

214-R-609 GEOGRID AND GEOGRID MATERIALS

(Adopted 12-20-12)

The Standard Specifications are revised as follows:

SECTION 207, BEGIN LINE 19, DELETE AND INSERT AS FOLLOWS:

Geogrid, Type ~~IB~~918.05(a)

SECTION 207, BEGIN LINE 114, DELETE AND INSERT AS FOLLOWS:

Type IV. ~~9/2 in. (225 mm)~~ of the subgrade excavated and replaced with coarse aggregate No. 53 on *Type IB* geogrid.

SECTION 214, BEGIN LINE 3, DELETE AND INSERT AS FOLLOWS:

214.01 Description

This work shall consist of furnishing and installing geogrid as shown on the plans *or as directed by the Engineer* and in accordance with 105.03.

MATERIALS

214.02 Materials

Materials shall be in accordance with 918.05.

CONSTRUCTION REQUIREMENTS

214.03 Foundation Preparation

The embankment foundation shall be cleared and grubbed in accordance with 201 and excavated using lightweight equipment to minimize disturbance of the embankment foundation *surface* soils. Construction activities using equipment which cause pumping and rutting of the embankment foundation soils shall be prevented where possible ~~or~~ *and shall* otherwise *be* minimized. Fine grading may be waived where impractical. However, when very soft soil is encountered, the embankment foundation shall be cleared of all trash and rubbish materials without disturbing the vegetation cover *or root mat*. The embankment foundation shall be subject to approval prior to placement of geogrid. Proofrolling of the embankment foundation will not be required *when geogrid is used in construction of embankment foundation treatment*.

214.04 Geogrid Placement

The geogrid shall be installed in accordance with the *Engineer's designs and/or* manufacturer's recommendations ~~with excess geogrid being removed. The Contractor may turn the excess portion of the geogrid into the fill layer as an alternative to removal, provided an acceptable installation is obtained.~~ The geogrid shall be kept taut during placement of the initial lift of backfill. Installation ~~may~~ *shall* require the use of stakes, staples, sandbags, pile of granular fill, or other approved means to hold the geogrid in place during fill placement operations. *Type IA geogrid shall be used for embankment foundation treatment. Type IB geogrid shall be used for subgrade treatment, Type IV. When placing Type IA geogrid, any rutting in the granular material shall not exceed 3 in. The Engineer may increase the lift thickness to obtain stability of the granular material.*

If required by the Engineer, The geogrid material supplier shall provide a qualified manufacturer's representative on the contract site at the start of the work to assist the Contractor. The representative shall also be available during the construction when required by the Engineer or the Contractor. ~~A copy of the manual for the installation shall be furnished to the Engineer.~~

When Type IB geogrid is used, proofrolling shall be performed prior to placing the Type IB geogrid. The first 6 in. of coarse aggregate No. 53 shall be spread and compacted with a 10 t roller in static mode. The spreading and compaction of the aggregate shall be performed so that adequate interlocking of the aggregate and geogrid is obtained. The second 6 in. of coarse aggregate No. 53 shall be constructed in accordance with 301.

The Geogrid shall be overlapped a minimum of 2 ft ~~(0.6m)~~ side to side and end to end for Type IB, and only end to end for type II. The Type IA geogrids shall be overlapped 3 ft ~~(0.9 m)~~ in areas where foundation conditions cannot support foot traffic or where 2 ft ~~(0.6m)~~ is found to be inadequate during fill placement. Overlaps shall be oriented in the direction of fill placement, or shingled, to prevent advancing fill from lifting any the geogrid roll edges. Overlaps shall be further secured to prevent separation during fill placement. Damaged geogrid shall be patched. Patching shall include placement of a minimum of 3 ft ~~(0.9m)~~ of overlapped geogrid beyond the damaged area. If the damaged portion extends for more than 50% of the roll in the width direction, the entire width shall be replaced.

Geogrid shall be covered with fill within 3 calendar days after placement. Only the amount of geogrid required for pending work shall be placed to minimize exposure of the geogrid.

214.05 Fill Placement

Construction vehicles shall not be permitted on the geogrid. The placement of the fill shall proceed forward along the roadway centerline and outward to the embankment edges and compacted in accordance with 203.23. The Engineer may waive density requirements for the 1st lift of *embankment foundation treatment* if the fill is determined to be too ~~soft~~ weak to support compaction equipment.

214.06 Method of Measurement

Geogrid will be measured by the square yard ~~(square meter)~~, for the type specified. The quantity will be computed based on the total area of geogrid shown on the plans, exclusive of the area of overlaps. *The aggregate used for the embankment foundation improvement will be measured in accordance with 301. ~~The portion of geogrid cut off or turned up into backfill layer will not be measured for payment. The geogrid reinforced subgrade shall be measured in accordance with 207.~~*

214.07 Basis of Payment

The accepted quantities of geogrid will be paid for at the contract unit price per square yard ~~(square meter)~~ per type of geogrid. *The aggregates will be paid for in accordance with 301. The geogrid reinforced subgrade shall be paid for in accordance with 207.*

Payment will be made under:

Pay Item

Pay Unit Symbol

Geogrid, _____ type SYS (m2)

The cost of furnishing the materials, manufacturer's representative, all labor and equipment required for furnishing and placing the geogrid, all work necessary to establish grades, geogrid splices, overlaps, stakes or pins, supplemental product test data, and patching or replacement of damaged geogrid shall be included in the cost of this work.

