IGS NEWS

NEWSLETTER OF THE INTERNATIONAL GEOSYNTHETICS SOCIETY

Dedicated to the scientific and engineering development of geotextiles, geomembranes, related products, and associated technologies

VOLUME 15 NO. 2 JULY 1999

Message from the IGS President
Professor R.J. Bathurst

This issue of IGS News reports many of the 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 IGS Chapters whose activities represent the most visible efforts of our growing society. It is a pleasure to be given the opportunity to highlight some important issues, describe some recent activities and identify some forthcoming events.

IGS Relocation and Postal Ballot

The IGS was originally registered as a non-profit organization in Switzerland in 1983. The IGS Officers and Council believe that it is now fiscally prudent to relocate the IGS from Switzerland to the United States. Swiss laws require that non-profit organizations with corporate membership must be taxed. IGS accountants and lawyers have advised that the IGS is not required to pay taxes as a registered non-profit organization in the USA and consequently the Officers have taken the necessary steps to affect the transfer. This change will require a change of the IGS bylaws. IGS members will be asked to vote in favor of this change by means of a postal ballot that will be sent to each member in August of this year (see article on page 6). In order to take advantage of the postal ballot mailing, a number of additional minor changes to the IGS bylaws will also appear in the ballot package and bring the bylaws up to date.

Conferences

The IGS is frequently asked to lend its support to conferences that are focussed on geosynthetics or contain sessions devoted to geosynthetics and their applications.

R.J. Bathurst

The IGS logo now appears as a quality mark on many conference bulletins and proceedings. We are pleased to report that in return for our support a total of 10 conferences have offered preferential registration fees for IGS members. Conferences that have IGS support include: Sardinia 99 - 7th International Waste Management and Landfill Symposium, Cagliari, Italy, 4-8 October 1999; Rencontres Geosynthetiques 99, Bordeaux, France 12-13 October 1999; 3rd Brazilian Symposium on Geosynthetics/1st South American Symposium on Geosynthetics - Rio de Janeiro, Brazil, 20-22 October 1999; Geosynthetics Asia 2000 (GA2000), Selangor Darul Ehsan, Malaysia, 29-31 May 2000; 4th International Conference on Ground Improvement (4th ICGIGS 2000), Helsinki, Finland, 7-9 June 2000; Terr@A International Conference, Napoli, Italy, July 2000; EuroGeo2 Conference, Bologna, Italy, 15-18 October 2000; GeoEng 2000, Melbourne, Australia, 19-24 November 2000; and the International Symposium on Earth Reinforcement (IS Kyushu 2001) Fukuoka, Kyushu, Japan, 14-16 November 2001.

IGS Chapters

Approximately 90% of IGS members are now members of IGS Chapters. It is well known that the success of the IGS is related to Chapter activities at the local and regional level. A Spanish Chapter of the IGS is now being formed. We look forward to reporting the details of this Chapter in the near future.

At the IGS meetings held in April 1999, the Officers and Council mem-

IN THIS EDITION:

do more to learn from the past failures, saying that "those that do not learn from the mistakes of others will learn from their own." Dr. Giroud repeated the need for rational analysis, and reinforced his points with several engaging examples.

Attorneys John Snyder and Nick Moraitakis' keynote presentation was "Law Practices in the Geosynthetics Industry." They noted that warranties, informal and formal, play an important part in the industry. Much of the litigation in the industry comes from breach of warranty, often through negligence in design. Both attorneys emphasized that mediation is much more preferable than going to trial to resolve differences between any parties engaged in a geosynthetics project.

Professor Alan McGown delivered the Mercer Lecture, one of the highest honors in the geosynthetics industry. Professor McGown's topic, "The Behaviour of Geosynthetic Reinforced Soil Systems in Various Geotechnical Applications", is described in more detail on p8.

Trade Show

Participants also took advantage of the opportunity to meet face-to-face with the 105 exhibitors during the trade show. The entire gamut of manufacturers, engineers and contractors was represented at the show.

The variety of participants left at least one Geosynthetics '99 exhibitor smiling. "We had an outstanding show," noted Kevin Spittle, of the Spittle Company, Cornelius, NC, USA, "The quality of leads was higher at Geosynthetics '99 than at any other show we participated in all year."

Technical Sessions and Workshops

Twenty technical sessions were held. A wide variety of geosynthetics topics were addressed including landfill leak detection, testing of geosynthetics, interface friction testing, walls, filtration and drainage and geosynthetic clay liners.

Four workshops were available to participants: welding flexible geosynthetic materials; destructive geomembrane seam testing; wall connections; and International Association of Geosynthetics Installers specifications. The workshops were informative and well attended.

Post Conference Tour

On the final day of the conference, over 180 participants and exhibitors took to the streets of Boston to survey one of the largest and most complex infrastructure projects in the world: the Boston Central Artery/Tunnel Project, known locally as "The Big Dig."

