U.S. National Committee on Tunneling Technology: Report for 1983 (1984)

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Report for 1983
U.S. National Committee on Tunneling Technology

A Summary of the Work
Conducted During Calen ar Year 1983

Commission on Engineering and Technical Systems
National Research Council

NATIONAL ACADEMY PRESS
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NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee and subcommittees were chosen for their special competences and with regard for appropriate balance.

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INTRODUCTION

The U.S. National Committee on Tunneling Technology (USNC/TT), a unit of the Commission on Engineering and Technical Systems, was formed within the National Research Council in 1972 by the presidents of the National Academy of Sciences and the National Academy of Engineering. It was formed in response to a request from the chairman of the Federal Council for Science and Technology for a "U.S. focal agency to be responsible for assessment of tunneling activities, and where appropriate, for stimulation of improvements in tunneling technology."

The committee's purposes, as stated in its constitution, are the following:

- To serve as the national organization for stimulating advancement in the state of the art of tunneling technology and in the effective use of the subsurface by promoting the coordination of activities pertaining thereto—assessment, research, development, education, training, and collection and dissemination of information.
- To effect appropriate participation in all activities of the International Tunnelling Association (ITA) through the National Academy of Sciences-National Academy of Engineering-National Research Council, which adheres to the ITA on behalf of the scientists, engineers, and technologists of the United States interested in tunneling technology.

The committee's functions include, but are not limited to, the following:

- Collection and dissemination of technical information related to tunneling, including current research, development, and innovative activities, as well as data on cost and performance of tunneling components and systems.
- Continuing assessment of the state of the art of the tunneling system to identify technical needs which might be met through research and development, to ascertain the overall level and structure of research and development, to review periodically the extent to which it is appropriate to the future demand for different types of tunneling, and to stimulate cross-fertilization of advanced technology developed for other purposes.
- Periodical statistical demand forecasting and collection of demand data.

- Study of contracting practices in relation to the present state of the art of tunneling, including consideration of how the risks are shared and how to encourage the use of improved techniques.
- Action necessary to improve the understanding on the part of planners, officials, and the general public of the benefits to be obtained from increased and planned use of the subsurface.
- Review of the adequacy of education and training of engineers in the field of tunneling.
- Participation in international activities concerned with the application, planning, and practice of tunneling.

This annual report describes the work of the committee and its subcommittees in calendar year 1983. The committee is grateful to the federal agencies that sponsor its activities.

ACTIVITIES OF THE COMMITTEE

Nomination and Appointment of Members and Officers

Ten members completed their terms on the committee on June 30, 1983; eight were succeeded by new members, and the terms of two were extended for three years.

The following new members were appointed for terms ending in 1984:

George J. Ziegler (government)
Robert J. Evans (government)

The following new member was appointed for a term ending in 1985:

Leon L. Beratan (government)

The following new members were appointed for terms ending in 1986:

Charles A. Baskerville (government)
Allen W. Hatheway (academic/research)
Stanley L. Paul (academic/research)
Donald L. Vieth (government)
John W. Wilson (representative of the American Institute of Mining, Metallurgical and Petroleum Engineers)

The following members were reappointed for a period of three years, ending in 1986:

Lloyd B. Underwood (representative of the Geological Society of of America)
J. Gavin Warnock (representative of the American Underground-Space Association)

Following acceptance of a request for representation on the committee by the Institute of Shaft Drilling Technology, Hassel E. Hunter was appointed as designated representative for a term ending in 1986.

Don A. Linger completed his term as committee chairman on June 30 and became immediate past chairman and ex officio committee member. He was succeeded by Dennis J. Lachel, who will serve as chairman from July 1, 1983 to June 30, 1984. Z.T. (Dick) Bieniawski was appointed vice chairman for the same period.

The membership of the committee and its subcommittees for the period July 1, 1983 to June 30, 1984 is listed in Appendix A.

Annual Meeting

Two regular topics of discussion at annual meetings are the programs of the subcommittees and the activities of the International Tunnelling Association (ITA). These programs and activities are summarized in subsequent sections of this report.

The twelfth annual meeting of the committee was held June 10-12, 1983, in Chicago, Illinois, in connection with the Rapid Excavation and Tunneling Conference (RETC). The committee meeting included three subcommittee and four task group meetings. In conjunction with the annual meeting the committee operated an information booth on committee activities in the RETC exhibit area and hosted a coordination breakfast meeting at which eleven societies and committees active in tunneling and related fields made presentations on their technical programs. The record of the annual meeting is included as Appendix B.

Special Activities

The activities of the U.S. National Committee on Tunneling Technology were covered in a special issue of *Underground Space* magazine published in January 1983. The issue focused on tunneling and contained reports on the committee and its subcommittees as well as on the International Tunnelling Association, the Tunnelling Association of Canada, the Rapid Excavation and Tunneling Conference, and the Underground Technology Research Council.

In October 1983, "Subspace 83," twin conferences on subsurface space as a vital natural resource, was held in Minneapolis at the University of Minnesota. The themes of the two conferences were "International Experience in the Development of Subsurface Space" and "The U.S. Urban Infrastructure and the Development of Subsurface Space." The committee was an institutional cosponsor of "Subspace 83" and held its annual Executive Committee meeting in conjunction with the conferences.

Changes in the Committee's Constitution

The Commission on Engineering and Technical Systems (CETS), at its meeting on October 26, 1983, approved changes in the constitution recommended by the committee at its meeting on June 12, 1983. The changes included revisions to reflect the current organization within the National Research Council and an increase in committee membership to include a designated representative of the Institute of Shaft Drilling Technology. The Governing Board received and accepted the Commission's approval of the amendments on November 7, 1983. A copy of the revised constitution is included at Appendix C.

ACTIVITIES OF THE SUBCOMMITTEES

The substantive activities of the USNC/TT are carried out primarily by ad hoc subcommittees. From time to time a subcommittee conducts a separately funded study resulting in a published report, but generally the subcommittees conduct their work as part of the committee's continuing activities and are supported with core funding. Some of the subcommittees perform work that supports U.S. participation in the activities of the ITA while others undertake tasks primarily related to tunneling within the United States. The programs of the seven subcommittees are summarized below. Rosters of the subcommittees are included in Appendix A; additional information on their activities appears in Appendix B.

Subcommittee on Contracting and Management Practices

The subcommittee continued work on three tasks initiated in 1980. These are (1) to review the implementation of recommendations discussed in three previously published reports—*Better Contracting for Underground Construction, Recommended Procedures for Settlement of Underground Construction Disputes,* and *Better Management of Major Underground Construction Projects;* (2) to facilitate participation in the ITA Working Group on Contractual Sharing of Risks; and (3) to study contractual arrangements among owners, engineers, and designers in order to effect innovation in design. For the first task, the subcommittee held a meeting in conjunction with the USNC/TT annual meeting and the 6th Rapid Excavation and Tunneling Conference (RETC), where twelve of the eighty papers related to contracting and management practices as recommended in the three previously published reports. The proposed survey was reviewed to insure consistency with the RETC papers. The follow-up survey will be conducted in 1984. With respect to the second task, the subcommittee chairman prepared a position paper entitled "Coordinated Insurance Program" for the ITA working group and the subcommittee prepared comments on three papers submitted for review. Action was deferred on the third task until results are evaluated from the follow-up survey to be conducted in 1984.

