

STATE

OF

TENNESSEE

(Rev. 10-10-16)

January 1, 2021

SPECIAL PROVISION REGARDING
REINFORCED SOIL SLOPES

General Requirements

This work shall consist of constructing a reinforced soil slope in accordance with the Contract Documents and as directed by the Engineer. This work involves preparation of the site, placement of geogrid and proper compaction of specified backfill as detailed in this specification, on the plans, and as directed by the Engineer.

The Contractor shall provide all labor, equipment, and materials necessary for, and incidental to, site preparation, furnishing, installing, and backfilling geogrid reinforcement as indicated.

Definitions of Terms and Abbreviations

Geogrid – A polymer grid structure specifically manufactured for use as soil reinforcement.

Uniaxial grid – A geogrid which has been manufactured with high tensile strength and modulus in one direction.

Direction of reinforcement – Refers to the orientation that the geogrid is used for a particular project, which is along the machine direction (roll direction) for uniaxial geogrid.

MD – Machine Direction

CMD – Cross-Machine Direction

Material Specifications

Geogrids shall be new, clean, and in accordance with material specifications. In no instance shall second-hand, previously used, salvaged, or damaged materials be used.

Materials shall be a product from Qualified Products List 36, Section C: Geogrids for Reinforced Soils Slopes, as listed at the time of the project letting. The Product shall be listed as Type 1, Type 2, Type 3, or Type 4 as required by the project plans.

a) Geogrid Strength Classification:

Geogrid Reinforcement	T _{al} – Long Term Tensile Strength (lb/ft)
Type 1	≥ 1000
Type 2	≥ 2400
Type 3	≥ 3300
Type 4	≥ 4200

The Long Term Tensile Strength, T_{al} , is determined using the National Transportation Product Evaluation Program's (NTPEP) geosynthetics reinforcement testing for specific geogrid products. The NTPEP verified Ultimate Tensile Strength, T_{ult} , is related to T_{al} by the following equation:

$$T_{al} = T_{ult} / (RF_{ID} \times RF_{CR} \times RD_D)$$

Where: RF_{ID} = Reduction factor for installation damage provided by NTPEP for Type 2 soil backfill. The minimum permitted value is 1.1

RF_{CR} = Reduction factor for creep deformation provided by NTPEP.

RD_D = Reduction factor for durability. The geogrid product must meet the minimum durability test results criteria outlined in NTPEP in order to allow for the use of a default reduction factor for durability. The minimum permitted value is 1.3.

b) Product Identification:

Each roll shall be plainly and permanently marked with the following information:

1. Name or trademark of manufacturer
2. Date of manufacture
3. Product identification

The Contractor shall supply data for each roll of material documenting that the strength and elongation at yield and break comply with the product specifications.

c) Submittals:

Product data and certifications shall be submitted in accordance with TDOT Standard Specifications 921.12.

Submit a 2.0 ft by 2.0 ft sample of each type of geogrid proposed. Samples shall be taken from materials delivered to the project site.

d) Product Delivery, Storage, and Handling

Contractor shall deliver sufficient materials to the site to prevent interruption of the work. Contractor shall inspect all materials upon delivery. Contractor shall notify the Engineer, and vice versa, of any damage. Damaged-materials shall be returned and replaced at no cost to the State. Geogrid shall be stored above 0°C. Contractor shall prevent mud, wet cement, epoxy, and similar materials which may affix themselves to the grid, from coming into contact with the geogrid material. Rolled geogrid material shall be laid flat or stood on edge for storage. Geogrid shall be kept covered with protective wrapping until ready for use.

Geogrid shall be handled carefully with approved handling devices in strict conformance with the manufacturer's recommendations. Products shall not be dropped or rolled off trucks, nor shall products be otherwise dragged, rolled, or skidded.

e) Material Specifications

Geogrid shall be regular grid structure with uniform grid openings. The geogrid shall have high resistance to deformation under sustained long-term design load while in service and shall be resistant

to damage under normal construction practices and all forms of biological or chemical degradation normally encountered in the reinforced zone.

- f) Refer to Soils Sheet, Reinforced Soil Slopes, Table “Required RSS Backfill Material”, for required fill properties.
- g) Where specified on the plans sheets, facing treatment such as stone fill, erosion control blankets, or special vegetation may be required.

