International Society for Rock Mechanics

THE ISRM "BLUE BOOK" CONTAINING ALL THE ISRM SUGGESTED METHODS

Prof. Dr. Resat Ulusay
Hacettepe University, Turkey
President of the ISRM
Commission on Testing Methods

"THE COMPLETE ISRM SUGGESTED METHODS FOR ROCK CHARACTERIZATION, TESTING AND MONITORING: 1974-2006"

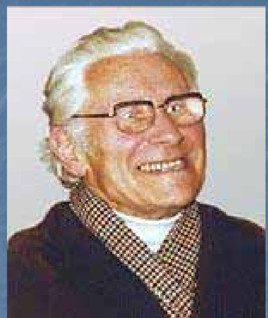
Suggested Methods prepared by ISRM Commission on Testing Methods

Editors:

R. Ulusay & J.A.Hudson

Compilation Arranged by the ISRM Turkish National Group
Ankara, Turkey
April 2007

ISRM was founded in 1962, by **Prof. Dr. Leopold Mueller** of Karlsruhe University, West Germany.

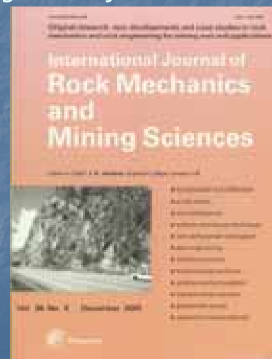


ISRM work products have historically been generated by its internal "commissions" as appointed by the leadership directorate, which are designed to bring forth practical solutions to recognized rock engineering data and methods needs.

Prof. Mueller chosed to release the Rock Testing Commission findings as separate papers.

Accordingly, since 1974, and through its Commission on Testing Methods, the ISRM has generated a succession of Suggested Methods (SMs) covering a wide range of subjects.

These have appeared in the International Journal of Rock Mechanics & Mining Sciences, published through an agreement With Pergamon Press.



These papers published as "Suggested Methods (SM)" devised to promote realistic design-related rock-engineering data through methods standardized to deliver accurate and reproducible numerical results, both from the field and in the laboratory.

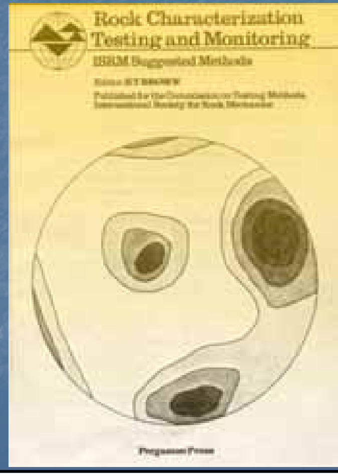
In 1992, the Dutch publisher Elsevier acquired Pergamon Press and elected to continue publishing the IJRMMS as the venue in which all new SMs are presented to the profession.

SUGGESTED METHODS: Standards → **NO**

They are explanations of recommended procedures to follow in the various aspects of rock characterisation, testing and monitoring.

"However, the SMs can be used as standards on a particular project if required, but they are intended more as guidance."

The first collection of these SMs released between 1974 and 1981 was edited by Prof. Ted Brown and was published by Pergamon Press as the ISRM "**Yellow Book**" in 1981.



This first version of the ISRM SMs contained 3 parts and 14 SMs.

Following Dr. Don Deere's initial work in the late 1960s and early 1970s in establishing the groundwork and priorities for the topics to be covered,

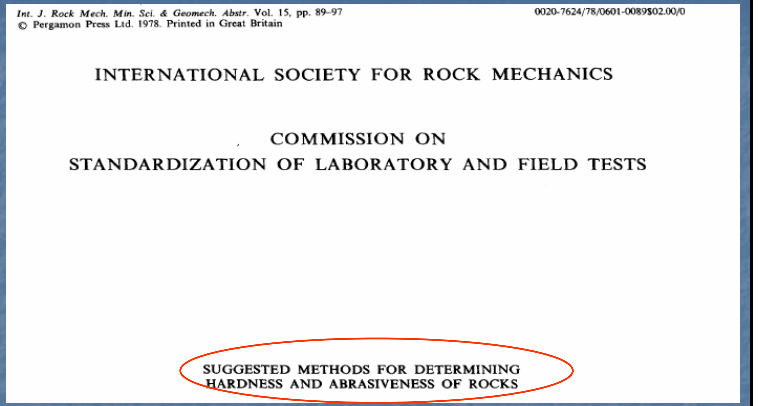
THE PROCEDURE

The production of the majority of the early SMs was managed by Prof. Richard Bieniawski and Dr. John Franklin who arranged Working Groups to produce successive drafts of each SM.

