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This report covers the activities of the Geotechnical Board and its two national committees, the US National Committee for Rock Mechanics (USNC/RM) and the US National Committee on Tunneling Technology (USNC/TT).

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THE GEOTECHNICAL BOARD
National Research Council

Activities Report
March 1, 1990 - February 28, 1991

This report covers the activities of the Geotechnical Board and its two national committees, the U.S. National Committee for Rock Mechanics (USNC/RM) and the U.S. National Committee on Tunneling Technology (USNC/TT), for the contract period from March 1, 1990 to February 28, 1991. A list of board and committee members, and a description of the Geotechnical Board and its national committees (including reports available) can be found in Attachment A.

A list of attachments follows:

A. Geotechnical Board brochure
B. Program for the Geotechnical Board and list of current sponsors
C. Summaries of Geotechnical Board meetings held during the contract period
D. Front material from An Initial Assessment of the Defense Nuclear Agency's Underground Technology Program (UTP)
E. Summary of the USNC/TT meeting held during the contract period
F. Summary of the International Tunnelling Association (ITA) meeting held during the contract period in China.
G. Summary of the USNC/RM meeting held during the contract period
H. Annual Summary of USNC/RM 1990/91
I. Summary of the International Society for Rock Mechanics (ISRM) Council Meeting held during the contract period in Swaziland.
J. Front material from Annual Review of U.S. Progress in Rock Mechanics: Rock Mass Modification
K. Prospectus for Committee on Fracture Characterization and Fluid Flow

ACTIVITIES OF THE BOARD

The overall focus of the board during the contract period was on developing initiatives and programs to undertake within the Academy context of advisory service to the government. Attachment B describes these activities in the context of four general themes adopted by the board's parent commission, the Commission on Engineering and Technical Systems. The board also welcomed two new core sponsors, the Nuclear Regulatory Commission and the Urban Mass Transportation Administration. A complete list of sponsors is also found in Attachment B.

In June 1990, Peter Smeallie, a senior staff officer with the Commission's Building Research Board, was appointed director of the Geotechnical Board.

The board held two meetings during the contract period; minutes from these meetings can be found in Attachment C.

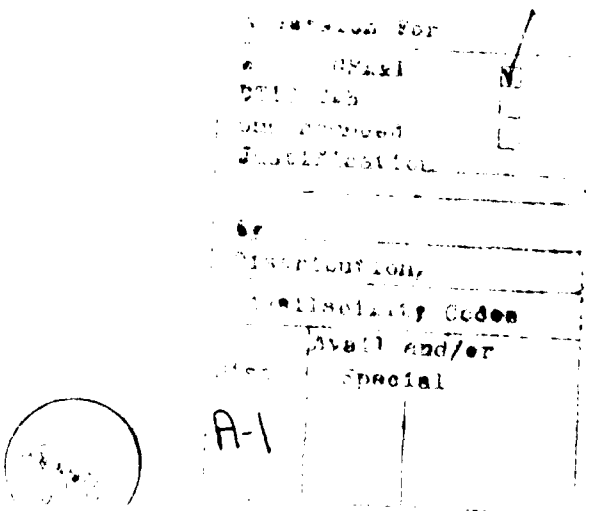
The committee of the board conducted and completed a study for the Defense Nuclear Agency entitled, An Initial Assessment of the Defense Nuclear Agency's Underground Technology Program (UTP), which was transmitted to DNA in February 1991. Attachment D contains photocopies of selected pages from the report.

ACTIVITIES OF THE U.S. NATIONAL COMMITTEE ON TUNNELING TECHNOLOGY (USNC/TT)

The USNC/TT held its annual meeting in San Antonio, Texas, in August 1990. A summary of the meeting is contained in Attachment E. A delegation of committee members attended the 16th Annual Meeting of the International Tunnelling Association held in Chengdu, China, in September 1990. Attachment F reports on this meeting. Finally, the USNC/TT nominated member Richard Robbins for membership on the Executive Council of ITA.

ACTIVITIES OF THE U.S. NATIONAL COMMITTEE FOR ROCK MECHANICS (USNC/RM)

The annual meeting was held in conjunction with the 31st Annual U.S. Rock Mechanics Symposium, which is sponsored by the USNC/RM, at the Colorado School of Mines in June 1990. A summary of the meeting is contained in Attachment G. Other significant activities of the committee are described by Chairman Wolfgang Wawersik in his annual summary found in Attachment H. A delegation of committee members attended the 1990 ISRM Council Meeting held in Swaziland. Minutes from this meeting are found in Attachment I. A committee of the National Research Council with the USNC/RM completed a report on rock mass modification, which was published during the contract period. Attachment J contains front material from this report. Finally, work is getting under way on a new committee effort on fracture characterization and fluid flow; Attachment K is a brief prospectus on the study.



THE GEOTECHNICAL BOARD
National Research Council

Activities Report

March 1, 1989 - February 28, 1990

This report covers the activities of the Geotechnical Board and the two committees under its aegis, the U.S. National Committee for Rock Mechanics and the U.S. National Committee on Tunneling Technology, for the contract period from March 1, 1989 to February 28, 1990.

