February 8, 2017

SPECIAL PROVISIONS
FOR
SECTION 604-D: GEOGRID BASE REINFORCEMENT

The 2014 Edition of the New Mexico Department of Transportation Standard Specifications for Highway and Bridge Construction shall apply in addition to the following:

1.0 GENERAL

1.1 DESCRIPTION

This work shall consist of furnishing and placement of Type 2 Geogrid base reinforcement, unless otherwise specified. Place geogrid at the bottom of the base course section; to the lines, grades, dimensions, details and locations in the Contract, and as per manufacturers recommendations. The Project Manager will have final approval of the installation.

1.2 SUBMITTALS

A. Submit geogrid product sample approximately 4 inches by 7 inches or larger. Refer to ASTM D 4354.

B. Submit geogrid product data sheet and certification from the Manufacturer that the geogrid product supplied meets the requirements of Section 2, Tables I through III. The supplied geogrid must meet the type as designated on the project documents.

C. Submit Manufacturer's installation instructions and general recommendations.

1.3 DELIVERY STORAGE AND HANDLING

A. Storage and Protection
   1. The contractor shall check the geogrid upon delivery to assure the proper material has been received.
   2. Prevent excessive mud, wet concrete, epoxy, or other deleterious materials from coming in contact with and affixing to the geogrid materials.
   3. Store at temperatures above -20 degrees F (-29 degrees C).
   4. Rolled materials may be laid flat or stood on end.
   5. Do not expose geogrid materials to direct sunlight for a period longer than recommended by the manufacturer.

1.4 ACCEPTANCE

The Department rejects geogrid at installation if it does not meet the specified Type (Type 1 through 3) as indicated on the project documents, has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transport, handling or storage.

2.0 MATERIALS.

2.1 Geogrid Base Reinforcement. The geogrid shall be a grid structure consisting of a continuous sheet of polypropylene material that is "punched and stretched" to create an integrally formed grid structure with a high tensile modulus, open apertures (rectangular or triangular), and thick ribs and junctions to permit significant mechanical interlock with the material being reinforced and with continuity of tensile strength through all ribs and junctions of the structure. The geogrid shall maintain its reinforcement and interlock capabilities under repeated dynamic loads while in service and shall also be resistant to ultraviolet degradation, to damage under normal construction practices and to all forms of biological or chemical degradation normally encountered in the material being reinforced.

The geogrid shall also conform in all respects to the property requirements listed in Table I through Table III:

Table I

Type 1 Geogrid				
Property	**Test Method**	**Units**	**Geogrid Requirements[1]**	
Geogrid Type	Observed	n/a	Punched and Drawn Polypropylene	
Rib Shape	Observed	n/a	Rectangular	
UV Resistance @ 500 hours	ASTM D4355	%	70	
Chemical Resistance	EPA 9090 Emersion Testing	%	100	
Junction Efficiency[2]	ASTM D7737 Method A	%	93	
Aperture Shape	Observed	n/a	Rectangular	Equilateral Triangular
Ribs Per Junction	Observed	n/a	4	6
Aperture Size (nominal)	Calipered	In	1.0 x 1.3[3]	1.3[4]
Radial Stiffness @ 0.5% Strain[5]	ASTM D6637	lb/ft	-	13,700
Isotropic Stiffness Ratio[6]	ASTM D6637	Unitless	-	0.60
Torsional Rigidity @ 20 kg-cm	GRI-GG9	m-N/deg	0.32	-
Flexural Rigidity	ASTM D7748	mg-cm	250,000	-
Tensile Strength at 2% Strain	ASTM D6637	lb/ft	280 x 450[3]	-
Ultimate Tensile Strength	ASTM D6637	lb/ft	850 x 1300[3]	-

Notes:

1. Minimum Average Roll Values (MARVs) determined in accordance with ASTM 4759, unless indicated otherwise.
2. Load transfer capability expressed as a percentage of ultimate rib tensile strength in the same direction as the juntion test (determined in accordance with ASTM D6637)
3. Machine Direction (MD) x Cross Machine Direction (XD)
4. Determined by measuring the spacing between sets of parallel ribs (i.e. the “rib patch”) in any direction.
5. ASTM D6637 Method B with a 2 aperture gage length tested in all “rib” and “mid-rib” directions. The radial stiffness is computed as the minimum measured modulus at 0.5% strain for each of the forementioned directions.
6. Minimum measured radial stiffness at 0.5% strain divided by the maximum measured radial stiffness at 0.5% strain.

