

## **Chapter 16**

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## 16.1 Overview

This chapter addresses the design of geosynthetics in the following applications:

- Underground drainage, including prefabricated drainage strips
- Soil separation
- Soil stabilization
- Permanent erosion control
- Silt fences
- Base reinforcement for embankments over soft ground
- Geomembranes

Investigation and design of geosynthetic walls and reinforced slopes is addressed in **WSDOT GDM Chapter 15**.

## 16.2 Development of Design Parameters for Geosynthetic Application

For underground drainage design, information regarding the gradation and density of the soil in the vicinity of the geosynthetic drain, as well as details regarding the likely sources of water to the drain, including groundwater, is needed. For shallow systems, hand holes will be adequate for this assessment. For drainage systems behind retaining walls, test holes may be needed. In general, the geotechnical site investigation conducted for the structure itself will be adequate for the drainage design.

In general for soil stabilization and separation, hand holes coupled with Falling Weight Deflectometer (FWD) test results will be adequate for design purposes. For extremely soft subgrade soils, subgrade shear strength data may be needed to allow a subgrade reinforcement design to be conducted.

For permanent erosion control, the gradation characteristics of the soil below the geotextile layer, and measurement of the groundwater, are important to the geosynthetic design. Test holes or test pits will be needed at key locations where permanent erosion control geotextiles are planned to be used.

Investigation for silt fences can generally be done by inspection, as silt fence design is, in general, standardized.

Investigation for base reinforcement of embankments over soft ground is addressed in **WSDOT GDM Chapter 9**.

For geomembrane design, groundwater information and soil gradation information is usually needed. If the geomembrane is to be placed on a slope, the geotechnical data needed to investigate slope stability will need to be obtained (see **WSDOT GDM chapters 7, 9, and 10**).

### **16.3 Design Requirements**

For Standard Specification geosynthetic design (underground drainage, separation, soil stabilization, permanent erosion control, silt fences, and prefabricated drainage strips), the WSDOT Design Manual, Chapter 530, shall be used for geosynthetic design. For situations where a site specific geosynthetic design is required, FHWA manual No. FHWA HI-95-038 “Geosynthetic Design and Construction Guidelines – Participant Notebook” (Holtz, et al., 1995) shall be used. For base reinforcement of embankments over soft ground, the FHWA manual identified above shall be used for design in addition to the requirements in **WSDOT GDM Chapter 9**. For geomembrane design, the above referenced FHWA manual should be used.

### **16.4 References**

Holtz, R. D., Christopher, B. R., and Berg, R. R., 1995, Geosynthetic Design and Construction Guidelines, Federal Highway Administration, FHWA HI-95-038.

WSDOT, *Design Manual*, 2004, Publication No. M22-01.