARE APPROVED.
 - FOR SLOPE EROSION CONTROL, USE GEOCELLS OR MATTING ON SLOPE FACES OF RSS AS FOLLOWS:

| RSS ANGLE | SLOPE EROSION CONTROL |
|---------------------|---|
| 1:1 TO < 1.5:1 (HV) | GEOCELLS WITH COMPOST BLANKET |
| 1.5:1 TO < 2:1 (HV) | GEOCELLS WITH COMPOST BLANKET OR COIR FIBER MAT WITH SHOULDER AND SLOPE BORROW* |
| 2:1 (HV) OR FLATTER | MATTING FOR EROSION CONTROL WITH SHOULDER AND SLOPE BORROW |

*SEE REINFORCED SOIL SLOPES AND SLOPE EROSION CONTROL SUMMARY TABLE IN THE ROADWAY SUMMARY SHEETS FOR SLOPE EROSION CONTROL ON SLOPE FACES OF RSS 1.5:1 (HV) TO STEEPER THAN 2:1.

| H (FT) | 0 - < 12 | | 12 - 24 | | > 24 - 36 | |
|----------------------------|----------|-----------|---------|-----------|-----------|-----------|
| SELECT MATERIAL CLASS | I | II OR III | I | II OR III | I | II OR III |
| 1:1 TO < 1.5:1 (HV) RSS | 1.25 | 1.20 | 1.15 | 1.10 | 1.10 | 1.00 |
| 1.5:1 TO 1.75:1 (HV) RSS | 1.10 | 1.00 | 0.95 | 0.90 | 0.90 | 0.85 |
| > 1.75:1 TO < 2:1 (HV) RSS | 1.00 | 0.85 | 0.80 | 0.75 | 0.75 | 0.70 |

L/H RATIO (L > 4' MIN)
(IF $L \leq 4'$, USE SECONDARY GEOGRID
INSTEAD OF PRIMARY GEOGRID.)



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**GEOTECHNICAL
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STANDARD DETAIL NO. 1803.01

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