

JUL 05 1984

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MEMORANDUM FOR: Mysore S. Nataraja, Section Leader  
Engineering Branch  
Division of Waste Management

FROM: John T. Buckley  
Engineering Branch  
Division of Waste Management

SUBJECT: TRIP REPORT COVERING THE ROCK MECHANICS  
SYMPOSIUM ON JUNE 25-27, 1984

The 25th U.S. Symposium on Rock Mechanics was held at Northwestern University in Evanston, Illinois on June 25-27, 1984. Technical papers were presented in 24 major areas. The program which outlines the speakers, authors, and presentation topics can be seen as Attachment 1 to this memo.

Wednesday morning and afternoon presentations dealt with the topic of Nuclear Waste Isolation. The morning session consisted predominantly of technical presentations dealing with the rock mechanics aspects of repository design. Papers presented in the afternoon session dealt primarily with an overview of the rock mechanics effort to date and the role of in-situ testing in the design of a nuclear waste repository (see Attachment 1 for the authors and topics of presentations).

Following the seven presentations on Nuclear Waste Isolation on Wednesday afternoon, the speakers gathered on stage as a panel to answer questions from the audience and to discuss opposing points of view. The NRC was represented on the panel by John T. Greeves. Many of the questions from the audience were directed at John and dealt with the NRC position concerning the role of in-situ testing prior to granting a construction authorization. The audience responded favorably to the dialogue between panel members.

A list of symposium attendees is presented with this memo as Attachment 2. Late registrants to the symposium are not listed in Attachment 2. All registered attendees of the symposium were given a hard cover copy of the proceedings. A copy can be found in my office (room 483).

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If you have any questions regarding the contents of this memo or would like any further information about the symposium, please call me at ext. 7-4544.

**ORIGINAL SIGNED BY**

John T. Buckley  
Engineering Branch  
Division of Waste Management

Attachments:  
As stated

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- HMiller
- JBuckley
- JOBunting
- LBHigginbotham

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OFC	:	WMEG <i>JB</i>	:	:	:	:	:	:
NAME	:	JBuckley/cj	:	:	:	:	:	:
DATE	:	84/05/07	:	:	:	:	:	:

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Monday Morning II  
10:30-12:30

## Machine-Rock Interaction Lecture Room 2

Chairmen: David A. Summers  
Univ. of Missouri

Priscilla Neilson  
Univ. of Texas

### A Rational Approach to Practical Performance Assessment for Rapid Excavation Using Boom-Type Tunneling Machines

Simon T. Johnson  
University of Newcastle upon Tyne, UK  
(co-author: R.J. Fowell)  
10:30-10:50

### Cutting Trials with a Water-Jet-Assisted In-Seam Tester

H.J. Handewith  
U.S. Bureau of Mines  
(co-authors: R. J. Evans, M. Hood)  
10:50-11:10

### Experimental Assessment of Borehole Drilling Damage in Basaltic Rocks

Kittiez Fuenkajorn  
Univ. of Arizona  
(co-author: J. K. Daemen)  
11:10-11:30

### Crater and Crack Formation in Rock from Impact of High Velocity Ceramic Projectiles

David C. Holloway  
Univ. of Maryland  
(co-authors: W. Wilson, D.B. Barker, A. Shukla)  
11:30-11:50

### Finite Element Simulation of Rock Cutting: A Fracture Mechanics Approach

Victor E. Saouma  
Univ. of Pittsburgh  
(co-author: M.J.J. Kleinosky)  
11:50-12:10

## Fracture Mechanics-Theory

### Lecture Room 3

Chairmen: Surendra P. Shah  
Northwestern Univ.

Harmut Spetzler  
Univ. of Colorado

### A Criterion for Quasibrittle Crack Growth

Len G. Margolin  
Los Alamos National Laboratory  
(co-author: B.W. Smith)  
10:30-10:50

### Mathematical Modeling of Progressive Cracking and Fracture of Rock

Zdenek P. Bazant  
Northwestern Univ.  
10:50-11:10

### Mixed Mode Fracture Mechanics with Emphasis on Transversely Isotropic Rocks

Patricia L. Lavery  
U.S. Army Corps of Engineers, Omaha NE  
(co-authors: K.P. Chong, M.D. Kuruppu)  
11:10-11:30

