

## **SECTION 000000**

### **Specification for Biaxial Geogrid Base Course and Subgrade Reinforcement for Paved and Unpaved Roadways**

#### **PART 1 GENERAL**

##### **1.01 SUMMARY**

- A. Section Includes – Biaxial geogrid reinforcement of base course and/or subgrade reinforcement in the construction of paved or unpaved roadways, parking areas, and similar installations. Design details for geogrid base course and subgrade reinforcement, including geogrid type, pavement cross-sections and all associated details, shall be as shown on the construction drawings.

Work consists of:

1. Furnishing biaxial geogrids in accordance with the specifications and as shown on the construction drawings.
  2. Storage, cutting, and placement of biaxial geogrids in accordance with the specifications and in close conformity with the lines, grades, and dimensions shown on the construction drawings or as approved by the Engineer.
- B. Related Sections
1. Section 02200 - Site Preparation
  2. Section 02300 - Earthwork
  3. Section 02700 - Bases, Ballasts, Pavements, and Appurtenances

##### **1.02 DEFINITIONS**

- A. Geogrid - A biaxial polymeric grid formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock, or earth to function primarily as reinforcement.
- B. Minimum Average Roll Value (MARV) - Value based on testing and determined in accordance with ASTM D4759-92.
- C. Traffic Benefit Ratio (TBR) (also known as Traffic Improvement Factor or TIF) - A ratio comparing the performance of a pavement cross-section with a geogrid-reinforced base course to a similar cross-section without geogrid reinforcement, based on the number of cycles to failure, with failure defined as a selected depth of rut.
- D. True Initial Modulus in Use - The ratio of tensile strength to corresponding zero strain. The tensile strength is measured via ASTM D6637 at a strain rate of 10 percent per minute. Values shown are MARVs.
- E. Subgrade Reinforcement – Placement of a geogrid immediately over a soft subgrade soil in order to improve the bearing capacity and mitigate deformation of the subgrade soil. The goal of this application may be to reduce undercut requirements, improve construction efficiency, reduce the amount of aggregate subbase/base material required, provide a stiff working platform for pavement construction, or combination of these.
- I. Base Reinforcement - Placement of a geogrid beneath or within the aggregate base course of a flexible pavement system to improve the performance of the system. The goal of this application may be to reduce the amount of aggregate base material required (reducing initial cost), increase the life of the pavement (reduce life-cycle cost), or a combination of the two.

### **1.03 REFERENCES**

- A. American Society for Testing and Materials (ASTM)
  - 1. D6637 Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-rib Tensile Method
  - 2. D4354-96 Practice for Sampling of Geosynthetics for Testing
  - 3. D4759-92 Practice for Determining the Specification Conformance of Geosynthetics
  - 4. D5818 Practice for Obtaining Samples of Geosynthetics from a Test Section for Assessment of Installation Damage
  
- B. Geosynthetic Research Institute (GRI)
  - 1. GRI-GG2 Standard Test Method for Geogrid Junction Strength
  
- C. American Association of State Highway and Transportation Officials (AASHTO)
  - 1. AASHTO Recommended Practice for Geosynthetic Reinforcement of the Aggregate Base Course of Flexible Pavement Structures, AASHTO PP46-01, April 2001 Interim Edition of the AASHTO Provisional Standards.
  - 2. Standard Specification for Highway Bridges (1997 Interim)
  - 3. AASHTO Guide for Design of Pavement Structures (1993)
  
- D. Geosynthetic Materials Association (GMA)
  - 1. Geosynthetic Reinforcement of the Aggregate Base/Subbase Courses of Pavement Structures (2000).

### **1.04 SUBMITTALS**

- A. Submit geogrid product sample approximately 4 inches by 7 inches or larger.
- B. Submit geogrid product data sheet and certification from the Manufacturer that the geogrid product supplied meets the requirements of sub-part 2.02 of this Section.
- C. Submit Manufacturer's installation instructions and general recommendations.

### **1.05 QUALITY ASSURANCE**

- A. Pre-Construction Conference - Prior to the installation of the geogrid, the Contractor shall arrange a meeting at the site with the geogrid material supplier and the geogrid installer. A representative of the geogrid supplier shall be available on an "as needed" basis during construction for technical support and assistance.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Storage and Protection
  - 1. Prevent excessive mud, wet concrete, epoxy, or other deleterious materials from coming in contact with and affixing to the geogrid materials.
  - 2. Store at temperatures above -20 degrees F (-29 degrees C).
  - 3. Rolled materials may be laid flat or stood on end.
  - 4. Geogrid materials should not be left directly exposed to sunlight for a period longer than recommended by the manufacturer.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. The approved source of geogrid is \_\_\_\_\_, Address, City, State, (000) 000.0000 or their designated representative.

