

A LOOK BACK AT GEOSYNTHETIC TESTING AND SPECIFICATION STANDARDIZATION – A CELEBRATION OF 20 YEARS FOR ASTM INTERNATIONAL COMMITTEE D35 ON GEOSYNTHETICS

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ABSTRACT

The formal process of standardizing testing protocols and specifications for geosynthetics had its beginning in the fall of 1977. A group of individuals gathered in New York City in response to a questionnaire sent out to determine such interest in what were then known as “construction fabrics,” or “filter fabrics.”

There have been many persons involved in the progress that has been made since that initial meeting. Many still are, but many have moved onto other responsibilities within their organizations, left the field entirely, or retired.

This paper will trace the activities and progress of the standardization since that time. Some of the early names involved will be highlighted also, as they are responsible for where we are today.

THE BEGINNINGS

In the Fall of 1977 a group of about 77 people, plus or minus, gathered in a small hotel room in New York City in response to a questionnaire that had been sent out from ASTM Committee D13 on Textiles seeking organizations and individuals interested in test standardization for the materials then known as “construction, or filter fabrics.” As a result of that first meeting a subcommittee on Filter Fabrics was organized in early 1978 under the jurisdiction of Committee D13. Trudy Rauman, then of Monsanto, was named as chairperson.

Ms. Rauman deserves a great deal of credit for setting the group in the right direction in its initial work. For many of us, this was our first introduction to the workings and protocols of ASTM. Paul Miller of the US Army Waterways Experiment Station in Vicksburg, MS was named as secretary. The subcommittee designation was D13.61 on Filter Fabrics. The subcommittee was divided into four sections; 1) Mechanical Properties, with Dick Van Scoy, followed very shortly after by Bennett Baird, as chairperson; 2) Endurance Properties, with Dana Toups as chairperson; 3) Permeability and Filtration, with John Ball as chairperson; and 4) Nomenclature, with Marshall Silver as chairperson.

In 1980 it was recognized that there was very little participation from the geotechnical engineering community. Recognizing the importance of having as many affected groups as possible involved in the standardization process, a joint subcommittee was formed between Committee D13 on Textiles and D18 on Soil and Rock. The subcommittee carried the designation D13.61/D18.19 on Geotextiles and Related Products. Ballots on draft standards went through subcommittees and Main Committees.

Administering these joint ballots, and resolving negatives or comments on these joint ballots, proved to be a nightmare. In actuality, there were no standards approved during this time. Therefore, in 1984, with the agreement of Committees D13 and D18, and ASTM Headquarters, this joint subcommittee became a full Main committee. The recognition of this took place in February of 1984, at the Town and Country Hotel in San Diego, CA. The committee was known as Committee D35 on Geotextiles and Related Products. Barry Christopher was named as the first chairperson of D35. In 1985, with the agreement of Committee D18 and D35, the D18 subcommittee on geomembranes, chaired by Ron Fobel, was moved under the jurisdiction of D35. Ron was also named as First Vice Chairperson of D35.

The original D35 Bylaws required that we meet during the same Committee Week as D18 to encourage continued participation from the geotechnical engineering community.

In 1989, after D35 had approved a definition for “geosynthetics,” we received permission from ASTM to change our name to Committee D35 on Geosynthetics.

Since 1977 there have been fifty-three meetings to date (June 2004), of Committee D35 and its predecessors. As is the practice of ASTM, they have been held throughout the United States and Canada. Locations have included: New York City (2); Philadelphia, PA (1); Washington, DC (1); Charlotte, NC (1); Atlanta, GA (4); Chicago, IL (1); Orlando, FL (3); Kansas City, KS (1); Kansas City, MO (1); Cincinnati, OH (1); St. Louis, MO (3); Louisville, KY (2); New Orleans, LA (3); Los Angeles, CA (1); San Diego, CA (3); San Francisco, CA (2); Ft. Lauderdale, FL (2); Cocoa Beach, FL (1) (The first shuttle tragedy took place during this meeting.); Tampa, FL (2); Albuquerque, NM (2); Toronto, CA (2); Baltimore, MD (2); Denver, CO (3); San Antonio, TX (1); Montreal, CA (2); Memphis, TN (1); Las Vegas, NV(1); Reno, NV (1); Atlantic, City, NJ (1), Salt Lake City, UT (1); and Norfolk, VA (1).