Table II

Type 2 Geogrid				
Property	**Test Method**	**Units**	**Geogrid Requirements[1]**	
Geogrid Type	Observed	n/a	Punched and Drawn Polypropylene	
Rib Shape	Observed	n/a	Rectangular	
UV Resistance @ 500 hours	ASTM D4355	%	70	
Chemical Resistance	EPA 9090 Emersion Testing	%	100	
Junction Efficiency[2]	ASTM D7737 Method A	%	93	
Aperture Shape	Observed	n/a	Rectangular	Equilateral Triangular
Ribs Per Junction	Observed	n/a	4	6
Aperture Size (nominal)	Calipered	In	1.0 x 1.3[3]	1.6[4]
Radial Stiffness @ 0.5% Strain[5]	ASTM D6637	Lb/ft	-	15,400
Isotropic Stiffness Ratio[6]	ASTM D6637	Unitless	-	0.6
Torsional Rigidity @ 20 kg-cm	GRI-GG9	m-N/deg	0.65	-
Flexural Rigidity	ASTM D7748	mg-cm	750,000	-
Tensile Strength at 2% Strain	ASTM D6637	lb/ft	410 x 620[3]	-
Ultimate Tensile Strength	ASTM D6637	lb/ft	1310 x 1970[3]	-

Notes:

1. Minimum Average Roll Values (MARVs) determined in accordance with ASTM 4759, unless indicated otherwise.
2. Load transfer capability expressed as a percentage of ultimate rib tensile strength in the same direction as the juntion test (determined in accordance with ASTM D6637)
3. Machine Direction (MD) x Cross Machine Direction (XD)
4. Determined by measuring the spacing between sets of parallel ribs (i.e. the “rib patch”) in any direction.
5. ASTM D6637 Method B with a 2 aperture gage length tested in all “rib” and “mid-rib” directions. The radial stiffness is computed as the minimum measured modulus at 0.5% strain for each of the forementioned directions.
6. Minimum measured radial stiffness at 0.5% strain divided by the maximum measured radial stiffness at 0.5% strain.

Table III

Type 3 Geogrid			
Property	**Test Method**	**Units**	**Geogrid Requirements[1]**
Geogrid Type	Observed	n/a	Punched and Drawn Polypropylene
Rib Shape	Observed	n/a	Rectangular
UV Resistance @ 500 hours	ASTM D4355	%	70
Chemical Resistance	EPA 9090 Emersion Testing	%	100
Junction Efficiency[2]	ASTM D7737 Method A	%	93
Aperture Shape	Observed	n/a	Equilateral Triangular
Ribs Per Junction	Observed	n/a	6
Aperture Size (nominal)[3]	Calipered	in	1.6
Radial Stiffness @ 0.5% Strain[4]	ASTM D6637	lb/ft	20,580
Isotropic Stiffness Ratio[5]	ASTM D6637	unitless	0.6

Notes:
1. Minimum Average Roll Values (MARVs) determined in accordance with ASTM 4759, unless indicated otherwise.
2. Load transfer capability expressed as a percentage of ultimate rib tensile strength in the same direction as the juntion test (determined in accordance with ASTM D6637)
3. Determined by measuring the spacing between sets of parallel ribs (i.e. the "rib patch") in any direction.
4. ASTM D6637 Method B with a 2 aperture gage length tested in all "rib" and "mid-rib" directions. The radial stiffness is computed as the minimum measured modulus at 0.5% strain for each of the forementioned directions.
5. Minimum measured radial stiffness at 0.5% strain divided by the maximum measured radial stiffness at 0.5% strain.