Subcommittee on Demand Forecasting

The subcommittee, having requested inactive status prior to initiating an update of the 1981 report, did not hold any meetings. At the June 1983 annual meeting, the committee confirmed its belief that a thorough demand forecast is needed by the U.S. tunneling industry. However, an estimate of the cost for conducting this demand forecast indicated that the effort appears to be beyond the resources available to the committee. Therefore, alternative approaches for collecting and maintaining a data base on planned underground construction projects in the United States are being considered. Solicitation of private funds or joint support with another technical group are possibilities.

Subcommittee on Design Considerations

The subcommittee held two meetings in 1983 and a report is in preparation on the use of precast concrete tunnel liners. The report will include an assessment of the technology, development of precast liners, and their appropriateness for particular situations. The objective of the report is to identify project uses and successes, assess advantages and disadvantages, and discuss problems of user acceptance. The subcommittee is coordinating its efforts with a technical committee of the Underground Technology Research Council which has drafted a report on cast-in-place tunnel lining design.

Subcommittee on Education and Training

The subcommittee activities addressed three principal areas in 1983: compilation of a mini slide set on rock bolting; a major update and expansion of the reading list; and education of engineering students for underground design and construction. Particular concern was expressed with regard to the lack of education requirements in earth sciences for civil engineers. As a result, most education for underground design and construction must occur either during graduate training (in a limited number of colleges) or during on-the-job training after employment. The committee proposed an effort to introduce careers in tunneling as a subject for career nights at the junior and senior high school levels.

The subcommittee's previously prepared slide set illustrating tunnel construction methods was presented at the USNC/TT exhibit at the RETC. As a result of increased demand following the exhibit, the supply of slide sets was exhausted. The slide set was restocked for future sales, in anticipation of additional demand following completion of the mini slide set.

Subcommittee on Geologic Site Investigation

The subcommittee is undertaking a special, separately funded study and evaluation of geologic site investigations for tunnels, initiated in December 1981. During 1983, the subcommittee concentrated its efforts on the collection of case-history data for tunneling projects which had been selected for the study. Subcontractors were used to compile and tabulate data collected by subcommittee members and to prepare and document a computer based tunnel information system. In December 1983, a workshop was held to review and analyze all data collected and prepare a draft report. In addition, the project was extended and expanded to include collection of data from a limited number of deep shaft projects. The subcommittee project is scheduled for completion in 1984.

Subcommittee on Planning and Evaluation of Subsurface Use

The subcommittee completed the first of five case-history studies on the use of the subsurface for urban mobility, common duct, and energy systems. The first case history study on the impact of the Pittsburgh light rail project included a site visit in February 1983. A summary report on the project was presented at the committee's annual meeting in June 1983 and at "Subspace '83," twin conferences which the committee jointly sponsored at the University of Minnesota in October 1983. The case history will be the subject of a report to be published by the committee in 1984.

In addition to the case-history studies, the subcommittee also sponsored a commissioned paper on the peacetime use of civilian defense shelters as dual-purpose underground facilities.

The subcommittee chairman, as animateur (chairman) of the ITA Working Group on Subsurface Planning, provides leadership of that group and liaison between the United States and other nations active in the use of the underground.

Subcommittee on Research Needs

The subcommittee completed an assessment of present tunneling research in the United States, which was presented at the committee's annual meeting. Particular concern was expressed that the present level of research is neither adequate to support university research and graduate training programs nor to sustain U.S. construction capabilities in the world market. The subcommittee chairman, as a member of the ITA Working Group on Research, prepared a report for the International Tunnelling Association.

REPRESENTATION OF THE UNITED STATES IN THE ACTIVITIES OF THE INTERNATIONAL TUNNELLING ASSOCIATION (ITA)

The USNC/TT functions to fulfill the responsibilities of the United States as a member-nation of the ITA, which is one of the basic purposes stated in its constitution. The committee works with the other 32 member nations of the ITA, thereby providing cross-fertilization of current, developing, and advanced technologies. Through the committee the U.S. maintains an active and leading role in the ITA, with one individual serving as ITA president and four others serving as members, animateurs, or vice animateurs of working groups. In addition, the committee provides input, when requested, for the activities of the other ITA working groups.

Meeting of the General Assembly

The Ninth Annual Meeting of the ITA was held in Warsaw, Poland, May 15-18, 1983, in conjunction with the international symposium "Underground Works-Man-Environment," organized by the Polish Federation of Engineering Association (NOT) and Polish Committee for Geotechnics. Representatives of 22 national and 2 international organizations participated in the meeting. Because of a U.S. Department of State prohibition on travel to Poland using federal funds and a restriction on travel of federal employees to Poland, the United States delegation consisted of only two persons: Jack K. Lemley, ITA Vice President, and Dennis J. Lachel, USNC/TT Vice Chairman. Mr. Lachel was the U.S. voting delegate. The two U.S. animateurs, Michael B. Barker and William W. Hakala, and other members of ITA working groups were unable to attend because of limited private funds available and the restriction on federal employee travel to Poland. This latter restriction also prevented attendance by the USNC/TT Chairman, Don A. Linger.

At the General Assembly there were no motions of particular significance; however, the election of members of the Executive Council was significant. ITA Vice President Jack K. Lemley, of the United States, was elected ITA President for a three-year term. He is the first U.S. citizen elected to the ITA presidency. Reports were given at the General Assembly on the status of ITA's application for United Nations recognition as an international nongovernmental organization (NGO) and on the ITA's participation in a UN sponsored workshop on use of subsurface space in

developing countries, held in Stockholm in October 1982. Also discussed were the publications policy of the association and the status of enrollment of affiliate members. Two new nations were accepted for membership and one nation has temporarily withdrawn, bringing the total membership to 33 nations.

The Executive Council confirmed Caracas, Venezuela, as the site for the 10th annual meeting in June 1984, in conjunction with the 1st Latin American Congress of Underground Works. In addition, the invitation extended by Czechoslovakia to host the 1985 ITA meeting was accepted.

A special open session was held jointly with the NOT symposium participants. The session, chaired by Dr. Gunter Girnau, ITA, and Dr. Stanatello, NOT, was entitled "Urban Contracting and the Environment."

A report on the ITA meeting is included as Appendix D.

Activities of the Working Groups

The ITA conducts its technical activities primarily through working groups with memberships representing a cross section of member nations. The areas of interest of the ten established working groups are as follows: standardization, research, contractual sharing of risk, subsurface planning, health and safety in work, maintenance and repair of underground structures, structural design models, catalogue of tunnels, seismic effects on underground structures, and cost/benefits of underground urban public transportation. The working groups carry on most of their activities by mail, but also have meetings as required, usually in conjunction with General Assembly meetings. Reports of the results of working group activities usually are published in the ITA journal, *Advances in Tunnelling Technology and Subsurface Use*.

During the period of this report, the United States was active in four of the working groups. Two individuals affiliated with the USNC/TT continue to fill very important positions of animateurs (chairmen) of the working groups: Michael B. Barker for Planning the Use of the Subsurface, and William W. Hakala for Seismic Effects on Underground Structures. In addition, two other individuals affiliated with the USNC/TT are vice animateurs of working groups: Winfield O. Salter for Contractual Sharing of Risk and Terence G. McCusker for Research.

During the 1983 General Assembly, each of the working groups held meetings. The results of these meetings are contained in Appendix D.