ORGANIZATION

In 1984, the newly formed Main Committee consisted of three technical subcommittees, and two administrative subcommittees. The technical committees were; D35.01 on Mechanical properties, chaired by Bob Carroll, D35.02 on Endurance Properties, chaired by Robert Koerner, and Permeability and filtration, chaired by Dave Suits. The two administrative subcommittees were the Executive subcommittee, chaired by Barry Christopher as Committee D35 chairperson, and the Terminology subcommittee. The name of the original D35.93 on Terminology chairperson has slipped the author's mind. As mentioned above, a fourth subcommittee, D35.10 on Geomembranes, with Ron Frobels as chairperson, was added in 1985.

The committee has now grown into a committee made up of six technical subcommittees and seven administrative subcommittees. The two additional technical subcommittees are D35.04 on Geosynthetic Clay Liners, originally chaired by Larry Well, and D35.05 on Erosion Control; Products, originally chaired by Curtis McCorsley. The additional administrative subcommittees include D35.91 on Editorial, D35.92 on Liaison, D35.93 on Terminology, D35.94 on Statistics, D35.95 on Awards, and D35.96, USA Technical Advisory Group to ISO/TC 221 on Geosynthetics.

Membership of the committee has been around 300 +/- since its formation in 1984. Membership has represented all facets of the industry including manufacturers, consultant engineers, government agencies, academia, private end users, and others. As per the ASTM regulations we must maintain a balanced voting membership between producers, and users/general interest members.

Since 1984, Committee D35 has had four Main Committee chairpersons; Barry Christopher, 1984 – 1989; L. David Suits, 1990 – 1995, 1998 – 2003; and David Wyant, 1996 – 1997, Sam Allen, current chairperson.

The current members of the Executive subcommittee are:

Sam Allen – Chairperson

Robert Mackey – 1st Vice Chairperson and D35.04 Chairperson

James Goddard – 2nd Vice Chairperson and Awards Chairperson

Elizabeth Peggs - Recording Secretary

Henry Mock - Membership Secretary

W. Allen Marr – D35.01 Chairperson

Robert Koerner – D35.02 Chairperson

L. David Suits – D35.03 Chairperson

Curtis McCorsley – D35.05 chairperson

Rich Lacey – D35.10 Chairperson
Jonathon Cheng – Editorial and Statistics Chairperson
James Olsta – Member - at - Large
Thomas Baker – Member - at- Large
Jacek Mylnarek – Member - at - Large
Christi Sierk – ASTM International Staff Manager

Past ASTM staff persons involved with the committee have been: James Thomas, current President of ASTM International, as staff manager for Committee D13, Kenneth Pearson, current Vice President of Technical Committee Operations, as staff manager for Committee D18, Robert Morgan, current staff manager for Committee D18, Janet Bove, Jamie Kerr, Robert Held, Pat Picariello, Maxine Topping, all past staff managers for Committee D35, and current staff manager, Christi Sierk.

STANDARDIZATION

As previously mentioned, while the now Committee D35 was a joint subcommittee D13.61/D18.19, there was a lot of work being carried on, but there were no standards approved for publication. The reason behind this was the diverse disciplines that were represented between the two Main Committees, D13 on Textiles, and D18 on Soil and Rock. The textile people on D13 not involved with geotechnical engineering, or geotextiles, didn't recognize the geotechnical aspects of the standards that were being put forth, and those persons on D18 not involved with geotextiles, didn't recognize the textile aspects of the standards being put forth. However, once the D35 was formed progress began to take place in getting standards approved for publication.

The first standard to become approved was D4354, Practice for Sampling of Geotextiles for Testing. Shortly there after, D4355, Test Method or Determination of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus) was adopted. Both of these standards received initial approval in 1984.

As of the writing of this paper, there are 104 geosynthetic standards contained in the ASTM International Book of Standards. Originally these standards appeared in Vol. 04.09 of the Book of Standards. In 2003, the 104 standards contained enough paper volume for them to be published in a volume of their own, 04.13.

