

## **GEOGRID REINFORCEMENT FOR PAVEMENTS**

### **1.01 DESCRIPTION**

This section shall cover work of furnishing and constructing geogrid reinforcement as specified hereinafter shown on the plans, or directed by the Engineer. The work shall include placement of the geogrid in general conformance to the line and grade shown on the plans and shall include the furnishing of the materials, and other incidentals necessary to maintain the geogrid in its required position until the completion of any other associated work items.

### **2.01 MATERIALS**

The biaxial geogrid shall be a single layer regular grid structure formed by biaxially drawing a continuous sheet of polypropylene material. The geogrid shall have high flexural rigidity and high tensile modulus in relation to the material being reinforced and shall also have high continuity of tensile strength through all ribs and junctions of the grid 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 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 A for Biaxial Geogrids. The value listed in Table A are minimum certified values and are equal to the mean value less three standard deviations, which reflect the desired 99% confidence level. These values are to be verified by an independent laboratory.

The increase in the structural layer coefficient of the base course due to the geogrid reinforcement must meet or exceed that of the geogrid upon which the design was based. Performance data (results of full-scale laboratory testing of flexible pavement structures reinforced with geogrids or in-ground testing of flexible pavement structures reinforced with geogrids), which quantifies the structural contribution of the geogrid to the pavement structure, shall be submitted to the Engineer 7 days prior to the bid opening.

Geogrids not meeting the physical properties of Table A may not be directly submitted into the project design without prior written approval of the Engineer.

Material substitutions for geogrids not conforming to the physical requirements of Table A must be submitted with an alternative design proposal to the Engineer at least 7 days prior to bid opening.

Alternate design proposals must be accompanied by the test data from an approved laboratory verifying all design and index properties in accordance with the test methods of Table A. Performance data, which quantifies the structural contribution of the geogrid to the pavement structure, shall be submitted to the Engineer.

### 3.01 DELIVERY, STORAGE, AND HANDLING

All shipments of geogrid shall be accompanied by a mill certificate or affidavit, signed by a legally authorized official from the company manufacturing the geogrid certifying that the material meets all stated chemical, physical, and manufacturing requirements.

At the time of installation, the geogrid shall be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. If approved by the Engineer, the damaged sections may be repaired by patching the damaged area with an additional layer of geogrid 2' to 3' around the affected area.

### 4.01 CONSTRUCTION METHODS

Subgrade shall be prepared as indicated on the plans or as directed by the Engineer. The geogrid shall be installed in accordance with the lines and grades shown on the plans. The geogrid shall be oriented such that the roll length runs parallel to the road direction. Geogrid sections shall be overlapped as indicated on the plans or as directed by the Engineer. Minimum lap shall be one (1) foot, based on the strength of the subgrade, or as specified on the plans. Care shall be taken to ensure that geogrid sections do not separate at laps during construction. Placement of geogrid around corners will require cutting of the geogrid and diagonal lapping to ensure that excessive buckling of grid material does not occur.

Base material shall be placed in lift thickness as shown on the plans. Tracked construction equipment shall not operate directly upon the geogrid. A minimum fill thickness of six (6) inches is required prior to operation of tracked vehicles over the geogrid.

Rubber-tired equipment may pass over the geogrid at slow speeds of less than five (5) miles per hour, if the underlying material is capable of supporting the loads without rutting or causing damage to the geogrid. Sharp turning or sudden braking shall be prohibited. The Contractor shall be required to replace, at his expense, sections of the geogrid that are damaged, during construction.