3.0 CONSTRUCTION REQUIREMENTS.

3.1 Weather Limitations. The geogrid shall not be placed when weather or surface conditions, in the opinion of the Project Manager, are not suitable for placement. This will normally be at times of very wet and snowy conditions, heavy rainfall, extreme cold or frost conditions.

3.2 Surface Preparation. The geogrid material and geotextile class 2 fabric shall be placed directly on the subgrade prepared according to manufacturers specifications. Where soft, yielding or pumping subgrade is encountered, care shall be taken to avoid excessive disturbance and weakening of the subgrade.

3.3 Geogrid Placement. The geogrid material shall be placed directly on the geotextile as shown on the contract documents. The geogrid shall be rolled out along the alignment in the direction of advancing construction. All wrinkles and folds shall be removed.

A 12 inch minimum overlap with securing pins is required at all joints (both the transverse and longitudinal) or per manufacturers recommendation. A larger overlap may be needed when soft, yielding or pumping subgrade condisions are encountered. As a general “rule of thumb”, if soils are yielding under foot traffic, an overlap of 24-36 inches should be used. At transverse joints, the preceding roll shall overlap the following roll in the direction that the base course will be placed. Securing pins shall be 3/16 inch steel bars, pointed at one end fabricated with a head to retain a steel washer having an outside diameter of not less than less 1.5 inch. U-shaped pins shall be another option as approved by the Project Manager.

The length of the securing pins shall be 8 inch minimum. The geogrid shall be tensioned by hand and anchored to the ground at the edges, including overlaps, and in the center of the roll at 30 feet intervals along the roll length, at the corners if applicable, or as directed by the Project Manager. The use of securing pins may be reduced or eliminated by the Project Manager if it can be shown that by careful installation and geogrid is adequately tensioned by hand and anchored by the placed base course in a progressive installation process as recommended by the manufacturer's representative.

Care should be taken to ensure that geogrid sections do no separate at overlaps during construction. Placement of geogrid around corners will require cutting of geogrid and diagonal overlapping of the same to make sure that excessive buckling of geogrid material does not occur.

3.4 Placing and Compacting Base Course. The base course shall be back dumped and spread in a uniform lift maintaining the design thickness at all times. The base course shall be bladed onto the geogrid in such a manner that the aggregate rolls onto the geogrid ahead, by gradually raising the machine blade while moving ahead.

If the material underlying the geogrid is capable of supporting rubber tire (end and belly dumps) they may drive over the grid at very low speeds, less than 5 mph, and dump base course as they go. Sudden stops and turning by trucks shall be avoided while on the grid. No tracked vehicles shall be allowed on the grid until there is a of 6 inches of material between the tracks and the grid. Any ruts which might develop during spreading or compacting the base course shall be filled with additional base course rather than bladed from surrounding areas. Placing additional base course into the rutted areas insures that the design base thickness is maintained.

Geogrid damaged after or during construction will be repaired in accordance with the manufacturer's recommended procedure. The repair and/or replacement will be done at the Contractor's expense and the cost will be incidental to the project.

Base course shall be compacted per the current Section 303 specification. Base course material shall not be mixed or processed on the geogrid. The base course shall be premixed at the stockpile area or another location in a manner approved by the Project Manager. The base course will be sampled for gradation after premixing and prior to placement on the geogrid material. Contamination and segregation of the base course prior to or during placement shall be minimized.

4.0 METHOD OF MEASUREMENT.

4.1 The geogrid shall be measured by the number of square yards from the lines and notes shown on the plans, or from lines and notes established in writing by the Project Manager. This excludes seam overlaps.

Excavation, base course, and geotextile class 2 fabric are separate pay items.

5.0 BASIS OF PAYMENT.

5.1 The accepted quantities of geogrid shall be paid for at the contract unit price per square yard in place. Said payment shall be full compensation for materials, storage, handling, tools, equipment, labor, all material waste and overlap, and appurtenances necessary to satisfactorily complete the work.

Payment shall be made under:

Pay Item	Pay Unit
Geogrid Base Reinforcement	Square Yard