### Compression-Induced Micro-Crack Growth

S. Nemat-Nasser  
Northwestern Univ.  
(co-author: H. Horii)  
11:30-11:50

### Development of Fracture Regions in Brittle Materials

Luis E. Vallejo  
Univ. of Pittsburgh  
(co-author: E. Pramono)  
11:50-12:10

### The Microcracking of Rock and the Prediction of Fracture and Failure

Alvin M. Strauss  
Vanderbilt Univ.  
12:10-12:30

## In-Situ Stress Auditorium

Chairmen: Bernard Amadei  
Univ. of Colorado

Kunsoo Kim  
Rockwell Hanford Operations

### Using a Sonic Technique to Estimate In Situ Stresses

N. Mao  
Lawrence Livermore Laboratory  
(co-authors: J. Sweeney, J. Hanson, M. Constantino)  
10:30-10:50

### Determination of In Situ Stress from Anelastic Strain Recovery Measurements of Oriented Core: Comparison to Hydraulic Fracture Stress Measurements in the Rollins Sandstone, Piceance Basin, Colorado

Lawrence W. Teufel  
Sandia National Laboratories  
(co-author: N.R. Warpinski)  
10:50-11:10

### In Situ Stress by Pulse Velocity Monitoring of Induced Fractures

J.M. Pitt  
Iowa State Univ.  
(co-author: L. A. Klosternann)  
11:10-11:30

### Development of a Wireline Hydrofracturing Technique and Its Use at a Site of Induced Seismicity

Bezael C. Haimson  
Univ. of Wisconsin  
(co-author: M.Y. Lee)  
11:30-11:50

### Mining-Induced Stress Measurement with Hydraulic Borehole Pressure Cells

Paul H. Lu  
U.S. Bureau of Mines  
11:50-12:10

### Analysis of Borehole Inclusion Stress Measurement Concepts Proposed for Use in the Waste Isolation Pilot Plant (WIPP)

Harold S. Morgan  
Sandia National Laboratories  
12:10-12:30

**Monday Afternoon  
2:00-4:00**

## **Analytical Techniques Auditorium**

**Chairmen:** Francois E. Heuze  
Lawrence Livermore National  
Laboratory  
Ashraf M. Mahtab  
Columbia Univ.

### **Numerical Modelling of the Stress and Displacement Fields Around Two- and Three-Dimensional Cracks**

John. H. Curran  
Univ. of Toronto  
(co-author: L. Vandamme)  
2:00-2:20

### **An Analysis of Ground Support Through Fully Grouted Rockbolts**

D. E. Van Dillen  
Agbabian Associates  
(co-author: C.M. St. John)  
2:20-2:40

### **Coupled Deformation/Flow Analysis with the Distinct Element Method**

John Kafritsas  
Massachusetts Institute of Technology  
(co-author: H.H. Einstein)  
2:40-3:00

### **Thermoviscoelastic Finite Element Model Simulations Associated with Underground Coal Conversion**

S. C. Lee  
Ohio State Univ.  
(co-authors: S.H. Advani, J.K. Lee)  
3:00-3:20

### **The Validity of Equivalent Rock Mass Models**

K. C. Lau  
Univ. of Toronto  
(co-authors: K. Smith, A.M. Crawford)  
3:20-3:40

### **Discontinuous Deformation Analysis**

Gen-Hua Shi  
Univ. of California, Berkeley  
(co-author: R.E. Goodman)  
3:40-4:00

## **Ground Control In Coal Mining Lecture Room 2**

**Chairmen:** Syd S. Peng  
West Virginia Univ.

Z.T. Bieniawski  
Penn State Univ.

### **Stress Control Method Applied to Stabilization of Underground Coal Mine Openings**

Shosei Serata  
Serata Geomechanics, Inc.  
(co-author: F. Carr)  
2:00-2:20

### **Optimum Mining Plan for Multiple Seam Mining**

Wen H. Su  
West Virginia Univ.  
(co-author: S.S. Peng, H.S. Hsiung)  
2:20-2:40