**TABLE A – TENSAR GEOGRID PHYSICAL PROPERTIES**

<b>PROPERTY</b>	<b>TEST METHOD</b>	<b>UNITS</b>	<b>BX 1100</b>	<b>BX 1200</b>
<b>Geometry</b>				
Aperture Size				
MD <sup>1</sup>	I.D. Calipered <sup>2</sup>	in / (mm)	1.00 / (25)	1.00 / (25)
CMD <sup>1</sup>	I.D. Calipered <sup>2</sup>	in / (mm)	1.30 / (33)	1.30 / (33)
Open Area	COE Method <sup>3</sup> CW-02215	%	70	70
Rib Thickness	Calipered	in / (mm)	0.03 / (0.76)	0.05 / (1.27)
Rib Shape	Observation	N/A	Rectangular or Square	Rectangular or Square
<b>Structural Integrity</b>				
Torsional Rigidity (Aperture Stability Modulus) @ 20 cm-kg	COE METHOD <sup>4</sup>	cm-kg/deg.	3.2 <sup>5</sup>	6.5 <sup>5</sup>
Flexural Rigidity (Stiffness) MD	ASTM D1388-96 <sup>6</sup>	Mg-cm	250,000	750,000
Tensile Strength MD	ASTM D6637-01 <sup>8</sup>	lb/ft / (kN/m)	280 / (4.1)	410 / (6.0)
CMD	ASTM D6637-01 <sup>8</sup>	lb/ft / (kN/m)	450 / (6.6)	590 / (8.6)
True Initial Modulus (min.) MD	ASTM D6637-01 <sup>8</sup>	lb/ft / (kN/m)	17,140 / (250)	27,420 / (400)
CMD	ASTM D6637-01 <sup>8</sup>	lb/ft / (kN/m)	27,420 / (400)	44,550 / (650)
Junction Strength MD	GRI GG2-87 <sup>7</sup>	lb/ft	765	1080
CMD	GRI GG2-87 <sup>7</sup>	lb/ft	1170	1778
Junction Efficiency	GRI GG2-87 <sup>7</sup>	%	93	93
<b>Durability</b>				
Resistance to Installation Damage	ASTM D5818	%SC/%SW/%G P	90/83/70	91/83/71
Resistance to Long Term Degradation	ASTM D5818 EPA 9090	%	100	100
<b>Material</b>				
Polypropylene	ASTM D4101 Group 1/Class 1/Grade 2	%	98	98
Carbon Black	ASTM 4218	%	0.5	0.5

NOTES:

1. MD dimension is along roll length; CMD dimension is across roll width.
2. Maximum inside dimensions in each principal direction measured by calipers.
3. Percent Open area measured without magnification by Corps. Of Engineers method as specified in CW02215.
4. Resistance to in-plane rotational movement measured by applying a 20cm-kg moment to the central junction of a 9" x 9" specimen restrained at its perimeter. (U.S. Army Corps of Engineers Methodology) & Grid Aperture Stability Test developed by Dr. T. Kinney at the University of Alaska, Fairbanks.
5. Secant Aperture Stability Modulus. Value listed is equal to the mean value less approximately one standard deviation.
6. ASTM D1388-96, Option A modified to account for wide specimen testing.
7. Geotextile junction strength and junction efficiency measured by Geosynthetic Research Institute test method GRI-GG2-87 "Geotextile Junction Strength." Geogrid shall not be pre-tensioned prior to testing strength parameter.
8. True resistance to elongation when initially subjected to a load measured using ASTM D6637 without deforming test materials under load before measuring such resistance or employing "secant" or "offset" tangent methods of measurement so as to overstate tensile properties. For single layer products use Test Method A, for multi-layer products use Test Method C.

5.01 MEASUREMENT

Measurement shall be made by the square yard of surface area as shown on the plans. No measurement will be made for lapping of material.

6.01 PAYMENT

The work performed and materials furnished, as prescribed by this item, and measured as provided above under Measurement, will be paid for at the unit price bid for Alternate Base with Geogrid Reinforcement. Payment shall be based on the type of geogrid specified, which price shall be full compensation for furnishing all labor, materials, freight, tools, shipment, and incidentals, and for doing all the work involved in placement of the grid, complete in place.

**END OF SECTION**