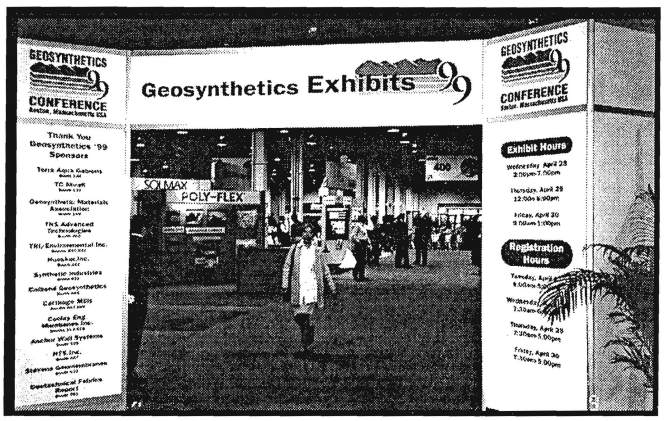
Participants received a first-hand look at the latest equipment and methods for slurry wall construction, excavation support systems, soft ground improvement and geotechnical instrumentation, as they walked a three kilometer section of the project through downtown Boston.

Conference Proceedings Available

The Geosynthetics '99 conference proceedings are available from the IFAI and the IFAI Bookstore.

The 1,133 page, two volume set includes a CD-ROM of the proceedings and sells for US$150 plus shipping and handling. To order a copy of the pro-

Prof. McGown (l) receives Mercer plaque from Dr. Bathurst.



Geosynthetics '99 Exhibits entrance.

G. Willibey (l), robot, and M. Theisen enjoy the Exhibition.

I. Peggs, J. Rohe, J. Mooney, and F. Rowe at NAGS reception.

- Mr. J. Paul (UK)
- Mr. A.M. Scuero (Italy)
- Dr. C.V.J. Varma (India)

Under the IGS bylaws, Prof. R.J. Bathurst and Ing. D.A. Cazzuffi are automatically members of Council in their capacity as President and Vice-President, respectively. They do not stand for re-election in 2000. The IGS bylaws stipulate that a Council Member may serve two consecutive terms. Hence, Dr. Chung, Dr. Lafleur, Mr. Paul, Mr. Scuero and Dr. Varma are eligible for re-election.

There are **eight** Council members to be elected. Under the bylaws of the IGS, only IGS members are eligible for these positions. **Candidates must be able to travel to and attend the IGS Council meetings, which are held once a year.** Meetings of the IGS Council are generally held in conjunction with international and regional conferences. The next IGS Council meeting following the election of new Council members will be held in conjunction with the Second European Conference on Geosynthetics (EuroGeo 2) in Bologna, Italy, 15-18 October 2000. At least three additional meetings will be held for those members whose terms expire in 2004. Typically these meetings are held in Asia, Europe and North America.

Signed letters of application together with a biographical note (not exceeding 12 lines) should reach the Secretariat of the IGS **not later than 31 January 2000.** Candidates must strictly adhere to the 12 line limit to ensure equal presentation space for all candidates. In their letter to the IGS Secretary, candidates must clearly identify their country of residence. Biographical notes which do not exceed 12 lines will be published in the March 2000 issue of IGS News, on the IGS World Wide Web home page and in the postal ballot package sent to each IGS member.

The IGS encourages any IGS member who is able to attend **all** IGS Council meetings to consider standing for one of the Council positions. It is important that all geographical regions are represented on the Council and that its members reflect the scope of the geosynthetics discipline.

Should you need further information, please contact the Secretary of the IGS, Mr. P. Stevenson, or the President of the IGS, Prof. R.J. Bathurst (addresses on p19)

reported by R.J. Bathurst
IGS President

Call for IGS Awards Nominations for the Period 1996-1999

(deadline for nominations 1 October 1999 – deadline for submissions 1 December 1999)

Purpose

IGS Awards will be granted in 2000 to individuals or groups of individuals who have made an outstanding contribution to the development and use of geotextiles, geomembranes, related products or associated technologies through their scientific and technological achievements. Awards will be made for the recognition of achievements completed and/or the validity of which has been demonstrated during a four-year period preceding the year of the award (i.e. 1996 through 1999 inclusive).

Types of awards

There are two awards:

- The Young IGS Member Award for IGS members who are less than 36 years of age on 31 December 1999.
- The IGS Award (regardless of age).

A maximum of five IGS Awards will be granted. Each award will consist of a specially commissioned medal and a diploma.

The winning entries will also be featured at the IGS booth at any conference held under the auspices of the IGS and will be publicized in the IGS News, in special press releases, on the IGS World Wide Web home page, and in other publications.