### **An Investigation of the Causes of Cutter Roof in a Central Pennsylvania Coal Mine: A Case Study**

John L. Hill  
U.S. Bureau of Mines  
(co-author: E.R. Bauer)  
2:40-3:00

### **Methods of Designing Mechanical Roof Bolting in Horizontally Bedded Strata**

D.H.Y. Tang  
West Virginia Univ.  
(co-author: S.S. Peng)  
3:00-3:20

### **Rock Bursts in Hunan Collieries**

Guangping Cui  
Xiangtan Institute of Mining Technology, China  
3:20-3:40

### **Constraint—The Missing Variable in the Coal Burst Problem**

C. Zabcock  
U.S. Bureau of Mines  
(co-author: D. Bickel)  
3:40-4:00

## **ASTM Workshop on Testing Standards Lecture Room 3**

**Chairman:** Howard J. Pincus  
Univ. of Wisconsin, Milwaukee

Representatives from industry, government and academia will give informal presentations on the status of rock mechanics testing standards. A summary report of the workshop will be published in the ASTM Geotechnical Testing Journal.

Tuesday Morning I  
8:00-10:00

## Fracture Mechanics- Experimental

### Auditorium

**Chairmen:** Harmut Spetzler  
Univ. of Colorado

Surendra P. Shah  
Northwestern Univ.

#### Ultrasonic Probing of the Fracture Process Zone in Rock using Surface Waves

Peter L. Swanson  
Univ. of Colorado  
8:00-8:20

#### Fracture Analysis of Subsize Charcoal Granite Specimens

Joseph F. Labuz  
Northwestern Univ.  
(co-authors: S.P. Shah, C.H. Dowding)  
8:20-8:40

#### Strain Localization During Deformation of Westerly Granite

N. Brodsky  
Univ. of Colorado  
8:40-9:00

#### Laboratory Hydraulic Fracturing Stress Measurements in Salt

Glenn M. Boyce  
Univ. of California, Berkeley  
(co-authors: T.W. Doe, E. Majer)  
9:00-9:20

#### Study of Fracture Mechanisms in Coal Subjected to Various Types of Surface Traction Using Holographic Interferometry

A. Wahab Khair  
West Virginia Univ.  
9:20-9:40

## Longwall Mining Ground Control

### Lecture Room 2

**Chairmen:** Z.T. Bieniawski  
Penn State Univ.

Syd. S. Peng  
West Virginia Univ.

#### Prediction of Inter-Strata Movements Above Longwall Faces

Neil Styler  
Univ. of Pittsburgh  
8:00-8:20

#### Controlled Load Development at Longwall Coalfaces

A.K. Isaac  
Univ. College, Cardiff, U.K.  
(co-author: T. J. Bradbury, C.J. Holland)  
8:20-8:40

#### Technique to Measure Resultant Load Vector on Shield Supports

Thomas M. Barczak  
U.S. Bureau of Mines  
(co-author: R.C. Garson)  
8:40-9:00

#### An Improved Technique of In-Situ Measurement of Fracture Zones Surrounding Coalmine Gateroads

B.G.D. Smart  
Univ. College, Cardiff, U.K.  
(co-authors: P.K. Nicholas, A.K. Isaac)  
9:00-9:20

#### Displacement Discontinuity Method for Three-Dimensional Stress Analysis of Tabular Excavations in Non-Homogeneous Rock

L.J. Wardle  
CSIRO, Australia  
9:20-9:40

#### The Comprehensive Observation Research on the Mechanism of Water-Eruptions From the Floor

Z.G. Jing  
Shandong Mining College, China  
(co-authors: B.Y. Li, Z.P. Sun, Z.A. Wang)  
9:40-10:00

## Characterization Studies

### Lecture Room 3

**Chairmen:** Don C. Banks  
USAE Waterways Experiment  
Station

George A. Kiersch  
Cornell Univ./consultant Tucson

#### Fractures and Physical Properties of the Mount Waldo Granite Pluton, Maine

Fitzhugh T. Lee  
U.S. Geological Survey  
(co-authors: S.F. Diehl, D.R. Miller)  
8:00-8:20

#### Characterization of the Precambrian Granite in Northwestern Illinois

Mary S. Coates  
Harza Engineering Co.  
8:20-8:40

#### Site Characterization Studies of a Volcanic Cap Rock

Henri S. Swolfs  
U.S. Geological Survey  
(co-author: W.Z. Savage)  
8:40-9:00

#### Engineering Properties of Maquoketa Shale in Northwestern Illinois

Terje Preber  
Dames & Moore  
9:00-9:20

#### Fracture Toughness of Sandstones and Shales

P.E. Senseny  
RE/SPEC Inc.  
(co-author: T.W. Pfeifle)  
9:20-9:40

#### The Relationship of Point-Load and Moisture Content Indices of Highly Anisotropic Sediments of the Illinois Basin

Robert A. Bauer  
Illinois State Geological Survey  
9:40-10:00

Tuesday Morning II  
10:30-12:30

## Mining Induced Subsidence

Auditorium

**Chairmen:** Edward J. Cording  
Univ. of Illinois

Michael Karmis  
Virginia Polytechnic Institute and  
State Univ.

