Project Name:
Project Number:

Section 02740

Specification for Geogrid Base Reinforcement of Flexible Pavement Structures

1 GENERAL

1.1 SECTION INCLUDES

A. Geogrid for use as reinforcement of base or subbase layers of flexible pavement structures.

1.2 RELATED SECTIONS

A. Section 02050 - Basic Site Materials and Methods
B. Section 02100 - Site Remediation
C. Section 02200 - Site Preparation
D. Section 02300 - Earthwork
E. Section 02700 - Bases, Ballasts, Pavements, and Appurtenances

1.3 UNIT PRICES

A. Method of Measurement: By the square meter (or square yard - as indicated in contract documents) including seams, overlaps, and wastage.

B. Basis of Payment: By the square meter (or square yard - as indicated in contract documents) installed.

1.4 REFERENCES

A. AASHTO Standards
1. T88 - Particle Size Analysis of Soils
2. T90 - Determining the Plastic Limit and Plasticity Index of Soils
3. T99 - The Moisture-Density Relations of Soils Using a 5.5lb (2.5 kg) Rammer and a 12in (305 mm) Drop.
4. M288-96 - Geotextile Specification for Highway Applications
5. AASHTO Guide for Design of Pavement Structures, 1993.

B. American Society for Testing and Materials (ASTM):
1. D 123 - Standard Terminology Relating to Textiles
2. D 276 - Test Method for Identification of Fibers in Textiles
3. D 4354 - Practice for Sampling of Geosynthetics for Testing
4. D 4355 - Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
5. D 4439 - Terminology for Geotextiles
6. D 4759 - Practice for Determining the Specification Conformance of Geosynthetics
7. D 4873 - Guide for Identification, Storage, and Handling of Geotextiles
8. D 5321 - Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method
9. D 6637 - Standard Test Method for Determining the Tensile Properties of Geogrids by the Single Rib or Multi-Rib Tensile Method

C. Geosynthetic Research Institute (GRI) - GRI-GG5 - Test Method for Geogrid Pullout

D. Federal Highway Administration (FHWA) - Geosynthetic Design and Construction Guidelines, Publication No. FHWA HI-95-038, May 1995.

E. American Association for Laboratory Accreditation (A2LA)

F. Geosynthetic Accreditation Institute (GAI) - Laboratory Accreditation Program (LAP)

G. International Standards Organization (ISO) - 9001:2000

H. National Transportation Product Evaluation Program (NTPEP)

1.5 DEFINITIONS

A. Minimum Average Roll Value (MARV): Property value calculated as typical minus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.

1.6 SUBMITTALS

A. Submit the following:

1. Certification: The contractor shall provide to the Engineer a certificate stating the name of the manufacturer, product name, style number, and chemical composition of the filaments or yarns and other pertinent information to fully describe the geotextile. The Certification shall state that the furnished geotextile meets MARV requirements of the specification as evaluated under the Manufacturer's quality control program. The Certification shall be attested to by a person having legal authority to bind the Manufacturer. Certifications from Private Label distributors will not be accepted

2. Quality Standards: The contractor shall provide to the Engineer the Manufacturer's Quality Control Plan along with current A2LA, GAI-LAP, and ISO 9001:2000 certificates.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. The geotextile Manufacturer shall have the following credentials:

a. Geosynthetic Accreditation Institute (GAI)- Laboratory Accreditation Program(LAP)

b. American Association for Laboratory Accreditation (A2LA)

c. ISO 9001:2000 Quality Management System

B. The geotextile Manufacturer shall have a GAI-LAP accredited laboratory at the location of production capable of performing the ASTM tests as outlined in the specification.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Geosynthetics labeling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.

B. Each geosynthetic roll shall be wrapped with a material that will protect the geosynthetic from damage due to shipment, water, sunlight, and contaminants.

C. During storage, geosynthetic rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, excess temperatures, and any other environmental conditions that may damage the physical property values of the geosynthetic.

2 PRODUCTS

2.1 MANUFACTURERS

A. TenCate Geosynthetics North America
365 South Holland Drive
Pendergrass, GA, USA 30567
1-800-685-9990
1-706-693-2226
1-706-693-4400, fax
www.tencate.com

2.2 MATERIALS

A. Reinforcement Geogrid:

1. Polymers used in the manufacture of geogrids shall consist of long-chain synthetic polymers, composed of at least 95 percent by weight of polyolefins, polyesters, or polyamides. They shall be formed into a stable network such that the ribs, filaments or yarns retain their dimensioned stability relative to each other, including selvages.

