

Project Name:
Project Number:

Section 32 32 00

Specification UV Stable Geotextile for Wall and Slope Facing

1. GENERAL

1.1 SECTION INCLUDES

- A. UV stable geotextile mesh to provide reinforcement and confinement for mechanically stabilized earth retaining structures. Specifically for facing soil reinforcement applications to retain soil backfill and promote vegetation growth.

1.2 RELATED SECTIONS

- A. Section 02 50 00 - Site Remediation
- B. Section 01 89 13 - Site Preparation Performance Requirements
- C. Section 31 00 00 - Earthwork

1.3 UNIT PRICES

- A. Method of Measurement: By the square yard (or square meter - as indicated in contract documents) including seams, overlaps, and wastage.
- B. Basis of Payment: By the square yard (or square meter - 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. Standard Specifications for Highway Bridges
 - 5. R69-15 – Determination of Long Term Strength for Geosynthetic Reinforcement
- B. American Society for Testing and Materials (ASTM):
 - 1. D4354 - Practice for Sampling of Geosynthetics for Testing
 - 2. D4355 - Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
 - 3. D4439 – Standard Terminology for Geosynthetics
 - 4. D4595 - Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
 - 5. D4759 - Practice for Determining the Specification Conformance of Geosynthetics
 - 6. D4873 - Guide for Identification, Storage, and Handling of Geotextiles
 - 7. D5262 - Test Method for Evaluating the Unconfined Tension Creep Behavior of Geosynthetics
 - 8. D5321 - Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method
 - 9. D6637 - Standard Test Method for Determining the Tensile Properties of Geogrids by the Single Rib or Multi-Rib Tensile Method
 - 10. D6706 – Standard Test Method for Measuring Geosynthetic Pullout in Soil
- C. National Concrete Masonry Association (NCMA) - Design Manual for Segmental Retaining Walls,

Third Edition, 2012.

- D. Geosynthetic Research Institute:
 1. GRI-GT7 - Determination of the Long-Term Design Strength of Geotextiles
 2. GRI-GG4 (b) - Determination of the Long-Term Design Strength of Flexible Geogrids
 3. GRI-GG7 - Carboxyl End Group Content of PET Yarns
 4. GRI-GG8 - Determination of the Number Average Molecular Weight of PET Yarns Based on a Relative Viscosity Value
- E. Federal Highway Administration (FHWA):
 1. FHWA NHI 10-024 & 10-025 - Mechanically Stabilized Earth Walls and Reinforced Soil Slopes (Volumes I & II)
 2. FHWA NHI-09-087 - Corrosion/Degradation of Soil Reinforcements for Mechanically Stabilized Earth Walls and Reinforced Soil Slopes
- F. Geosynthetic Accreditation Institute (GAI) - Laboratory Accreditation Program (LAP).
- G. National Transportation Product Evaluation Program (NTPEP)
- H. International Standards Organization (ISO) – 9001:2015

1.5 DEFINITIONS

- A. Minimum Average Roll Value (MARV): Property value calculated as typical minus two standard deviations.

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 filaments or yarns 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.
 2. Quality Standards: The contractor shall provide to the Engineer the manufacturer's Quality Control Plan along with their current, GAI-LAP, and ISO 9001:2015 certificates.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 1. The geotextile manufacturer shall have all of the following credentials:
 - a. Geosynthetic Accreditation Institute (GAI) - Laboratory Accreditation Program (LAP)
 - b. ISO 9001:2015 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. Geosynthetic labeling, shipment, and storage shall follow ASTM D4873. 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 Americas
365 South Holland Drive
Pendergrass, GA, USA 30567
1-800-685-9990
1-706-693-2226
1-706-693-2083, fax
www.mirafi.com

2.2 MATERIALS

- A. UV Stable Geotextile:
 - 1. Geosynthetic reinforcement shall consist of facing geogrid manufactured specifically for facing soil reinforcement applications to retain soil backfill and promote vegetation growth using virgin resin and one hundred percent made in America. Facing geogrid shall be weaved from high tenacity monofilament polypropylene yarns to produce an open mesh geogrid with aperture size of 0.08 inches..
 - 2. Facing geogrid shall have life expectancy of 75 years exposed to sunlight extrapolated on average half life based on ASTM D7238 QUV Testing. UV Resistance at 500 hours shall be 100 percent retained based on ASTM D4355. Facing geogrid shall have green color.
 - 3. The facing geogrid shall be sufficiently labeled for easy identification in the field, this includes labels on the rolls and in the core indicating original manufacturer, style name, roll size, and tracking roll number.
 - 4. The facing geogrid shall meet the requirements of Table 1.

