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IGS NEWS

IGS Activities in Brief

by

Professor R.J. Bathurst, Vice President of the IGS

This issue of IGS News reports the many ongoing activities of our society. In particular, it records the many efforts of the IGS Officers and Council that continue year round and the efforts of many of the IGS Chapters whose activities represent the most visible efforts of our growing society. It is a pleasure to be given the opportunity to provide a synopsis of some of the most recent activities and some important forthcoming events.

IGS Council Elections

In the last issue of IGS News (v11 no. 3, Nov 1995), a call for candidates for the IGS Council was announced to fill a total of eight positions for a four year term commencing July 1996. I am pleased to report that a slate of strong candidates from amongst the IGS membership has stepped forward to accept the challenge.

The importance of proactive Council Members representing a broad spectrum of disciplines and geographical regions cannot be overemphasized. The energies of the IGS Council Members will decide the level of success of our society. In May of this year each IGS member will receive a postal ballot with the names of the candidates and be asked to rank order their choices for the eight available positions. I ask all members to participate in this postal ballot and to carefully weigh their choices in the best interests of our society.

To assist those IGS members who may not be familiar with all the candidates, a brief biographical sketch of each candidate can be found on page 2 of this newsletter.

IGS World Wide Web Home Page (<http://igs.rmc.ca>)

The IGS home page was announced in the IGS News last summer (v11 no. 2, Jul 1995). The page continues to grow and the positive response of many IGS members and many others has been very encouraging. The Web site now functions as a vehicle for current information on events and announcements of interest to our members and compliments the IGS News by providing this information between the three annual issues of this newsletter. Every effort is made to announce conferences, calls for papers and the like as quickly as they are received by the Officers of the IGS. IGS members are encouraged to submit their announcements in electronic form (email) directly to the writer at bathurst@rmc.ca. The IGS Web site now contains full journal abstracts for Geosynthetic International and we hope to provide a similar service for Geotextiles and Geomembranes soon. Corporate Members are invited to submit a one page synopsis of their company or organization for publication on the Web site (see IGS Web site for detailed instructions and information). Links to other Web sites that may be of interest to our members are being added on a regular basis and those individual members or Corporate Members who would like to have their Web

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Visit the IGS Web site at <http://igs.rmc.ca>

sites linked from the IGS home page are invited to contact the writer.

6IGC

IGS members will soon receive the first bulletin of the 6th International Conference on Geotextiles, Geomembranes, Related Products and Associated Technologies that will be held in Atlanta, Georgia, USA 25-29 March 1998. The bulletin includes a call for abstracts that will be due on 1 September 1996. Be sure not to miss this important deadline. The organizing committee chaired by Dr. Robert M. Koerner has been working very hard to continue the success of the previous international conferences and indeed to make the 6IGC the best conference yet.

EuroGeo1

The Dutch Chapter of the IGS has completed the final

details of the forthcoming EuroGeo1 Conference to be held in Maastricht, The Netherlands 30 September - 2 October 1996. This conference will be the first regional European conference of the IGS and promises to be an exciting mix of events and very informative as outlined in the article on p16 of this newsletter. IGS members should have received the second bulletin for EuroGeo1. Members are encouraged to make their plans now to attend.

Chapters

This newsletter continues the series of chapter reports that appeared in the last issue of IGS News. These reports are evidence of the high level of activity of our chapters and their commitment to fulfil the goals of the society including the advancement of our society and dissemination of technical information. Several other organizations are actively pursuing the formation of new chapters of the IGS. We look forward to introducing these new chapters soon.

Candidates for the IGS Council

Toshinobu Akagi (Japan)

Dr. Toshinobu Akagi, P.E., is Professor of Geotechnical Eng., Dept. of Civil Eng., Toyo University, Japan and a geotechnical consultant in Japan and abroad (1966-present). He has degrees in civil engineering from the University of Tokyo (BSCE and Dr. Eng.) and the University of Illinois (MSCE). He has worked as Soils Engineer for two U.S. consultants in Seattle and in New York (1960-1965); served as Professor at Asian Institute of Technology, Bangkok while on leave (1978-1980); has served on the IGS Council since 1992, as Associate Editor (Asia) of IGS News since 1990 and as Liaison Secretary of the Japan Chapter of IGS since 1985. He was a Keynote Lecturer at 5IGC, Singapore, 1994. Formerly, he was the President of the Japanese Chapter of ASCE, Chairman of Committee on Earth Structures and Foundations of JSCE and Director of the JGS.

Barry R. Christopher (United States)

Barry Christopher, Ph.D., P.E., is an independent geo-engineering consultant, President of NAGS, and current Council member. He has a BSCE from U.N.C., Charlotte, a MSCE from Northwestern University, and a Ph.D. from Purdue University. He is a registered Professional Engineer with 18 years of experience in geotechnical and geosynthetics engineering including: reinforced soil and other ground improvement technologies; geo-environmental containment system design; and laboratory testing. Before serving as a Vice President of Polyfelt Americas, he was Principal Engineer at STS Consultants, Ltd. His professional service includes: ASTM D35 on Geosynthetics; technical chair for Geosynthetics '91; chair for Geosynthetics '93; and past technical committee chair for the Industrial Fabrics Association International. He has authored over 60 technical papers including five geosynthetics design manuals for U.S. federal agencies.

Hyung-Sik Chung (Korea)

Professor Chung received his MSCE at Purdue University in 1964 and his Ph.D. at Purdue in 1973. Professor Chung has taught civil engineering since 1964 at the Korea Military Academy (1964-1986) and Hanyang University (1987-present). Several public agencies, including the Korea Housing Corporation, The Korea Ministry of Construction and Transportation, The Seoul Metropolitan Mass Transit System, The Korea Highway Corporation and the Korea Rural Development Corporation, have engaged Professor Chung as an advisor. Professor Chung is a member of the Korean Society of Civil Engineering, the Korean Geotechnical Society, the Architectural Institute of Korea, the International Society of Soil Mechanics and Foundation Engineering, the International Geosynthetics Society and was one of the founding members of the Korean Chapter of the IGS.

Jean Lafleur (Canada)

Professor of Geotechnical Engineering at Ecole Polytechnique de Montreal, Dr. Lafleur is conducting research and consultation works on the characterization and the application of geosynthetics to filtration and drainage in environmental works, roads and dams. He is the author of more than sixty technical papers. He has made a French translation of Holtz and Kovacs' textbook *Introduction to Geotechnical Engineering*. Dr. Lafleur was awarded, with Andre Rollin and co-workers, the *NAGS Award of Excellence for Geosynthetics Research* for 1991. He served as member of the IGS Awards Committee in 1995 and has recently co-chaired the International Symposium *Environmental Geotechnics '96* in Paris. In addition to chairing the organizing committee of *GEOFILTERS '96*, he also is serving as the editor of the *CGS Geotechnical News*.

Chris Lawson (Malaysia)

Chris Lawson graduated from the University of New South Wales, Sydney, Australia with a civil engineering degree specializing in geotechnical engineering. For almost twenty years he has been involved with geotextiles and has worked in many parts of the world with them. Until 1986 he worked as a consultant throughout Australia and Southeast Asia specializing in geotextiles. Between 1986 and 1988 he was employed as technical manager by ICI Fibers Ltd., UK, with responsibilities for the technical marketing of their high performance geotextiles. In 1988 Chris took the position of technical and marketing manager for Exxon Chemical Geopolymers Ltd., UK. He presently works for Royal Ten Cate in Malaysia. Chris has published numerous papers on the subject of geotextiles over the past fifteen years and has been a member of IGS since its inception. For the last four years he has served on the IGS Council as Co-Chairman of the Technical Committee.

James Paul (United Kingdom)

Mr. Paul studied civil engineering at the University of Strathclyde where he earned BSc and MPhil degrees. He spent twelve years in general civil engineering before moving to Netlon Limited in 1982 at the early stages of commercialization of their geogrids. This involved much time and effort learning the relatively new principles of reinforced soil design as well as the full range of geosynthetics functions and related test methods. Since 1987, he has been Director of the Civil Engineering Division of Netlon Limited, responsible for activities and liaison with licensees throughout the world. In 1987, Mr. Paul was a founding member of the UK Chapter of IGS. He served as Secretary until 1991, Vice-Chairman from 1992 to 1993 and Chairman from 1993-1995. He is also a member of the European Activities Committee of IGS and was an early advocate of a European Regional Conference. Mr. Paul believes that his long apprenticeship with the UK IGS Chapter allied to his extensive knowledge of geosynthetics activities in many parts of the world would allow him to play a useful part in the work of the IGS Council.

Wang Tie Ru (China)

Professor Wang has taught soil mechanics and foundation engineering at Zhejiang University for forty years. Since 1980 he has been devoted to research, application and information dissemination concerning geosynthetics. Among his prominent accomplishments and many publications is the co-authorship of the volume "Application Manual of Geosynthetics Engineering" published in China in 1994. Professor Wang is a member of the IGS and a member of the standing committee of the Chinese Technical Association of Geosynthetics (CTAG) which is a chapter of the IGS.

Alberto M. Scuro (Italy)

Mr. Alberto M. Scuro, born in Italy in 1949, received a degree in Hydraulic Civil Engineering at the Turin Polytechnical School. He attended post-graduate courses on geosynthetics

and QA in construction. He worked twelve years in Europe and Africa as Project Manager for roads and bridges construction. In 1986 he joined the CARPI Group, a private organization with operations in Europe and North America. CARPI is a geomembrane specialist and contractor, focused on design, manufacturing and installation of waterproofing geomembranes on hydraulic and environment protection structures. He is now Chairman and Technical Director of the CARPI Group, member of ICOLD, Coordinator of ICOLD European Working Group on Geomembranes and Geosynthetics as Facing Material on Dams, and Italian Representative at CEN Joint Working Group 189/254 for Hydraulic and Underground Structures. He speaks Italian, French, English and some Spanish and Portuguese. He is the inventor and holder of several patent rights regarding installation of geomembranes and geocomposites.