ACTIVITIES OF THE BOARD

After completion of their report entitled **Geotechnology--Its Impact on Economic Growth, the Environment, and National Security** (distributed to sponsors January 1989), the Geotechnical Board turned its attention to two areas, administrative operations of the board and its two committees, and what issues the board should focus on for the near and long term.

March 1989 Meeting

At the March meeting, held in Washington, D.C., the board heard presentations from the following organizations about their respective programs and activities:

The U.S. Dept. of Energy, Office of Geoscience Research
The Federal Energy Regulatory Commission, Office of Hydropower Licensing
Clean Sites, Inc.
U.S. Bureau of Reclamation, Geotechnical Program

The board discussed the presentations and agreed to explore what they could do to assist in solving FERC's need for consistency in sedimentation modeling. The need for dedicated national geotechnical testing sites and safety in underground construction were also discussed.

The necessary reduction in the size of the two national committees was discussed and it was decided that it should be left to the committees to implement the reduction in their own ways.

September 1989 Meeting

An invitation was extended to all the sponsors to attend the fall board meeting, held in Washington, D.C., in order to obtain input to the process of identifying and prioritizing issues for the board to address and provide the opportunity to get acquainted. The board heard presentations from the Nuclear Waste Technical Review Board (an independent agency of the federal government), the Board on Radioactive Waste Management of the National Research Council, the Land Disposal Branch of the Environmental Protection Agency, and the Defense Nuclear Agency. A panel discussion was held on the limits of technology in the Superfund Program.

At the end of these presentations the board discussed the issues as presented to determine which might be appropriate to develop further. Two areas were identified: one was the role of geotechnology in engineering and management of waste sites; the other was the DNA request to pursue the problems involved with testing at their Nevada test site.

February 1990 Meeting

At the February meeting, which was held in Washington, D.C., the board reviewed its future activities and those of its newly reconstituted committees.

The Defense Nuclear Agency was invited back to further discuss their potential study on tunnel survivability. It was decided that a prospectus could now be written to be presented to the NRC Governing Board for approval, as well as a proposal to the DNA.

Two other topics, an EPA study involving special funding and another concerning geotechnology education, were identified to be pursued. Two members of the board were identified to initiate communication with the potential sponsor.

The board will meet again in July 1990.

ACTIVITIES OF THE U.S. NATIONAL COMMITTEE ON TUNNELING TECHNOLOGY (USNC/TT)

At the annual meeting of the committee, held in conjunction with the Rapid Excavation and Tunneling Conference (RETC), an in-depth discussion was held, prior to decision, to determine the best way to reduce the size of the committee and still maintain the objectives and goals of the committee, including effective interaction with the Geotechnical Board, interested federal agencies, and the various societies and associations.

International Tunnelling Association (ITA)

A USNC/TT delegation was sent to the ITA meeting in Toronto in September 1989. The chairman of the USNC/TT, Harvey Parker, was the official voting delegate, while Michael Barker and Winfield Salter attended on behalf of the United States as chairmen of Working Groups on Subsurface Planning and Contractual Sharing of Risk, respectively. Raymond Sterling, Vice Chairman of USNC/TT, went as the alternate delegate and attended as many of the other working groups as possible.

Specially Funded Study

The U.S. National Committee was responsible for a study, specially funded by the Dept. of Energy, entitled **Contracting Practices for the Underground Construction of the Superconducting Super Collider.** This eighteen-month study was accomplished on time and within budget and produced a report which has been well received (see enclosure).

Publications

Micro- and Small-Diameter Tunneling
Tunneling Technology Newsletter--3 issues

ACTIVITIES OF THE U.S. NATIONAL COMMITTEE FOR ROCK MECHANICS (USNC/RM)

The annual meeting was held in conjunction with the 30th Annual U.S. Rock Mechanics Symposium, which is sponsored by the USNC/RM, at the University of West Virginia in Morgantown in June 1989. The host for the 32nd symposium was selected at the meeting. It will be held at the University of Oklahoma in June 1991. Colorado School of Mines is hosting the 31st symposium in June 1990. Awards, selected by a subpanel of the USNC/RM, were presented for exceptional papers in rock mechanics fields of Applied Research, Basic Research, Case Histories and Student Research.

The committee resolved the problem of reducing the size of the committee in a manner that would continue to provide for representation of the societies and associations, as well as the broad spectrum of the rock mechanics community. The current annual review panel is working on the topic Borehole Stability, which should be published sometime in 1990. The previous annual review, on Rock Mass Modification, will be sent to press within the month.

International Society for Rock Mechanics (ISRM)

The ISRM Council meeting was held in Pau, France in conjunction with an ISRM-sponsored symposium on Rock at Great Depth. The USNC/RM delegation consisted of the Vice President for North American, James Coulson of the United States, the chairman of the USNC/RM, Wolfgang Wawersik, and Staff Associate Virginia Lyman. There were 267 ISRM members from the United States in 1989. The Rock Mechanics Congress, held every four years, will be in Aachen, Germany in 1991. A Call for Papers has been announced. U.S. authors must send abstracts of their papers to the Geotechnical Board office for consideration by July 15, 1990.