Candidates

At least one member of an award entry must be a member of the IGS. Each entry is restricted to a maximum of four persons. All members of the IGS are eligible with the exception of the President of the IGS and the members of the Awards Committee. In the case of a group submission to the Young IGS Member Award, all members of the group must satisfy the age requirement. Any individual or group that is a candidate for the Young IGS Member Award is automatically considered for both award categories (unless requested otherwise by the candidate). However, a candidate may only receive one award for the 1996-1999 period.

Nominations

Nominations of candidates should be typed in English on plain paper (not letterhead) and submitted to the IGS Secretariat at the address on the back page of this issue.

The nomination must include:

- a clear statement of the contribution of the candidate that is to be considered (e.g. if a product, provide a clear definition of the product; if a paper(s) or book, give a full reference of the paper(s)/book; if a report, include a full reference to the report; if a construction method, a clear description of the method and any references, etc.),
- a statement indicating the originality and significance of the candidate's contribution to the discipline (i.e. in the field of geotextiles, geomembranes, related products and/or associated technologies).

Nominations may be made by any IGS member except members of the Awards Committee. Under the IGS Awards rules any IGS member can nominate himself/herself for any award. The Publications Committee, Education Committee, Corporate Members Committee and IGS Chapters are invited to make nominations.

Item 6
Current
7.04 The minutes of the General Assembly proceedings shall be sent to the members of the Council.

Proposed
7.04 The minutes of the General Assembly proceedings shall be sent to the members of the Council, and the IGS Chapter Presidents and sent to any other IGS member upon written request. A synopsis of the minutes of the General Assembly shall be published in the IGS News.

Item 7
Current
13.01.01 No alteration or amendment of these bylaws shall be made except at an Ordinary, or an Extraordinary General Assembly.

Proposcd
13.01.01 No alteration or amendment of these bylaws shall be made except at an Ordinary, or an Extraordinary General Assembly, or a postal ballot.

Item 8
Current
13.01.02 The Council or one fifth of the member votes of the Society may initiate amendments to the bylaws.

Proposed
13.01.02 Amendments to the bylaws may be initiated by the Council or by a membership vote representing one fifth of the eligible voting members of the Society.

Item 9
Current
13.02.02 The Council or one fifth of the member votes of the Society shall initiate any proposal seeking to dissolve the Society.

Proposed
13.02.02 Any proposal seeking to dissolve the Society shall be initiated by the Council or by a membership vote representing one fifth of the eligible voting members of the Society.

reported by P.E. Stevenson
IGS Secretary

IGS Council Meeting Minutes, April 1999

The IGS Council met on 7 April 1999 during the Geo'99 conference at the Seaport Hotel and Conference Center, Boston, Massachusetts, USA.

President R. J. Bathurst opened the meeting. Five Officers were present: Immediate Past President C.J.F.P. Jones, Vice President D. Cazzuffi, Treasurer W. Voskamp, and Secretary P. Stevenson. Council members present were: T. Akagi, B. Christopher, H. Chung, J. Collin, S. Corbet, P. Delmas, J.P. Gourc, G. Heerten, J. Lafleur, E. Palmeira, J. Paul, and P. Rimoldi. Council member C. Varma was absent. Council members F. Tatsuoka and A. Scuero were absent with apologies. Also present was IGS Secretariat Manager R. Stevenson. B. Christopher was appointed facilitator/assistant secretary for the meeting (action list).

The key issues and agenda items were as follows.

The IGS Directory: A British Chapter proposal to recognize Chapter sponsors was discussed and the following was agreed. For each Chapter whose membership includes company supporters of the Chapter and its activities; the IGS will publish the list of those company supporters in the Directory. The list of Chapter supporters will be positioned after the end of the list of individual members of the Chapter.

Election 2000: A postal ballot election is planned for 2000. Candidates for Council are encouraged to step forward (see related article on p4).

IGS Awards: The IGS Awards program for the period 1996-1999 will be conducted in 2000. An awards committee has been nominated and nominations for candidates for IGS awards are sought.

An awards review committee was formed chaired by C.J.F.P. Jones. The members include D. Cazzuffi, S. Corbet, P. Delmas, C. Lawson and P. Stevenson. Issues under consideration are the rules and guidance for lifetime achievement, company or corporate candidacy, contractors, and a review of the overall program. The committee plans to submit a draft proposal to the IGS Officers in October 1999 with the intent of finalizing any new proposals for consideration by the Council in October 2000.

In addition, a new type of service award was proposed, discussed and approved in principle. Treasurer Voskamp will draft the rules, eligibility and responsibility for nomination for review by the IGS Officers in October 1999.

A Student Competition committee was formed (see p4).

Conferences: The IGS granted support to the IS Kyushu, Terr@A, Helsinki Conference and Sardinia 99 conferences.

A preliminary report on Geo '99 reported 405 fully paid conference attendees, and 1500 exhibit attendees.