Giuseppe Sembenelli (Italy)

Mr. Giuseppe Sembenelli has a five-year degree in civil engineering from Padova University, Italy, and over thirteen years experience in the field of soil mechanics and geotechnical engineering. After a three year experience in a prominent soil mechanics laboratory, he joined Piero Sembenelli Consultants in 1986. Since then he has worked as an independent consultant on the analysis, design and construction supervision of several dams, highways and foundation projects worldwide. In the field of geosynthetics, his main experience is with reinforcement and drainage applications in connection with roads, highways, embankments and earth dams. Author of several technical papers, Giuseppe Sembenelli is a Professional Engineer, registered in Italy. He is a member of IGS, AGI (Italian Geotechnical Society), ISSMFE, ISRM, and UNI (Italian Standardization Institute). He is also an active member of the Editorial Board of RIG-Rivista Italiana di Geotecnica (the Italian Geotechnical Journal).

C.V.J. Varma (India)

Mr. C.V.J. Varma is the Member Secretary of the Indian Chapter of IGS. The use of geosynthetics for various engineering applications in India was visualized by Mr. Varma as early as the eighties. He introduced the material to the engineering community of India through the first ever workshop organized on the subject in 1985. This was followed by a series of national and international events on geosynthetics. He was mainly responsible for forming the India Group of Geotextiles and the Indian Chapter of IGS. He has been involved in bringing out more than fifteen publications on the subject which are considered the main reference material in the country. He is also associated with other international organizations viz., ICOLD, IWRA, ISAM, ITA, etc. and has acted as the Secretary General of IWRA and Vice President of ICOLD in the past. In recognition of his outstanding contribution in creating awareness and popularizing the use of geosynthetics in the country during the decade he has been awarded the first Tenax Award for the year 1994.

IGS News Recognizes IGS Award Winners

At its last meeting held in Beaune, France, the IGS Council agreed that more exposure of the IGS Awards program was warranted in order to attract as many high calibre submissions as possible for future awards.

One way to achieve this aim is to inform the IGS membership of the achievements of past winners. Each of the IGS Award winners honored at the Fourth International Conference in Singapore in September 1994 has been invited

to submit a two-page article to IGS News that is focused on any part of the body of work described in their award citation. The award winners and their citations can be found in v10 no. 3 of IGS News (November 1994, pp. 9-10).

Professor Tatsuoka has graciously accepted this invitation. His article, with his co-workers, appears below.

*reported by R.J. Bathurst
Vice President of the IGS*

Applications of Geosynthetic-Reinforced Soil Retaining Walls to Railway Embankments in Japan

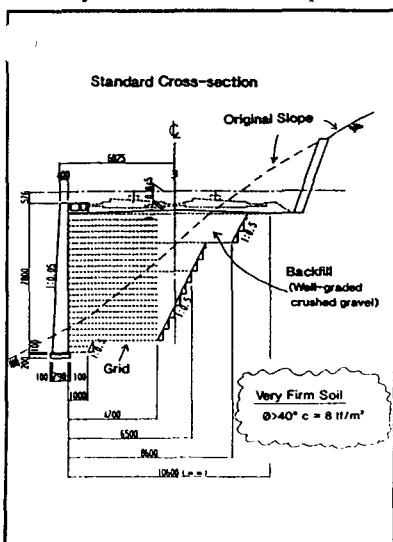
Fumio Tatsuoka, Professor, University of Tokyo, Japan

Masaru Tateyama, Osamu Murata and Hisashi Tarumi, Research Engineers, Railway Technical Research Institute, Japan

Introduction

Based on the results of an extensive series of model and material tests in the laboratory, field full-scale model wall tests, and theoretical and numerical analyses performed during a period of 1982-1993, a team of researchers has developed a new construction system for permanent geosynthetic-reinforced soil retaining walls (GRS-RW). In this system, a GRS-RW having a wrapped-around wall face is first constructed with the help of gravel-filled bags placed at the shoulder of each soil layer, which is followed by casting-in-place a light steel-reinforced concrete facing directly on the wall face after the deformation of the supporting ground and the back-fill soil has stopped.

The authors are very proud of having received the 1994 IGS Award for applications of this GRS-RW system to railway embankments in Japan.



Brief History and Current Trends

Since 1987, particularly after the approval in 1992 by the Ministry of Transport, Japan, many permanent GRS-RWs to support important high-speed railway tracks have been constructed using this system. The typical wall height is 5m, while the tallest one so far constructed is 10m. The

total length of the walls constructed by the end of 1995 is nearly 20 km. The rate of construction was still increasing in 1995.

One of the most important recent construction projects is the construction of GRS-RWs for the main tracks of a new bullet train line, Hokuriku Shinkan-sen, which is now under construction between north Tokyo and Nagano City. This line will be completed before the 1999 Winter Olympic Games in Nagano City. Fig. 1 shows the typical cross-section of the wall west of Karuizawa, which extends for 250m between a tunnel entrance and a bridge abutment. The wall height ranges between 4.6m and 8.6m. Fig. 2 shows the wall under construction.

The results of an extensive research program by the authors and their colleagues and the performance of many actual full-scale GRS-RWs have yielded benefits. This work has shown that the staged-construction method is effective both in avoiding damage to the facing and reinforcement (due to relative settlement between a rigid facing and a backfill soil) and in developing large tensile strains in reinforcement members during construction.



Fig. 2. A view of the GRS-RW (Fig. 1) under construction.

Fig. 1. Cross-section of a typical GRS-RW supporting the main tracks of a bullet train line, Hokuriku Shinkan-sen, near Karuizawa.

The construction project which took the best advantage of the staged construction method, is the one performed in 1994-1995. In that project, GRS-RWs with an average constructed wall height of 3m were constructed for a total length of 1,800m by using a nearly saturated clayey backfill soil over a thick very compressible soil deposit for a Shinkansen yard north of Nagano City (Figs. 3 and 4). The backfill soil was originally a nearly saturated weathered tuff, which became, after compaction, a nearly saturated clay having an average water content of 30% and a degree of saturation of 70%. A woven/non-woven composite was therefore used for the dual functions of tensile-reinforcing and drainage. Before casting-in-place a full-height rigid facing, a preloaded fill was constructed on the embankment to induce a settlement of nearly 1m. After the preload was removed, a full-height rigid facing was constructed on the wall face. This is the first Japanese large scale construction project using a permanent GRS-RW with a clay backfill. The success of this project has shown that most types of low quality on-site soils can be used as backfill soil for this GRS-RW system.

The results of the laboratory and field full-scale model tests also showed that a full-height rigid facing enhances the stability of the wall and the durability and aesthetics of the wall face. The full-height facing also assists in using relatively short reinforcement to alleviate space limitation problems. Moreover, a full-height rigid facing can support structures such as foundations for electric poles or frames, or noise barrier walls. Fifteen GRS bridge abutments, supporting railway bridge girders, were constructed. The longest bridge girder supported by GRS-RWs is 13.2m.

In total, six 5m high full scale test fills were constructed by 1993, followed by long-term monitoring of their behavior and loading tests to failure. Most recently (in 1995), another full-scale test geogrid-reinforced gravel retaining wall was constructed. In this test, three test segments of reinforced backfill were preloaded and prestressed in the vertical direction by using tie rods. Fig. 5 shows the primary features

of the preloaded/prestressed GRS-RW. This configuration was adopted to substantially increase the vertical rigidity of the wall against vertical load so that the wall can support a long bridge girder (length 30m) without exhibiting noticeable instantaneous and long-term wall deformation. The behavior of the test segments observed so far indicates that this unique construction method is quite promising.

A series of shaking table tests using small-scale models and a half-scale model were performed for investigating the seismic stability of GRS-RWs. The seismic design method accounts for the effect of facing rigidity on wall stability.

In Higashi-Nada-Ku, Kobe City, a 300m long GRS-RW was constructed in 1991 on the south slope of the railway embankment of JR (Japan Railway) Kobe Line. The site is located in an area seriously damaged during the 1995 Great Kobe Earthquake. The GRS-RW behaved very satisfactorily during the earthquake, as was reported in IGS News, v11, no. 2, Jul 1995. Masonry and gravity type unreinforced concrete retaining walls for railway embankments which collapsed totally or were damaged very seriously were reconstructed using GRS-RWs for a length of about 1.5km.

Summary

The GRS-RW system may be characterized by the following features:

1. the staged construction method;
2. the use of a full-height rigid facing cast-in-place directly against a wrapped-around wall face;
3. the use of relatively short reinforcement lengths when needed; and
4. the use of low-quality on-site soil as the backfill soil when needed.

This system has been validated by the excellent post-construction performance of the walls. The use of the GRS-RW system is now spreading to highway structures.

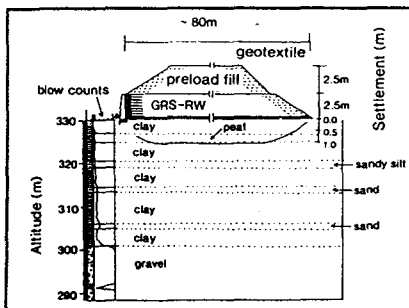


Fig. 3. Typical cross-section of GRS-RWs having a nearly saturated clay backfill for the Shinkansen yard north of Nagano City (a full height rigid facing was constructed after preload was removed).