THEN

The final versions of the SMs were submitted to the IJRMMS for publication

The early SMs did no authors, only the Woking Group members were acknowledged

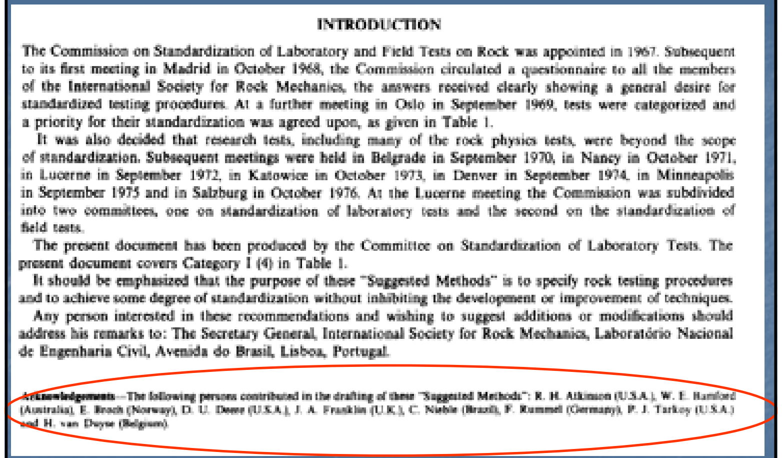


Int. J. Rock Mech. Min. Sci. & Geomech. Abstr. Vol. 15, pp. 89–97 0020-7624/78/0601-0089$02.00/0

INTERNATIONAL SOCIETY FOR ROCK MECHANICS

COMMISSION ON
STANDARDIZATION OF LABORATORY AND FIELD TESTS

SUGGESTED METHODS FOR DETERMINING
HARDNESS AND ABRASIVENESS OF ROCKS



INTRODUCTION

The Commission on Standardization of Laboratory and Field Tests on Rock was appointed in 1967. Subsequent to its first meeting in Madrid in October 1968, the Commission circulated a questionnaire to all the members of the International Society for Rock Mechanics, the answers received clearly showing a general desire for standardized testing procedures. At a further meeting in Oslo in September 1969, tests were categorized and a priority for their standardization was agreed upon, as given in Table 1.

It was also decided that research tests, including many of the rock physics tests, were beyond the scope of standardization. Subsequent meetings were held in Belgrade in September 1970, in Nancy in October 1971, in Lucerne in September 1972, in Katowice in October 1973, in Denver in September 1974, in Minneapolis in September 1975 and in Salzburg in October 1976. At the Lucerne meeting the Commission was subdivided into two committees, one on standardization of laboratory tests and the second on the standardization of field tests.

The present document has been produced by the Committee on Standardization of Laboratory Tests. The present document covers Category I (4) in Table 1.

It should be emphasized that the purpose of these "Suggested Methods" is to specify rock testing procedures and to achieve some degree of standardization without inhibiting the development or improvement of techniques.

Any person interested in these recommendations and wishing to suggest additions or modifications should address his remarks to: The Secretary General, International Society for Rock Mechanics, Laboratório Nacional de Engenharia Civil, Avenida do Brasil, Lisboa, Portugal.

Acknowledgements—The following persons contributed in the drafting of these "Suggested Methods": R. H. Atkinson (U.S.A.), W. E. Hanford (Australia), E. Broch (Norway), D. U. Deere (U.S.A.), J. A. Franklin (U.K.), C. Nieble (Brazil), F. Rummel (Germany), P. J. Tarkoy (U.S.A.) and H. van Duyse (Belgium).

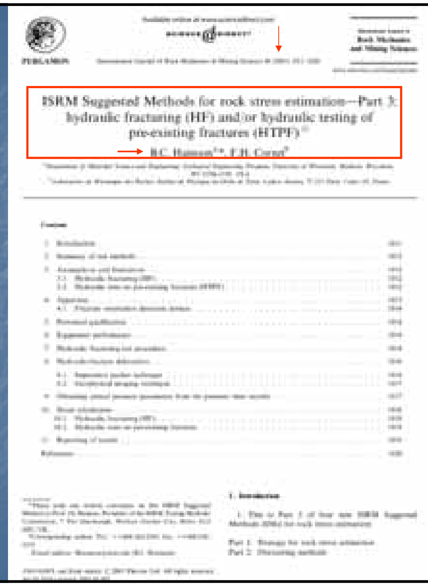
The "**Yellow Book**" was an instant success; however, the significant amounts of time and effort required to prepare it led to long lags in publication credits for the contributing committees of authors.