### Recent Developments in Subsidence Prediction and Control for the Eastern U.S. Coalfields

Michael Karmis  
Virginia Polytechnic Institute and State Univ.  
(co-authors: T. Triplett, P. Schilizzi)  
10:30-10:50

### A Method for Assessing the Potential of Mine Subsidence at Abandoned Mine Sites Through the Assistance of Finite Element Modeling

R. Bischke  
International Exploration, Inc.  
(co-author: P. S. Getty)  
10:50-11:10

### Ground Movements Associated with Pillar Extraction Coal Mining in Northern West Virginia

Robert W. Bruhn  
GAI Consultants, Inc.  
(co-author: R.C. Speck)  
11:10-11:30

### Application of Time Domain Reflectometry to Mining

Kevin O'Conner  
Northwestern Univ.  
(co-author: C.H. Dowding)  
11:30-11:50

### Proposed Criteria for Subsidence Damage to Buildings

S. Bhattacharya  
Engineers International  
(co-authors: M.M. Singh, C.Y. Chen)  
11:50-12:10

### Construction of Residential Structures Above Abandoned Illinois Coal Mines

Jim Mahar  
Univ. of Illinois  
12:10-12:30

## Protective Structure Design

Lecture Room 2

**Chairmen:** Christopher St. John  
Agbabian Associates

Donald Linger  
Defense Nuclear Agency

### Dynamic Rock-Liner Interaction in Tunnels

T. Krauthammer  
Univ. of Minnesota  
(co-author: P.A. Cundall)  
10:30-10:50

### Testing and Modelling of Joints and Interfaces Under Static and Cyclic Loading

C.S. Desai  
Univ. of Arizona  
(co-authors: E.C. Drumm, K. Fishman)  
10:50-11:10

### CAVS/STEALTH Simulations of Tunnel Response in Jointed Rock

M.B. Gross  
Science Applications, Inc.  
(co-authors: G. Yee, D.E. Maxwell)  
11:10-11:30

### Scale Model Experiments Investigating the Response of Protective Structures to Nuclear Attack Loading

C. Michael Dickinson  
SRI International  
(co-author: H.E. Lindberg)  
11:30-11:50

### History of Protective Structures Development

Donald Linger  
Defense Nuclear Agency  
11:50-12:10

## Characterization Studies - In-Situ

Lecture Room 3

**Chairmen:** Don Banks  
USAE Waterways Experiment Station

G.B. Baecher  
Massachusetts Institute of Technology

### Successful Prediction of In Situ Fracture Permeability and Stiffness Characteristics Through Statistical Rock Mass Characterization

Paul R. La Pointe  
ARCO Oil & Gas Company  
(co-author: H.C. Ganow)  
10:30-10:50

### Poisson's Ratio as a Parameter for Determination of Elastic Modulus

David M. Cregger  
Stone & Webster Engineering Corp.  
(co-author: T.J. Lamb)  
10:50-11:10

### Rapid Assessment of Shear Strength and Its Variability

J.M. Pitt  
Iowa State Univ.  
(co-author: J.R. Rohde)  
11:10-11:30

### Performance Testing of the Doorstopper Biaxial Strain Cell

Randall G. Slickney  
RE/SPEC Inc.  
(co-authors: P.E. Senseny, E.C. Gregory)  
11:30-11:50

### Characterization of Rock Conditions for the Deep Tunnel Project in Milwaukee.

R.C. Isley  
D'Appolonia Consulting Engineers, Inc.  
(co-authors: S. Fradkin, J.M. McBee)  
11:50-12:10