Fig. 4. A view of the GRS-RW (Fig. 3) before casting-in-place.

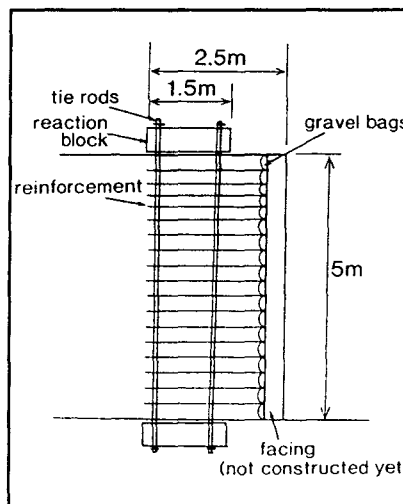


Fig. 5. Concept of preloaded/prestressed GRS-RW.

6th Int'l Conference on Geosynthetics: Call For Papers

The 6th International Conference on Geosynthetics will be held 25-29 March 1998 at the Inforum, Atlanta, Georgia, U.S.A. The conference is organized under the auspices of the International Geosynthetics Society by the North American Geosynthetics Society (NAGS) and the Industrial Fabrics Association International (IFAI).

The conference will feature four keynote lectures (including the Giroud Lecture) and approximately one hundred technical presentations on both state-of-the-practice and state-of-the-art with respect to the use of geosynthetics.

Papers will be presented in three parallel sessions. A three-day exhibition of products and services will run in conjunction with the conference which is expected to attract more than two thousand attendees including: geotechnical, environmental and civil engineers; project designers and specifiers; fabricators and installers; geosynthetics manufacturers and distributors; contractors; government officials; and civil engineering professors and students.

The official language of the conference will be English.

Abstracts Due 1 September 1996

Original papers describing novel and innovative developments, practical applications, new technologies and research are invited for presentation at the conference. The contact for information on submission of abstracts is given on p18 (Calendar).

Authors will be notified in January 1997 of acceptance or rejection based on the abstract review. Following acceptance of the abstract, the full text of the paper will be due for peer review not later than 1 May 1997.

Dr. Robert M. Koerner chairs the Organizing Committee. He is assisted by Prof. R. Kerry Rowe, Dr. J.P. Giroud, Dr. John F. Beech, and Mr. Steven M. Warner. Ms. Danette R. Fettig is the Secretary-General.

The New IGS Education Program

On October 19, 1995 I spoke to the Association of Engineers and Architects of the Bologna (Italy) region at a conference held in conjunction with the Geotechnical Association of Italy (AGI) which has a joint membership with the Italian Chapter of the IGS. The invited subject was "The IGS". I used the opportunity to introduce the new education program that the Council recently adopted. An abbreviated text of that address follows:

First let me express my appreciation to the organizers of this event and for inviting me to speak to you about the IGS. Of course, the AGI is one of the organizations that provides a foundation for the IGS. In fact, the concept of a foundation built upon national organizations is the very essence of the IGS.

I would like to discuss three subjects today. First, a brief description of the IGS in general. Second, I will present a few of the benefits of membership in the IGS and third, I will tell you about the new IGS education program.

The IGS was formed in 1983 with the several missions of providing a forum for industry professionals, growing the discipline and the industry and promoting the advancement of the state of the art. Membership in January 1995 exceeded 1600 individuals as well as fifty corporations and a large number of students. The society is organized with five officers and up to twenty-two council members. The council functions through committees and is founded upon national organizations that are chapters of the society. The IGS publishes a newsletter, the IGS News, a Membership Directory and maintains a home page on the World Wide Web.

There are many benefits of membership (see IGS News, v11, no. 3). The principal benefit to membership in the IGS is the opportunity to contribute to the growth of the industry and the discipline.

Turning to education, the IGS is making a great effort and, in my opinion, doing good work. When President Jones took office in September 1994, he challenged the council to

produce a significant result from the IGS. In the next two council meetings, at Nashville, Tennessee, in February 1995 and at Beaune, France, in September 1995, he has driven the council down the path of education.

The first problem is the definition of education. What does education mean to this small group, 20 or so, of people from Singapore, Italy, Japan, the USA, France, Germany, the United Kingdom and The Netherlands? The answer, the council has concluded, is distribution. This means that we realize that the IGS cannot teach in the classic sense, nor can we create as in research or authorship but.....the IGS can distribute - or - communicate information. Here is the plan.

The IGS has produced one video 'Geosynthetics in Landfills'. A second video, 'Geosynthetics in Transportation', is underway. The IGS has invited the chapters to identify a few key educators in their membership to which the IGS will provide these materials at no cost. And that is not all.

Many other organizations, academic, commercial and professional, have produced excellent materials that teach geosynthetics. The IGS proposes to distribute these materials such as film or slide presentations and allow the materials themselves to 'teach' geosynthetics. For example: The Netherlands chapter of the IGS has produced a slide presentation on Geosynthetics in Hydraulic Applications. The IGS will provide this presentation to the recommended educators. The educators can use the materials as they see fit and they can contact the original producers if they require more depth or additional detail.

So, the concept of education within the IGS is becoming that of the distribution of information with the intent of facilitating "in depth" contact between interested parties.

In closing, I issue a challenge. This challenge is for you professionals to join the IGS and through the IGS, teach Italian geosynthetic technology to the world.

*contributed by P.E. Stevenson
IGS Secretary*

IGS Chapter Reports

Editor's note: Chapter reports are submitted yearly, and published as space allows. These reports are for 1995.

The Dutch Chapter (IGSN)

Activities

1. A seminar on 2 Feb 1995 regarding the use of geosynthetics in hydraulics and road construction.
2. General annual meeting of the chapter held on 4 Apr 1995.
3. A seminar on the milling of reinforced bituminous concrete held on 14 Sep 1995.
4. A first course on the use of geosynthetics, targeted at Dutch polytechnic students, was prepared and given during the first university semester in 1995.

Planned Events

1. A seminar on the use of geosynthetics for river dike reinforcement, to be held in autumn 1995.
2. EuroGeo1, the first European Geosynthetics Conference, to be held in 1996.

Publications

1. Six newsletters were published and sent to all IGSN members.
2. A special newsletter will be issued on river dikes reinforcement to coincide with the seminar of the same theme on 16 Nov 1995.
3. The result of a study on the use of geosynthetics in hydraulics and road construction was published on 2 Feb 1995.

Membership and Officers

Individual membership stands at 120.

President: Koos A. G. Mouw
Vice-president: Wim Voskamp
Secretary General: Peter C. Mazure
Treasurer: Marc J. M. van den Elzen

*contributed by Peter C. Mazure
Secretary of IGSN*

The German Chapter

As reported earlier the German Chapter acts in accordance with the section of the German Society for Geotechnique (DGGT e.V.). This section is called "Fachsektion Kunststoffe in der Geotechnik" (FS-KGEO). Within the FS-KGEO three technical committees, which have been recently renamed, are still at work, :

AK 5.1 (former name: AK 14A): Geosynthetics in Geotechnical Engineering and Hydraulic Applications
Chairman: Univ.-Prof. Dr.-Ing. S. Kohlhasse, Universitat Rostock.

AK 5.2 (former name: AK 14B): Calculation and Design Methods for Earth Reinforcement with Geosynthetics

Chairman: Dr.-Ing. B. Thamm, Bundesanstalt für Straßenwesen, Bergisch-Gladbach.

Publications: the working group is preparing a guideline that will be finished by the end of 1995 as a draft for public discussion.

AK 5.3 (former name: AK 14C): Application of Geosynthetics in Road Construction

Chairman: Dr. W. Wilmers, Baustoff- und Bodenprufstelle, Wetzlar.

Publications: Merkblatt für die Anwendung von Geotextilien und Geogittern im Erdbau des Straßenbaus (published in 1994);

Technische Lieferbedingungen für Geotextilien und Geogitter im Straßenbau (published in 1995).

Both papers are available through: Forschungsgesellschaft für Straßen- und Verkehrswesen, Postfach 501362, D-50973 Köln.

The last national conference of the FS-KGEO covering its general meeting was held in Munich, Mar 1995. There will be a short report submitted to the IGS News. The proceedings (in German) are available at the DGGT. About forty papers were presented, which showed the practical use, the possibilities and the problems of using geotextiles at various sites and buildings. There were about three hundred participants at the conference and ten producers presenting their goods at the associated technical exhibition.

During this conference the regular meeting of the IGS Chapter members was held with reports dealing with the international conferences, the first European Conference 1996 (EuroGeo 1) and the German participation. Support for EuroGeo 1 will be enlisted by sending a letter to all members to encourage their participation and the submission of technical papers for the conference and to check the interest of the members for arranging for a bus to travel to the conference. Furthermore, the German chapter plans to organize a special session on "Damage During Installation" at EuroGeo 1.

*contributed by Prof. Dr. Ing. R. Floss
Chairman, German IGS Chapter*

The Indian Chapter (CIGSI)

Activities

1. A short course on recent developments in the design of embankments on soft soils was organized and presented 1-5 May 1995 in New Delhi, India.

Planned Events

1. One day seminar on geosynthetic materials and their application was held 11 Aug 1995 in New Delhi, India.
2. General meeting was 11 Aug 1995 in New Delhi.
3. Short course on recent developments in the design of embankments on soft soils was held 8 Oct 1995 in New Delhi.
4. Short course on ground improvement with geosynthetics

was held 13 Oct 1995 in New Delhi.