SECTION 918, BEGIN LINE 81, DELETE AND INSERT AS FOLLOWS:

918.05 Geogrid

Geogrid shall be ~~an~~biaxial or multi axial of a regular network of ~~in-integrally~~ connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding material. *The material shall be polypropylene, ASTM D 4101 (97% minimum) and Carbon Black, ASTM D 1603 (0.5% minimum).* The geogrid structure shall be dimensionally stable and shall be able to retain its geometry under construction stresses. The geogrid structure shall have a resistance to damage during construction, ultraviolet degradation, and all forms of chemical and biological degradation encountered in the soil being placed ~~on~~.

Geogrid shall be in accordance with the property requirements as specified in the Geosynthetic Research Institute, *GRI*, Standard Test Methods GG1, GG3, GG4, ~~and~~ ASTM D 5262, *and ASTM D 6637*.

During periods of shipment and storage, the geogrid shall be protected from temperatures greater than 140°F (~~60°C~~), mud, dirt, dust, and debris. Each geogrid roll shall be labeled or tagged to provide product identification. The manufacturer's recommendations shall be followed with regard to protection from direct sunlight. At the time of installation, the geogrid will be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. All damaged portions of geogrid *shall be replaced* for the entire width of the roll ~~shall be replaced~~. *All of the geogrid shall meet the requirements of ASTM D 4873. The Contractor shall furnish the product labels that clearly show the manufacturer's or supplier's name, product identification, lot number, manufactured date, roll dimension and provide a document that the material is in accordance with manufacturer's or supplier's certificate.*

Only geogrids selected from the Department's list of approved Geogrids shall be used. Geogrids will be placed and maintained on the Department's list in accordance with ITM 806, procedure ~~CS~~. ~~No relabeled materials will be considered for approval. A specified material shown on the approved list will not be listed under more than 1 name.~~

The geogrid shall be in accordance with the property requirements for the type specified as follows.

(a) Type IA and Type IB

PROPERTY	TEST METHOD	UNIT	Type IA VALUE, Min.	Type IB VALUE Min.
Aperture Area	Calibered	Sq in. (mm)	0.5 by 0.5 1.3 (13 by 13)	1.3
Open Area	COE, CW02215	percent	> 50.0, ≤ 80.0	> 50.0 ≤ 80.0
Junction Strength	ASTM D 7737	lbs/ft	-----	788
Tensile Modulus, machine direction	ASTM D 6637 ^{1,2,3}	lb/ft (N/m)	10,000-(146,000)	10,000
cross-machine direction		lb/ft (N/m)	10,000-(146,000)	10,000
Ultimate Strength, machine direction	ASTM D 6637 ^{2,3}	lb/ft (N/m)	800-(11,670)	800
cross-machine direction		lb/ft (N/m)	800-(11,670)	800
Ultraviolet Stability	ASTM D 4355	-----	-----	70% at 500 hrs
1. Secant modulus at 5% elongation. 2. Results for machine direction, MD, and cross machine direction, CMD, are required. 3. Minimum average roll values shall be in accordance with ASTM D 4759.				

(b) Type II

PROPERTY	TEST METHOD	UNIT	VALUE, Min.
Open Area	COE, CW02215	percent	> 50.0, ≤ 80.0
Tensile Modulus, machine direction	ASTM D 6637 ^{1,2}	lb/ft (N/m)	49,300-(720,000)
Ultraviolet Stability	ASTM D 4355	70% at 500 hrs	
Creep Limited Strength, machine direction at 5% strain	ASTM D 5262	lb/ft (N/m)	1,090-(16,000)
1. Secant modulus at 2% elongation. 2. Minimum average roll values shall be in accordance with ASTM D 4759.			

(c) Type III

Geogrid material shall be of high-density polyethylene, HDPE; polypropylene, PP; or polyester, PET, polymers and have the following properties.

PROPERTY	TEST METHOD	UNIT	VALUE Min.
Open Area	COE, CW02215	percent	> 50.0 ≤ 80.0
Ultraviolet Stability	ASTM D 4355	70% at 500 hrs	
Ultimate Strength, machine direction	ASTM D 6637	lb/ft	1,500
Long-Term Design Strength, Allowable, LTDS, machine direction	GRI-GG4	lb/ft	1,000*
* Minimum Average Roll Value, MARV: Property value calculated as average minus two standard deviations. $LTDS = \frac{T_{ult}}{(RF_{CR})(RF_{IR})(RF_D)}$ <p>Where:</p> <p>T_{ult} = Ultimate strength RF_{CR} = Reduction factor for creep RF_{IR} = Reduction factor for installation damage RF_D = Reduction factor for durability</p>			

The minimum reduction factors are as follows:

$RF_{CR} = 2.6$ for HDPE, 4.0 for PP, 1.6 for PET

$RF_{IR} = 1.10$

$RF_D = 1.10$