It was noted that there are important conferences that have not applied to the IGS for support. The Officers and Council discussed the essential conflict between the desire to achieve wide spread recognition of the IGS and its logo as a quality mark for various conferences and the requirement that a conference that claims IGS support must offer a significant benefit to the membership of the IGS (usually a discount).

IGS Relocation: The plan to relieve the IGS of the tax burden in Switzerland by relocating it to the USA was approved by the Council (see related article on page 6).

Treasurer's Report: The Treasurer reported that the 6th International Conference (Atlanta 1998) had 808 fully paid attendees.

The Treasurer proposed (and the Council approved) the extension of Chapter support for Chapter activities at the rate of US$100 per corporate

Professor McGown very briefly described the composition and construction of GRSS's and suggested that they were relatively simple structures constructed in a rather standardized manner, and that this is one of their particular advantages. However, he highlighted the fact that they are generally subject to a combination of different types of loads and deformations, some short-term and some long-term.

He suggested that there were three types of design approaches, all now available, namely, limit equilibrium methods (the most common), hybrid or transitional approaches (recently introduced and based on limit state but with modifications to keep outcome design similar to limit equilibrium results), and true limit state approaches (yet to be fully adopted). He recommended the rapid introduction of true limit state designs.

In addition, Professor McGown suggested that it was necessary to reassess our present approach to the selection of input parameters for the soil and the geosynthetics in GRSS's, whether they be roads, railways, slopes, embankments, walls or other structures.

While a wide range of soils is used for reinforced structures, compacted granular fill is the most common. Professor McGown questioned whether or not we were representing these good quality materials properly.

He suggested we consistently underestimate peak angles of friction by up to ten degrees. By using more representative values, there could be savings of up to 30% made in the amount of geosynthetics required in walls of 10m or more in height.

To represent the geosynthetic reinforcements better, Professor McGown suggested it was necessary to re-think current methods of modeling load-strain-time-temperature behavior.

Professor McGown then introduced a new approach based on "Isochronous Strain Energy" (ISE). This approach identifies two components of geosynthetic reinforcement behavior based on "Immediately Recoverable Strain Energy" and "Locked-in Strain Energy" at any time after loading.

He suggested that this allowed a better understanding and correlation of different types of test data, and allowed a better interpretation of extrapolation processes together with a better consideration of construction damage/ environment degradation effects.

Professor McGown

Lastly, Professor McGown applied the ISE approach to the problem of modeling complex load/deformation combinations on GRSS's, the so-called multi-stage actions. He showed, using this method, that the strength available in short-term loading, in addition to long-term sustained loading, was very large and suggested that this was not being accounted for (or at least fully allowed for) in current designs.

In conclusion, Professor McGown suggested that the very low failure rates of GRSS's was at least in part attributable to the very conservative design approach presently being taken. He suggested that it is time for a reassessment of current design methods in order to take further advantage of the technical and economic advantages which GRSS's offer.

The Mercer Lecture will be delivered by Professor McGown at EuroGeo2 which will be held 15-18 October 2000 in Bologna, Italy, and GeoEng 2000, 19-24 November 2000 in Melbourne, Australia (see Calendar, p17, for details).

Editor's note: the following is a brief background of the Mercer Lectures series:

The Mercer Lecture series was established 10 years ago. This lecture series allows the very best contributors to the technical advancement of geosynthetics the opportunity to present their work at international venues around the world. The Mercer Lecture is named after Dr. Brian Mercer the founder of Tensar International in the United Kingdom.

Dr. Mercer passed away in November of last year at the age of 70.

In the 1950's Dr. Mercer invented the Netlon process in which plastics are extruded into net-like products. This process continues to be used today in a diverse range of packaging, agriculture, gardening and industrial uses.

Dr. Mercer developed Tensar geogrids which are used in reinforcement applications. He received many honors for his innovative work related to the development of high performance plastics. These included the Order of the British Empire and Fellow of the Royal Society.

The Mercer Lecturer is selected by a panel comprising one representative from Tensar International, one from the International Society of Soil Mechanics and Geotechnical Engineering and one from the International Geosynthetics Society.

Previous Mercer Lecturers have been Dr. Robert Koerner, Professor J.-P. Gourc and Professor Fumio Tatsuoka.

Tensar International provides the funding to send the Mercer Lecturer to three international venues – typically one in Europe, one in Asia and one in North America during the two-year period of each lecture series.

reported by D. Elton
Editor, IGS News

EuroGeo3 Sponsor Sought for 2004

A European IGS Chapter is sought to host EuroGeo3 in the year 2004. As agreed by the Officers and the IGS Council, the European Activity Committee (EAC) will approach all European IGS Chapters. However, EuroGeo3 may also be held in a European country where a Chapter does not yet exist, but which would be willing to organize the Conference in cooperation with the IGS. The Dutch IGS Chapter organized the EuroGeo1 Conference in Maastricht (1996), the Italian IGS Chapter will host the EuroGeo2 Conference in Bologna (2000). The French Chapter has already started preparations for the 7th International Conference on Geosynthetics in the year 2002 in Nice, France.