PUBLICATIONS

Tunneling Technology Newsletter

The committee published four issues of the *Newsletter* in 1983. Each featured one or more technical articles on an aspect of tunneling as well as notices of meetings and other items of interest. Most issues also listed recent reports on tunneling and underground construction and included calls for papers at forthcoming conferences. Each issues was distributed to approximately 1400 individuals and organizations. The technical articles published in 1983 were:

- "TBM Tunnels in the Western Hemisphere—An Overview"
- "Evaluation of TBM Performance from Case History Studies"
- "ICBM Deep Basing Egress Systems"
- "Vertical Egress Feasibility Field Tests"
- "MBTA's Red Line Northwest Extension"

Peacetime Use of Civilian Defense Shelters

This short, special report was commissioned by the Subcommittee on Planning and Evaluation of Subsurface Use. The report summarizes current practices in the design and construction of underground facilities which can be utilized as emergency shelters.

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TWELFTH ANNUAL MEETING
U.S. NATIONAL COMMITTEE ON TUNNELING TECHNOLOGY

JUNE 10-12, 1983
Chicago, Illinois

Record of the Meeting

ATTENDEES

COMMITTEE AND SUBCOMMITTEE MEMBERS:

Don A. Linger, *Chairman*
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Michael B. Barker, *Chairman, Subcommittee on Planning and Evaluation of Subsurface Use*
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Sam D. Guy
Howard J. Handewith
William L. Hansmire
Allen W. Hatheway
Fred H. Kulhawy, *Chairman, Subcommittee on Education & Training*
Jack K. Lemley (June 11), *ITA President*
John W. Leonard (June 12)
Terence G. McCusker, *Chairman, Subcommittee on Research Needs*
Malcolm J. McPherson
Stanley L. Paul
Don Rose (June 12)
Edward J. Ruff
Winfield O. Salter, *Chairman, Subcommittee on Contracting and Management Practices*
P.E. Sperry, *ASCE Representative*
Harry Sutcliffe (June 12)
Erland A. Tillman
Glen R. Traylor
Donald L. Vieth (June 12)
Eugene B. Waggoner (June 12), *Chairman, Subcommittee on Geologic Site Investigations*
J. Gavin Warnock, *AUA Representative*

GUESTS:

Hassell E. Hunter (June 12) *Representative, Institute of Shaft Drilling Technology*
Thomas R. Kuesel (June 12)
Jay Merritt (June 12)
Harvey W. Parker (June 12)

STAFF:

John E. Wagner, *Executive Secretary*
Susan V. Heisler, *Assistant Executive Secretary*
Virginia M. Lyman, *Administrative Assistant*
Charles W. Daugherty (June 12), *Consultant, Subcommittee on Geologic Site Investigations*

During the evening of June 10, the Program Committee, officers, and staff met to review the agenda for the meeting to be held on June 11 and 12, to provide guidance to subcommittee chairmen on tasks and goals, and to organize task groups consisting of all persons attending the meeting and not participating in subcommittee meetings.

JUNE 11 (morning session)

The chairman, Don A. Linger, opened the meeting at 8:45 a.m., welcomed the participants, and requested an introduction from each one. Following the introductions the chairman discussed the agenda and conduct of the meeting, and staff presentations were made on administrative matters and the financial status of the committee.

Potential Sources of Bias

John E. Wagner, executive secretary, informed the members that each ongoing committee within the NAS-NAE-NRC is required to review annually the status of members with regard to potential sources of bias. He then read the letter from Dr. Press, president of the NAS, that is printed on the reverse of each bias form and explains relevant Academy policies and procedures. Bias, as well as conflict of interest, was identified and discussed by the group.

Subcommittee and Task Group Meetings

Following the brief opening discussions, the session was adjourned to permit meetings of the following subcommittees and task groups:

- Subcommittee on Contracting and Management Practices
- Subcommittee on Education and Training
- Subcommittee on Planning and Evaluation of Subsurface Use
- Task Group on Future Studies
- Task Group on Overall Direction of the USNC/TT
- Task Group on Coordination and Interaction
- Task Group on Research

JUNE 11 (afternoon session)

The chairman convened the afternoon session at 3:00 p.m., and announced that the ITA president, Jack K. Lemley, would present his report on the ITA meeting, after which the committee would follow the printed agenda and hear reports of the task groups.

Report of ITA President

The annual meeting of the ITA Council and General Assembly was held in Warsaw, Poland, May 16-19, 1983, in conjunction with an international symposium entitled "Underground Works-Man-Environment," sponsored by the Polish Federation of Engineering Associations (NOT) and the International Tunnelling Association. The ITA meeting was particularly important because the election of ITA officers was held during

the 1983 General Assembly meeting. Problems associated with travel to Poland resulted in lowered attendance by a number of the nations which would normally participate in the ITA and the symposium. The symposium was well organized and was attended by approximately 200 participants, of which approximately 100 were Polish. There were many observers from the communist bloc nations, including the USSR and Czechoslovakia.

Of the 33 member nations of ITA, 22 nations participated in the General Assembly and Working Group meetings. U.S. participation was limited to Mr. Lemley, and the USNC/TT vice chairman, Dennis J. Lachel. During the meeting two nations were admitted to ITA membership: Colombia and Hungary. The membership of one nation, Denmark, was discontinued in response to its notification of withdrawal from membership

The ITA officers and Executive Council members elected at the General Assembly were:

Jack K. Lemley (USA), President
Einar Broch (Norway), Vice President
H.P.S. Van Lohuizen (Netherlands), Vice President
Gao Quqing (P.R. China), Executive Council
Y. Onouchi (Japan), Executive Council
Z. Gergowicz (Poland), Executive Council
E. Tegido Nogues (Spain), Executive Council

Mr. Lemley also reported the following:

- The ITA's application for United Nations recognition as a Non-Governmental Organization (NGO) will be considered in January 1984.

- The new class of ITA memberships approved in 1982 has resulted in 14 corporate and 5 individual affiliate members. The additional revenue will allow ITA to maintain its dues at present levels.

- The 1984 meeting of the ITA is scheduled for Caracas, Venezuela, in conjunction with the first Latin American Tunneling Conference. Although there have been several changes in the planned conference dates, the ITA meeting is expected to be held about June 7, 1984.

- The ITA now has 10 working groups. The status of their activities, briefly summarized, is as follows:

Working Group on Standardization is having some difficulty reaching international agreement on standardized diameters and methods.

Working Group on Subsurface Planning, chaired by K. Pronk in the absence of Michael B. Barker, received eight papers.

Working Group on Catalog of Tunnels has compiled a list, format and procedures. Plans call for preparing an update every two years on work under construction, and every three years on completed work.

Working Group on Maintenance and Repair of Underground Structures is being reconstituted because progress to date has been disappointing.

Working Group on General Approaches to Design of Tunnels, chaired by H. Duddeck, has published a report on design criteria and specifications.

Working Group on Seismic Effects on Underground Structures meeting was cancelled due to the absence of the animateur, William W. Hakala.

Working Group on Health and Safety has prepared a paper on standardization of signs for underground construction and guidelines for practice.

Working Group on Cost/Benefits of Underground Urban Public Transportation, a recently formed group, is defining its task and collecting data.

Working Group on Research, chaired by J.F. Bougard, has prepared a volume on soft-ground tunneling. It is now working on the use of TBMs in hard rock and the problems associated with water in underground construction.

Working Group on Contractual Sharing of Risks approved recommendations on provision of insurance and on the operation of performance bonds for adoption as policy by the ITA. Work is progressing on the role of the engineer and measurement problems.