Tuesday Afternoon I  
2:00-4:00

## Mining Ground Control Lecture Room 2

**Chairmen:** John F. Abel  
Colorado School of Mines

W.G. Pariseau  
Univ. of Utah

### Instrumentation and Monitoring for Pillar Extraction in A Deep, Faulted Uranium Mine

Thomas R. Scotese  
Tudor Engineering Co.  
2:00-2:20

### Reinforcement of Large Pillars by Bolting

S.J. Mitchell  
Agapito & Associates  
(co-authors: J.F.T. Agapito, L.A. Weakly)  
2:20-2:40

### Pressure Measurements in Gob

H.N. Maleki  
Agapito & Associates  
(co-authors: W. Hustrulid, D. Johnson)  
2:40-3:00

### Determination of Solution Cavern Spacing in Deep Salt Deposit

D.Z. Mraz  
Chevron Canada Resources Limited  
(co-authors: M.B. Crowe, M.B. Dusseault)  
3:00-3:20

### Leached Salt Cavern Design Using a Frac- ture Criterion for Rock Salt

D.S. Preece  
Sandia National Laboratories  
(co-author: W.R. Wawersik)  
3:20-3:40

### Numerical Modeling of "Stiff" Backfill in the Coeur d'Alene Mining District

Ed Van Eeckhout  
Montana College of Mineral Science and  
Technology  
3:40-4:00

## Foundations And Slopes Auditorium

**Chairmen:** C. William Lovell  
Purdue Univ.

Fred H. Kulhawy  
Cornell Univ.

### Load Transfer for Drilled Shafts in Weak and Porous Limestone

T.J. Logan  
Dames & Moore  
(co-authors: J.R. O'Brian, C.P. Cupton)  
2:00-2:15

### Behavior of Rock Anchors and Sockets

Kent A. Pease  
CH2M-Hill  
(co-author: F.H. Kulhawy)  
2:15-2:30

### Stability of Slopes in Discontinuously Jointed Rocks

Thomas M. Tharp  
Purdue Univ.  
2:30-2:45

### Groutability Ratio for Filter Blocking of Joints in Rocks

A.M. Crawford  
Univ. of Toronto  
(co-author: G. Groskopf)  
2:45-3:00

### A Case History of the Effect of Mine Subsidence on a Concrete Arch Bridge in Northern West Virginia

Roger B. Alke  
West Virginia Dept. of Highways  
(co-author: B.L. Thompson)  
3:00-3:15

### Catastrophic Failure of a Tied-Back Wall on the Interstate in Charleston, West Virginia

Berke L. Thompson  
West Virginia Dept. of Highways  
(co-author: D.C. Martin)  
3:15-3:30

### Foundation Studies for a Roller Compacted Concrete Gravity Dam

Gregg A. Scott  
U.S. Bureau of Reclamation  
3:30-3:45

## Properties and Characteristics of Discontinuous Media Lecture Room 3

**Chairmen:** Gregory B. Baecher  
Massachusetts Institute of Technology

Fitzhugh T. Lee  
U.S. Geological Survey

### Large Scale Static and Dynamic Friction Experiments

Khosrow Bakhtar  
Terra Tek Engineering  
(co-author: N. Barton)  
2:00-2:20

### Frictional Sliding and Fracture Behavior of Some Nevada Test Site Tuffs

C.A. Morrow  
U.S. Geological Survey  
(co-author: J. Byerlee)  
2:20-2:40

### The Quantification of Power Law Indices for Discontinuity Shear Strength Prediction

B. Denby  
McGill Univ.  
(co-author: M.J. Scoble)  
2:40-3:00

### Application of Artificial Intelligence to Pro- blems of Rock Mechanics

William S. Dershowitz  
Massachusetts Institute of Technology  
(co-author: H.H. Einstein)  
3:00-3:20

### A Similarity Test for Groping Orientation Data in Rock Mechanics

M. Ashraf Mahtab  
Columbia Univ.  
(co-author: T.M. Yeguialp)  
3:20-3:40

### Interpretation of Fracturing in Drill Cores

Louis A. Panek  
U.S. Bureau of Mines  
3:40-4:00

Wednesday Morning I  
8:00-10:00

## Behavior Under Special Conditions

### Auditorium

**Chairmen:** Wolfgang R. Wawersik  
Sandia National Laboratory  
Zdenek Bazant  
Northwestern Univ.

#### **Ambient Temperature Testing of the G-Tunnel Heated Block**

Roger M. Zimmerman  
Sandia National Laboratories  
(co-authors: M.P. Board, E.L. Hardin, M.D. Voegelé)  
8:00-8:20