All European IGS Chapters and representatives of European countries interested in hosting EuroGeo3 in the year 2004 are encouraged to contact the Secretary of the IGS, Mr. P. E. Stevenson (226 Sitton Road, Easley, South Carolina, 29642-8393, USA) and request an information package which contains all information required to prepare a successful bid.

Bid packages should be submitted by 29 February 2000, so that a decision can be made in a timely manner. The location of EuroGeo3 will be announced in Bologna, Italy, during EuroGeo2 in October 2000.

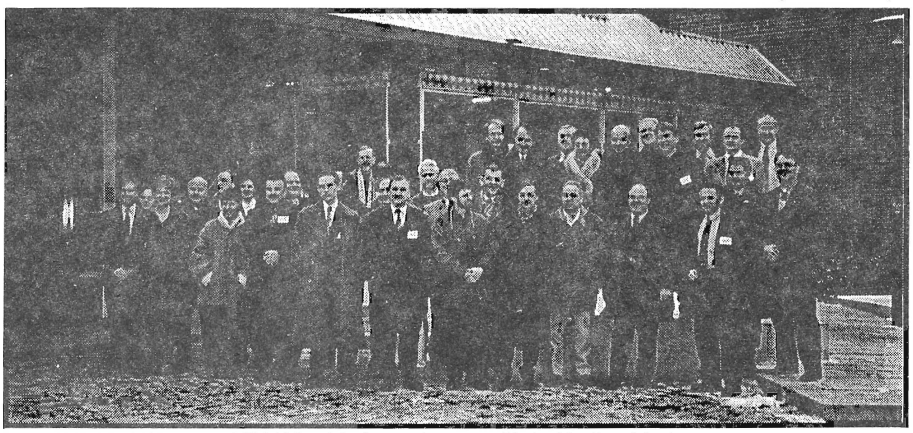
submitted by Dr.-Ing. Georg Heerten
Chairman EAC, IGS

CEN TC 189 Meets in Germany

The Task Committee TC 189 - Geotextile and Geotextile Related Products - of the European Committee for Standardization CEN (Comité Européen de Normalisation), chaired by Gert den Hoedt from The Netherlands, held its second annual meeting at Nuremberg, Germany 1 - 4 December 1998. The event was organized by the convenor of WG 2, Helmut Zanzinger, head of the Geosynthetics Laboratory of LGA. Four of the five CEN working groups (Application, Terminology, Mechanical Testing, Hydraulic Testing, Durability) and the Joint Working Group of CEN TC 189 / TC 254 dealing with geomembranes and geomembrane related products, comprised of about 60 delegates from 15 countries, met at the convenient facilities of LGA (Landesgewerbeanstalt Bayern). Considerable progress was achieved in the preparation of European standards on geosynthetics and their harmonization with ISO. A somewhat controversial discussion arose about the formal question whether GCLs should be classified as "geomembranes" or as "geomembrane related products" or whether a new category of product should be established under the caption "geomembranes and geomembrane related products".

The delegates enjoyed a short visit to the famous "Christkindles Markt" in the center of medieval Nuremberg and felt the touch of European history at the Frankonian "Bratwurst" and wine dinner in a 500 year-old restaurant, sponsored by the Association of German Geosynthetics Manufacturers IVG (Interessenverband Geokunststoffe). In his address to the European geosynthetics experts, IGS Vice President Daniele Cazzuffi emphasized the importance of public relations for the IGS and for the promotion of geosynthetics. The IGS European Activities Committee and the European geosynthetics Product Certification Group took advantage of the CEN meeting at Nuremberg to get together and exchange ideas about their future work.

reported by Helmut Zanzinger
LGA, Nuremberg, Germany



CEN TC 189 Committee at Christkindles Markt

North America Geosynthetics Society News

The North American Geosynthetics Society held meetings in conjunction with the Geosynthetics '99 conference in Boston, Massachusetts, USA in April 1999 (see p2 for related article).

NAGS held the General Assembly, called to order by then-President John Paulson.

The NAGS board members are President John Paulson, President Elect Rick Thomas, Immediate Past President Richard J. Bathurst and Vice Presidents Shobha Bhatia, Karen Henry, Mark Cadwallader, and Dave Suits. The new Treasurer is Mark Myers, and the new General Secretary is Doris Runa.