In the early years of the work of D35 and its predecessors, the emphasis was on taking existing textile test methods and revising them to meet the needs of the geotechnical engineering and geosynthetics community. They were basically simple index property tests used to characterize individual materials, and not appropriate as engineering design tests. It was also a conscious decision not

develop any material specifications until the appropriate test methods had been developed.

Once the basic index tests were approved work turned to some of the more intricate and complex testing that was/is needed for proper design of geosynthetics into an engineering project. Some of these include: D6244 – Test Method for Vertical Compression of Geocomposite Pavement Panel Drains; D6916, Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units; D1987, Test Method for Biological Clogging of Geotextile or Soil/Geotextile Filters; D5322, standard Practice for Immersion Procedures for Evaluating the Chemical Resistance of Geosynthetics to Liquids; D5721, Standard Practice for Oven-Aging of Polyolefin Geomembranes; D6992, Test Method for Accelerated Tensile Creep and Creep Rupture of Geosynthetic Materials on Time-Temperature Superposition Using Stepped Isothermal Method; D5567, Test Method for Hydraulic Conductivity Ratio (HCR) Testing of Sol/Geotextile Systems; D6767, Test Method for Pore Size Characteristics of geotextiles by Capillary Flow Method; D6243, Test Method for Determining the Internal and Interface Shear Resistance of Geosynthetic Clay Liner by Direct Shear; D6496, Test Method for Determining Average Bonding Peel Strength Between the Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners; D6524, Test Method for Measuring the Resiliency of Turf Reinforcement Mats; D5617, Test Method for Multi-Axial Tension Test for Geosynthetics; D7002, Standard Practice for Leak Location on Exposed Geomembranes using the Water Puddle System.

In the past four to five years it was recognized that it was time for the committee to begin to develop specifications in the various areas of interest for the committee. While there has not been a dearth of work completed to date, there have been several specifications developed in this time frame. These include: D6707, Standard Specification for Circular – Knit Geotextiles for Use in Subsurface Drainage Applications; D8001, Standard Specification for Geocomposites for Pavement Edge Drains and Other High – Flow Applications; D6817, Standard Specification for Rigid Cellular Geofoam; D6826, Standard Specification for Sprayed Slurries, Foams, and Indigenous Materials Used as Alternate Daily Cover for Municipal Solid Waste Landfills; D7008, Standard Specification for Geosynthetic Alternate Daily Covers. There is ongoing work on a few other specifications, but as they have not been approved yet, they will not be named here.

Beside work within the D35 Committee, several of its members have been, or are involved with standards development at the international level. In the past there were five delegates to the former ISO geotextile subcommittee. These were Ronald Frobel, Barry Christopher, Dave Suits, and Deron Austin. D35 hosted two

of the subcommittee meetings in conjunction with their regular Committee Week meetings. These were held in Orlando, FL and Montreal, Canada. The former subcommittee was formed into a full ISO Technical Committee in 2000, with Dave Suits being appointed as the Chairperson of ISO/TC221. Since that time Sam Allen has been appointed as convenor for ISO/TC221 Working Group 5 on Mechanical Properties, and Robert Mackey as convenor for Working Group 2 on Terminology. D35 hosted the second meeting of TC221 in Norfolk, VA in 2001. In 2002, Dave Suits representing ISO/TC221, and Sam Allen, representing D35 signed a Memorandum of Understanding which stated that the two committees agreed to work together to avoid duplication of efforts in standards development. This meant that both committees would recognize the work being carried on within the other committee, and where possible, accept each other's standards. The Technical Management Board of ISO has yet to formally act on acknowledging the agreement. However, the two committees are following the intent of the agreement, and working very hard to avoid duplication of efforts.

Several members of the committee also belong to the Canadian General Standards Board Geosynthetics Committee. These include, Andre Rollin, Chairperson; Jacek Mlynarek; Patrick Diebel; Eric Blond; and Dave Suits

There are many representatives from outside North America serving as members of the committee. The countries represented include, United Kingdom, France, Italy, Germany, Taiwan, South Korea, Australia, Peru, South Africa, Columbia, China, Turkey, Malaysia, Chile, Japan, Ireland, Saudi Arabia, and Romania. In total, including the US and Canada, there are twenty countries represented on D35, making the work of the committee truly an international effort.