Task Group Reports

Task Group on Overall Direction of the USNC/TT

The task group, consisting of D.A. Linger, D.J. Lachel, Z.T. Bieniawski, E.J. Cording, A.W. Hatheway, P.E. Sperry, and J.K. Lemley, reviewed the origins, objectives, and accomplishments of the USNC/TT. They particularly considered the scope of planned and published reports, the *Tunneling Technology Newsletter*, and the USNC/TT role as the focal agency for tunneling in the United States. They felt that this role was especially hard to maintain, but that the USNC/TT is probably doing more to achieve this function than most of the other national groups in the ITA. Even so, the U.S. is a big country with diversified geology and tunneling needs, and the committee could do more and in some ways needs to redirect or increase its emphasis. In particular, the committee should expand its concerns to a broader perspective of the tunneling industry and critical issues. At this time these issues include the source of the next generation of tunnelers (given floundering educational programs in the universities) and inadequate research programs. The extensive range of talent on the committee should be used to better advantage to focus on issues and to effect changes. Some of the most important areas are the following:

- Representation of American manufacturers and equipment suppliers on USNC/TT
- International image of U.S. competence (should be promoted through foreign journals)
  —encourage technical articles that illustrate U.S. capabilities and rebuttals that combat negative image
- Review of the state of the art of U.S. tunneling by a USNC/TT group
- Increased involvement in public policy arena (should have better definition of USNC/TT role)
- Closer coordination with agencies and organizations
  —identify areas of mutual interest
  —use combined high profile to strengthen efforts

- Improved support of secretariat, including word processing
- Identification and conduct of new special studies.

Task Group on Coordination and Interaction

The task group, consisting of W.O. Salter, C.A. Baskerville, G.L. Butler, and J.G. Warnock, reviewed the purposes, objectives, and means of accomplishing the USNC/TT role to focus liaison and cooperation. They felt that there should be continuing and improved emphasis on the purposes and objectives of interaction between societies and agencies—e.g., mutual support of R&D and technology transfer; mission definition; mutual support of goals, needs, and interests; and understanding of the industry as a whole. More input should be received from interfacing groups because the information flow is presently unidirectional; additional liaison with agency, university, and society entities might be appropriate. An important effort would be providing better insight into U.S. demand and the planned uses of underground space. A single point of contact in each state, as well as in societies and agencies, would be desirable. Such an effort would require data collecting and processing and feedback to the contributors. A "public relations" approach might be useful; it could include an historical review of old tunnels which would be featured in the *Tunneling Technology Newsletter*. Several tunnels and underground works are almost as old as the Brooklyn Bridge and may deserve similar recognition.

Task Group on Research

The task group, consisting of T.G. McCusker, H.H. Einstein, B. Dietl, S.L. Paul, S.D. Guy, and R.J. Evans, reviewed the subcommittee's recent assessment of present tunneling research in the United States and prepared a statement outlining actions considered necessary to attain/retain U.S. leadership in areas of tunneling relevant to economic welfare and security. Areas of concern included the following:

- Reduction in project costs and increased need for use of underground space vis-à-vis the availability of a skilled work force
- Leadership position and need for graduate-level engineers vis-à-vis exposure to research
- Lack of federal funds for university conducted research vis-à-vis private industry research capability
- Difference in direction and applicability of university research vis-à-vis private industry programs.

It was recommended that the USNC/TT seek appropriate means of informing the President's Science Advisor of the committee's concerns.

Task Group on Future Studies

This task group, consisting of H.J. Handewith, G.R. Traylor, E.A. Tillman, E.J. Ruff, W.L. Hansmire, and J.L. Drake, reviewed the studies that had been completed to date, new studies identified in the draft Program Plan, and additional general and R&D topics with a view toward future needs. Strongly recommended was initiation of a study related to maintenance, operation, and rehabilitation of

underground structures. The study should consist of an assessment of the problem, consideration of corrective actions, and alternatives and recommendations. A part of this study should include identification of improvements in design and construction practice to avoid some of the current problems. The group endorsed the inventory (demand forecasting) effort and studies on the integrated use of underground space. The continuing problem of water detection and isolation was considered important. The group proposed establishment of a subcommittee which would act as a clearinghouse to review study activities, to coordinate and endorse the work of other groups, and to identify gaps.

JUNE 12

The chairman convened the session at 8:30 a.m. and welcomed participants who had not attended the June 11 sessions.

Subcommittee Reports

Subcommittee on Contracting and Management Practices

Winfield O. Salter, chairman, reported that the subcommittee had completed the survey and address list for the follow-on of the previous studies on better contracting and better management. This assessment will provide a report on the acceptance and incorporation into practice of the recommendations given in the previous studies. The subcommittee also completed a draft paper entitled "Proposition XIV - Coordinated Insurance Program" submitted to the ITA Working Group on Contractual Sharing of Risks.

Subcommittee on Education and Training

Fred H. Kulhawy, chairman, presented a report on the meeting of his subcommittee—its objectives, accomplishments, and future plans. The subcommittee is completing a mini-slide set on rock bolting and a major update and expansion of the reading list.

In reviewing its objectives, the subcommittee focused on education of the engineer for underground design and construction. It considered general information that might be compiled and made available, as well as developing a proposed training outline (guidelines for content) for a workshop on tunneling re "tricks of the trade" and basic practice. Of particular concern was the lack of an education requirement in earth sciences for civil engineers. As a result, preparation for underground design and construction must be either in the form of graduate training (at a limited number of schools) or on-the-job training after employment. Don A. Linger will draft, for committee review, a policy statement to the ECPD on the issue. Another proposed task was preparation of material on careers in tunneling that would be suitable for junior high school and high school career counselors. It was suggested that personal appearances on "career nights" would be helpful.

Subcommittee on Planning and Evaluation of Subsurface Use

Michael B. Barker, chairman, presented a summary of the subcommittee's plans to conduct several case history studies on the use of underground space. The subcommittee has completed a site visit to review the planning, design, and construction of a subsurface light rail transit system in the Golden Triangle area of

Pittsburgh. A slide presentation and discussion of this case history was conducted. The subcommittee would like to conduct about 5 case history studies, not all of which would be transportation related. Possible other sites include Toronto, San Francisco, and Frankfurt, Germany. The subcommittee chairman proposed to seek support of the German Marshall Plan for the proposed German site visit. The committee endorsed the subcommittee plans, subject to the availability of funds.

Subcommittee on Design Considerations

Don A. Linger reported on the subcommittee activities in the absence of Drupad B. Desai, chairman. The subcommittee recently held a meeting at which the use of precast concrete tunnel liners was considered. A report on this effort will include an assessment of the technology, development of precast liners, and their appropriateness for particular situations. The report will identify project uses and successes, assess the advantages and disadvantages, and discuss problems of user acceptance. The subcommittee does not advocate precast linings as an answer to all problems, but is developing procedures to compare various lining types. It is desirable to obtain data on design, construction, and maintenance costs for tunnel liners. Additional members of the subcommittee should include S.L. Paul, H.W. Parker, and Bruno Dietl, who participated in the recent review. A discussion was held about leakage criteria for tunnel liners; Glen R. Traylor pointed out problems with the seals for precast liners.

A discussion was held concerning the future direction and role of the subcommittee, particularly in view of activities of the UTRC group on tunnel liner design. (It was noted that a concentrated effort has been made to avoid overlap with UTRC.) An UTRC report on precast concrete liners is expected in fall 1983, after which a workshop related to tunnel leakage would be appropriate. At the present state of the art, precast concrete liners are not acceptable for pressure tunnels which carry sewage, because of leakage and exfiltration problems.

