MATERIALS BULLETIN

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(for Materials & Geotechnical Branch)

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GEOSYNTHETICS AND GEOTEXTILES

This Materials Bulletin clarifies the terminology and application of geosynthetics as specified in the Standard Specifications and the standard special provision (SSP), *Revision of Sections 208, 420, 605, and 712 – Geosynthetics and Geotextiles*.

Only geotextiles on the New York DOT's Approved Products List (NY APL) may be used on CDOT projects. The link to this web site can be found in the SSP or in the 2008 Field Materials Manual, within the QA Schedule, Item 420. The web address for the NY APL is:

https://www.nysdot.gov/portal/page/portal/divisions/engineering/technical-services/materials-bureau/materials-and-equipment
Geosynthetics for Highway Construction
Geotextiles

If a proposed geotextile product is not on the NY APL, the manufacturer will need to contact NYDOT and submit samples for testing and approval prior to use on a CDOT project.

All geotextiles shall conform to AASHTO M 288; the tables in Subsection 712.08 of the Standard Specifications have been deleted by the SSP, *Revision of Sections 208, 420, 605, and 712 – Geosynthetics and Geotextiles*.

1. THE FOLLOWING LIST SUMMARIZES THE DEFINITIONS OF TERMS USED FOR GEOSYNTHETICS IN CDOT SPECIFICATIONS.

Geosynthetics

Geosynthetics is the general term used to describe a range of synthetic products used to solve geotechnical problems. The term comprises four main product categories: geotextiles, geogrids, geomembranes, and geocomposites. The synthetic natures of the products make them suitable for use in the ground where high levels of durability are required. Geosynthetics are available in a wide range of forms and materials, each to suit a slightly different end use. These products have a wide range of applications and are currently used in many civil and geotechnical engineering applications including roads, airfields, railroads, embankments, retaining structures, reservoirs, canals, dams, bank protection and coastal engineering.

Geotextiles

Geotextiles are defined as permeable textiles used with foundation, soil, rock, earth, or any other geotechnical engineering material as an integral part of a man-made project, structure, or system. Geotextiles are usually produced as either woven or non-woven textiles.

Geogrids

Geogrids are defined as regular networks of integrally connected polymeric materials used primarily for reinforcement with foundation, soil, rock, earth, or any other geotechnical-related material as an integral part of a man-made structure or system. Geogrids are discernibly stiffer than geotextiles and have relatively large voids within the material.

Geomembranes

Geomembranes are defined as very low permeability synthetic membrane liners or barriers used with any geotechnical engineering related material to control fluid migration in a man-made project, structure, or system. Geomembranes are essentially impermeable sheets produced from polymeric materials.

Geocomposites

Geocomposites are a combination of any of the above three geosynthetics. The materials and manufacturing methods vary with the composite geosynthetics used. For example, a geonet (similar to a geogrid) sandwiched between two non-woven geotextile layers can be used to provide a drainage layer with high transmissivity.

2. THE FOLLOWING TABLE SUMMARIZES THE APPLICATIONS FOR GEOSYNTHETICS AS USED IN CDOT SPECIFICATIONS.

GEOSYNTHETIC APPLICATIONS

Type/Example ➔ Function ↓	Geotextiles	Geogrids	Geomem-branes	Geocomposites	Examples
Drainage	Yes	No	No	Yes	Retaining Walls
Filtration	Sometimes [1]	No	No	No	Embankments
Stabilization	Yes	Yes	No	No	Roadway/MSE Walls
Reinforcement	Yes	Yes	No	No	MSE Walls
Barrier/Liners	Sometimes [2]	No	Yes	No	Pond Liners
Separation	Yes	No	Yes	No	Roadways
Erosion	Yes	No	No	Yes	Silt Fence

[1] In certain applications

[2] When appropriately coated

3. THE FOLLOWING DESCRIBES THE APPLICATIONS FOR WHICH GEOSYNTHETICS MAY BE USED.

Geosynthetic Function Applications

Drainage. Drainage is required in nearly all geotechnical structures. Geotextiles and geocomposites may be used to reduce lateral pressure on a retaining wall or a number of other drainage situations. Drains of various designs have been used in the past, most based on the use of a high permeability layer built into the ground using aggregates; a single layer of

geosynthetic can produce the same results. Drains can be distinguished from filters as follows: water travels across the plane of filters and travels with the plane of drains. Geotextiles and geocomposites are well suited to this application.

Filtration. Filtration may be needed to enhance the performance of a geotechnical structure, and geosynthetics can be used to produce an effective filtration system. The purpose of a filter is to allow water to pass through the plane of the filter, while retaining particles of the filtered soil. Filtration can improve the performance of a geotechnical structure by controlling the erosion of the structure and reducing the amount of fines that are washed out of the soil matrix. When fines get washed out of a soil it can reduce the cohesion of the matrix and thus the strength of the soil; this is referred to as *piping*. Mitigating these two problems also improves the durability of a structure. Geosynthetic filters can be an improvement over the reliability and performance of traditional graded soil filters and require less work to construct. Geotextiles are well suited to this application.

Stabilization. Stabilization is the process of converting an active material into an inert or non-reactive material. Both geotextiles and geogrids are used to control soil and rock movement in geotechnical structures and slopes by increasing the effective angle of shear and increasing the stability of an earth structure.

Reinforcement. Geotextiles and Geogrids can be used to reinforce a soil mass, increasing the effective angle of shear and increasing the stability of an earth structure. In the reinforcement function, the geosynthetic is subjected to a sustained tensile force. Soil and rock materials are noted for their ability to withstand compressive forces and their relative low capacity for sustained tensile forces. In much the same way that tensile forces are taken up by steel in a reinforced concrete beam, the geosynthetic supports tensile forces that cannot be carried by the soil in a soil/Geosynthetic system. Geogrids and geotextiles are best suited to this function.

Protection/Barrier/Liner. In some geotechnical applications barriers or liners are necessary to separate or protect one section of the work from another. Examples include stopping leachate seepage, protecting a structure from moisture and protecting a geotechnical structure from erosion. Geotextiles and Geomembranes are suited to this application.

Separation. A geotextile or geomembrane can act to separate two layers of soil that have different particle size distributions. For example, geotextiles are used to prevent road base materials from penetrating into soft underlying soils, thus maintaining design thickness and roadway integrity. Separators also help prevent fine-grained subgrade soils from being pumped into permeable granular road bases. Geotextiles and geomembranes are most suited to this application.

Erosion. Erosion is the group of processes whereby earth or rock material is loosened or dissolved and removed from any part of the earth's surface. It includes the processes of weathering, solution, corrosion, and transportation. Geosynthetics, such as a silt fence geotextile, act to contain soil particles while allowing wind and water to pass through them in a controlled manner thus limiting the effects of erosion.