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# Administrative report of TC9 – Geosynthetics and earth reinforcement

## Compte rendu technique de la No. CT 9 – Géosynthétiques et renforcement des sols

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**ABSTRACT:** TC-9 has covered the professional area of the subjects on Geosynthetics and its application to geotechnical engineering, and it had been called “Geotextiles and Geosynthetics” during the period 1994-1997. But the name of TC-9 was changed to “Geosynthetics and Earth Reinforcement” in order to match the activities which are expected to develop in the future. This was based on the great success of the International Symposium on Earth Reinforcement (IS Kyushu) which were held in Fukuoka, Japan in 1988, 1992 and 1996. For this reason, the Japanese Geotechnical Society (JGS) has supported the activities of TC-9 as a Host Member Society, and a supporting committee has been established in the framework of JGS. One of main activities for TC-9 is to support the International Symposium on Earth Reinforcement (IS Kyushu 2001) which will be held on November 14-16, 2001 in Fukuoka, Japan under the joint-auspices of the Japanese Geotechnical Society and the TC-9. Besides, the final results of TC-9 activities will be published in the symposium proceedings of IS Kyushu 2001.

### 1 INTRODUCTION

TC-9 has covered the professional area of the subjects on Geosynthetics and the application to geotechnical engineering, and it had been called “Geotextiles and Geosynthetics” during the period 1994-1997. But the name of TC-9 was changed to “Geosynthetics and Earth Reinforcement” in order to match the activities which are expected to develop in the future. This was based on the great success of IS Kyushu (International Symposium on Earth Reinforcement) which were held in Fukuoka, Japan in 1988, 1992 and 1996. For this reason, the Japanese Geotechnical Society (JGS) has supported the activities of TC-9 as a Host Member Society, and a supporting committee has been established in the framework of JGS. One of main activities for TC9 is to support International Symposium on Earth Reinforcement (IS Kyushu 2001) which will be held under the joint-auspices of the Japanese Geotechnical Society and the TC9. TC-9 has contributed some of the organizing works such as scientific matters. Besides, the final report of TC-9 activities will be published in the symposium proceedings of IS Kyushu 2001.

This is an administrative report on TC9/ISSMGE activities for the period 1997 – 2001. First of all, the action plan is introduced and the contents of IS Kyushu 2001 are indicated. Then, the activities by TC-9 such as meetings and organized session are also reported. Finally, the future prospects for TC-9 activities are summarized. It is noted here that all those activities reflect to the final report in the IS Kyushu proceedings.

### 2 TERMS OF REFERENCE

Terms of reference for the TC-9 are shown as follows:

- 1) To continue in developing and spreading the knowledge on Geosynthetics and Earth Reinforcement,
- 2) To promote the activities for the use of geosynthetics in geotechnical engineering,
- 3) To participate actively in the technical program of the conferences and symposia related to the topic on geosynthetics and earth reinforcement,
- 4) To support International Symposium on Earth Reinforcement (IS Kyushu 2001) which will be held on November 14-16, 2001 in Fukuoka, Japan , and
- 5) To cooperate with the International Geosynthetics Society.

### 3 MEMBERS, SUBCOMMITTEES AND SUPPORTING COMMITTEE

A well selected international group of experts became appointed as responsible members of this committee based on the candidates recommended by ISSMGE member societies, presided from 1997 to 2001 by Prof. H.Ochiai as Chairman and Prof. J.Otani as Secretary. List of members are shown in the APPENDIX 1.

The subcommittees (SC) have been set up in the TC-9 in order to enhance the activities. The themes of each subcommittee with the head persons are shown as follows:

Sub-Committee	Title	Leader
TC-9/SC-1	Case History and Data Base	Mr. Lawson (Malaysia)
TC-9/SC-2	Long Term Performance under Extreme Loading”	Dr. Murata (Japan)
TC-9/SC-3	Design and Parameter Determination	Prof. Leshchinsky (U.S.A.)
TC-9/SC-4	Education	Prof. Gourc (France)
TC-9/SC-5	New Approach and Applications	Prof. Jones (U.K.).