↓

Prof. John A. Hudson acted as the President of the ISRM Commission on Testing Methods between 1987 and February 2006

↓ **SYSTEM**

He continued with the production of the SMs and their publication in the IJRMMS and initiated a system where the documents were produced more in the form of papers – **SO THAT THE AUTHORS WOULD RECEIVE FULL CITATION RECOGNITION OF THEIR EFFORTS.**



ISRM Suggested Methods for rock stress estimation—Part 3: hydraulic fracturing (HF) and/or hydraulic testing of pre-existing fractures (HTPF)

B.C. Haimson, F.H. Cornet

The "**Yellow Book**', is out of print and many new SMs have been produced since 1981.

↓

In 2005, **Professor John A. Hudson** was elected to the Presidency of the ISRM for the period 2007-2011

↓

Responsibility for the Commission on Testing Methods
(February 2006)

↓

Resat ULUSAY

↓

Based on the decision taken by the Commission during the first meeting in Singapore in 2006, re-publication of all the SMs in a book was one of the main targets of the Commission.

Re-publication of the ISRM Suggested Methods

↓

Co-Editors: Prof. Resat ULUSAY & Prof. John A. HUDSON

But due to continuing uncertainty with Elsevier in terms of re-publishing the ISRMs in book form, the co-editors decided to ask the **ISRM Turkish National Group (TNG)** to help in its printing. The TNG accepted to take the responsibility of its printing in Turkey on behalf of ISRM.

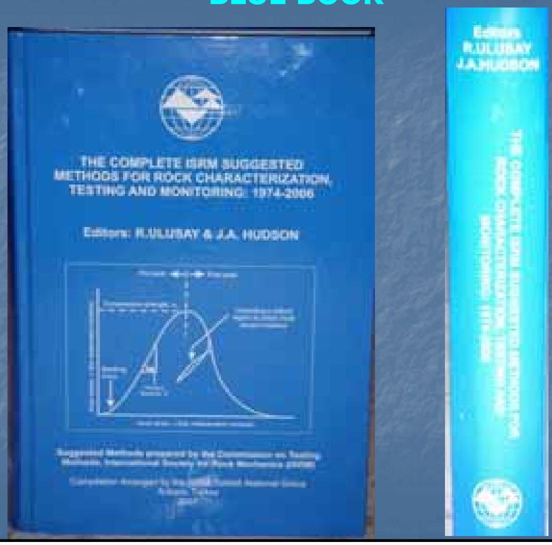
Official permissions were obtained from

Elsevier (39 SMs) and Springer Verlag (1 SM) in February 2007

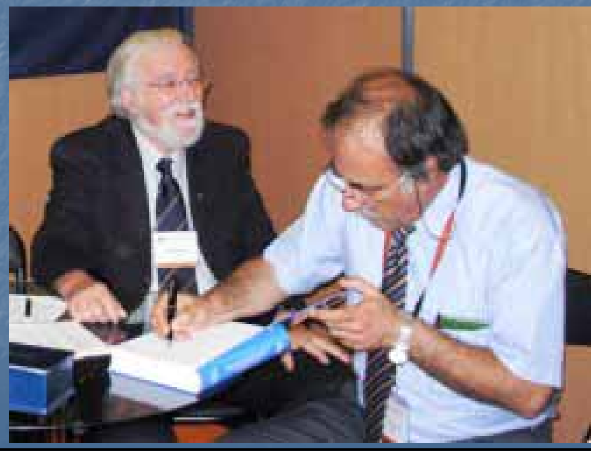
Based on the agreement between ISRM and Turkish National Group and after the editorial works have been completed, the pdfs of all SMs, generated from 1974 to December 2006,

were compiled and 2000 COPIES were printed in Ankara, Turkey, in April 2007 ⟶ sent to the ISRM

BLUE BOOK



THE BLUE BOOK WAS INTRODUCED TO THE GEO-ENGINEERING COMMUNITY AND SIGNED BY THE CO-EDITORS AT THE ISRM DESK DURING THE ISRM LISBON CONGRESS (July 11, 2007)



A HARD COVER BOOK → 628 pages, 40 SMs

- PREFACE
- CONTENTS
- INTRODUCTION

Four parts:

Part 1: Site Characterization
Part 2: Laboratory Testing
Part 3: Field Testing
Part 4: Monitoring

Preface by the ISRM President

PREFACE

The main activity of the ISRM as an organization is to provide opportunities for exchange of ideas, developments and experiences of its members. The organization itself does not perform research, teaching or consultancy even though it may encourage those and provide opportunities for growth of its members.