Subcommittee on Geologic Site Investigations

Eugene B. Waggoner, chairman, and Charles W. Daugherty, consultant, presented a status report on this separately funded study. The executive secretary followed this with a discussion of the study budget. The proposal for this project envisioned a two-year study in which approximately 200 tunnels would be reviewed, and approximately 100 projects from 50 owners were expected to be considered. As a result of difficulties in collecting case history data, only about 80 projects will be included in the study. Case histories of 17 tunnels have been completed and are being reviewed by three subcommittee members tasked as analyzers. Writing of initial-draft chapters of the final report has started. The project is approximately four months behind schedule, but remains within budgeted costs. However, an additional $28,000 is needed because one project sponsor failed to provide the promised financial support.

Subcommittee on Demand Forecasting

Gilbert L. Butler, chairman, was present at the meeting but did not present a report because the subcommittee was on inactive status during the year. The executive secretary questioned the need for continuing this subcommittee; however, in view of the recommendations of the Task Group on Coordination and Interaction, the committee feels that a thorough demand forecast (inventory) is needed.

Institute of Shaft Drilling Technology

Hassell E. Hunter, proposed designated representative of ISDT, briefed the committee on the activities and objectives of the Institute, which was being considered for membership on the USNC/TT. In the ensuing discussion, the opinion was expressed that the Society of Mining Engineers represents the technology for mined shaft construction and that acceptance of ISDT for membership on the committee would provide additional balance to the committee. There was a unanimous vote of the USNC/TT members present to accept ISDT for representation on the USNC/TT. This membership will be effective July 1, 1983, and will require a minor constitutional amendment.

Other Business

Following a working lunch, Dennis J. Lachel, U.S. delegate to the ITA meeting in Warsaw, gave his impression of the meeting to supplement the earlier report of the ITA president.

Allen W. Hatheway reported on a recently completed Corps of Engineers study which has resulted in the incorporation of many USNC/TT recommendations into a new procedures manual for underground construction.

Edward J. Cording reported on a new International Society for Rock Mechanics commission on the Rock Failure Mechanisms in Underground Openings. Dr. Cording has been requested by the U.S. National Committee for Rock Mechanics to head the U.S. effort in this commission. It was the consensus that this project should receive joint support of both committees.

Don A. Linger proposed to task the USNC/TT to report (via a workshop session) on the state-of-the-art capabilities of tunneling in the United States as compared to foreign capabilities, particularly European countries and Japan. He feels that small groups with specific tasks would be a good approach and would be a vehicle to get more funds into technology base programs for tunneling. Bruno Dietl asked if other nations prepare reports on design and construction projects; he would like to see a USNC/TT advocacy for such a federal requirement. Such reports should be available through NTIS.

It was noted that the designated representative of the Geological Society of America, Lloyd B. Underwood, is recovering very satisfactorily from open-heart surgery. The chairman was asked to write to him on behalf of the committee.

Plans for the Coming Year

Don A. Linger, outgoing chairman, thanked the members for their efforts during his term and turned the meeting over to Dennis J. Lachel, the incoming chairman. Mr. Lachel noted his appreciation of Dr. Linger's and Dr. Cording's leadership during their terms. He stated his opinion that the committee's introspection during the meeting had been healthy and productive and that he and the vice chairman, Z.T. Bieniawski, were looking forward to initiating the committee's suggestions and continuing with planned accomplishments.

The committee considered Seattle, Washington, site of the Mt. Baker Ridge tunnel project, and Glenwood Springs, Colorado, as candidates for the 1984 annual meeting and field trip. Seattle was accepted, following Harvey W. Parker's discussion of the Mt. Baker Ridge project. The meeting may also include a field trip to the Robbins Company plant and the Snoqualamie Falls underground power plant.

At the request of the University of Minnesota and the American Underground-Space Association, it was agreed that the fall 1983 executive committee meeting should be held at Minneapolis on October 14, in conjunction with "Subspace 83," subject to availability of funds.

The meeting was adjourned at 3:00 p.m.

As a follow-on to the annual meeting and in conjunction with the Rapid Excavation and Tunneling Conference, the USNC/TT hosted a Coordination Breakfast on Wednesday, June 15, at which presentations on underground activities were made by ASCE, AIME, AEG, AUA, ASTM, ISDT, RETC, UTRC, TRB, USNC/RM and USNC/TT. Also in connection with the RETC meeting, the USNC/TT operated an exhibit booth featuring the slide set on tunneling and the publications of the USNC/TT. Particularly well received was the report *Demand Forecast of Underground Construction and Mining in the United States*.

Appendix C

CONSTITUTION OF THE U.S. NATIONAL COMMITTEE ON TUNNELING TECHNOLOGY

Approved by the Governing Board
National Research Council
June 4, 1972

Amended
February 12, 1973
October 7, 1975
August 8, 1980
October 26, 1983

I. PURPOSES

The purposes of the U.S. National Committee on Tunneling Technology (USNC/TT), hereinafter referred to as the Committee, shall be:

A. To serve as the national organization for stimulating advancement in the state-of-the-art of tunneling technology and in the effective use of the subsurface by promoting the coordination of activities pertaining thereto — assessment, research, development, education, training, and collection and dissemination of information.

B. To effect appropriate participation in all activities of the International Tunnelling Association (ITA) through the NAS-NAE-NRC, which adheres to the ITA on behalf of the scientists, engineers, and technologists of the United States interested in tunneling technology.

II. COGNIZANCE

The Committee shall be responsible to the Commission on Engineering and Technical Systems of the NRC.

III. FUNCTIONS

The functions of the Committee shall be to encourage and in other ways stimulate programs and actions to improve tunneling technology. These shall include the following:

A. Collection and dissemination of technical information related to tunneling, including current research, development, and innovative activities, as well as data on cost and performance of tunneling components and systems.

B. Continuing assessment of the state-of-the-art of the tunneling system to identify technical needs which might be met through research and development, to ascertain the overall level and structure of research and development, to review periodically the extent to which it is appropriate to the future demand for different types of tunneling, and to stimulate cross-fertilization of advanced technology developed for other purposes.

C. Periodical statistical demand forecasting and collection of demand data regarding the amount of subsurface construction planned for the future for all uses, classified by ground conditions, size, use, and type of structure, and divided into two categories, namely:

   1. Short-range demand (say 5 years), resulting from conventional uses, current technology, and current sponsor preferences.

   2. Medium-range demand (say 10 years), including unconventional uses, new technology, and potential changes in user patterns.

D. Systematic compilation of geological data for geographical areas in which tunneling activity is expected, particularly in areas of anticipated urban growth.

E. Review of existing legal requirements and traditional standards as to their effectiveness for obtaining the maximum benefit from tunneling for the community at large.

F. Study of contracting practices in relation to the present state-of-the-art of tunneling, including consideration of how the risks are shared among the respective parties to the Contract and how to encourage the use of improved techniques.

G. Action necessary to improve the understanding on the part of planners, officials, and the general public of the benefits to be obtained from increased and planned use of the subsurface.

H. Review of the adequacy of education and training of engineers in the field of tunneling.

I. Participation in international activities concerned with the applications, planning, and practice of tunneling.

IV. MEMBERSHIP

A. MEMBERS. The Committee shall consist of twenty-six (26) voting members, each knowledgeable and experienced in tunneling or tunneling related activities, as follows:

   1. Six (6) members from federal, state, and/or local governments.

   2. Six (6) members from manufacturing, construction, and consulting organizations.

   3. Six (6) members from academic and research institutions or organizations.

   4. Eight (8) members designated as representatives of agencies and professional societies, as follows:

      (a) One member representing the federal agencies that have responsibilities for tunneling or tunnel related activities.