5. Four workshops on geosynthetics to be held during 1995-96.

6. Third International Workshop on Geosynthetics to be held Nov 1997 at Bangalore.

Publications

1. A manual on the use of geosynthetics for erosion control.
2. Publication of papers contributed on geosynthetics in various meetings.

Membership

Individual membership is now 61.

*contributed by Mr. A.R.G. Rao
CIGSI Member*

The Italian Chapter (AGI-IGS)

Activities

1. Organization of a field trip to visit three landfill construction sites. This took place in Apr 1995 in the Northeast Italian area, with an attendance of seventy-nine people. (See IGS News, v11, no. 2, Jul 1995).

2. Organization of the 9th Italian Conference on Geosynthetics with the support of the Bologna Engineers Association and BolognaFiere. The conference will be devoted to selected applications of geosynthetics in Italy, with the oral presentation of seventeen papers and one general paper.

3. Planned book on Italian case histories and visit to Geosynthetic Laboratories.

Membership and Officers

Corporate Members: 2

Individual Members: 161

Student Members: 11

President: Sandro Martinetti

Vice-presidents: Daniele Cazzuffi and Piero Sembenelli

Secretary-Treasurer: Sergio Di Maio

Council Members: Pietro Rimoldi, Ruggiero Jappelli, Ezio Baldovin, Alessandro Ghinelli, Leonardo Sarti.

*contributed by Ing. Daniele Cazzuffi
Vice President of the Italian Chapter (AGI-IGS)*

The Japanese Chapter (JC-IGS)

Activities

1. The General Assembly, held in Tokyo 19 Jan 1995.

2. Geotextile seminar on "Geosynthetics '95 held in Nashville, Feb 21-23," held in Tokyo 16 Mar 1995. There were fifty participants.

3. The second geomembrane seminar was held in Tokyo on 6 Apr 1995 with sixty participants.

4. Annual meeting of the Japanese Geotechnical Society (JGS) in Kanazawa on 11-13 Jul 1995. There were 2300 participants and 45 papers on related subjects.

5. Survey was conducted on the amount of geosynthetics used in Japan in 1993 by sending questionnaires to manufacturers

and distributors.

Planned Events

1. Participation in the annual meeting of JSCE in Matsuyama
2. The Tenth Geotextile Symposium to be held 30 Nov 1995.

Publications

1. Notes for the geotextile seminar, Mar 1995.
2. Proceedings of the geomembrane seminar, Apr 1995.
3. A book entitled "Introduction to Geomembranes- Design & Construction" is to be published in October 1995.
4. Proceeding of the Tenth Geotextile Symposium to be published in Nov 1995.

Membership

Honorary Member: 1

Individual Members: 198

Student Members: 41

Corporate Members: 22

*contributed by Prof. T. Akagi
IGS Council Member*

Japanese Chapter, Special Activities

The Japanese Chapter of the IGS set up a committee on Geomembranes in Nov 1993. Mr. Takashi Horiguchi is the chairman of this committee, which has about thirty members. Anybody who is interested in this area can join this committee, but he must take responsibility to make some contribution to this committee. This committee has been very successful. The meetings were held every month. Two members gave lectures about their own experiences. They thought that it was better to give a report for other members. The title of this report is "Outline of Geomembrane Technology - Design and Construction." (172 pages).

Chapter 1: Methods of preventing seepage and geomembranes.

Chapter 2: Properties of geomembranes and test methods.

Chapter 3: Design and construction.

Chapter 4: Case records in Japan.

Chapter 5: Trends in other countries.

A short course was held on 12 Oct using the report of the committee. Approximately fifty persons attended. The committee is considering its next step. Currently, a committee dealing with the draft of the Japanese Industrial Standard on geosynthetics including geomembranes has been working, chaired by Professor K. Makiuchi.

The Committee on Structural Analysis for Design was set up, chaired by Professor F. Tatsuoka. The first step of their work will be to collect well documented case records and study these case records by modern analytical methods. Better and fully instrumented case records should be taken to this committee. Laboratory testing for soils and geosynthetics and field instrumentation are important for this purpose. Fortunately, our IGS Past President, Prof. R.K. Rowe, and Professor J.-P. Gourc, chairman, TC9 Geotextiles and Geosynthetics, ISSMFE, have offered assistance.

*contributed by Mr. Masami Fukuoka
Chairman, JCIGS*

The Korean Chapter (KC-IGS)

Activities

1. Lecture on Geotextiles and a technical meeting held 10 May 1994 in Seoul, Korea. The two keynote addresses were presented by Prof. Ochiai Hidetodhi and by Prof. Hayashi Shigenori.

2. Management of a geotextile session in the Korean Geotechnical Society 1995 National Conference on 25 Mar 1995 in Seoul, Korea. Six papers were presented in the session.

Planned Events

1. A one day seminar on geosynthetic materials and their applications to be held in Nov 1995 in Seoul, Korea.

Membership

Individual memberships increased from 30 to 35.

Extraordinary General Meeting (Minutes)

Date: 10 Oct 1995 Place: Seoul, Korea

1. Opening address was given by Professor Hyung-Sik Chung, President of KC-IGS.

2. Dr. Sam-Deok Cho, Secretary of KC-IGS, briefed the activities of KC-IGS since Sep 1993. The activity plan of KC-IGS for 1996 was discussed and amended as follows:

- Organization of "1996 Geosynthetics Seminar".
- Organization of a technical visit to field sites for construction of civil structures reinforced with geosynthetics.
- Publication of "Geosynthetics Handbook".
- Establishment and revision of testing methods for geosynthetics.
- Promotion of the publication of "KC-IGS Newsletter".

3. The plan of "1995 Geosynthetics Seminar" was explained by Dr. Sam-Deok Cho. The plan was discussed and amended. The Seminar will be held 17 Nov 1995 in Seoul, Korea through the joint organization of KC-IGS and KGS (Korean Geosynthetics Society).

4. The new officers of the KC-IGS elected according to the Bylaws of the KC-IGS, were as follows:

President: Prof. Byung-Hee Kang (Civil Engineering Dept., Inha University)

Vice President: Prof. Young-Shik Paik (Civil Engineering Dept., Kyunghee University)

Prof. Soo-Il Kim (Civil Engineering Dept., Yonsei University)

Mr. Jae-Heon Son (President, Construction Engineering Development Co. Ltd.)

Secretary: Dr. Sam-Deok Cho (Geotechnical Engineering Div., Korea Institute of Construction technology)

Treasurer: Mr. Eun-Soo Lee (President, E & S Engineering Co.)

Auditors: Prof. Song Lee (Civil Engineering Dept., Seoul City University)

Mr. Yoon-Mo Yoon (President, DaeHan Industrial Material Co.)

Executive committee Member: Prof. Soo-Sam Kim (Civil Engineering Dept., Chungang University.)

5. The presidential address was given by Prof. Byung-Hee Kang. The President appointed two advisers on the recommendation of the Executive Committee. They are: Prof. Sang-Kyu Kim (Dongguk University) and Prof. Hyung-Sik Chung (Hanyang University).

*contributed by Sam-Deok Cho
Secretary of KC-IGS*

The Southeast Asia Chapter (SEAC-IGS)

Activities

1. Two council meetings.

2. Production of Vol. 4 of the 5th International Conference on Geotextiles, Geomembranes, and Related Products held in Sep 1994. It should be finished by the end of 1995.

Planned Events

1. Introductory seminars/workshops on geosynthetics application.

2. Workshops by Vector Engineering, Inc.

3. Bengt B. Broms Symposium, organized by Nanyang Technological University.

*contributed by S.D. Ramaswamy
President of SEAC-IGS*

The United Kingdom Chapter

Activities

The principal activity is the organization of evening meetings which are open to all and are generally arranged jointly with a local association of the Institution of Civil Engineers or other specialist geotechnical groups. Topics covered during 1994-1995 include the use of geosynthetics in bridging over areas of mining subsidence, geosynthetics specification testing and application, geosynthetics in unpaved roads, soil reinforcement and road construction case histories.

Planned Activities

1. Meeting in December with the topic "Review of European Design Methods" and "Reinforced soil retaining walls and some practical aspects of construction".

2. Joint conference on ground improvement to be held with the British Geotechnical Society in 1997.

Membership

There are currently 57 individual members and fourteen corporate members.

*contributed by J. Paul
President, UK Chapter*

CORPORATE PROFILES

The IGS Council has decided that in each issue of the IGS News, up to three Corporate Members will be allocated space to allow them to introduce their company or association and present their achievements. The criteria for selection of corporate profiles were described in IGS News, v4, no. 2, p7. Alternatively, you can get details by writing to the Editor. There is no charge for having a corporate profile published; it is a benefit of corporate membership.

Geofabrics

Liversedge, W. Yorkshire, United Kingdom by B. Warwick, Company Director

Geofabrics is one of the UK's leading manufacturers of geotextiles. Their comprehensive range of products is used principally to provide geomembrane protection in landfill sites and filters for river and coastal protection.

All products are designed and manufactured at Geofabrics' own premises, which are equipped with some of the most modern computer-controlled plants in Europe. Geofabrics is concerned with incorporating cost-efficient principles in product design. Geofabrics' plants give the company the ability to manufacture geotextiles with an increased width. This results in less overlap on site because fewer geotextile strips are laid, leading to substantial cost-saving on an overall project.