All the contributions and final report have been done based on the activities by those subcommittees.

TC-9 has also set up the supporting committee in the framework of the Japanese Geotechnical Society (JGS) in order to enhance the activities of TC-9. The members of Japanese Supporting Committee are also listed in the APPENDIX 1.

### 4 IS KYUSHU 2001

The International Symposium on Earth Reinforcement, IS Kyushu 2001, will be held at Garden Palace Hotel in Fukuoka, Japan on November 14-16, 2001 under the joint-auspices of the Japanese Geotechnical Society (JGS) and the TC-9. This symposium is a continuation of the three previous international symposia, IS Kyushu '88, '92, and '96 which have provided successful contributions to the development of earth reinforcement practice in geotechnical engineering. The aim of those symposia are to discuss various problems and topics on earth reinforcement for the benefit of collecting and exchanging knowledge concerning recent developed techniques and to spread the knowledge to all the

countries of the world for further development. Recently, a global standardization has become a key issue for testing and design around the world and new design concepts such as limit state design and performance based design have been discussed. This symposium will offer an excellent opportunity to discuss such issues. The final results of TC-9 activities will be published in the symposium proceedings.

#### 4.1 Program

The contents of the symposium are as follows:

- (1) Day 1(November 14)
  - Morning Session: Special Lecture, Keynote Lecture I
  - Afternoon Session: Keynote Lecture II, Technical Session 1
  - Evening Session: Welcome party, Poster Session (1)
- (2) Day 2(November 15)
  - Morning Session: Keynote Lecture III, Technical Session 2
  - Afternoon Session: Technical Session 3, Keynote Lecture IV
  - Evening Session: Poster Session (2), TC9-IGS Joint Meeting
- (3) Day 3(November 16)
  - Morning Session: Special Session on "Soil Nailing", Keynote Lecture V
  - Afternoon Session: Summary Discussion Session on "Design Procedure"
  - Evening Session: Farewell Party

#### 4.2 Guest Speakers and Chairpersons

- (a) Special Lecture: Prof.R.Bathurst (President of IGS): "Recent full-scale testing of reinforced soil walls and implications to design"
- (b) Keynote Lectures:
  - 1) Mr. M.Hirano (Japan): "Earth reinforcement practice for natural slopes"
  - 2) Mr. C.Lawson (Malaysia): "Issues facing reinforced soil structures in Asia"
  - 3) Dr.O.Murata (Japan): "An outlook on recent research and development concerning long-term performance and extreme loading"
  - 4) Prof. R.Kerry Rowe (Canada): "Insights from consideration of case histories involving reinforced embankments, slopes and walls"
  - 5) Mr. G.R.A.Watts (U.K.): "Application of geosynthetics for retaining walls and slopes for long term performance"
- (c) Chairpersons:
  - 1) Chairperson for Special Session on Soil Nailing: Dr. R. Jewell (Belgium):
  - 2) Co-chairpersons for Summary Discussion Session on Design Procedure: Prof. D. Leshchinsky (U.S.A.) and Prof. J. Zornberg (U.S.A.)

## 5 SUMMARY OF TC-9 MEETINGS

TC-9 have set up mailing list which is [issmge\\_tc9@cc.nda.ac.jp](mailto:issmge_tc9@cc.nda.ac.jp) in order to discuss on e-mail. And meantime, the meetings during the conferences on the related topics with earth reinforcement were organized as much as possible. Followings are the contents of the meeting, in which we have done in the four year period 1997-2001 Each meeting has set the main topic based on the theme of each subcommittee. Here, the meetings by Japanese Supporting Committee are also included

#### 5.1 Topic on Total Activities

- (1) June 8th in 1999 in Amsterdam (during 12th European Regional Conference in ISSMGE)
  - (a) number of participants:10