NAGS also held an Awards of Excellence reception to recognize the best papers at the Geosynthetics '99 conference. Awards were given in several categories. The winner for Geotechnical Engineering Technology was J.P. Gourc et al. for "Sinkholes Beneath a Reinforced Earthfill - A Large Scale Motorway and Railway Experimentation". The winner for Research and De-

Geotextiles and Geomembranes an Official Journal of the IGS

Geotextiles and Geomembranes is ahead of schedule with the posting of Volume 17 (1999), nos. 5& 6 (a special issue on filtration with Dr. Jean Lafleur as Special Editor) in August 1999. Preparation is well underway for of Volume 18 (2000) which will include a special issue on GCLs with Dr. Malek Bouazza as Special Editor.

Dr. Jean-Pierre Gourc is planning to prepare a Special issue on Erosion. If you are interested in contributing to this special issue, please contact Dr. Gourc at the address on p18, or by email: gourc@ujf-grenoble.fr

The Editorial Board members and reviewers have worked very hard work over the past year to provide detailed, constructive reviews in a very timely manner. The average review period is less than 3 months. Papers come from a wide range of countries with approximately a third of the papers coming from the Americas, Europe and the rest of the world. The rejection rate is 44%. The Journal's Editor and Board members are extremely appreciative of the author's hard work in addressing the reviewers' comments and the quick return of revised papers.

All technical contributions and inquiries should be directed to:

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email: r.k.rowe@uwo.ca

Authors should submit four copies of any paper for review by at least two reviewers. No original figures should be included initially.

Please contact Elsevier Science at the address given below, if you wish to subscribe to the 1999 Volumes or purchase individual issues. Subscriptions may also be backdated. The subscription rate for 1999 is NLG 1103 or US$560. **Individual members of the IGS may subscribe at an 80% discount, i.e. NLG 221, or US$112.** IGS Corporate members may subscribe at a 50% reduction, i.e. 552 NLG , or US$280. **Please indicate that you are an IGS member when requesting the special subscription price.** All inquiries should be directed to:

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submitted by R. Kerry Rowe
Editor

IGS Chapter Reports

French Chapter

New Officers: President - Daniel Fayoux; Vice Presidents - Thierry Gisuert, Didier Gourvat; Treasurer - Gaetan Potie; Secretary - Francois Caquel; Secretariat - Daniele Peck; President of Organizing Committee International IGS Conference NICE 2002 - Philippe Delmas.

1998
Twenty members of CFG participated in the IGS International Conference in Atlanta. We celebrated the 20th anniversary of our organization: 270 members attended this activity. We have organized a one-day training course (Technical day) in Nantes for 110 people. We published a 56-page guideline for use of GCLs, in French.

1999
Ten working groups are continuing to prepare other technical recommendations for geotextiles or geomembranes, geotextiles for conventional works, erosion, drainage / reinforcement, certification of waterproofing companies, welding factors, puncturing and geomembranes used in concrete hydraulic works.

Two technical days are planned:
Rencontres 99 - a two-day conference on geotextiles and geomembranes is scheduled in Bordeaux the 12-13 Oct 1999 – see calendar (p19) for details.

The Chapter is making all preparations for the next IGC in Nice, France in 2002.

reported by Daniel Fayoux, President CFG, French IGS Chapter

German Chapter

1. Membership as of March 1999: 79 members of the German IGS-Chapter within the 272 members in the special section "Geosynthetics in Geotechnics" (FS-KGEO is the "Fachsektion Kunststoffe in der Geotechnik") of the "German Society for Geotechnics" (DGGT).

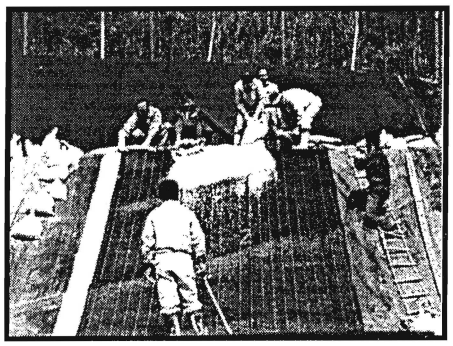
2. Chairmanship: The chairmen for the special section FS-KGEO and the German IGS chapter for 1998 - 2001 are: Chairman: Univ.-Prof. Dr.-Ing. R. Floss, Lehrstuhl und Prufamt fur Grundbau, Bodenmechanik und Felsmechanik der Technischen Universitat Munchen; Vice-Chairmen: Dr.-Ing G. Heerten, Naue Fasertechnik GmbH & Co., Lubbecke, Dr. W. Wilmers, Baustoff- und Bodenprufstelle, Wetzlar.

3. "Geotechnik"- Journal of the DGGT: The FS-KGEO was responsible for the paper selection for issue 4 in 1998. The selection was finished in August and the journal was distributed in Dec 1998 containing five papers on geosynthetics. The second issue in 1999 will be a special publication for the European Conference on Soil Mechanics and Geotechnical Engineering in Amsterdam (June

resisted by the loading, and the hole is effectively sealed off.