      (b) One member representing the American Society of Civil Engineers (ASCE).

(c) One member representing the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME).

(d) One member representing the Geological Society of America (GSA).

(e) One member representing the Association of Engineering Geologists (AEG).

(f) One member representing the Associated General Contractors (AGC).

(g) One member representing the American Underground Space Association (AUA).

(h) One member representing the Institute for Shaft Drilling Technology (ISDT).

B. *EX OFFICIO* MEMBERS. Non-voting *ex officio* members shall include:

1. The President of the National Academy of Sciences.

2. The President of the National Academy of Engineering.

3. The Foreign Secretary of the National Academy of Sciences.

4. The Foreign Secretary of the National Academy of Engineering.

5. The Chairman of the Commission on Engineering and Technical Systems, National Research Council.

6. The Immediate Past Chairman of the Committee.

7. Any U.S. resident who is an officer of the International Tunnelling Association (ITA).

8. The Executive Secretary of the Committee.

C. TERM OF OFFICE. Committee members shall be appointed to serve three (3) years and in such manner that approximately one-third of the terms expire on June 30 of each year. Committee members may be reappointed but continuous membership on the Committee shall be limited to two (2) consecutive three-year terms, except for members who are appointed officers. The term of a member appointed as an officer of the Committee shall be extended, if necessary, to permit the member to serve as Vice Chairman and Chairman in succession, as provided for in Section V, below. If a member's employment or his affiliation with his professional society changes in a manner which affects the composition of the Committee, as specified in Section IV A, herein, the member's term on the Committee shall automatically terminate and a successor shall be nominated, as provided for in Section IV D, below. These provisions do not apply to *ex officio* members.

D. NOMINATION OF MEMBERS. Each year, prior to the expiration date of membership terms, the Chairman of the Committee shall appoint a subcommittee, with representation from the three groups, i.e., government, industry, and academia, collectively representing the scope of the Committee's interests. The nominating subcommittee shall recommend a nominee for appointment to fill each vacancy occasioned by expiration of terms of members and to maintain the overall composition of the Committee, as provided for in Section IV A, above. The Committee may request suggestions for nominations from United States' industrial, professional,

and governmental organizations actively participating in tunneling technology development, and the nominating subcommittee shall consider these suggestions in selecting a group of nominees required to maintain the overall composition of the Committee. Organizations from which nominations may be requested include, but are not limited to, those listed in Section IV A 4, and the Society of Exploration Geophysicists (SExG), the American Mining Congress (AMC), the American Society for Engineering Education (ASEE), the American Society of Mechanical Engineers (ASME), the American Public Works Association (APWA), the American Road Builders Association (ARBA), the American Institute of Planners (AIP), and the American Society for Testing and Materials (ASTM). The organizations listed in Section IV A 4 shall be requested to nominate individuals to be considered for appointment as designated representatives of their organizations, as provided for in Section IV A 4.

The names of nominees recommended by the nominating subcommittee shall be submitted to the Committee for endorsement and the list of nominees, recommending a nominee for each vacancy, shall then be submitted to the Chairman of the Commission on Engineering and Technical Systems for appointment, with the approval of the Chairman of the National Research Council.

The officers of the Committee shall nominate successors for completion of unexpired terms of members and submit these nominations to the Chairman of the Commission on Engineering and Technical Systems for consideration and recommendation for appointment, as provided for above.

E. NON-MEMBER PARTICIPATION. The Committee may invite interested non-members to attend its meetings as advisors or observers, and to serve as members of subcommittees and panels.

V. OFFICERS

A. The officers of the Committee shall be a Chairman and a Vice Chairman, who shall be appointed to these offices by the Chairman of the Commission on Engineering and Technical Systems, with the approval of the Chairman of the National Research Council, from nominations made by the Committee from its membership. The Chairman and Vice Chairman shall be nominated and appointed from separate areas of professional activity, i.e., from government, from industry, and from academic and research activity. On appointment as an officer, an individual shall continue as one of the members of the Committee, having the same voting privileges as other members of the Committee.

B. The terms of office for the officers shall be limited to one year in each of the offices of Vice Chairman and Chairman.

C. At the end of the terms of office, the position of Chairman of the Committee shall be filled by the Vice Chairman. If the Chairman is unable to complete his term, the unexpired term shall be filled by the Vice Chairman. A Vice Chairman shall be nominated by the Committee membership, and appointed by the Chairman of the Commission on Engineering and Technical Systems, with the approval of the Chairman of the National Research Council.

D. The Chairman of the Committee shall perform the usual duties of a committee chairman, including the following:

1. Calling the meetings of the Committee.

2. Presiding over the meetings of the Committee.

3. Requesting the Chairman of the Commission on Engineering and Technical Systems to appoint subcommittees and panels of the Committee.

4. Serving as a member *ex officio* of all subcommittees and panels of the Committee.

5. Acting for the Committee, in consultation with the Executive Committee, in any emergency requiring the rapid transaction of urgent business; this action to be referred to the full membership of the Committee for information and comment as soon as possible.

E. The Vice Chairman shall assist the Chairman in discharging his duties. The Vice Chairman shall act for the Chairman in the Chairman's absence.

VI. Administrative Staff

A. A full-time Executive Secretary shall be assigned to the Committee, with administrative assistance as required.

B. The Executive Secretary shall serve as a member *ex officio* (non-voting) of the Committee and all subcommittees and panels.

VII. Executive Committee

A. The Executive Committee shall consist of the Chairman, the Vice Chairman, the Immediate Past Chairman of the Committee (*ex officio*, non-voting), and members of the Committee who are appointed designated representatives of agencies and professional societies, as provided for in Section IV A 4.

B. The Executive Committee shall exercise responsibility for the policy, administration, guidance, and funding of the Committee, including acting on behalf of the full Committee on all matters not otherwise specifically excluded herein, and in emergencies on all matters, provided the full Committee is notified within 30 days of the action taken. The Executive Committee shall meet on the call of the Chairman at least two (2) times each year and more frequently if required to accomplish the purposes of the Committee.

VIII. Program Committee

A. The Program Committee shall consist of the Chairman, Vice Chairman, subcommittee and panel Chairmen, and other members from the Committee nominated by the Committee Chairman and appointed by the Chairman of the Commission on Engineering and Technical Systems, with the approval of the Chairman of the National Research Council.

B. The Program Committee shall review the technical programs of the Committee conducted for government sponsors and provide guidance on those

programs to the subcommittees and panels concerned. The Program Committee shall meet on the call of the Chairman.

IX. Subcommittees and Panels

A. Within budgetary limitations and resources, subcommittees and panels may be appointed as needed but they shall be *ad hoc* in nature.

B. The subcommittees and panels shall be appointed by the Chairman of the Commission on Engineering and Technical Systems, with the approval of the Chairman of the National Research Council, at the request of the Chairman of the Committee and with the approval of the Executive Committee.

X. Meetings

Meetings of the Committee shall be called by the Chairman of the Committee at times and places designated by him. At least one such meeting shall be held each year.

XI. Voting

A quorum for the Committee shall consist of half of the voting members of the Committee plus one. A quorum for the Executive Committee shall consist of five of its voting members. Unless otherwise specified in the Constitution, actions presented to the Committee, the Executive Committee, and the Program Committee shall be resolved by a simple majority of the votes cast.

XII. Financial and Business Management

The financial and business affairs of the Committee shall be conducted in conformity with established procedures of the National Academy of Sciences, the National Academy of Engineering, and the National Research Council.