- (b) Discussion on the members and terms of reference
- (c) Correction of terms of references as follows
- (d) Discussion on the theme and the activities of sub-committees
- (e) Discussion on the target of TC-9 including the possible contents of final report
- (f) Confirmation of upcoming meeting schedule
- (2) August 9 in 1999 in Iguassu Falls, Brazil (during XI Panamerican Conference in ISSMGE)
  - (a) number of participants: 4
  - (b) Discussion on the potential activities to be under-taken under TC-9
  - (c) Confirmation of participation in upcoming Events
  - (d) Possible future meeting

#### 5.2 Topic on Case History (TC-9/SC-1)

- (1) August 19 in 1999 in Seoul, Korea (during 11th Asian Regional Conference in ISSMGE)
  - (a) Number of participants:100(including 13 TC9members)
  - (b) Organizing 'Special Session on Earth Reinforcement Technique in Asia'
  - (c) 6 panelists from any countries and regions in Asia about Case Histories
  - (d) Discussion on the current status of earth reinforcement technique and the future prospects in Asia
- (2) August 7 in 2000 in Denver, U.S.A. (during GeoDenver 2000)
  - (a) number of participants: 12 (including 4 TC-9 members)
  - (b) Presentations about Case Histories from Japan (Dr.Otani) and U.S.A. (Mr.Barrett)
  - (c) Free discussion on the TC9 activities

#### 5.3 Topic on Design (TC-9/SC-3)

- October 15 in 2000 in Bologna, Italy (during EuroGeo2 in IGS)
- (a) Number of participants:19 (including 15 TC-9 members)
  - (b) Presentations about design procedure in France (Dr.Gotteland) and Japan (Dr.Otani and Dr.Hirai)
  - (c) Three short presentations: Prof. Jones (U.K.), Mr. Voskamp (Netherlands), and Mr. Cazzufi(Italy)
  - (d) Discussion on the harmonization of design code and partial safety factor
  - (e) Free discussion on the TC-9 activity

#### 5.4 Topic on Education(TC-9/SC-4)

- November 22 in 2000 in Melbourne, Australia (during Geo-Eng2000)
- (a) Number of participants:12
  - (b) Two presentations from U.S.A. and Japan about current situation on the education system: Prof. Imaizumi (Japan) and Prof. Bowders (U.S.A.)
  - (c) Presentation by Prof. Jones of U.K. about education materials including the contents of short course
  - (d) Presentation by head of education subcommittee, Prof. Gourc (France) about TC-9 activities
  - (e) Free discussion on the TC-9 activity

#### 5.5 TC-9 meetings (Japanese Supporting Committee)

The meetings were held by Japanese Supporting Committee for three or four times in each year and the discussion by this supporting committee was a guideline for the whole activities by TC-9. Some of the contents in those meeting are highlighted as follows:

- (1) Record of the meetings:
  - 1) 2 meetings in 1998
  - 2) 3 meetings in 1999

- 3) 3 meetings in 2000 and
- 4) 4 meetings in 2001 (by the end of March)

(2) Highlights of agenda:

- 1) Discussion on the contents of terms of references
- 2) Discussion on the active plan
- 3) Preparation of agendas for all the meetings
- 4) Discussion on the recent activities in Japan
- 5) Exchanging the information with IGS

## 6 SPECIAL SESSION DURING 11TH ASIAN REGIONAL CONFERENCE

The TC-9 organized a Special Session on the title of Earth Reinforcement Technique in Asia -Current Topics in Asia and New Horizon for 21st Century- during 11th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering in Seoul, Korea, August 19, 1999. Followings are the summary of this session.