Conventional geomembranes often have several limitations: fracture at low stress; spreading of the fractured section; leakage though damaged geomembranes; costly remediation of leaks; and physical degradation by UV radiation. Single geomembrane liners have to withstand many loads and forces while remaining impermeable. Because this is difficult to achieve, double liner systems or composite liner systems are used, consisting of geomembranes in close contact with a clay or bentonite layer. The new system is intended to overcome these limitations.

Japan has very strict liner requirements. A liner system must have



The new system applied to a slope.

a long-term reliability to assure the safety of users and nearby residents. It would be desirable for the system to be able to be self-mending.

Requirements with Respect to Bentonite

In this system, the bentonite plays a crucial role. The thickness of the bentonite layer must be carefully controlled, even on slopes. Movement of the bentonite powder or grains between the geomembrane layers must be prevented.

To assist with this, the bentonite must meet the following requirements: particle size must be between 0.7-7.0 mm, the thickness of the layer must be 20 or 30 mm, and a spacer system must be used for containment of the bentonite between the two geomembranes. When this is done, the thickness of the bentonite layer will be within the specified limits.

On-site Tests

In order to check the system's reliability, in September 1995 extensive on-site tests were carried out regarding: installation of the bentonite-layer thickness, stability of the bentonite, the spacer on the slopes, the effects of wind on the installation, the self-mending properties and the long-term stability.

Installation Tests

On an existing landfill, a sloped and partly horizontal test section was constructed. To measure any water leakage, a third-geomembrane and a drainage mat were installed underneath the test section.

The bentonite was spread using a crane supporting a bag container with a discharge opening at the bottom. The spacer permitted good control of the bentonite thickness, which only had to be slightly thicker than the spacer. The test results showed that the bentonite layer on the slope was stable, without reducing its thickness.

During construction, bentonite concentration in the air was measured by a digital dust detector: at a wind velocity of 1 m/s, at a 5m distance, the measured concentration was 0.055 mg/m^3; at a wind velocity of 3 m/s, at a 3m distance, the measured concentration was 0.129 mg/m^3. These concentrations were well within acceptable levels.

Test of the Self-mending Properties

To check the self-mending properties of the system, the bentonite swell thickness and the area of the swelled section were measured at the punctured parts of the geomembrane. Some sections were covered with a capping layer; others were kept open.

Three types of damage were initiated: thrust damage, punch-hole and cross-cut damage. Water was applied on the damaged areas in a quantity equaling 10 mm of rainfall (10 l/m^2). After one hour, the volume of water that penetrated the combined system was measured.

Afterwards the geomembrane was removed in order to measure the water absorption and swelling condition of the bentonite. The quantity of leaked water at the damaged section was compared to the swelled area. In another section, long-term effects were measured 14 months after the water test.

The largest swelling areas observed evolved from the cross-cut damage. The swelled areas remained intact in the sections covered with a soil capping layer. No water penetrated into the bentonite layer. The swelling in the areas with a soil layer was considerably less because of the confining pressure.

Conclusions

The swelling properties of the bentonite when coming in contact with water created an effective self-mending system. The two geomembranes supplied a primary and secondary barrier, while the bentonite between these two layers sealed off any damage in the top layer.

Large holes were effectively blocked by the bentonite before leachate could reach the second geomembrane. Thus the combination of bentonite between two geomembranes created an effective barrier system. The geosynthetic spacer between the geomembranes helped create a uniform thickness bentonite layer. With this method, the bentonite thickness remained within design tolerances even on slopes.

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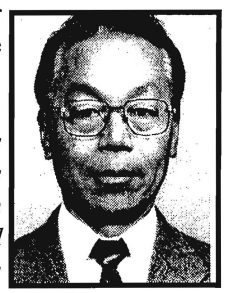

Mr. Hasegawa

Editor's note: this article was excerpted from Colbond Geosynthetics News, v7, 1999

Calendar of Events

Peruvian IECA Conference
3 Oct 1999
Contact: Jesus Cordozo Rubio Tel.: +51-13680757, Fax: 13681830
email: andex@amauta.rcp.net.pe

Sardinia 99 – 7th International Waste Management and Landfill Symposium
Cagliari, Italy, 4-8 Oct 1999
Contact: EuroWaste Srl, Via Altinate 96, I - 35121 Padova, Italy
Tel.: +39 049 663 860
Fax: +39 049 663 960
email: eurowaste@tin.it
http://www.pengo.it/sardinia99

Rencontres Geosynthetiques 99
Bordeaux, France, 12-13 Oct 1999
Contact: Secretariat, Boite postale 81
50 avenue de Verdun
33611 CESTAS CEDEX
Tel.: +33 0 55 78 90 190
Fax: +33 0 55 78 90 191
email: rencontres.GST99@bordeaux.cemagref.fr