Geofabrics "Protectors" established a reputation for themselves particularly when used to protect geomembranes in landfill sites. Geofabrics also manufactures a comprehensive range of geotextiles for filters which are used in the construction of river and coastal defenses. They provide excellent filtering efficiency as well as a high level of absorption to mechanical stresses and abrasion resistance.

Company Director, Bob Warwick, began working with geotextiles in 1976 when at ICI and has experience as a contractor building motorways, roads, bridges, dockworks, airfields and industrial developments. He was a founding member of the UK Chapter of the IGS and has represented the UK on ISO committees developing geotextile testing methods.



Fig. 1. Chyandour to Long Rock Coast

Case Histories.

Site: Chyandour to Long Rock Coast Protection Scheme, Penzance, Cornwall, UK.

This revetment has been installed to protect the eastern part of Penzance. The construction included the use of over 14,000 m² of Geofabrics GF60, a 600 g/m² nonwoven needlepunched geotextile with a high permeability and puncture resistance. The geotextile was used as a filter layer under approximately 0.5 m thickness of corestone topped with 8-12 tonnes primary armor. Figure 1 shows construction of the project.

Site: Hallliloo Valley Golf Course, Woldingham, Surrey, UK.

At Hallliloo Valley, a new golf course under construction has three underground reservoirs which collect water from the golf course's drainage system. The sloping sides of the reservoirs are constructed of mass concrete, and in order to protect the reservoirs' geomembrane liners, 3,000 m² of Geofabrics Protector GP50 had been installed between the geomembrane liner and the concrete. Geofabrics GP50 is a 4mm thick needlepunched nonwoven geotextile of 500 g/m². It is specially formulated to have a very high puncture resistance. Figure 2 shows construction of the project.

Geofabrics became a Corporate Member in 1995.

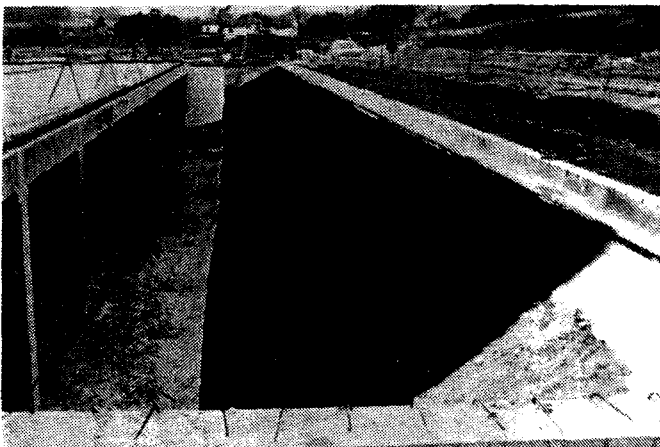


Fig. 2. Hallliloo Valley Golf Course

Engtex AB

Mullsjö, Sweden

by Mr. Torbjörn Eng, R&D

Engtex AB was founded in 1938 as a textile company with main production for fashion and home furnishings. Through several structural changes in the Swedish textile industry, Engtex, in 1983, finally adopted a new business idea of customizing technical textiles. Engtex's corporate goal is: "To develop and manufacture functional textiles of the highest technical standard in close collaboration with our clients."

This business concept has generated several products in such various fields as:

- cut resistant textiles for protection against malfunctioning chainsaws;
- textiles for medical applications;
- substrates for plastic coatings with built in radar camouflage properties;
- substrates for single ply roofing systems;
- lightweight fabrics for chemical protection and UV radiation;
- heavy textiles for conveyor belts and tire cord;
- stretchable inner ceiling systems;
- car upholstery and linings for the automotive industry;
- high performance customized composite materials;
- textiles for geotechnical applications.

Engtex was, as the first textile manufacturer in Northern Europe, certified in 1993 in accordance with the international QA standard ISO 9001.

By 1993 Engtex had developed a leading range of optimized geogrids using the Karl Mayer WIWK process. The WIWK process enables the optimum use of existing high performance materials. Through the choice of processes we have obtained a range of geogrids with the following advantages:

- manufactured from high molecular weight, highly oriented, high performance polyester fibers, resistant to hydrolysis and to all chemicals found in soils
- high long term strength (creep strength) at over 60% of tensile strength
- high resistance to site damage
- ease of installation

Through collaboration and joint development with Polyfelt of Austria, Engtex has developed a composite material used as asphalt reinforcement. By joining the advantages of glass fibers and a nonwoven fabric, an asphalt paving material is obtained that has waterproofing ability and minimal strain rates.

A totally new patented concept of using electrically conductive synthetics has been developed as a co-invention with Engtex Kjell Eng, Newcastle University Prof. Colin Jones and Mr. John Templeman, UK. By using different materials and technologies, Engtex has obtained a material that makes use of the basic processes of electro-osmosis and electro-galvanism. The new material, Electro Kinetic Geosynthetics, reinforces and drains soil, rids soils of pollutants, and promotes consolidation. The latter function helps avoid the need for surcharging soil to obtain the required shear strength.

The basic elements as well as the principles have been proved in laboratory tests at Newcastle University. Full scale tests with prototypes as well as methods for installation have been performed during 1995.

Mr. Torbjörn Eng, R&D, has been a member of the IGS since 1994. Engtex has been a Corporate Member of the IGS since May 1995.



Fig 1. Installation of asphalt composite.

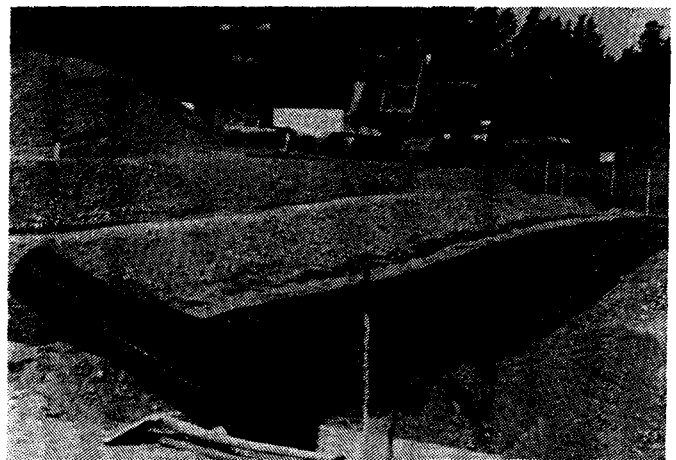


Fig 2. Installation of geogrids as piling support.

A Decade of Geosynthetics in India

Pietro Rimoldi, IGS Council Member

The Committee for International Geotextile Society of India (CIGSI) in conjunction with the Central Board of Irrigation and Power (CBIP) of India, celebrated "A Decade of Geosynthetics in India" on 1 December 1995 in the Conference Hall of the CBIP in New Delhi.

The event was attended by almost 100 invited persons from all over India, representing technical authorities, universities, consultants and producers of geosynthetics. The celebration, organized by the CBIP and the CIGSI, was co-sponsored by Tenax Geosynthetics Pt Ltd., the Indian subsidiary of the Tenax Group.

Mr. A.R.G. Rao, Director of the CBIP, addressed a warm welcome to all the attendees, and then reported on the activities of CBIP and CIGSI. These activities which give an impressive idea of the work done by the Indian Chapter of IGS, can be summarized as follows:

1. Workshop on Geomembranes and Geofabrics, New Delhi, 1985;
2. Workshop on Reinforced Soil, August 1986, New Delhi;
3. International Workshop on Geotextiles, November 1989, Bangalore;
4. National Workshop on Role of Geosynthetics in Water Resources Projects, January 1992, New Delhi;
5. Short Course on Recent Developments in the Design of Embankments on Soft Soils, December 1993;
6. Short Course on Recent Developments in the Design of Embankments on Soft Soils, January 1994, Calcutta;
7. 2nd International Workshop on Geotextiles, January 1994, New Delhi;
8. Workshop on Role of Geosynthetics in Hill Area Development, November 1994, Guwahati;
9. Workshop on Engineering with Geosynthetics, December 1994, Hyderabad;
10. Short Course on Recent Developments in the Design of Embankments on Soft Soils, May 1995, New Delhi;
11. Seminar on Geosynthetic Material and Their Application, August 1995, New Delhi;
12. Short Course on Recent Developments in the Design of Embankments on Soft Soils, October 1995, New Delhi;
13. Short Course on Ground Improvement with Geosynthetics, October 1995, New Delhi.

The celebration then continued with the Keynote Address, presented by Prof. G. Venkatappa Rao, Professor & Head, Dept. of Civil Engineering, IIT, Delhi. It was followed by an address by Mr. Som Sarkar, Managing Director of Tenax Geosynthetics in New Delhi.

Mr. Pietro Rimoldi, IGS Council Member, delivered the Presidential Address on behalf of Prof. Colin J.F.P. Jones, President of the IGS :

"Dear Colleagues

It gives me great pleasure, as President of the International Geosynthetics Society, to send my warmest greeting to all those attending the celebration of 'A Decade of Geosynthetics in India' and the Workshop on Environmental Geotechnology in New Delhi. Meetings of this nature have an essential role in providing a means for the exchange of information and providing education with respect to the benefits which can be gained from the correct use of geosynthetics. I send my warmest congratulation to the Indian Chapter on their tenth anniversary and it is my great hope that during my Presidency I will be able to visit India".

Mr. Rimoldi then presented the following IGS Address :

GEOSYNTHETICS: REVOLUTION FROM DEVELOPMENT

In Vienna, seventy years ago, geotechnical engineering was born, and soon became a science.

