SECTION

Specification for Geogrid Base Reinforcement

1.0 GENERAL

1.1 SECTION INCLUDES

A. Geogrid for use as reinforcement of base or sub base layers.

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 yard or as indicated in contract documents; including seams, overlaps, and wastage.

B. Basis of Payment: By the square yard or 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 form 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 Constriction Guideline, Publication No. FHWA HI-95-038, May 1995.

F. American Association for Laboratory Accreditation (A2LA).

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

1.5 DEFINITIONS

A. Minimum Average Roll Value (MARV): Property value calculated as typical minus tow 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, chemical composition of the product and other pertinent information to fully describe the geosynthetic. The Certification shall state that the furnished geosynthetic 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.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Geosynthetic Accreditation Institute (GAI) – Laboratory Accreditation Program (LAP).
2. American Association for Laboratory Accreditation (A2LA).

1.8 DELIVERY, STORAGE AND HANDLING

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

C. During storage, geogrid 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 geogrid.

2.0 PRODUCTS

2.1 MANUFACTURERS

A. US Fabrics Inc
3904 Virginia Avenue
Cincinnati, OH 45227
1-800-518-2290
1-513-271-6000
1-513-271-4420 (fax)
www.usfabricsinc.com

2.2 MATERIALS

A. Reinforcement Geogrid:

1. Polymers used in the manufacture of geogrids shall consist of multiple layers of high strength extruded biaxially oriented polypropylene geogrids. The layers shall be rolled and stitched or welded together without superimposing the grids creating a geogrid with random sized apertures designed to accommodate a variety of fill materials.

2. The random aperture geometry, many tensile elements, and multiple layer of the geogrid will enhance soil/geogrid interactions. Punched & Drawn products shall not be acceptable.

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

Table 1 Reinforcement Geogrids

TECHNICAL CHARACTERISTICS	TEST METHOD	UNIT	MD[1]	TD[1]
Strengths and Load Capacity:				
Peak Tensile Strength	ASTM D 6637	lb/ft (kN/m)	925 (13.5)	1,400 (20.5)
True Tensile Strength in Use: @ 2% Strain	ASTM D 6637	lb/ft (kN/m)	301 (4.4)	450 (6.57)
@ 5% Strain			616 (9.0)	920 (13.42)
True Initial Modulus in Use	ASTM D 6637	lb/ft (kN/m)	17,140 (250)	27,420 (400)
Tensile Modulus: @ 2% Strain	ASTM D 6637	lb/ft (kN/m)	15,050 (220)	22,500 (328)
@ 5% Strain			12,320 (180)	18,400 (269)
Structural Integrity:				
Junction Tensile Strength: @ 1% Strain	GRI-GG2	lb/ft (kN/m)	170 (2.48)	200 (2.92)
@ 2% Strain			235 (3.44)	300 (4.38)
Junction Tensile Modulus: @ 1% Strain	GRI-GG2	lb/ft (kN/m)	17,000 (248)	20,000 (292)
@ 2% Strain			11,780 (172)	15,000 (219)
Junction: Strength	GRI-GG2	lb/ft (kN/m)	860 (12.55)	1,315 (19.2)
Efficiency		%	90	90
Flexural Rigidity	ASTM D 1388	mg-cm	250,000	250,000
Pullout Coefficient of Interaction	ASTM D 6707		> 1.0	> 1.0
Durability:				
Resistance to Installation Damage	ASTM D 5818	%SC/%SW/%GP	>90/>90/90	>90/>90/90

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

4. Approved geogrid is as follows:

Basegrid 22

2.3 QUALITY CONTROL

A. Manufacturing Quality Control: Testing shall be performed at a laboratory accredited by GAI-LAP and A2LA for test required for the geosynthetic, at frequency meeting or exceeding ASTM D 4354.

3.0 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 geogrid shall be laid smooth without wrinkles or folds on the prepared subgrade in the direction of construction traffic. Adjacent geogrid rolls shall be overlapped 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 geogrid 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 geogrid 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 geogrid shall be inspected by a certified inspector of the Engineer to ensure that the geogrid has not been damaged during installation. Damaged geogrid, as identified by the Engineer, shall be repaired immediately. Cover the damaged area with a geogrid patch which extends an amount equal to the required overlap beyond the damaged area.

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

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

F. On subgrades having a CBR Value of less that 1, the sub base 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 sub base or base material, and compacted to the specified density.

H. If placement of the backfill material causes damage to the geogrid, 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