#### **Laboratory Permeability Measurements in Support of an Aquifer Thermal Energy Storage Site in Minnesota**

S.C. Blair  
Pacific Northwest Laboratory  
(co-authors: W.J. Deutsch, L.D. Kannberg)  
8:20-8:40

#### **The Effect of Discontinuities, Stress Level, and Discontinuity Roughness on the Thermal Conductivity of a Maine Granite**

Thomas C. Sandford  
Univ. of Maine  
(co-authors: E.B. Decker, K.H. Maxwell)  
8:40-9:00

#### **The Effect of Pore Pressure and Heating Time on the Strength and Sliding Stability of Serpentinite Gouge**

Diane E. Moore  
U.S. Geological Survey  
(co-authors: M. Jin, R. Summers, J.D. Byerlee)  
9:00-9:20

#### **Time-Dependent Behavior of Joints in Shale**

R.K. Bowden  
Univ. of Toronto  
(co-author: J.H. Curran)  
9:20-9:40

#### **Strength of Indiana Limestone in True Biaxial Loading Conditions**

B. Amadei  
Univ. of Colorado  
(co-authors: V. Janoo, M. Robinson, R. Kuberan)  
9:40-10:00

## Tunnel Support Requirements

### Lecture Room 2

**Chairmen:** James Monsees  
Parsons Brinckerhoff Quade & Douglass  
Harvey W. Parker  
Shannon Wilson, Inc.

#### **Ground Support and Related Requirements**

Jan Patricio  
Rockwell International  
8:00-8:20

#### **Rock Support of the Jones Island Pump Station, Milwaukee, Wisconsin**

Tim Smirnoff  
Howard Needles, Tamman and Smirnoff  
8:20-8:40

#### **Design Charts for a Deep Circular Tunnel Under Non-Hydrostatic Loading**

Christopher M. St. John  
Agabian Associates  
(co-authors: E. Detournay, C. Fairhurst)  
8:40-9:00

#### **Estimating Support Requirements from Simulation of Key Blocks**

Lap-yan Chan  
Woodward-Clyde Consultants  
9:00-9:20

#### **Rock Mechanics Studies at the Calumet Pumping Station, Chicago, Illinois**

Frank S. Shuri  
Foundation Sciences, Inc.  
(co-author: H.S. Kelsay)  
9:20-9:40

#### **Excavation Through Highly Fractured and Sheared Host Rock, Pacheco Pumping Plant**

R.S. Sinha  
U.S. Bureau of Reclamation  
(co-authors: P.F. Carlson, G.O. Bnggs, S.R. Barden)  
9:40-10:00

## Blast Fragmentation Lecture Room 3

**Chairmen:** Robert G. Lundquist  
Ohio State Univ.

Alfred J. Hendron  
Univ. of Illinois

#### **Studies on Explosively Driven Cracks Under Confining In-Situ Stresses**

K.R.Y. Simha  
Univ. of Maryland  
(co-authors: W.L. Fournay, R.D. Dick)  
8:00-8:20

#### **Primary Mechanism for Breaking Rock with Explosives**

Robert R. Britton  
Ohio State Univ.  
(co-authors: C.J. Konya, D.R. Skidmore)  
8:20-8:40

#### **A Study of Fracture Pressurization as a Result of Explosive Detonation**

William L. Fournay  
Univ. of Maryland  
(co-authors: K.R.Y. Simha, R.D. Dick)  
8:40-9:00

#### **Time Histories of Principal Strains Generated in Rock by Cylindrical Explosive Charges**

Douglas A. Anderson  
Martin Manetta Laboratories  
(co-authors: S.R. Winzer, A.P. Ritter)  
9:00-9:20

#### **Methods for Predicting Rubble Motion During Blasting**

J.T. Schamaun  
Sandia National Laboratories  
9:20-9:40

#### **Shock Wave-Induced Fragmentation of Copper Porphyries**

Catherine T. Aimone  
New Mexico Institute of Mining and Technology  
(co-authors: M.A. Meyers, N. Mojtabai)  
9:40-10:00

**Wednesday Morning II  
10:30-12:30**

**Nuclear Waste Isolation:  
Some Rock Mechanics  
Considerations**

**Auditorium**

**Chairmen:** Francis S. Kendorski  
Terraform Engineers, Inc.

William R. Judd  
Purdue Univ.