Today, we are witnessing the consecration of a discipline that was not taken seriously 20 years ago. But this discipline has however transformed geotechnical engineering to the point that it is no longer possible to do geotechnical engineering without geosynthetics.

Twenty years ago, only a few geotechnical engineers were aware of geosynthetics. Ten years ago many of them were aware of geosynthetics but elected to ignore them.

Today, geotechnical engineers are all aware of geosynthetics and have already used them, or are expected to use them soon. This is probably the most important revolution in the history of geotechnical engineering: a revolution that comes from product development. And nowadays, the revolution has extended from geotechnical to environmental engineering, finding its definitive consecration in this new multidisciplinary science: environmental geotechnology.

In this century the industry has experienced a major revolution with the development of synthetic fibers:

- 1913: first synthetic fiber, made from PVC;
- 1930: first "modern" synthetic fiber, a polyamide fiber ("nylon");
- 1930's: first polyester fiber;
- 1949: first low strength, coarse polyethylene filament;
- 1954: first high strength, fine polyethylene filament;
- 1954: first polypropylene fiber by Giulio Natta of Italy;
- 1965: manufacturing process for nonwoven fabrics made from continuous synthetics filament.

The development of synthetic fibers brought to the development of new products.

- 1957: sand bags made of nylon woven fabrics were used in the Netherlands for extensive coastal works;
- 1958: a synthetic woven fabric was used between soil and rip-rap for erosion control in Florida;
- 1966: first use of a non-woven fabric in civil engineering, for asphalt overlay in USA;
- 1967: synthetic nets were used for the first time in a civil engineering project, for the reinforcement of soft soil in Japan;
- 1970's: development of geonets and geomembranes;
- 1980's: development of geogrids, geomats, geocells, and vertical drains;
- 1990's: development of geocomposites and geocomposite clay liners (GCL);
- 2000's: products evolution : geosynthetics will become lighter, stronger, cheaper, more specialized and more effective;
- development of "systems": geosynthetics and traditional materials used in organized methods for walls, vegetated slopes, drainage, landfills, and so on.

In the meantime, the "geosynthetics profession" has progressed as well:

- 1977: an "International Conference on the use of fabrics in geotechnics" took place in Paris;
- 1983: formation of the "International Geotextile Society", IGS;
- 1985: first national chapter of the IGS, the Japanese Chapter;
- 1989: formation of the Indian Chapter of IGS;
- 1994: IGS becomes "International Geosynthetics Society", dedicated to the scientific and engineering development of geotextiles, geomembranes, related products and associated technologies;
- 1995: construction of the first geogrid reinforced soil wall in India, the Okla Flyover in Delhi;
- 1995 onward: a new decade of geosynthetics development in India.

Geomembranes, GCLs, geomats, and geocells, shall be brought into this country and widely incorporated into civil engineering and geoenvironmental projects.

India is quickly closing the gap with America and Europe in many fields. Now we need the work of everybody here - consulting engineers, academicians, contractors and authorities - to bring the level of geosynthetics applications in India to the top of its tremendous potential.

Geosynthetics must become, like in many other countries, one of the elements of progress and environmental awareness and protection. Let's work together for this fundamental goal.

After the speech by Mr. Rimoldi, the chief guest of the Celebration, Dr. Dilip K. Biswas, Chairman of the Central Pollution Control Board of India, gave a speech about the environmental situation in India and the benefit from the new technologies, including geosynthetics.

Mr. Rao then presented the most recent publications of the CBIP: 1. Geosynthetics in Dam Engineering; 2. Erosion Control with Geosynthetics.

The last event was the institution of the Tenax Award by Mr. Som Sarkar. The Tenax Award, sponsored by Tenax Geosynthetics Pt Ltd., will be presented every year to an Indian personality who is distinguished in the development and dissemination of knowledge about geosynthetics.

The Award is decided by an Award Committee, comprised of personalities from the academic world and the Authorities of India. It consists of a citation, plaque and a check. Prof. G. Venkatappa Rao announced that the recipient of the first Tenax Award is Dr. C. J. Varma, Member Secretary of the CBIP.

The citation and plaque were given to Dr. Varma by Dr. Dilip K. Biswas, while the check was given by Mr. Pietro Rimoldi.

Dr. Varma, in his Awardee speech, announced his decision to offer the check to the CBIP to continue its work in the dissemination of geosynthetics awareness in India.

A vote of thanks by Mr. A.R.G. Rao concluded the celebration.

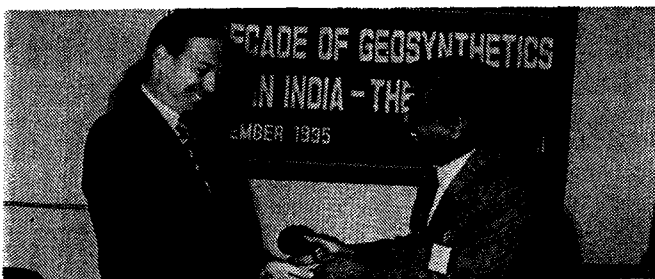


Fig. 1: Dr. Dilip Biswas (right), Chairman of the Central Pollution Control Board of India, welcomes Mr. Pietro Rimoldi as representative of the IGS.



Fig. 2: Guest table (left to right) seated, Mr. A.R.G. Rao, Mr. Pietro Rimoldi, Dr. Dilip K. Biswas, Dr. G.V. Rao, and Mr. Som Sarkar.

Workshop on Geosynthetic Clay Liners

by R. Kerry Rowe

Immediate Past President of IGS

Geosynthetic Clay Liners (GCLs) are rapidly gaining wide acceptance as an excellent alternative to compacted clay liners for many applications requiring a low permeability cover. However, despite the growing use and familiarity with GCLs, many questions are often raised regarding their use in this and other newer areas of application. In an attempt to distinguish between those questions for which there are good answers and those that require additional investigation, a workshop on the state-of-knowledge with respect to the GCLs was held at the 5th International Landfill Symposium (Sardinia, October 1995 - see also IGS News, v11, no. 3, p15). To initiate discussion, short lead presentations were made by G. Heerten, S. Purdy, G. Bresse and M. Zinesi, P. Garcin and P. Rimoldi. This was followed by a general discussion of issues raised in the presentations as well as other issues brought forward by workshop participants. This article provides a summary of the key issues discussed. Readers are invited to send any comments on these issues to the author (see p19 for address).

Issues That Are Well Understood

There was a general consensus that issues such as the effects of:

- freeze/thaw cycles;
- cycles of wetting and drying;
- overlapping of seams; and
- ultraviolet light

on the performance of GCLs were reasonably well understood and little in the way of additional research was required. In addition, the peak shear characteristics of unreinforced GCLs was also considered to be well understood.

Areas Where More Work Is Needed

A number of areas were identified as requiring additional research and/or field investigation, namely:

- the long term shear behavior of reinforced GCLs;
 - the effect of roots, microbes and rodents on long term bulk hydraulic conductivity of GCLs;
 - compatibility of GCLs with leachate for bottom liner (base seal) applications; and
 - equivalency of GCLs with respect to compacted clay for use in bottom liner (base seal) applications.
- In addition, there was a strong consensus that there is a great need for suitable standard test procedures.

It was well recognized that care is required when using GCLs on side slopes. Reinforced GCLs have shown evidence

of substantially increasing the internal shear resistance of GCLs. However, the question as to what will be the long term shear strength needs to be addressed. In particular, concern is often expressed regarding the potential for creep of the fibers providing the increased shear strength for reinforced GCLs. In response to the question, one of the participants indicated that due to the extremely large number of fibers per square meter (approx 2×10^6 fibers/m²) for needlepunched GCLs, the stress mobilized in the fibers under normal design conditions is extremely small. It was also indicated that recent experimental work has shown little, if any, time dependent movement of GCLs under long term sustained working stresses.

The effect of roots, microbes and rodents on the long term bulk hydraulic conductivity of GCLs used in covers was considered by many to require additional investigation (while recognizing that similar questions arise with respect to compacted clay liners). These effects are difficult if not impossible to properly simulate in the laboratory. However, there was a strong consensus that the issue should be addressed by a long term monitoring of cover performance. This monitoring should include trial test pits/exhumation of parts of covers at different times after construction followed by careful visual and laboratory examination of the exhumed GCL. The effects of aging of the GCLs should be examined.

There is growing interest in the use of GCLs in bottom liners in landfills (base seals) both to reduce the volume occupied by conventional barrier systems and to provide an alternative when suitable clay for a compacted clay liner is not readily available. This raises the question of equivalency. More research is required with respect to both clay-leachate compatibility (at appropriate stress levels) and with respect to diffusive contaminant transport (see Rowe et al., 1995 for a discussion of this issue). Also, it should be remembered that equivalency should be viewed in the context of both design conditions and conditions that may subsequently develop when leachate pumping ceases to be effective in controlling the leachate mound to design levels. It was generally agreed that more research is required before GCLs could be accepted as a substitute for part (or all) of the compacted clay in a bottom liner (base seal) but that GCLs had great promise and, with additional research, there would be considerable potential for this application.

Need For Test Standards

A common concern of workshop participants was the need for appropriate GCL testing standards. Issues requiring particular attention are shear tests and hydraulic conductivity tests although there is also a clear need for appropriate index test (e.g. mass/unit area). For example, in shear tests there is

a need to standardize rate of testing, method of attachment, hydration procedures, and sample size. The issues of appropriate strain rate and method of clamping generated a lot of discussion and little agreement indicating that much more work needs to be done before a consensus is reached. Difficulties were reported due to the widely ranging physical characteristics of different types of GCLs.