### 2.02 MATERIALS

A. Biaxial Subgrade/Base Reinforcement Geogrid – The geogrid shall be integrally formed and deployed as a single layer having the following characteristics (ALL VALUES ARE MINIMUM AVERAGE ROLL VALUES UNLESS A RANGE OR CHARACTERISTIC IS INDICATED):

REINFORCEMENT PROPERTIES		TEST METHOD	MARV VALUES	
			Lbs/ft	kN/m
Ultimate Strength	MD	ASTM 6637	2,388	34.9
	XMD		3,870	56.5
Initial Modulus	MD	ASTM 6637	178,000	2,598
	XMD		172,900	2,524
Load at 2% Strain	MD	ASTM 6637	526	7.7
	XMD		578	8.4
Load at 5% Strain	MD	ASTM 6637	792	11.5
	XMD		1,042	15.2
Sum of Junction Strength Criteria	MD	GRI GG2	3,403	49.6
	XMD		4,213	61.5
Coefficient of Pullout Interaction		ASTM 6706 Sandy Gravel Sand	C <sub>i</sub> = 1.0 C <sub>i</sub> = 1.0	
Aperture Size		Measured	MD	1.0 in.
			XMD	1.0 in.

Standard Roll Size: 12' x 150'

- B. Alternate Subgrade/Base Reinforcement Materials – Alternate structural soil reinforcement materials will be considered in accordance with the following conditions:
1. Geotextile materials will not be considered as an alternate to geogrid materials for subgrade improvement or base/sub-base reinforcement applications. A geotextile may be used in the cross-section to provide separation, filtration or drainage; however, no structural contribution will be attributed to the geotextile.
  2. Alternate geogrid materials shall not be used unless submitted to the Engineer and pre-approved in writing by the Engineer.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. The Contractor shall check the geogrid upon delivery to verify that the proper material has been received. The geogrid shall be inspected by the Contractor to be free of flaws or damage occurring during manufacturing, shipping, or handling.

### **3.02 PREPARATION**

- A. The subgrade soil shall be prepared as indicated on the construction drawings or as directed by the Engineer.

### **3.03 INSTALLATION**

- A. The geogrid shall be laid at the proper elevation and alignment as shown on the construction drawings.
- B. The geogrid shall be installed in accordance with the installation guidelines provided by the manufacturer or as directed by the Engineer.
- C. The geogrid may be temporarily secured in place with ties, staples, pins, sand bags or backfill as required by fill properties, fill placement procedures or weather conditions or as directed by the Engineer.
- D. The geogrid shall be joined (overlapped) based on the following CBR values:

Soil CBR	Method of Joining
Greater than 3	300 mm (12 in.) overlap
1 – 3	600 mm (24 in.) overlap
0.5 – 1	900 mm (36 in.) overlap or with mechanical ties
Less than 0.5	1000 mm ( 40 in.) with mechanical ties or Bodkin

### **3.04 GRANULAR FILL PLACEMENT OVER GEOGRID**

- A. Granular fill material shall be placed in lifts and compacted as directed under Section 02300 and Section 02700. Granular fill material shall be placed, spread, and compacted in such a manner that minimizes the development of wrinkles in the geogrid and/or movement of the geogrid.
- B. A minimum loose fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid. Rubber-tired equipment may pass over the geogrid reinforcement at slow speeds (less than 10 mph).

### **3.05 INSPECTION**

- A. The Owner or Owner's representative may randomly inspect geogrid before, during and after (using test pits) installation.
- B. Any damaged or defective (i.e. damaged coating, separated junctions, separated layers, tears, etc.) will be repaired/replaced in accordance with section 3.06

### **3.06 REPAIR**

- A. Any roll of geogrid damaged before, during and after installation shall be replaced by the Contractor at no additional cost to the Owner.
- B. Proper replacement shall consist of replacing the affected area + 3ft (1m) of geogrid to either side of the affected area.

### **3.07 PROTECTION**

- A. Follow the Manufacturer's recommendations regarding protection from exposure to sunlight.

END OF SECTION