### 6.1 Contents of Special Session

The contents of the Special Session were as follows:

- (1) Introduction by Chairman of TC-9 (Prof. Ochiai, Japan)
- (2) Presentations by panelists, chaired by Dr. Kuwano (Japan)
  - 1) A state-of-the-art-report on soil reinforcement in Turkey, E. Guler (Turkey)
  - 2) Earth Reinforcement studies and practices in India M.R. Madhav (India)
  - 3) Earth reinforcement technique with geosynthetics in Asian region C.R.Lawson (Malaysia)
  - 4) The application of geosynthetics in Hong Kong, K.C. Yeo (Hong Kong/China)
  - 5) Application of geosynthetics and earth reinforcement technique in Korea S.D. Cho and E.C. Shin (Korea)
  - 6) The current status and outlook for soil nailing in Japan S. Tayama and Y.Kawai (Japan)
- (3) Discussion Session chaired by Mr. Lawson (Malaysia) and Dr.Otani (Japan)

### 6.2 Discussion Session

This session was organized by TC-9/SC-1 (Case History and Data Base) which is in charge by Mr.Lawson who is a head person for that subcommittee. There were six reports (20min. each) on the topic of earth reinforcement technique in Asia and also there was a discussion session on the issues of current state and next step for earth reinforcement technique. At the beginning of discussion session, three short presentations were also performed by Prof. D. Bergado from Thailand, Dr.T. Uchimura from Japan and Prof. C. Yoo from Korea, and active discussion were done from the floor. At the end of discussion session, Mr. Lawson concluded with following remarks:

- 1) The development of earth reinforcement technique in Asia is highly expected in 21st century, and
- 2) The increase of the use of earth reinforcement technique is still expected in Asian region.

### 6.3 General Remarks

About 100 researchers and engineers were attended in this Session and it was one of the successful activities for TC-9. We hoped that the contents of this special session are going to be a milestone for the topic of earth reinforcement for not only in Asia but also around the world. All the reports were published in the special volume for the proceedings of XI Asian Regional Conference (edited by H.Ochiai and J.Otani). Those contents will be also discussed at IS Kyushu 2001.

## 7 FUTURE PROSPECTS FOR TC-9 ACTIVITIES

TC9 activities for the period of 1997 to 2001 are summarized:

- (1) TC-9 meetings took place 6 times during several international conferences including the 12th European Regional Conference, the 11th Pan-American Conference, the 7th Asian Regional Conference, GeoDenver 2000 and GeoEng 2000. The meetings of Japanese supporting committee were also held 3-4 times in each year to support the activities of TC-9. TC-9 mailing list was set up in order to exchange the information of TC-9 activities.
- (2) The mutual relationship between ISSMGE and IGS (International Geosynthetics Society) has been constructed during this period.
- (3) Earth reinforcing techniques and applications to geotechnical engineering practice are widely varied depending upon the region and the countries. Those case histories were well accumulated and analyzed.
- (4) Not only the research of the latest topics on geosynthetics and earth reinforcement but also the educational matters such as its system and contents were widely discussed.
- (5) The International Symposium on Earth Reinforcement (IS Kyushu 2001) will be held in Fukuoka, Japan on November 14-16, 2001 under the joint-auspices of TC-9 and the Japanese Geotechnical Society (JGS). All results of TC-9 activities will be published in the conference proceedings.

It is, therefore, proposed that the Japanese Geotechnical Society (JGS) will be strongly expected to be a Host Member Society for the next term (2001-2005), again based on those active performances by current members and the Japanese supporting committee.

The following will be pointed out for TC-9 activities during the next term (2001-2005):

- (1) Ground improvement covers a wide area of geotechnical techniques as shown in the APPENDIX 2. Among others the TC-9 treats of the earth reinforcing techniques which have become a useful, powerful and economical solutions to many problems in geotechnical and geoenvironmental engineering practice. Both the usual and new applications of geosynthetics to geotechnical and geoenvironmental engineering should also be covered by TC-9.
- (2) The education of earth reinforcement is very important issue. This should be continued both the system and material of education, such as publishing the text for both printed materials and CD ROM.
- (3) The global standardization has become a popular concept. Topics on the design and testing methods of earth reinforcement should be discussed in TC-9 such as critical state design and partial safety factors.
- (4) TC-9 should contribute actively for the next ICSMGE which will be held in Osaka, Japan.
- (5) TC-9 should continue the enhancement in developing and spreading the knowledge on both research and practice of geosynthetics and earth reinforcement.
- (6) TC-9 should continue to have close relationship with the International Geosynthetics Society (IGS).