There appears to also be a need for better ways to perform long term creep tests and for performing tests to examine the interface properties between geosynthetics (e.g. geonet - geomembrane; geomembrane - GCL, etc.). It was emphasized that when designing slopes consideration must be given to the shear resistance that can be developed on all interfaces where sliding could occur.

Training and CQC/CQA

There was general consensus that GCLs are relatively easy to install. However, there is a need to ensure that the contractor/installer knows exactly what is required and has appropriate training in installation procedures. The difficulty of writing specifications prior to GCL selection due to the very different physical characteristics and correspondingly different installation practices for different types of GCLs was emphasized by several participants. There was

consensus that there is a need for high quality Construction Quality Control (CQC) and Construction Quality Assurance (CQA) in the construction for low permeability covers (either with or without a GCL included).

Conclusion

The workshop proved to be very fruitful in highlighting many areas where the use of GCLs may now be regarded as a "mature" technology but also in identifying areas requiring additional investigation. The two areas requiring the most immediate attention were that of developing suitable standardized tests for GCLs and the need to provide adequate training for installers as well as ensuring CQC/CQA. Participants expressed a high level of confidence in the use of GCLs as a substitute for compacted clay in covers provided that there is appropriate design and construction quality control/assurance. Thus the use of GCLs in covers is becoming a mature application. The use of GCLs as a substitute for compacted clay in bottom liners (base seals) requires additional research but has great potential as a future application.

REFERENCE: Rowe, R.K., Quigley, R.M. and Booker, J.R., 1995. **Clayey Barrier Systems for Waste Disposal Facilities.** E & FN Spon (Chapman & Hall), London, 390 p.

Geosynthetics Installers Form Association

A new international association has been created to provide a unified voice for geosynthetics installers worldwide in order to address common concerns and industry development strategies. The International Association of Geosynthetics Installers (IAGI) was created in 1995 in response to enthusiastic support from the industry. Interest in creating an association has been building over the last several years, culminating in an enthusiastic gathering at Geosynthetics '95 in Nashville where more than 50 industry representatives gave strong support. IAGI was officially incorporated in November 1995.

IAGI will strive to advance geosynthetics installation and construction technologies by developing and promoting standard technical specifications, approved construction methodologies, certification of expertise and research of new technologies. By pooling the collective expertise of its members in the field, IAGI will serve as a central clearinghouse for information on the industry and a forum for the exchange of ideas, thereby facilitating better communication within the industry. In addition, IAGI will work to develop professional conduct guidelines, have input on certification protocols and promote the credibility and image of geosynthetics installation as a soundly safeguarded industry.

IAGI will benefit all segments of the geosynthetics installer industry including installers, regulators, manufacturers, clients, facility owners, design engineers and quality assurance monitors. The association will have the following three categories of membership:

- Installer membership - open to organizations engaged in the installation of geosynthetics.
- Associate membership - available to organizations not engaged in installation, but who regularly do business with the industry.
- Affiliate membership - open to any organization which is interested or otherwise allied with the industry.

IAGI's founding board of directors consists of Bob Denis, Solmax Geosynthetics, Inc., Boucherville, Quebec, Canada; Mark Cadwallader, Cadwallader Technical Support Services, Conroe, Texas; Fred Rohe, Environmental Protection Inc., Mancelona, Michigan; Frank Taylor, Atlantic Lining Co. Inc., Robbinsville, New Jersey; Rick Halbom, Environmental Geosynthetics Inc., Telford, Pennsylvania; Eric Snow, Environmental Design and Construction, Moseley, Virginia; and Martha Barnes, TFA Management Group, St. Paul, Minnesota, USA.

For more information or to join IAGI contact:

Ms. Martha Barnes, Managing Director, IAGI
345 Cedar St., Suite 800
St. Paul, MN 55101-1088
USA

Tel.: 1 (612) 225-6943 Fax: 1 (612) 222-8215

*contributed by Ms. Martha Barnes
Managing Director, IAGI*

BS 8006: A Code of Practice on Strengthened/ Reinforced Soils and Other Fills

The IGS Technical Committee announces the publication of BS 8006 which is the first published Code of Practice on reinforced soil in general.

BS 8006 is a limit state Code with partial factors applied to loads, soil material properties and reinforcement strengths. The partial factors were derived by a process of calibration with existing limit equilibrium methods to reflect existing practice. The Code allows the use of polymeric and metallic reinforcements provided specific generic criteria are met. While the Code follows recommended British practice, the application and procedures presented are relevant all over the world. The Code is 160 pages and is divided into nine sections and a number of appendices. The sections cover

concepts and fundamental principles of reinforced soil, materials, overall design requirements, design of walls and abutments, design of fill construction and maintenance.

For copies, please contact:

British Standards Institution
389 Chiswick High Road
London W4 4AL
United Kingdom
Tel.: 44-181-9969000
Fax: 44-181-9967400

*contributed by Mr. Chris Lawson
Co-Chairman, IGS Technical Committee*

EuroGeo 1 Coming Soon!

The Dutch Chapter of the International Geosynthetics Society is pleased to invite you and your colleagues to attend the First European Geosynthetics Conference and Exhibition (EuroGeo1), in Maastricht, The Netherlands, 30 September - 2 October 1996.

This conference is different. It does not deal only with research, and above all it is practical. It will give you an opportunity to learn more about geotextiles, geomembranes, and related products, as well as their design and application in roads, waterways, environmental engineering and in special civil engineering structures. EuroGeo1 offers a case study session on each topic, presentations from a number of different European countries, and a wide variety of keynote lectures, workshops and short courses where the best specialists will tell you all you want to know about the state of the art geosynthetics.

The schedule for each half-day of EuroGeo1 includes a keynote lecture, followed by a break and then by parallel activities to discuss the keynote lecture. The different parallel activities that fill each session after the keynote lectures are:

- A. Case study sessions,
- B. Chapter presentations,
- C. Workshops,
- D. Discussion sessions serving as platforms for discussion on hot topic questions posed by the discussion leader,
- E. Short courses, teaching sessions for engineers, and
- F. Demonstrations.

Each day is completed with a central poster session on themes from the keynote lectures of the day. The poster sessions will concentrate mainly on scientific subjects and new developments, whereas all other activities (except perhaps discussion sessions) will be aimed at the transfer of existing knowledge.

The specific discussion session topics are: interaction between soil and geosynthetics, durability, geosynthetic clay liners, and CEN testing methods. We eagerly invite you to submit theses on the theme of your choice. Such theses should have a length of ten lines at maximum. We welcome controversial statements! If the thesis fits in the related discussion session adequately (to be judged in consultation with the discussion chairman), they will be incorporated into the proceedings, provided that they are received by April 30, 1996 (address below).

EuroGeo1 is proud to announce that the prestigious biennial Mercer Lecture will be delivered on Wednesday morning. The Mercer Lecture is a significant honor awarded to individuals who have made outstanding technical contributions to the advancement of geosynthetics. The Mercer Lecture was established under the co-sponsorship of ISSMFE, IGS and Netlon Ltd. and is presented in Europe, Asia, and North America. The 1996-7 Mercer Lecturer is Prof. Fumio Tatsuoka of the University of Tokyo. His lecture will be titled: "Geosynthetic-Reinforced Soil Retaining Walls as Important Permanent Structures."

The Wednesday morning program is completed with the presentation of the IGS Awards and the Italian Chapter presentation on dams and reservoirs.

For more information, please contact:

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THE NETHERLANDS
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email: eurogeo96@hoc.nl

*contributed by Gert den Hoedt
Secretary General, EuroGeo1*

Publisher's Report: Geotextiles and Geomembranes ***an Official Journal of the IGS***

During 1993, the international journal *Geotextiles and Geomembranes* decided to increase its frequency from eight issues a year to monthly for the 1994 volume. This ambitious change in frequency was in response to a sustained increase in the number of manuscripts submitted for publication in the journal. The journal succeeded in meeting this schedule for 1994 but now needs to respond to an increase in number of competing journals and conferences; as a result there is now a much wider variety of publishing avenues for geosynthetic research papers. We have therefore taken the decision to carry the 1995 volume of the journal over to 1996.

Subscribers to the 1995 volume have paid for and will receive twelve issues of the journal. These issues will not all be published during 1995, but will span the two years 1995 and 1996. In view of the reduced paper flow, the 1997 volume is likely to revert to the lower frequency of six issues.

At the time of preparing this report, over thirty manuscripts are under peer review. We are also planning to publish several special issues including one on 'Geosynthetics in Infrastructure Enhancements and Remediation' (from a

leading conference that was held in Philadelphia, PA, USA, 12-13 December 1995. Contact Dr. R. M. Koerner at Drexel University, for conference details).

We can assure IGS members of our commitment to publishing the premier international research papers in the journal *Geotextiles and Geomembranes*.

The full subscription price for 1996 is £330UK or \$510US. **Members of the IGS may subscribe at an 80% discount, i.e. £66UK or US\$102. Corporate members of the IGS may subscribe at a 50% discount, i.e. £163 or US\$255.** Reduced subscriptions are available directly from the publisher and may be paid for by cheque or credit card. Please write to:

Subscriptions Department
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The journal continues to publish frontier research in the field and has an

established subscriber base in over forty countries worldwide. As *Geotextiles and Geomembranes* is an official journal of the IGS, members of the society are eligible to subscribe to this publication at a greatly reduced rate, as shown above. Members are reminded that to take advantage of this discount they must inform Elsevier Science Ltd. that they are a member of the IGS. IGS members are encouraged to use *Geotextiles and Geomembranes* as an outlet for their technical papers and thus contribute toward the continuing success of this high quality publication which now has subscribers in over 40 countries worldwide. Papers should contain work not published in full elsewhere and should be sent to:

Dr. Nigel W.M. John
Department of Civil Engineering
Queen Mary & Westfield College
University of London
Mile End Road London, E1 4NS United Kingdom

Instructions to authors are available from Dr. Nigel John.

