Overview

As chairman of the ASTM Symposium on Geotextile Testing and the Design Engineer, I also have the honor of being the editor of this resulting special technical publication (STP). Geotextiles have been defined by ASTM Committee D35 on Geotextiles, Geomembranes, and Related Products as "permeable textiles used with geotechnical materials as an integral part of a man-made project, structure or system." Geotextiles are part of a larger family of materials called geosynthetics, which are used by civil, geotechnical, environmental, and structural engineers in their designs. These materials include geotextiles, geomembranes, geogrids, geonets, geomats, geocomposites, and a host of other geo- terms, the list of which is growing every year as new applications are discovered.

The authors of the papers presented in this STP represent all facets of the geosynthetic discipline: academia, manufacturers, end-users, and design consultants. Furthermore, they bring with them more than a century of combined experience in a discipline which is only 10 to 15 years old.

It is important to note the difference between the geosynthetic industry, geosynthetic materials, and the geosynthetic discipline. The geosynthetic industry encompasses all the people, facilities, equipment, materials, knowledge, applications, and economics involved with geosynthetics. Geosynthetic materials, better known simply as "geosynthetics," are the products developed by researchers, made by manufacturers, sold by salesmen, and purchased by end-users to be installed by contractors in applications designed by engineers. The geosynthetic discipline is that body of knowledge which has been developed to make it possible to design with geosynthetics using rational engineering design methods and to explain the success of these materials using modern scientific concepts and principles. This discipline therefore refers to those scientists and engineers who are concerned with the development of geosynthetic theory and understanding as well as the design of these applications.

This STP is directed at the heart of the geosynthetic discipline. It describes the tests used by scientists and engineers to develop and then specify geosynthetics, and it then discusses the design of applications where those test results are used. One consistent goal of this discipline has been to develop design methods and approaches which are consistent with, and, whenever possible, extensions of existing engineering design methods. As a consequence, many of today's geosynthetic design approaches will seem very familiar to civil, geotechnical, environmental, and structural engineering designers. This has been no mean feat since this discipline, as reflected in the published literature, began only recently, (although it describes an industry which is almost as old as civilization itself: the Babylonians constructed soil-reinforced "ziggurats" more than 3000 years ago, and the Chinese have used reeds to construct a type of corduroy road since prehistoric times). Only recently have we learned to understand the engineering functions of geosynthetics, to calculate the engineering forces involved, and therefore to design with and predict the success of these materials in various engineering applications. It has been this understanding, that is, the engineering discipline, which has prompted the acceptance of geosynthetics as engineering "state-of-practice" materials. As a result of this growing acceptance, combined with manufacturer marketing efforts, more than 200 million square metres of geosynthetics are now being sold per year in North America, and the market is growing at roughly a 15 to 20% annual rate of increase.

This rapid growth has been plagued with many of the problems which beset any emerging discipline, and one problem which has been particularly troublesome is interdisciplinary communications. Of necessity, the geosynthetic discipline has representation from civil, geotechnical, environmental, structural, industrial, mechanical, chemical, textile, and plastics engineering, as well as the scientific fields of chemistry, biology, physics, and others. Unfortunately, each of these disciplines has its own jargon, and their language and concepts are sometimes confusing to, if not in conflict with, each other. For example, the term "filter," as used by mechanical engineers, chemists, and chemical engineers, refers to a completely different concept than that used by civil and geotechnical engineers—the former expect filters to clog and to be periodically replaced, while the latter devote considerable energy to designing filters that will not clog. Similarly, textile engineers struggle with designing textiles for the clothing industry which are smooth to the touch and stretch easily with body movement, while geotechnical engineers yearn for geotextiles with high friction angles and high modulus, which means they must be rough and unyielding.

The only answer to this type of apparent impasse is to increase the avenues and opportunities for communication between the parties involved.

This STP is one such opportunity. It discusses both the textile industry tests and the relevance of those tests to the design engineer. The tests are grouped by the broad types of properties which they measure—mechanical, hydraulic, and endurance—and each category is followed by papers which describe the relevance of the test results to the design engineer. Additionally, there is a section on the future of geosynthetic tests and applications, which shows clearly that, although we have come very far, we still have a long way to go.

One other highlight of the STP is the ASTM position paper prepared by Christopher, Carroll, and Suits. This paper is intended as an interim guide for those laboratories which cannot wait for the publication of ASTM standards which are currently under development. ASTM Committee D35 (and its predecessors, ASTM Committees D13.61 and D18.19) has already published several standards, and many others are currently in various stages of development. This position paper describes the current (1985) state of development of those standards which are not yet complete. No suggestion or representation is made concerning the relevancy, accuracy, appropriateness, or completeness of the tests described in the position paper. In fact, the tests described may bear little resemblance to the standards that are eventually published. Nonetheless, the tests described are, in the opinion of this editor as well as the authors, representative of the tests most commonly in use at this time.

No introduction to an STP which results from the work completed by ASTM Committee D35 would be complete without a word about the members of this committee. Many of these scientists and engineers have faithfully participated in D35 (and its predecessor committees) since 1978, and have struggled with every painstaking step in the process of developing new standards. As of January 1986, the following geosynthetic standards have been passed by ASTM:

Standard Number	Title
D 4354-84	Practice for Sampling of Geotextiles for Testing
D 4533-85	Test Method for Trapezoid Tearing Strength of Geotextiles
D 4595-86	Test Method for Tensile Properties of Geotextiles by the Wide Width Strip Method
D 4632-86	Test Method for Breaking Load and Elongation of Geotextiles (Grab Method)
D 4355-84	Test Method for Deterioration of Geotextiles From Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
D 4594-86	Test Method for Effects of Temperature on Stability of Geotextiles
D 4491-85	Test Method for Water Permeability of Geotextiles by Permittivity

D 4437-84	Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes
D 4545-86	Practice for Determining the Integrity of Factory Seams Used in Joining Manufactured Flexible Sheet Geomembranes
D 4439-85	Terminology for Geotextiles

To those veterans of the geosynthetic standards wars, as well as to those newer members who are helping to continue the campaign, I offer heartfelt thanks.

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