
Standard Specification for Geosynthetic Specification for Highway Applications

AASHTO Designation: M 288-21

Technically Revised: 2021

Editorially Revised: 2021

Technical Subcommittee: 4e, Joints, Bearings, and Geosynthetics



**American Association of State Highway and Transportation Officials
555 12th Street NW, Suite 1000
Washington, DC 20004**

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1. SCOPE

- 1.1. This is a materials specification covering geosynthetics for use in subsurface drainage, separation, stabilization, erosion control, temporary silt fence, paving, and soil (walls and slopes). This is a material purchasing specification and design review of use is recommended.
- 1.2. This specification sets forth a set of physical, mechanical, and endurance properties that must be met or exceeded by the geosynthetic being manufactured.
- 1.3. In the context of quality systems and management, this specification represents a manufacturing quality control (MQC) document. However, its general use is essentially as a recommended design document.
- 1.4. This specification is intended to assure both good quality and performance of geosynthetics used as listed in Section 1.1 but is possibly not adequate for the complete specification in a specific situation, especially in reinforcement applications. Additional tests, more restrictive values for the tests indicated, or values based on project specific design may be necessary under conditions of a particular application.
- 1.5. Minimum strength values provided in this specification are based on geosynthetic survivability from installation stresses. Designers should be aware that the classes and/or property requirements in this specification reflect this basic premise. Refer to Appendix X1 for most geosynthetic construction guidelines.

2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
 - R 69, Determination of Long-Term Strength for Geosynthetic Reinforcement
 - T 88, Particle Size Analysis of Soils
 - T 90, Determining the Plastic Limit and Plasticity Index of Soils
 - T 99, Moisture–Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
 - T 289, Determining pH of Soil for Use in Corrosion Testing
- 2.2. *ASTM Standards:*¹
 - D123, Standard Terminology Relating to Textiles
 - D276, Standard Test Methods for Identification of Fibers in Textiles

- D4354, Standard Practice for Sampling of Geosynthetics and Rolled Erosion Control Products (RECPs) for Testing
- D4355/D4355M, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc-Type Apparatus
- D4439, Standard Terminology for Geosynthetics
- D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity
- D4533/D4533M, Standard Test Method for Trapezoid Tearing Strength of Geotextiles
- D4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
- D4603, Standard Test Method for Determining Inherent Viscosity of Poly(Ethylene Terephthalate) (PET) by Glass Capillary Viscometer
- D4632/D4632M, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
- D4751, Standard Test Methods for Determining Apparent Opening Size of a Geotextile
- D4759, Standard Practice for Determining the Specification Conformance of Geosynthetics
- D4873/D4873M, Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
- D5035, Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
- D5141, Standard Test Method for Determining Filtering Efficiency and Flow Rate of the Filtration Component of a Sediment Retention Device
- D5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles
- D6140, Standard Test Method to Determine Asphalt Retention of Paving Fabrics Used in Asphalt Paving for Full-Width Applications
- D6241, Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
- D6637/D6637M, Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method
- D7409, Standard Test Method for Carboxyl End Group Content of Polyethylene Terephthalate (PET) Yarns
- D7737, Standard Test Method for Individual Geogrid Junction Strength

2.3. *U.S. Environmental Protection Agency:*

- EPA/600/R-93/182, Quality Assurance and Quality Control for Waste Containment Facilities

2.4. *Other Standards:*

- ISO 13438:2004(en), Geotextiles and geotextile-related products—Screening test method for determining the resistance to oxidation
- GRI GG8, Determination of the Number Average Molecular Weight of PET Yarns Based on a Relative Viscosity Value

3. TERMINOLOGY

- 3.1. *effective design temperature*—The temperature that is halfway between the average yearly air temperature and the normal daily air temperature for the warmest month at the reinforced soil structure site.

- 3.2. *formulation*—The mixture of a unique combination of ingredients identified by type, properties, and quantity. For geosynthetics, a formulation is defined as the exact percentages and types of resin(s), additives, and/or carbon black.
- 3.3. *geogrid (uniaxial or biaxial)*—A geosynthetic formed by a regular network of integrally connected elements with apertures greater than ¼ in. to allow interlocking with surrounding soil, rock, earth, and other surrounding materials to function primarily as reinforcement.
- 3.3.1. *biaxial geogrid*—A biaxial geogrid is defined as a geogrid that develops tensile stiffness and strength in two orthogonal directions.
- 3.3.2. *uniaxial geogrid*—A uniaxial geogrid is defined as a geogrid that develops tensile stiffness and strength primarily in one direction.
- 3.4. *geosynthetic*—A class of products consisting of manufactured planar materials used in geotechnical applications and inclusive of both geotextiles and geogrids.
- 3.5. *geotextile (woven or nonwoven)*—A permeable geosynthetic comprised solely of textiles.
- 3.6. *manufacturing quality control (MQC)*—A planned system of inspections that is used to directly monitor and control the manufacture of a material that is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract specifications [ref. EPA/600/R-93/182].
- 3.7. *minimum average roll value (MARV)*—For geosynthetics, a MQC tool used to allow manufacturers to establish published values such that the user/purchaser will have a 97.7 percent confidence that the property in question, when tested, will meet published values. For normally distributed data, MARV is calculated as the average value minus two standard deviations from documented quality control test results for a defined population from one specific test method associated with one specific property.
- 3.8. *minimum value*—The lowest sample value from documented MQC test results for a defined population from one test method associated with one specific property.
- 3.9. *maximum value*—The highest sample value from documented MQC test results for a defined population from one test method associated with one specific property.
- Note 1**—Other terminology related to textiles (e.g., nonwoven) and geosynthetics (e.g., apparent opening size) may be used in this specification. Definitions for this terminology may be found in ASTM D123 or D4439.

4. PHYSICAL REQUIREMENTS

- 4.1. Fibers, yarns, straps, and sheets used in the manufacture of geotextiles and geogrids used in a reinforcement application, and the threads used in joining geotextiles by sewing, shall consist of long-chain synthetic polymers, composed of at least 95 percent, by weight, polyolefins or polyesters. They shall be formed into a stable network such that the filaments, yarns, or ribs retain their dimensional stability relative to each other, including selvages. Fibers used in the manufacture of geotextiles for paving fabrics requiring low ultimate elongation, and the threads used in joining these geotextiles by sewing, shall consist of combinations of glass fibers or fiberglass and long-chain synthetic polymers, with the combination composed of at least 95 percent, by weight, of fiberglass, polyesters, or polyolefins.