**Rock Support for Nuclear Waste  
Repositories**

Lee. W. Abramson  
Parsons Brinckerhoff Quade & Douglas  
(co-author: B. Schmidt)  
10:30-10:50

**Prediction of Long Term Creep Closure in  
Salt**

Jeff W. Nelson  
United Engineers and Constructors, Inc.  
(co-author: P.C. Kelsall)  
10:50-11:10

**Design of a Salt Repository Based on Field  
Verification**

John F. Abel Jr.  
Colorado School of Mines  
(co-author: F. Djahanguiri)  
11:10-11:30

**Rock Mechanics Aspects of Volume  
Changes in Calcium Sulfate Bearing Rocks  
Due to Geochemical Phase Transitions**

Caner Zambak  
South Dakota School of Mines and Technology  
(co-author: R. Arthur)  
11:30-11:50

**Geomechanics Characterization of a  
Proposed Nuclear Waste Repository Site in  
Basalt**

K. Kim  
Rockwell International  
(co-author: W.M. McCabe)  
11:50-12:10

**Deep Tunnel and  
Reservoir TARP  
Orientation**

**Lecture Room 2**

10:30 and 11:30

The films and question and answer session are designed for those going on the field trip on Thursday. Others are welcome who do not have the opportunity to go on the trip but are interested in learning about the multi-billion dollar construction project.

**Blasting Case Histories**

**Lecture Room 3**

**Chairmen:** Alfred J. Hendron  
Univ. of Illinois

Robert G. Lundquist  
Ohio State Univ.

**Results From Some Oil Shale  
Fragmentation Experiments Conducted at  
the Anvil Points Mine, Colorado**

Richard D. Dick  
Los Alamos National Laboratory  
10:30-10:50

**Rock Engineering for the Tyee Lake Tap**

John Cogan  
International Engineering Company, Inc.  
(co-author: F. Kintzer)  
10:50-11:10

**Lake Thistle Draining Project**

Randall J. Essex  
Woodward-Clyde Consultants  
(co-author: L.L. Oriard)  
11:10-11:30

**Microcomputer Simulation of Rock  
Blasting to Predict Fragmentation**

C. Dinis da Gama  
Instituto de Perquisas Technologicas, Brazil  
11:30-11:45

**Prototype Sheathed Explosive Rock-  
Breaker Charge for Open Shooting in  
Flammable Atmospheres**

R.J. Maniero  
U.S. Bureau of Mines  
(co-author: J.E. Hay)  
11:45-12:00

**Probabilistic Analysis of Blasting Impact  
on Open Pit Stability**

Dae S. Young  
Michigan Technological Univ.  
12:00-12:15

**Study of Blasting Mechanics and Its  
Application**

Sundar S. Saluja  
Univ. of North Dakota  
12:15-12:30

**Wednesday Afternoon  
2:00-4:00**

## **Nuclear Waste Isolation: Status of Rock Mechanics Considerations**

**Auditorium**

**Chairmen:** William R. Judd  
Purdue Univ.

Francis S. Kendorski  
Terraform Engineers, Inc.

### **An Overview of the OCRWM Program Efforts**

J. Fiore  
U.S. Dept. of Energy  
(co-authors: V. Der, V. Montenyohl)  
2:00-2:20

**Exploration**  
David L. Pentz  
Golder Associates  
2:20-2:40

### **Laboratory Testing For Repository Characterization**

James E. Russell  
Texas A&M Univ.  
(co-authors: J. Handin, N. Carter)  
2:40-3:00

### **Field Testing Policy Questions Related to the Role of Field Testing in the Establishment of a Radioactive Waste Repository**