2. The geosynthetic shall meet the requirements of Table 1. All numeric values in Table 1 represent MARV in the specified direction.

TABLE 1 - FLEXIBLE PAVEMENT REINFORCEMENT GEOGRID

Property	Test Method	Units	Required Value	
Reinforcement Properties			MD[1]	CD[1]
Tensile Strength @ 1% Strain	ASTM D 6637	kN/m (lbs/ft)	5.5 (375)	5.5 (375)
Tensile Strength @ 2% Strain	ASTM D 6637	kN/m (lbs/ft)	9.1 (625)	9.1 (625)
Tensile Strength @ 5% Strain	ASTM D 6637	kN/m (lbs/ft)	14.6 (1000)	14.6 (1000)
Tensile Modulus @ 1% Strain	ASTM D 6637	kN/m (lbs/ft)	547.1 (37500)	574.1 (37500)
Coefficient of Interaction -Ci (sand)	ASTM D 5321	--	0.8	
Survivability Index Values			MD[1]	CD[1]
Ultimate Tensile Strength	ASTM D 6637	kN/m (lbs/ft)	36.5 (2500)	36.5 (2500)
Ultraviolet Stability (after 500 hrs)	ASTM D 4355	%	70	

[1] MD - Machine, or roll, direction; CD - Cross machine direction

3. Approved geosynthetics are as follows:

BXG11

2.3 QUALITY CONTROL

A. Manufacturing Quality Control: Testing shall be performed at an on-site laboratory accredited by GAI-LAP and A2LA for tests required for the geotextile, at frequency meeting or exceeding ASTM D 4354.

B. Ultraviolet Stability shall be verified by an independent laboratory on the geosynthetic or a

geosynthetic of similar construction.

3 EXECUTION

3.1 PREPARATION

A. The installation site shall be prepared by clearing, grubbing, and excavation or filling the area to the design grade. This includes removal of topsoil and vegetation.

3.2 INSTALLATION

A. The geosynthetic shall be laid smooth without wrinkles or folds on the prepared subgrade in the direction of construction traffic. Adjacent geosynthetic rolls shall be overlapped, sewn or joined as required in the plans. Overlaps shall be in the direction as shown on the plans. See table below for overlap requirements.

Soil CBR	Method of Joining
Greater than 3	300 - 450 mm (12 - 18 in) overlap
1 - 3	600 - 1000 mm (24 - 40 in) overlap
0.5 - 1	1000 mm (40 in) overlap or sewn
Less than 0.5	Sewn
All roll ends	1000 mm (40 in) overlap or sewn

B. The **base reinforcement geosynthetic** shall be laid directly on the subgrade. The reinforcement geogrid shall be laid beneath or within the base course as directed by the Engineer.

C. On curves, the geosynthetic may be folded or cut to conform to the curves. The fold or overlap shall be in the direction of construction and held in place by pins, staples, or piles of fill or rock.

D. Prior to covering, the geosynthetic shall be inspected by a certified inspector of the Engineer to ensure that the geosynthetic has not been damaged during installation. Damaged geosynthetics, as identified by the Engineer, shall be repaired immediately. Cover the damaged area with a geosynthetic patch which extends an amount equal to the required overlap beyond the damaged area.

E. The subbase or base shall be placed by end dumping onto the geosynthetic from the edge of the geosynthetic, or over previously placed subbase or base aggregate. On soils with CBR>3, most rubber-tired vehicles can be driven at slow speeds, less than 16 km/h (10 mph) and in straight paths over the exposed geosynthetic without causing damage to the geosynthetic. Sudden braking and sharp turning should be avoided. Tracked construction equipment should not be operated directly upon the geosynthetic. A minimum fill soil thickness of 15cm (6 in) is required prior to operation of tracked vehicles over the geosynthetic. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geosynthetic.

For soils with CBR<1, construction vehicles shall not be allowed directly on the geosynthetic. The subbase or base shall be placed such that at least the minimum specified lift thickness shall be between the geosynthetic and equipment tires or tracks at all times. Turning of vehicles shall not be permitted on the first lift above the geosynthetic.

F. On subgrades having a CBR value of less than 1, the subbase or base aggregate should be spread in its full thickness as soon as possible after dumping to minimize the potential of localized subgrade failure due to overloading of the subgrade.

G. Any ruts occurring during construction shall be filled with additional subbase or base material, and compacted to the specified density.

H. If placement of the backfill material causes damage to the geosynthetic, the damaged area shall be repaired as previously described above. The placement procedure shall then be modified to eliminate further damage from taking place.

END OF SECTION

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