## APPENDIX 1: LIST OF MEMBERS

CHAIRMAN:  
Ochiai, H., Japan

SECRETARY:  
Otani, J., Japan

**CORE MEMBERS:**

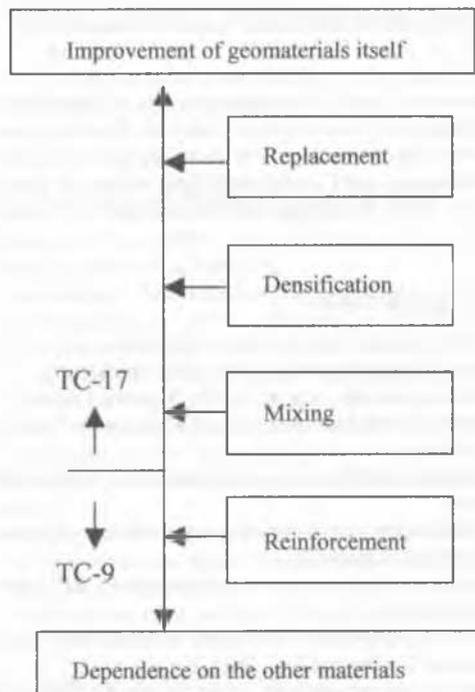
Gourc, J.P., France  
Kuwano, J., Japan  
Lawson, C.R., Malaysia  
Leshchinsky, D., USA  
Rowe, R.K., Canada

Uchimura, T., Japan  
Yamamoto, A., Japan  
Yashima, A., Japan  
Yokota, Y., Japan

**MEMBERS:**

Abramento, M., Brazil  
Atmatzidis, D.K., Greece  
Bouassida, M., Tunisia  
Cancelli, A., Italy  
Cazzuffi, D.A., Italy  
Cho, S.D., Korea  
Delmas, P., France  
Dembicki, E., Poland  
Didier, G., France  
Floss, R., Germany  
Gnanendran, C.T., Australia  
Guler, E.F., Turkey  
Hausmann, M.R., Australia  
Heerten, G., Germany  
Hermann, S., Norway  
Jones, C.J.F.P., UK  
Legrand, C., Belgium  
Lopes, M.D.G.A., Portugal  
Matys, M., Slovak Republic  
Murata, O., Japan  
Palmeira, E.M., Brazil  
Paredes, L., Chile  
Paskauskas, S., Lithuania  
Rao, G.V., India  
Rogbeck, Y., Sweden  
Timofeeva, L.M., Russia  
Uriel, S., Spain  
Voskamp, W., Netherlands  
Watn, A., Norway  
Yeo, K.C., Hong Kong  
Zornberg, J.G., U.S.A.

**APPENDIX 2: CLASSIFICATION OF GROUND IMPROVEMENT**



**JAPANESE SUPPORTING COMMITTEE**

**CHAIRMAN:**

Ochiai, H., Japan

**TC9 MEMBERS:**

Otani, J., Japan  
Kuwano, J., Japan  
Murata, O., Japan

**MEMBERS:**

Abe, H., Japan  
Fukuda, N., Japan  
Hayashi, S., Japan  
Hirai, T., Japan  
Hirata, M., Japan  
Imazumi, S., Japan  
Kojima, K., Japan  
Kumagai, K., Japan  
Makiuchi, K., Japan  
Miki, H., Japan  
Miyata, Y., Japan  
Miyatake, H., Japan  
Nakamura, K., Japan  
Nishimura, J., Japan  
Ogata, K., Japan  
Ogisako, E., Japan  
Otani, Y., Japan  
Shimaoka, T., Japan  
Tayama, S., Japan