*contributed by James Milne
Publishing Editor, Elsevier Science Ltd.*

Geosynthetics International ***an Official Journal of the IGS***

Geosynthetics International is an official journal of the IGS. Consequently, each issue of *Geosynthetics International* is published with the IGS logo on the cover.

In recognition of the adoption of Geosynthetics International by the IGS, the Industrial Fabrics Association International, publisher of *Geosynthetics International*, has introduced a special reduced subscription rate for individual IGS members. For individual IGS Members the rate is now US\$99 per six issues with the standard rate of US\$225 applying to non-IGS Members, IGS Corporate Members and other corporations or institutions. IGS members are encouraged to use *Geosynthetics Inter-*

national as an outlet for their technical papers and thus contribute toward the continuing success of this high quality publication. Papers should be work not published in full elsewhere and should be sent to any of the following:

Editor, Dr. T.S. Ingold, Mulberry Lodge, St. Peters Close, St. Albans, AL1 3ES, UK
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St. Paul, MN 55101 USA
Tel.: 1 (612) 222-2508
Fax: 1 (612) 222-8215

Calendar of Events



Geofilters '96 Second International Conference on Filtration and Drainage in Geotechnical Engineering; Montreal, Quebec, Canada, 29-31 May 1996

Contact: Conference Secretariat GEOFILTERS '96, c/o Service des Congres, Ecole Polytechnique, Campus de l'Universite of Montreal, C.P. 6079 Succursale Centre Ville, Montreal, Quebec, CANADA

Tel.: 1 (514) 340-3215 Fax: 1 (514) 340-4440

Fourth International Conference on Polluted and Marginal Land '96, Uxbridge, West London, England, 2-4 Jun 1996

Contact: Conference Secretariat, ECS Publications, 46 Cluny Gardens, Edinburgh EH10 6BN, UNITED KINGDOM

Fax: 44 (0131) 452-8596

Third International Symposium on Environmental Geotechnology, San Diego, California, USA, 10-12 Jun 1996

Contact: H.Y. Fang, Lehigh University, Department of Civil and Environmental Engineering, Fritz Engineering Laboratory, 13e Packer Ave., Bethlehem, PA 18015-3176, USA

Tel.: 1 (610) 758-3566 Fax: 1 (610) 758-4522

China - Geosynthetics '96 The First Chinese International Exhibition & Symposium on Geosynthetics, Shanghai, P.R. China, 19-22 Jun 1996

Contact: Professor Wang Zhenghong, Secretary General of CTAG, Institute of Water & Hydroelectric Power Conservancy, Zizhuyuan, Beijing 100044, CHINA (PEOPLE'S REPUBLIC)

Tel.: 86 (1) 841-7950

First European Conference on Geosynthetics (EuroGeo1) Maastricht, The Netherlands, 30 Sep-2 Oct 1996

Contact: EuroGeo1, c/o Holland Organizing Centre, Parkstraat29, 2514 JD The Hague

THE NETHERLANDS

Fax: 31 (70) 3614846

Third International Conference of Reflective Cracking in Pavements, Maastricht, The Netherlands, 2-4 Oct 1996

Contact: Foundation C.R.O.W., P.O. Box 37, NL-6710 BA EDE, THE NETHERLANDS

Tel.: 31 (8380) 20410 Fax: 31 (8380) 21112

EPS Tokyo '96, Tokyo, Japan, 29-30 Oct 1996

Contact: Mr. Kouzaburo Ohgi, No. 8 Matsuda Bldg. 2-1-9 Okubo, Shinjuku-ku, Tokyo, 169 JAPAN

Tel.: 81 (3) 3205-7911 Fax: 81 (3) 3205-7963

IS-Osaka '96 Second International Congress on Environmental Geotechnics, Osaka, Japan, 5-8 Nov 1996

Contact: Secretariat IS- Osaka '96, Geomechanics Section, Disaster Prevention Research Institute, Kyoto University, Gokacho, Uji, Kyoto 611, JAPAN

Tel.: 81 (774) 33-3521 Fax: 81 (774) 33-4115

IS- Kyushu '96 Third International Symposium on Earth Reinforcement, Fukuoka, Kyushu, Japan, 12-14 Nov 1996,

Contact: Prof. Ochiai, Dept. of Civil Engineering, Kyushu University, 6-10-1 Hakozaki, Hagashi-ku, Fukuoka 812, JAPAN

Tel.: 81 (92) 641-1101 Fax: 81 (92) 641-5195

Geosynthetics '97 Long Beach, California, USA 11-13 Mar 1997

Contact: Danette Fettig, IFAI, 345 Cedar St., Suite 800, St. Paul, MN 55101-1088 USA

Tel.: 1 (612) 222-2508 Fax: 1 (612) 222-8215

email: ifaidan@aol.com

Geosynthetics Asia'97 - Asian Regional Conference, Bangalore, India 26-29 Nov 1997

Abstracts due 31 Aug 1996

Contact: C.V.J. Varma, c/o Central Board of Irrigation and Power, Plot No. 4, Industrial Area Malcha Marg, Chanakyapuri, New Delhi, INDIA 110021

Tel.: 91 11 3015984/3016567 Fax: 91 11 3016347

Sixth International Conference on Geosynthetics, Atlanta, Georgia, USA

25-29 Mar 1998

Contact: Danette Fettig, IFAI, 345 Cedar St., Suite 800, St. Paul, MN 55101-1088 USA

Tel.: 1 (612) 222-2508 Fax: 1 (612) 222-8215

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Note: Items in bold print are organized under the auspices of the IGS or with the support of the IGS.

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The IGS News is published thrice yearly. Material for publication should be submitted to the Editor or one of the Associate Editors by 16 Feb, 16 Jun, 16 Oct for the Mar, Jul and Nov issues respectively. Short articles are always welcome. Web site <http://igs.mmc.ca/>

Dr. T. Akagi, Associate Editor (Asia)
Toyo University

The IGS Council

Elected in 1992: T. Akagi (Japan); B.R. Christopher (USA); R.A. Jewell (Belgium); C. Lawson (Malaysia). Elected in 1994: D. Cazzuffi (Italy); J. Collin (USA); J-P. Gourc (France); R. Holtz (USA); G. Heerten (Germany); P. Rimoldi (Italy); F. Tatsuoka (Japan); W. Voskamp (The Netherlands). Co-opted in 1992: M. Fukuoka (Japan). Co-opted in 1994: G.P. Karunaratne (Singapore); P.E. Stevenson (USA). The IGS Council includes the 5 IGS Officers serving for the period 1994-98.

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note: date indicates earliest year of continuous membership

OBJECTIVES OF IGS (*)



The International Geosynthetics Society was formed with the following objectives:

- (1) to collect, evaluate and disseminate knowledge on all matters relevant to geotextiles, geomembranes, related products, and associated technologies;
- (2) to improve communication and understanding regarding geotextiles, geomembranes, related products, and associated technologies, as well as their applications;
- (3) to promote advancement of the state of the art of geotextiles, geomembranes, related products, and associated technologies;
- (4) to encourage through its members the harmonization of test methods, equipment and criteria for geotextiles, geomembranes, related products and associated technologies.

WHY BECOME A MEMBER OF THE IGS?

First, to contribute to the development of our profession.

Becoming a member of the International Geosynthetics Society:

- Helps support the aims of the IGS, especially the development of geotextiles, geomembranes, related products, and associated technologies.
- Contributes to the advancement of the art and science of geotextiles, geomembranes, related products, and associated technologies.
- Provides a forum for designers, manufacturers, and users, where new ideas can be exchanged and contacts improved.

Second, to enjoy the benefits.

The following benefits are available now to all IGS members:

- A directory of members, the IGS DIRECTORY, published every year, with addresses, telephone, telex and fax numbers.
- Newsletter, IGS NEWS published three times a year.
- Reduced purchase price on all documents published by the IGS.
- Reduced registration fee and preferential treatment at all conferences organized under the auspices of the IGS.
- Reduced subscription fees for the journals "Geotextiles and Geomembranes" and "Geosynthetics International".
- A central system for ordering selected publications.
- Possibility of being granted an IGS award.

MEMBERSHIP APPLICATION

Membership of the Society is open to Individuals or Corporations "...engaged in, or associated with, the research, development, teaching, design, manufacture or use of geotextiles, geomembranes, and related products or systems and their applications, or otherwise interested in such matters". The annual fee for membership is (US) \$45 for Individual Members (US) \$1000 for Corporate Members. Individuals or Corporations who voluntarily contribute a minimum of (US) \$200 annually to the Society, in excess of their membership dues, will be mentioned in the IGS Directory in a separate list as benefactors.

Attach card or fill in your address as you wish it to appear in the next IGS Directory (your professional address is recommended but your personal address is acceptable if the tel., telex and fax numbers are also your personal numbers). *If the address below is your personal address please check this box:*

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Fax: 1 (864) 859-1698

Eligibility (i.e. connection with geosynthetics, related products or associated technologies):

* A copy of the By-laws is available upon request.

Membership fee: Individual (US) \$45 Corporate (US) \$1000 Benefactor's contribution (at least (US) \$200): _____

Mode of Payment:

Check enclosed

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