Installation

The contractor shall provide an on-site representative for consultation from the geogrid supplier or manufacturer for a minimum of three days at the start of the geogrid installation. If there are multiple installation sites, on-site supplier or manufacturer representative shall only be required for the first installation.

The Contractor shall be responsible for storage, handling and installation of all geogrids in accordance with specifications and the manufacturer’s recommendations.

Contractor shall confirm that the as-built geometries for the reinforced soil slope conform to the approximate geometries shown on the construction drawings and to the direction of the Engineer.

All areas immediately beneath the installation area for the geogrid shall be properly prepared as detailed on the Plans, as specified within these provisions, and as directed by the Engineer. Subgrade surface shall be level and free from deleterious material and loose, or otherwise unsuitable material. Foundation surface shall be inspected and approved by the Engineer prior to fill placement. Any soft or unsuitable areas, as determined by the Engineer, shall be excavated and replaced with suitable compacted soils. Where reinforced soil slopes will be against an existing slope or new cut, pre-benching shall be required in the existing or newly cut slope.

Geogrid Placement: The geogrid shall be installed in accordance with the Contract Plans.

The geogrid shall be placed within layers of the compacted soil as shown on the Plans or as directed by the Engineer. The geogrid shall be placed in continuous longitudinal strips in the direction of the main reinforcement. Horizontal coverage of less than 100 percent shall not be allowed unless specifically detailed on the plans.

Place only that amount of geogrid required pending work to prevent undue damage. After a layer of geogrid has been placed in its entirety, the next succeeding layer of soil shall be placed in its entirety and compacted. After the specified layer has been placed in its entirety, the next geogrid layer shall be installed in its entirety. The process shall be repeated for each subsequent layer of geogrid and soil.

Geogrid reinforcement shall be placed to lay flat and pulled tight prior to backfilling. After a layer of geogrid has been placed, suitable means, such as pins or small piles of soil, shall be used to hold geogrid in position until the subsequent soil layer can be placed. Under no circumstances shall a track-type vehicle be allowed on the geogrid before at least 6 inches of backfill has been placed.

During construction, the surface of the fill shall be kept horizontal. Geogrid shall be placed directly on the compacted horizontal fill surface. Geogrids are to be placed within 1 in of the design spacing and extend the length as shown on the Contract Plans, unless otherwise directed

by the Engineer. The Contractor shall verify correct orientation of the geogrid.

Backfill Placement: Replace any damaged geosynthetic prior to placement of any overlying material at no cost to the State. Backfill shall be placed and compacted as specified by TDOT Standard Specifications or to at least 95 percent of the maximum density determined in accordance with AASHTO-T99, whichever is greater. Backfill within 3 feet of the slope face shall be compacted with hand equipment or lightweight equipment. Under no circumstances will lesser compaction of soil near the slope face be allowed.

Backfill shall be graded away from the slope crest and rolled at the end of each workday to prevent ponding of water on the reinforced soil mass. Site shall be maintained to prevent the flow of water from overtopping slope crest during construction and after completion of slope. Slope face shall be trimmed such that geogrid reinforcement extends (daylights) to the slope surface.

Turning of tracked vehicles shall be kept to a minimum to prevent tracks from displacing the fill and the geogrid. Rubber-tired equipment may pass over the geogrid reinforcement at slow speeds, less than 10 mi/hr. Sudden braking and sharp turning shall be avoided.

In-place density testing and approval shall be in accordance with TDOT Standard Specifications and with appropriate Division of Materials and Tests Standard Operating Procedures.

Quantities

Geogrid shall be measured on a square yard basis and is computed on the total area of geogrid reinforcement shown on the construction drawings, exclusive of any overlap areas. Overlaps of geogrid are an incidental item.

Payment will be made under:

Item No.	Description	Pay Units
205-02.01	RSS BACKFILL MATERIAL	C.Y.
740-07.03	GEOGRID REINFORCEMENT TYPE 1	S.Y.
740-07.04	GEOGRID REINFORCEMENT TYPE 2	S.Y.
740-07.05	GEOGRID REINFORCEMENT TYPE 3	S.Y.
740-07.06	GEOGRID REINFORCEMENT TYPE 4	S.Y.