Sixth Annual IECA Conference, Workshop and Trade Show, Ocean City, MD, USA, 13-14 Oct 1999
Contact: Butch Wilson Tel.: 1 (410) 296-3333, Fax: 1 (410) 296-4705 or Paul Clement Tel.: 1 (410) 329-3100, Fax: 1 (410) 472-2200

XIII Italian National Conference on Geosynthetics
Bologna, Italy, 15 Oct 1999
Contact: Susanna Antonielli, AGI-IGS
Piazza Bologna 22, I - 00162 Roma, Italy
Tel.: +39 06 4424 9272
Fax: +39 06 4424 9274
email: agiroma@iol.it

3rd Brazilian Symposium on Geosynthetics/1st South American Symposium on Geosynthetics, Rio de Janeiro, Brazil, 20-22 Oct 1999
Contact: Dr. M. Ehrlich, Coppe/Federal University of Rio de Janeiro, Cidade Universitaria
C.P. 68506, 21945-970 Rio de Janeiro, RJ, Brazil
email: me@GEOTEC.COPPE.UFRJ.BR

Filtration'99, Chicago, IL
2-4 Nov 1999
Contact: INDA, P.O. Box 1288, Cary, NC 27512 USA, Tel.: 1 (919) 233-1210 ext. 126, Fax: 1 (919) 233-1282
http://www.inda.org

9th Annual TANDEC Nonwovens Conference
Knoxville, Tennessee, USA
10-12 Nov 1999
Contact: Dr. Dong Zhang, Conference Co-Chair Textiles and Nonwovens Development Center (TANDEC), 1321 White Ave., The University of Tennessee, Knoxville, TN 37996-1950
Tel.: 1 (423) 974-3573
Fax: 1 (423) 974-3580
email: tancon@unix.cas.utk.edu

Forum'99, St. Hyacinthe, Quebec, Canada, 25-26 Nov 1999
Contact: Dr. Jacek Mlynarek, Chairman of FORUM'99, Geosynthetics Technology Center
SAGEOS, 3000 rue Boull'e
Saint-Hyacinthe, Quebec, J2S 1H9, Canada
Tel.: +1 (450) 771-4608
Fax: +1(450) 778-3901
email: sageos@sageos.ca

GRI-13 Conference on "Geosynthetics in the Next Millennium", Hilton Airport Hotel, Philadelphia, PA
14-15 Dec 1999
Contact: Ms. Marilyn Ashley, Geosynthetic Institute, 475 Kedron Avenue, Folsom, Pa 19033-1028, USA
Tel.: 1 (610) 522-8440
Fax: 1 (610) 522-8441
email: marilyn.ashley@coe.drexel.edu

Fourth International RILEM Conference, Ottawa, Canada
26-30 March 2000
Contact: Pierre Lamoureax, Conference Services, National Research Council
Bldg. M-19
Ottawa, Ontario, Canada K1A 0R6
Tel.: 1 (613) 993-9628
Fax: 1 (613) 993-7250
email: pierre.lamoureaux@nrc.ca

International Symposium on Physical Modeling & Testing in Environmental Geotechnics
La Baule, France, 15-17 May 2000
Contact: Dr. Sepr. J. Garnier, LCPC, Centre de Nantes
Route de Bouaye BP 19, 44340 Bouguenais, France
Fax: (33) 2 4084 5997
email: Necer@lcpc.fr
http://www.lcpc.fr/~necer/symp2000

Geosynthetics Asia 2000 (GA2000), Selangor Darul Ehsan, Malaysia
29–31 May 2000
Contact: IEM Secretariat, The Institution of Engineers, Malaysia, Lots 60/62, Jalan 52/4
P.O. Box 223, Jalan Sultan, 46720 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel.: 603-7684001/17
Fax: 603-7577678
email: sec@iem.po.my
http://www.jaring.my/iem/geotech/GA2000.html

Geofilters 2000, Warsaw, Poland
5-7 Jun 2000
Contact: Prof. W. Wolski, Chairman for Geofilters 2000, Department of Geotechnics, Warsaw Agricultural University ul Nowoursynowska 166, 02-787 Warszawa POLAND, Tel.: and Fax: (48) (22) 847 00 13 or
(48) (22) 645 95 18
email: qf2000(@alpha.sggw.waw.yl
http://www.alpha.sggw.waw.pl/konferencje/gf2OOO

4th International Conference on Ground Improvement (4th ICGIGS 2000), Helsinki, Finland, 7-9 Jun 2000
Contact: Secretary General NGM 2000 Hans Rathmayer, VTT-Technical Research Centre, Communities and Infrastructure, Box 19031, FIN-02044 VTT, FINLAND
Tel: +3589 4561
Fax: +3589 463251
email: Hans.Rathmayer@vtt.fi
http://www.sgy.fi/

6th Canadian Environmental Specialty Conference
London, Ontario, Canada
8-10 Jun 2000
Contact: Dr. R. K. Rowe

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note: date is earliest year of continuous membership