OTHER WORK OF THE COMMITTEE

In addition to the development of testing standards and specifications, the committee bears a responsibility to communicate the state of the art to the geosynthetics and geotechnical communities. This has been accomplished in several ways. The major means of carrying out this communication is through workshops and symposia on relevant topics of the time. To date there have been nine symposia sponsored by Committee D35. Each of these symposia has resulted in a Standard Technical Publication with the papers presented at the symposia appearing in their respective publications. A list of the publications, their number and year of publication, and the editor(s) for each follows:

1985 – Geotextile Testing and the Design Engineer (STP 952) – Joseph Fluet

1989 – Geosynthetics: Microstructure and Performance (STP 1076) Dr. Ian Peggs

1990 – Geosynthetics Testing for Waste Containment Applications (STP 1081) – Dr. Robert Koerner

1993 – Geosynthetic Sol Reinforcement Testing Procedures (STP 1190) – Robert Carroll, Jr. and Dr. Jonathon Cheng

1995 – Geotextile Filters and Prefabricated Drainage Geocomposites (STP 1281) Dr. Shobha Bhatia and L. David Suits

1996 – Testing and Acceptance Criteria for Geosynthetic Clay Liners (STP 1308) Larry Well and Kent von Maubeuge

1999 Grips, Clamps, and Extension Measurements (STP) - Peter Stevenson

1999 – Geosynthetics in Subsurface Drainage (STP 1390) – Jointly sponsored with Committee D18, TRB Committees A2K06 on Subsurface Drainage, and A2K07 on Geosynthetics – James Goddard, John Baldwin and L. David Suits

2003 – Advances in Geosynthetic Clay Liner Technology (STP 1456) - Robert Mackey

Besides these formal symposia there have been a number of technical workshops presented over the life of the committee. These are generally aimed at bringing people up to date on the state of practice in various areas, and several times have led to one or more of the above formal symposia and publications.

Within ASTM International there are other publications through which communication takes place. One is the monthly publication of “Standardization News,” in which many articles on the work of D35 have appeared. Another is the formal ASTM International Geotechnical Testing Journal. Over the years there have been many geosynthetic related papers submitted and accepted for publication. Each year the Journal presents an award for the outstanding practical paper published the preceding year in the Journal. A paper written by three D35 members was selected as the 2002 winner of this award. The paper, “Development of RECP Performance Test Methods,” by C. Joel Sprague, Carrie Carver, Sam Allen appears in the December 2002 issue of the Journal.

RECOGNITION OF MEMBERS

The work of any ASTM International Technical Committee is primarily carried out through the volunteer efforts of its members. They give of their time, their knowledge, and abilities in accomplishing the ultimate goal of published, usable test methods, practices and specifications. It is very critical to recognize and

acknowledge persons for the time and effort which they give in these undertakings. Over the years D35 has recognized its members in many ways. Many times formally, many times in fun ways.

Among the formal ways that members are recognized is through service awards presented to each person who has taken on the development of a standard and saw it through to acceptance and publication. These are too numerous given that there are 104 D35 standards currently, to list individually here. But that in no way minimizes the meaning of these recognitions. The committee has also recognized organizations for their participation in the round robin programs aimed at the initial development of standards and the following round robins necessary to develop precision and bias statements for each standard.

ASTM International recognizes the efforts of committee members with its highest award, the Award of Merit. A member is nominated by the sponsoring committee, a volunteer standing committee of the Society reviews the nomination, and determines the appropriateness or not of the award. Over the life of the Committee, D35 has recognized seven of its members with this Award. With it goes the membership status of “Fellow,” of the Society. Those persons thus far recognized by D35 with the Award of Merit include: 1986 – L. David Suits; 1987 – Robert Carroll, Jr.; 1988 – Jack Hodge; 1990 – Barry Christopher; 1992 – Ronald Frobel; 1994 – Robert Koerner; 2003 – Robert Mackey.

