

Coastal Engineering Technical Note

USE OF GEOTECHNICAL FABRICS

PURPOSE: To call attention to the use of geotechnical fabrics as an alternative to sand and gravel filters for coastal structures.

BACKGROUND: Normally, filters to protect soils from surface erosion of piping losses are made-up of layers of graded sand, gravel, and stone materials in various combinations and thicknesses. Often these materials are expensive and, in some locations, proper materials are not economically available. Even if the required materials are readily available, proper placement in the field, particularly at inwater sites can be tedious and demands close inspection.

GEOTECHNICAL FABRICS: The term "Geotechnical Fabric" applies to a variety of synthetic fiber textile products used in the construction of engineering works including coastal engineering projects. These fabrics, both woven and non-woven, have been used in projects involving quarry stone revetments, groins, seawalls, jetties, and breakwaters. In these coastal structures the fabric can replace one or more layers of a graded sand-and-gravel filter and is also effective for erosion-control where the fabric can prevent piping and erosion of cohesionless materials while allowing drainage and dissipation of excess hydrostatic pore pressures. The seawall shown in the Figure was constructed at the north end of Carolina Beach, North Carolina, in 1970, by the Corps of Engineers, and utilizes a geotechnical fabric. Structures of a generally similar cross section using these fabrics have been built along the Atlantic seaboard since 1958. Stone weights, slopes, and elevations varied with local conditions. More recently fabrics have been used behind steel, concrete, and timber sheet-pile bulkheads in connection with french drains, weepholes, and joints.

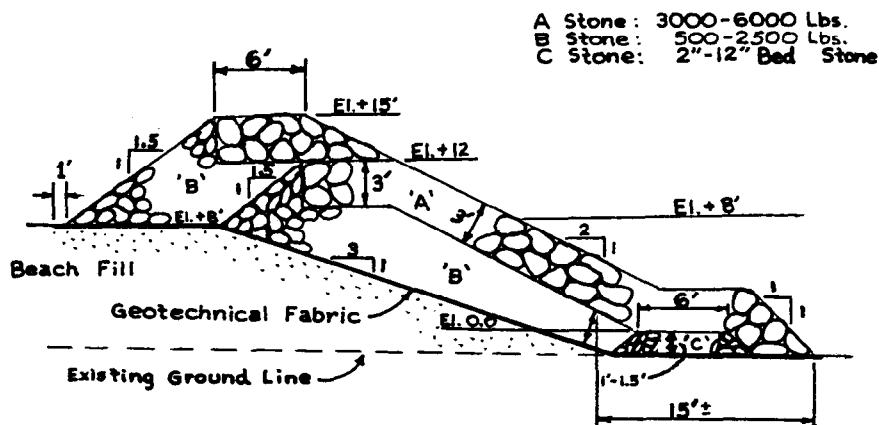


Figure - Use of Geotechnical Fabric in Seawall at Carolina Beach, NC (Corps of Engineers project).

The great flexibility of these fabrics helps to assure the long-term continuity of the filter. While all of these fabrics will bend, crease, fold, and stretch to some degree without rupturing, the relative performance of different proprietary fabrics are quite varied. However, it is important to properly place the fabric loosely so that distortions that occur from placement of heavy stones will not subject the fabric to stresses beyond its elastic limits and to adequately overlap adjacent sections to insure continuity.

Over 30 different fabrics for coastal usage are commercially available in the United States in either woven or nonwoven styles. In any given project application it is important to consider which of these proprietary fabrics will best meet the engineering design parameters. Before selection of a particular geotechnical fabric is made for its applicability to a specific design, it is important to determine the physical, chemical, and engineering properties of commercially available filter fabrics with respect to design criteria. There may be large variations in these properties (see Table) and the cost can vary greatly.

TABLE
General Properties of Geotechnical Fabrics

<u>ITEM</u>	<u>REMARKS AND REFERENCES</u>
1. Weave . . . . .	.Woven, Nonwoven, or Perforated
2. Thickness . . . . .	.ASTM-D-1777, Dimension of Fibers
3. Weight . . . . .	.ASTM-D-1910, Construction Characteristics
4. Breaking Load and Elongation . . .	.ASTM-D-1682, Grab and Strip Test a. Warp Direction (length) b. Fill Direction (width)
5. Bursting Strength . . . . .	.ASTM-D-751, Testing of Fabrics
6. Puncture Test . . . . .	.ASTM-D-751, Modified
7. Abrasion Resistance . . . . .	.ASTM-D-1175
8. Abrasion Strength . . . . .	.ASTM-D-1682
9. Equivalent Opening Size (EOS). . . (US Sieve No. Equivalent)	.Care should be used to prevent clogging by sediment or loss of fines through the fabric.
10. Elastic Properties . . . . .	.ASTM-D-1774
11. Water Permeability . . . . .	.Gradient-Ratio should not exceed 3 (see Guide Specifications, OCE, 1977)
12. Chemical Composition . . . . .	.Fiber material could be: nylon, polypropylene, polyamide, polyester, olefine, fiber glass, etc.
13. Accelerated Aging . . . . .	.Some deterioration after prolonged exposure to sunlight if not buried in structure. (See Fed. Stnd. 191.)

Guidelines for quality control can be found in the following reference:
U.S. ARMY, CORPS OF ENGINEERS, "Plastic Filter Cloth," Guide Specifications CW-02215, Office of the Chief of Engineers, Washington, DC, November, 1977.