Publications

Quality Assurance Aspects of Geotechnical Practices for Underground Radioactive Waste Repositories

MEMBERSHIP FOR THE BOARD AND THE COMMITTEES

Request for membership appointments were submitted and approved by the chairman of the National Research Council to reconstitute the two national committees and fill vacancies created by the rotation of board members. A copy of each of the rosters is attached.

FINANCIAL STATUS

This year for the first time, proposals were sent out to perform the activities under the Geotechnical Board to each federal sponsor instead of having a single contracting agency. Most of them terminated February 28, 1990. Proposals have been sent out to most of the agencies for the ensuing year. Where there have been changes in program officers, and new ones have not been identified, proposals are still pending.

Program for the Geotechnical Board

The board has developed a program of studies and activities to address some of the priority geotechnical issues facing the nation. The board's program can be organized around four themes:

1. Technology and a Competitive Environment

- ***U.S. National Committees*** The U.S. National Committee on Tunneling Technology and the U.S. National Committee for Rock Mechanics advise the federal government on issues of concern in tunneling and rock mechanics and carry out activities, such as symposia and other outreach activities, that serve as forums for individuals from industry, universities, practice and government to discuss subjects of mutual interest. Each committee is also the U.S. representative to its respective international organization, viz., the International Tunnelling Association, and the International Society for Rock Mechanics. Participation in these international groups helps further the interests of maintaining U.S. technological leadership in tunneling and rock mechanics.

- ***Use of Tunneling and Underground Space for Infrastructure Improvement*** A candidate program to conduct colloquia on at least two topics: (1) planning and allocation of urban underground space, and (2) anticipated impact of recent advances in tunneling technology on the underground infrastructure in the future. In addition, the National Science Foundation has asked the Geotechnical Board to develop a research agenda for the 1990s on infrastructure innovation.

- ***Geotechnology and Mining*** A candidate program with a view toward mining in the 21st century. Items identified for consideration include the role of automation in mining, expert systems for safety and ground support, degasification practices, underground hydraulics, and the secondary use of underground space (i.e., post-mining).

- ***Surface or Underground Planetary Basing*** A candidate program to conduct a workshop that would identify the advantages and disadvantages of surface or underground basing and construction. Any basing or development on extraterrestrial bodies will require excavation and the application of geotechnology.

2. Technology and National Security

- ***Committee Study on the Survivability of Deep Underground Structures Under Explosive Loading*** A committee working to advise the Defense Nuclear Agency (DNA) on aspects of DNA's Underground Technology Program (UTP) for estimating the hardness of underground structures under explosive loading. The committee's report will provide guidance for future direction of the UTP.

- ***Application of In-Situ Determination of Earth Properties*** While advances have been made in the science of imaging and characterization of the subsurface, the application to civil engineering is lacking. A workshop is proposed to evaluate where gaps exist and identify where research is needed to bring the science to greater application.

3. Technology and the Environment

- ***Environmental Protection and the Role of Geotechnology*** A candidate program to conduct studies in the areas of waste containment and remediation of contaminated sites. Specific issues include: stability of waste impoundments, seepage through liners and caps, locating contaminants in the ground, understanding and remediation of groundwater contamination problems, and isolation of contaminants, cleanup, and removal. Potential studies were identified: (1) application of the observational method to environmental protection; (2) site evaluation and cleanup operations; (3) development and evaluation of innovative impoundment technologies; and (4) application of risk assessment technology to development of cleanup strategies.

- ***Excavation Methods for the Proposed Yucca Mountain Nuclear Waste Repository*** A candidate program to evaluate the various excavation methods (drill and blast, tunnel boring machines, roadheaders, raiseborers, shaft borers, and shaft drilling) for application to repository investigation and construction.

- ***Borehole Stability*** A committee of the U.S. National Committee for Rock Mechanics, as part on the annual review of U.S. progress in rock mechanics, is developing a report on the stability, failure, and measurements of circular ground openings. Circular openings and boreholes are critical to mining and petroleum recovery activities.

- ***Fracture Networks*** A committee of the U.S. National Committee for Rock Mechanics has been established to undertake an annual review of U.S. progress in rock mechanics on the characterization of subsurface fracture networks and fluid flow through fractures. Mapping fracture zones and understanding such zones from a geomechanical viewpoint are critical issues especially for secondary and tertiary resource recovery and for waste containment.

4. Technology, Human Resources, and Management

- ***Safety in Construction*** A candidate program to help OSHA and other federal agencies on policy direction for its safety-related implementation and enforcement actions on construction sites. The U.S. National Committee on Tunneling Technology believes the construction safety issue is broader than tunnel construction, per se, and advocates an initiative with other relevant boards of the NRC such as the Building Research Board and the Marine Board.

- ***Geotechnical Research and the Federal Government*** A candidate program to identify current geotechnical research being done by the federal government. The workshop would have as its purpose developing new roles for the Geotechnical Board to serve as the point of knowledge for federally-supported geotechnical research.