XIII. Amendments

Subject to approval by the Governing Board of the National Research Council, this Constitution may be amended by an affirmative vote of two-thirds of the full voting membership of the Committee.

NINTH ANNUAL MEETING
OF THE
INTERNATIONAL TUNNELLING ASSOCIATION

Warsaw, Poland May 15-19, 1983

ATTENDANCE

U.S. Delegation (NRC-USNC/TT)	Dennis J. Lachel, Voting Delegate
Number of Countries Represented	22 (out of 33 member countries)
International Organizations Represented	Permanent International Association of Road Congreses (PIARC) International Society for Rock Mechanics (ISRM)

ADMINISTRATIVE

Election of Officers	Jack K. Lemley (USA) was elected president for a 3-year term. E. Broch (Norway) and H.P.S. Van Lohuizen (The Netherlands) were elected vice presidents, each to serve for 3 years. Four additional members were elected to the Executive Council: E. Tegido Nogues (Spain), Y. Onouchi (Japan), Goa QuQing (P.R. China), and Z. Gergowicz (Poland).
Nominating Committee	The nominating committee consisting of A.M. Muir Wood, H.C. Fischer, G. Girnau, and J.K. Lemley was accepted as proposed.
Future Meetings	The 10th Annual Meeting will be held in Caracas, Venezuela, June 3-7, 1984, in conjunction with an international congress entitled "Underground Construction in Heterogeneous Soils," sponsored by the Venezuelan Association of Underground Works. Czechoslovakia was approved to organize the 1985 ITA meeting. It was anticipated that it would be in September; the dates will be determined at the 10th Annual Meeting.

The invitation from Italy to hold the 1986 Annual Meeting in Italy was accepted. The president expressed a wish to hold the 1987 General Assembly outside Europe. A preliminary invitation has been extended from Spain for 1988 or 1989.

United Nations Activities

The official application for recognition as a Non-Governmental Organization (NGO) was completed. However, the UN committee that considers the applications has not had time to consider the ITA request. J.K. Lemley will follow this matter with the United Nations.

The president reported that a workshop on "Subsurface Space Use in Developing Countries" was held in Sweden in October 1982 at the invitation of the UN and the Swedish Government. The ITA Executive Council participated extensively in the technical sessions and assisted in preparing the report to the United Nations.

Financial Report

The financial report for 1982 and the budget for the 1983-1984 financial years were accepted (Attachment 1).

Publications

Good working relations between the publisher of the ITA journal and the contributors have been established. The Executive Council recommends that the member nations publish the ITA recommendations and resolutions in their official journals in order to disseminate the information more widely.

TECHNICAL ACTIVITIES

The technical activities of the ITA consisted of working group meetings and a joint session by the ITA and the Polish Federation of Engineering Associations (NOT).

Open Session: Urban Contracting and The Environment

The theme was the numerous constraints facing contractors involved in underground works in an urban site. Six speakers discussed experiences in their own countries (Attachment 2).

Working Group Reports:

Standardization

M. Hurpin (France). Representatives of four countries participated. A draft report on standardization for circular tunnels has been prepared and a detailed questionnaire will be sent to each member nation in order to obtain broader input. The "Glossary of Terms for Excavation" will be

published before June 1984 in English, German, and Japanese. Because current work is almost complete, it was decided to solicit subjects worth considering from all the member nations. Proposals for study will be presented at the next working group meeting.

Research

J.F. Bougard (France). Thirteen delegates from ten countries participated. The ongoing study concerning the use of TBMs in hard rock is almost complete except for the section on research, improvements, and new techniques. The report on water problems is nearly finished and should be presented at the next meeting. New subjects for study include extruded linings and settlements occurring in tunnels excavated in urban sites.

Contractual Sharing of Risk

J. Leeny (UK). Nine nations were represented. Recommendations on "wrap-up" insurance and performance bonds were approved and presented to the General Assembly for adoption as policy by the ITA (Attachment 3). They were approved. Papers are being developed on measurement problems and the role of the engineer. A dialogue with the Federation Internationale des Ingenieurs Conseils (FIDIC) is being arranged in order to implement the use of the ITA recommendations in the FIDIC code. National professional and contractor organizations are urged to support this initiative.

Subsurface Planning

K. Pronk (The Netherlands) representing M. Barker (USA). Seventeen participants representing twelve countries attended. The aim of the activities is to improve the possibilities of planning the use of the subsurface by identifying the basic factors governing this use, with emphasis on the use of the underground in energy related projects. Eight presentations were made and nine more papers are expected, of which two will be in the field of emphasis. It is planned that recommendations will be presented to the Executive Council next year on the use of the subsurface for energy related projects.

Health and Safety in Work

N. Krige (South Africa). Nine delegates representing five countries participated. Design proposals for six new safety signs were approved, which will now be finalized and presented for approval to the Executive Council. The working group accepted the amendments by the tutor to the document "Guidelines for Good Tunnelling Practice," and plans to publish it as soon as possible. After discussion it was decided that some guidelines could be developed on the use of compressed air in tunnels and work should continue on that subject. It was decided to use existing regulations of various countries to compile a set of proposals on electrical installations.

Maintenance and Repair of Underground Structures	M. O'Reilly (UK) Five delegates from three countries participated. The working group is developing a two-year program, recognizing the increasing economic and social importance of this subject.
General Approaches to the Design of Tunnels	P. Gesta (France). Representatives of five countries attended. Based on the objectives formulated at last year's meeting, it was decided to focus on four topics which constitute the basic steps of every tunnel design procedure: (1) determination of the geological, hydro-geological, geotechnical, geometrical and environmental parameters, (2) choice of the design model, (3) definition of in-situ monitoring for checking the behavior of the structure, and (4) practical rules for design.
Seismic Effects on Underground Structures	H.C. Fischer (Sweden) representing W. Hakala (USA). The formal meeting of the working group was cancelled and an informal discussion was held, with four countries represented. The main objective of the group for 1984 will be the production of a monograph on "Aseismic Design of Underground Structures," to be submitted to the 1984 ITA General Assembly.
Catalogue of Tunnels	M. Fukuchi (Japan). Eight participants from six countries attended. A guideline for use by member nations in preparing catalogues was discussed and approved. A new schedule of priorities was established for the preparation of catalogues, as follows: future projects, every year; for those under construction, every two years; and for tunnels completed, every three years. Methods for more rapid and lower-cost distribution of information were discussed.
Cost-Benefits of Underground Urban Public Transportation	M. Blenneman (FRG). Nine delegates from seven countries attended. At this inaugural meeting two tasks were agreed upon as the focus for the group's objective to show why it is useful and necessary to go underground for urban transportation. The first task will be to collect data which will serve to point out the benefits of underground transportation systems; the second will be to collect information on cost-benefit calculation methods to show the positive effects of underground transportation systems. Several papers were presented covering these areas, which will form the basis for an initial report at the next ITA meeting.

CONCLUSIONS

The 1983 ITA Meeting was well organized and conducted. The overall facilities were somewhat limited and not all countries were represented due to political constraints. In light of the fact that an American, Mr. Jack Lemley, was elected ITA President at this meeting, it was not only proper that the U.S. be represented but would have been an affront to the ITA and Mr. Lemley if we had not been present. As such, the meeting was a success. I attended as many of the working group meetings as possible and carried the regards and messages of the various U.S. committee members to their respective members. The ITA meeting in Warsaw was an interesting and valuable experience and I appreciated the opportunity to represent the U.S.A. and the USNC/TT.