W.A. Hustrulid  
RE/SPEC Inc.  
(co-author: W.F. McClain)  
3:00-3:20

### **Hydrogeologic Overview of the Nuclear Waste Isolation Program**

Irwin Remson  
Stanford Univ.  
3:20-3:40

### **A Geologic High Level Nuclear Waste Repository Considered as an Underground Facility Design Problem**

Francis S. Kendorski  
Terraform Engineers, Inc.  
3:40-4:00

### **Panel Discussion on Nuclear Waste Isolation**

Above authors will be panel members  
4:00-4:30

## **Fracture Modeling and Field Verification For Gas Extraction**

**Lecture Room 2**

**Chairmen:** Jean-Claude Roegiers  
Dpwell Inc.

John C. Sharer  
Gas Research Institute

### **Finite Elements Modeling of the Interaction Between Hydrofractures and Slanted Interfaces in Non-Homogenous Rock**

R. J. Shaffer  
Lawrence Livermore National Laboratory  
(co-authors: R. K. Thorpe, A. R. Ingraffea, F. E.  
Heuze)  
1:30-1:50

### **Growth of a Crack Through Interfacial Boundary**

J. C. Lee  
Northwestern Univ.  
(co-author: L. M. Keer)  
1:50-2:10

### **Rock Mechanics Effects Observed Subsequent to Multiple Fracturing of Well- bores**

J. F. Cuderman  
Sandia National Laboratories  
2:10-2:30

### **The Interaction of Geology, Mechanical Properties and In-Situ Stresses in Hydraulic Fracturing**

Jeffrey N. Schuyler  
Dow Chemical  
(co-author: J. D. McLennan)  
2:30-2:50

### **Gas Fracturing: Numerical Calculations and Field Experiments**

Stewart K. Griffiths  
Sandia National Laboratories  
(co-authors: C. W. Smith, R. H. Niison)  
2:50-3:10

## **Wave Propagation** **Lecture Room 3**

**Chairmen:** Arley G. Franklin  
U.S. Army Corps of Engineers  
Waterways Experiment Station

Eari P. Hoskins  
Texas A&M Univ.

### **Cross-hole Acoustic Measurements in Basalt**

M. S. King  
Lawrence Berkeley Laboratory  
(co-authors: L. R. Myer, J. J. Rezwani)  
1:30-1:50

### **A Laboratory Study of Seismic Velocities and Attenuation of Host Rocks for a Nuclear Waste Repository**

Bjorn N. P. Paulsson  
Univ. of California, Berkeley  
1:50-2:10

### **The Potential and Application of Sonic Wave Methods in Engineering Rock Characterization**

P. Schilizz  
Virginia Polytechnic Institute & State Univ.  
(co-authors: M. Karmis, Z. Agoutantzi)  
2:10-2:30

### **Site Characterization for Prediction and Simulation of Dynamic Events**

Dwain K. Butler  
U.S. Army Corps of Engineers' Waterways Ex-  
periment Station  
2:30-2:50

- REVISED AGENDA -

WEDNESDAY AFTERNOON - NUCLEAR WASTE ISOLATION: STATUS OF ROCK MECHANICS  
CONSIDERATIONS

AUDITORIUM

Chairmen: William R. Judd, Purdue University  
Francis S. Kendorski, Terraform Engineers, Inc.

- 2:00 - 2:20 "In Situ Testing Strategy for HLW Repositories"\*  
Jay Rhoderick, U.S Department of Energy
- 2:20 - 2:40 "Repository Exploration"  
David L. Pentz, Golder Associates
- 2:40 - 3:00 "Laboratory Testing for Repository Characterization:  
James E. Russell, Neil L. Carter, John Handin,  
Texas A & M University
- 3:00 - 3:20 "Hydrogeologic Overview of the Nuclear Waste Isolation Program"  
Irwin Remson, Stanford University
- 3:20 - 3:40 "A Geologic High Level Nuclear Waste Repository Considered  
as an Underground Facility Design Problem"  
Francis S. Kendorski, Terraform Engineers, Inc.
- 3:40 - 4:00 BREAK
- 4:00 - 4:20 "Policy Questions Related to the Role of Field Testing in the  
Establishment of a Radioactive Waste Repository"  
William A. Hustrulid, Colorado School of Mines  
William C. McClain, RE/SPEC, Inc.
- 4:20 - 4:40 "Reasonable Assurance and Its Relationship to In Situ Testing  
for HLW Repositories"\*  
John T. Greeves and Robert J. Wright,  
U.S. Nuclear Regulatory Commission
- 4:40 - 5:30 Panel Discussion on Nuclear Waste Isolation

\*Papers available before session

25th U.S. SYMPOSIUM ON ROCK MECHANICS

June 25-27, 1984

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