While it is always dangerous to name names for fear of leaving some out, there are a few names of individuals that have not been previously mentioned, but have played major roles in the activities of Committee D35 that should be mentioned. These individuals for mostly career reasons are no longer active. That in no way diminishes their contributions. These include: Dr. Alan Haliburton (deceased), Dr. Thomas Kinney, Dr. Neil Williams, Robert Barrett (not Bob Barrett from Colorado DOT), Dr. Gregory Richardson, Alice Comer, Janice Singh, Ian Clough, Dr. J.P. Giroud, Dr. Rudy Bonaparte, Jack Fowler, and Vern McGuffey among many.

ROLE OF DR ROBERT KOERNER AND GSI IN ASTM D35

As you have read through this paper you have noticed Dr. Koerner’s name mentioned many times. To say that Dr. Koerner and the Geosynthetics Institute have had a profound impact on the work of Committee D35 is an understatement.

The original institute, known as Geosynthetics Research, Inc., was formed in 1986, with the name being amended to Geosynthetics Research Institute (GRI) in 1989. In 1991 the Geosynthetics Institute became the umbrella organization for several other institutes, of which the GRI is one. Right from the inception, Dr.

Koerner worked in conjunction with Committee D35 in trying to expedite the development of standards. He would tackle some of the more complex issues in developing specific standards, and get a usable standard drafted under the auspices of GRI, or later GSI, and then bring it into the ASTM arena, and push it through the formal approval process. Once approved as a D35 standard he withdrew the GRI or GSI standard from the Institute's list of standards, and referenced the new ASTM document. This truly expedited, and continues to do so, the work of D35.

Dr. Koerner not only brings the paperwork with him, but his knowledge and expertise of both the geosynthetic and geotechnical engineering communities, a balance that has provided much needed perspectives in the field.

Dr. Koerner also encouraged many of his students to become involved in the work of the committee not only by attendance at the meetings, but by getting them directly involved in the development of several of the test methods. This not only exposed them to others in the geosynthetics community, but helped them to build an understanding of how standards are developed, and the amount of time and effort that goes into their preparation.

Personally, it was about 35 years ago this fall that our then Assistant Director called me into his office and told me that he would like to assign me to the Soil Mechanics Laboratory as the assistant supervisor. If he had said to me then that 35 years later I would be standing before a group of persons considered to be the gurus of our profession, honoring one of them that I have come to consider as a personal mentor and friend, I would have either laughed, or vehemently argued against the assignment, for at the time in my career I did everything possible to avoid having to be in front of large groups. Dr Koerner is one of the persons that helped me tremendously in overcoming that reluctance, as well as building a deeper understanding of geosynthetics.

The above references are but a few of the many many contributions that Dr. Robert Koerner has made to what was a young, new, sometimes misunderstood industry. Without these, and the many other contributions, that he has made, the geosynthetics industry, including manufacturing, engineering, sales, testing, and specifying, would not be in the position is today, as a State of the Practice solution to intricate geotechnical engineering design and construction problems.

SUMMARY

It was 27 years ago this fall that a small group of people gathered in small hotel room in New York City just to investigate people's interest in working together in a brand new industry. With the formation of D35 twenty years ago, the 'new' industry came of age, and was recognized as an important part of the engineering

community. I don't think any of us that were in that room 27 years ago pictured it evolving into what it is today.

While some say, "Standardization stifles innovation," the author says just the opposite, "Standardization allows innovation." When "State of the Art" moves onto "State of the Practice," it allows concentration on new areas, new applications, and new materials.

ASTM International Committee D35 on Geosynthetics, and its predecessors, D13.61 and D18.19, have indeed moved many of the geosynthetic materials and practices from State of the Art to State of the Practice over the last 27 years. Evidence that this has allowed innovation can be seen in the new products such as the geosynthetic clay liners, geocomposite drainage materials, new formulations, new applications such as reinforced slopes and walls, and detailed design procedures that are now in place.

As long as we don't become complacent and think there is no work left to do, the industry, and Committee D35 has a bright future in front of them.