Respectfully submitted,

Dennis J. Lachel
Vice Chairman, USNC/TT

EXERCICE 1983 - 1984 - PREVISION DE BUDGET Attachment 1

1983 - 1984 FINANCIAL YEAR - ESTIMATED BUDGET

	1983	1984
RECETTES/REVENUE		
Cotisations à 4000 F Subscriptions at 4000 F	120.000,oo	120.000,oo
Membres Affiliés Affiliate Members	30.000,oo	50.000,oo
TOTAL	150.000,oo	170.000,oo
DEPENSES/EXPENDITURES		
a) Organisation des réunions Organization of meetings	-	-
b) Publications/Publications Statuts	2.500,oo	
c) Secrétariat/Secretariat		
- Honoraires comptable/Book-keeping honoraries	3.500,oo	3.500,oo
- Salaires, poste, photocopie, télex /Salaries, mail, xeroxing, telex	76.000,oo	80.000,oo
- Déplacements/Travels	35.000,oo	35.000,oo
- Téléphone/Phone	5.500,oo	5.500,oo
TOTAL	122.500,oo	124.000,oo
BILAN ATTANDU/EXPECTED BALANCE	+ 25.500,oo	+ 46.000,oo

13. RESULTS FROM THE OPEN SESSION OF MAY 18, 1983

The Secretary General recalled the topic of the Open session : "URBAN CONTRACTING AND THE ENVIRONMENT". The session was presided by G GIRNAU (ITA) and H STAMATELLO (Poland), and co-ordinated and introduced by V ROISIN, who particularly mentioned the numerous constraints a contractor involved in underground works in urban site is faced with.

Six speakers reported on experiences in their own countries : T BRATEN (Norway), W DIETZ (Federal Germany), M LEGEAIS (France), J K LEMLEY (USA), T ROMANOWSKI (Poland), and J VANDER LINDEN (Belgium). The subsequent discussion showed up :

- the care to elaborate,in full agreement with all involved parties, construction methods and means allowing to preserve environment;

- the necessity of a good co-operation between all involved parties : contractor, consultants, control departments, companies, police...;

- the importance of reactions from residents concerned by the works and the necessity to keep them informed;

- the necessity to clearly define how responsibilities will be distributed, regarding definition and implement of actions required to preserve and possibly to improve environment;

- the necessity to study the impact on the structure costs of arrangements taken to preserve environment.

- Prior to the preparation of tender documents, the Owner should make a determination whether the scope, complexity and site conditions of the project warrant proceeding with a Coordinated Insurance Programme.

- If the evaluation reveals the appropriateness of a C.I.P., the Owner shall determine the types of coverage, limits, deductibles and discovery periods which best fit the project and shall obtain such C.I.P..

Prior to advertising for tenders for tunnelling or other underground construction on the project, the Owner and the Insurer shall prepare an insurance specification describing the C.I.P. for all prospective tenderers and issue such a document as a part of the tender documents for the information and reference of the tenderers and ultimately to form part of the contract.

During the course of the project and for a reasonable period following completion of the constructed works having regard for the legal liabilities of the parties, the Owner shall maintain his C.I.P. intact and provide cover for himself, his design engineers and his contractors.

Work on Performance Bonds was also completed and it is suggested that the General Assembly adopt the following recommendation.

PROPOSITION - XIII

International Tunnelling Association - Working Group Risk

PERFORMANCE BONDS

The subject of the various contractual bonds that owners may require to guarantee the satisfactory completion of the work by their contractor is so wide that it has not been possible to summarize the matter as for other subjects the Working Group has dealt with.

In addition the regulations differ so much from country to country, from total absence of bonds to excessively severe requests that, if bonds are required, a more uniform tendency is advised.

So an extended study of these problems will be published by the ITA as a reference document. The ITA wishes to formulate the following recommendations.

The International Tunnelling Association recommends that:

-All types of bonds—bid bonds and performance bonds—should aim at a balance between the rights and the obligations of the parties and at a reasonable coverage of the risks.

-International effort should be made to standardize the rules and formats under which bonds would be required.

-The value of the bonds, expressed as a percentage of the contract sum, should be limited to moderate and equitable levels, thus resulting in a more economic coverage of the risks, here too international standardization is highly desirable.

-Prequalification procedures of the contractors should reduce the size of the performance bonds required.

-The value of the performance bonds required should decrease as the work progresses towards completion.

-On-first-demand or unconditional guarantees shall never be requested because of the risk of an arbitrary call and the increasing cost of covering this risk.

May 1983
Warsaw

PROPOSITION - XIV

INTERNATIONAL TUNNELLING ASSOCIATION
WORKING GROUP : CONTRACTUAL SHARING OF RISKS

COORDINATED INSURANCE PROGRAM

An important part of any construction project is the management of risk which the owner, the contractor, the design engineer and the general public are exposed to as a result of the contractor's activities in constructing the works. A portion of such risk is offset by the placement of insurance scaled to reasonally match the exposure estimated to be present for the particular type of work and site conditions. For the common scope of construction contracts and contractor operations it is appropriate for the owner to require the contractor to provide at least such insurance coverage as the owner deems necessary and warranted, the cost of which is included in the tender price agreed. There are project circumstances, however, where a Coordinated Insurance Program, designed, furnished and controlled by the owner, is the most appropriate from of risk management and the most cost-effective. Such project circumstances include underground construction involving multiple exposures to risk and to damage claims by third parties. Such coordinated Insurance Program /sometimes called "wrap-up" insurance/ is particulary applicable to major underground construction projects in complex urban sites, especially where many contractors are involved in the work. Although each case must be examined on its merits the advantages of an owner-controlled program include:

- The owner, not the contractor, negotiates policy terms and costs, eliminating redundant charges for expense end profit items.
- The safety and loss control program are uniform.
- Cross ligitation is eliminated
- Claim handling is uniform.

- Small contractors may participate where otherwise the the insurance requirements may effectively preclude them.

- Cash flow advantages benefit the owner.
- Insurance costs are confined solely to the project.
- The administrative burden of maintaining records on contractor compliance with contract specifications for insurance ie eliminated.

The coverage of an owner-controlled Coordinated Insurance Program would include all of the cover normally appropriate for the type of work and site and would extend to all contractors involved in the project with the possible exception of hauling contractors and supply contractors who operate principally off-site. The Program likewise wraps up the design engineer if he is not already covered as a part of the contractor coverage.

To maintain the contractor's incentive to promote safety and to give contractors with a good claim-loss record a reward for such performance and a competitive advantage in the tendering process, premium refunds earned by the owner should be passed on to each contractor contributing to the low claim-loss record.

The International Tunneling Association recommends that all tunnelling contracting be based on the following procedures and stipulations:

1. Prior to preparation of tender documents, the owner should make a determination whether the scope, complexity and site conditions of the project warrant proceeding with a Coordinated Insurance Program.

2. If the evaluation reveals the appropriateness of a Coordinated Insurance Program, the owner shall determine the types of coverage, limits, deductibles and discovery periods which best fit the project and shall obtain such Coordinated Insurance Program.

   a. Prior to advertising for tenders for tunneling or other underground construction on the project, the owner and the insurer shall prepare an insurance specification

describing the Coordinated Insurance Program for all prospective tenderers and issue such document as a part of the tender documents for each contract for the information and reference of tenderers and ultimately to form part of the contract.

b. During the course of the project and for a reasonable period following completion of the constructed works having regard for the legal liabilities of the parties concerned, the owner shall maintain his Coordinated Insurance Program intact and provide cover for himself, his design engineers and his contractors.

May 1983
Warsaw.