TABLE 1 - REINFORCEMENT FACING GEOGRIDS

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Tensile Strength (at ultimate)	ASTM D4595	lbs/ft (kN/m)	1440 (21.0)	1733 (25.3)
			Minimum Value	
Creep Reduced Strength	ASTM D5262	lbs/ft (kN/m)	471 (6.9)	566 (8.3)
Long Term Allowable Design Load ¹	GRI GT-7	lbs/ft (kN/m)	407 (5.9)	490 (7.2)
			Typical Value	
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	100	
UV Resistance (at 2000 hours)			97	
UV Resistance (at 5000 hours)			90	
Mass/Unit Area	ASTM D5261	oz/yd ² (g/m ²)	5.8 (196.6)	
			Minimum Test Value	
Design Life	See Note ²	Years	75	

¹ Long Term Allowable Design values are for sand, silt and clay. Creep Reduction Factor based on 75-year design life.

² Extrapolated from the average half-life based on ASTM D7238 (QUV). Data also found in the Miraf[®] UV Durability Technical Note.

5. Long-Term Design Strength (LTDS) and Allowable Tensile Strength (T_a) are determined per AASHTO, FHWA, GRI, and NCMA guidelines where;

$$LTDS = \frac{T_{ULT}}{(RF_{CR})(RF_{ID})(RF_D)}$$

- a. T_{ULT} , Ultimate Tensile Strength, shall be the minimum average roll value (MARV) ultimate tensile strength as tested per ASTM D4595.
- b. RF_{CR} , Reduction Factor for Creep Deformation, is the ratio of T_{ULT} to creep limited strength determined in accordance with ASTM D5262 based on 10,000 hr creep testing. The RF_{CR} shall be 3.05 for Miramesh GR.
- c. RF_{ID} , Reduction Factor for Installation Damage, shall be 1.05 for Miramesh GR.
- d. RF_D , Reduction Factor for Durability, shall be determined by FHWA durability testing covering the range of expected soil environments. The RF_D shall be 1.10 for Miramesh GR in typical soil backfill.

5. Soil Interaction Coefficient, C_i value shall be determined from short-term effective stress pullout tests per ASTM D6706 over the range of normal stresses encountered. The maximum pullout force used to determine C_i shall be limited to the lessor of T_a or the force that yields 1.5 inches displacement. The minimum C_i value shall not be less than 0.8, determined as follows:

$$C_i = \frac{F}{2L\sigma_N \tan\phi}$$

- where
- F = Pullout Force (lb/ft), per ASTM D6706
 - L = Geosynthetic Embedment Length in Test (ft)
 - σ_N = Effective Normal Stress (psf)
 - ϕ = Effective Soil Friction Angle, Degrees

6. UV Resistance shall be determined in accordance with ASTM D4355. Geosynthetics shall retain a minimum of 90% of the Ultimate Tensile Strength per ASTM D4595 after 5000 hours of UV exposure.

2.3 QUALITY CONTROL

- A. Manufacturing quality control testing shall be performed by a laboratory in the production facility accredited by ISO 9001, GAI-LAP and A2LA for facing geogrid. Ultimate Tensile Tests at frequency meeting ASTM D4354. Current certificates shall be submitted with facing geogrid certification data sheet.
- B. Ultraviolet Stability shall be verified by an independent laboratory on the geosynthetic or a geosynthetic of similar construction and yarn type.

3. EXECUTION

3.1 PREPARATION

- A. Backfill material where facing geogrid will be placed should be placed in lifts and compacted as directed under project specifications before geotextile placement.

3.2 INSTALLATION

- A. Facing geogrid shall be laid at the proper elevation and orientation as shown on the construction drawings or as directed by the Engineer. Correct orientation of the geosynthetic shall be verified by Contractor.
- B. Facing geogrid may be temporarily secured in-place with staples, pins, sand bags or backfill as required by fill properties, fill placement procedure or weather condition, or as directed by the Engineer.
- C. Where embedment or wrapped facing is required, backfill material shall be placed in lifts and compacted as directed under project specifications. Backfill shall be placed, spread and compacted in such a manner as to minimize the development of wrinkles in and/or movement of the geosynthetic. A minimum fill thickness of 6 in (150 mm) is required prior to the operation of tracked vehicles over the geosynthetic. Maximum fill thickness should be directed by the Engineer to obtain minimum project compaction requirements.
- D. Turning of tracked vehicles should be kept to minimum to prevent tracks from displacing the fill and damaging the geosynthetic. Rubber tired equipment may pass over the geosynthetic reinforcement at low speeds, less than 10 mph (16 km/hr). Sudden braking and sharp turns shall be avoided. Any geosynthetic damaged during installation shall be replaced by the Contractor at no additional cost to the Owner.
- E. Facing geogrid installation shall be in accordance with the construction drawings and geogrid manufacturer's installation guidelines.

END OF SECTION

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UNITIS
CONTRACTOR SUPPLIES