There are only two classes of lasting products of the ISRM, namely the records produced of various conferences and the work of the various Commissions. This book is a shining example of the latter.

Commission members give up their time to produce lasting items of value to the international rock engineering community. They do not get paid or compensated in any other way for their work. Their only reward is the knowledge that they have contributed to making the world a better place for all through sharing their insight, knowledge and experience with everyone.

The Commission on Testing Methods is one of only two that have historically always been re-appointed by each new President, clear indication of the need for and value of this work. Professor John A. Hudson has been at the helm of this Commission for several years and Professor Resat Ulusay recently took over as President after having been involved for a long time.

On behalf of the ISRM, I congratulate all the authors on this great work and thank them for the initiative they took to provide the methods described in the following pages in a single volume. No rock engineering bookshelf should be without it.

Nielen van der Merwe
ISRM President 2003-2007

Table of contents

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Introduction by the Co-editors

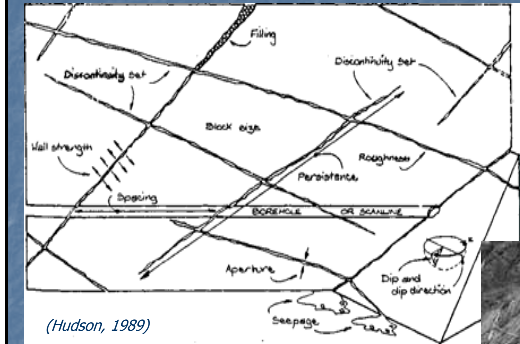
INTRODUCTION

ISRM Suggested Methods are presented with standardized formats, each of which has the following contents:

(1) Introduction and history of the suggested method,
(2) Scope,
(3) Apparatus,
(4) Procedure,
(5) Calculations,
(6) Reporting,
(7) Final credits,
(8) Acknowledgments, and
(9) References

PART 1. SITE CHARACTERIZATION

- The Quantitative Description of Discontinuities in Rock Masses



(Hudson, 1989)

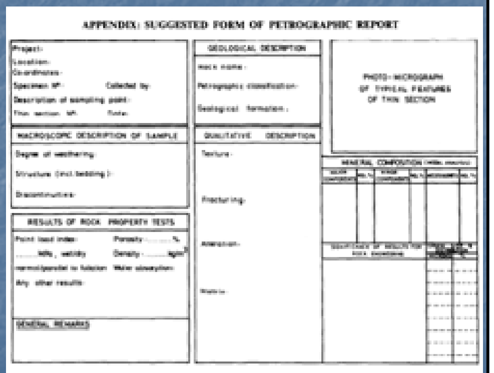

Scan-line survey

- Geophysical Logging of Boreholes

PART 2. LABORATORY TESTING

- Petrographic Description of Rocks


Thin section


APPENDIX: SUGGESTED FORM OF PETROGRAPHIC REPORT

Project:
Location:
Co-ordinates:
Specimen Nº: Collected by:
Description of sampling point:
Thin section Nº: Date:

GEOLOGICAL DESCRIPTION
Rock name:
Petrographic classification:
Geological formation:

PHOTO-MICROGRAPH OF TYPICAL FEATURES OF THIN SECTION

MACROSCOPIC DESCRIPTION OF SAMPLE
Degree of weathering:
Structure (incl. bedding):
Discontinuities:

QUALITATIVE DESCRIPTION
Texture:
Fracturing:
Alteration:

MINERAL COMPOSITION

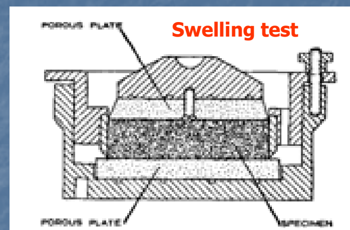
RESULTS OF ROCK PROPERTY TESTS
Point load index: Porosity: %
MPa, validity Density: kg/m³
normal/parallel to foliation Water absorption:
Any other results:

GENERAL REMARKS

(Nieble et al., 1978)

- Determining Water Content, Porosity, Density, and Related Properties and Swelling and Slake-Durability Index Properties


Mercury porosimeter



Swelling test

(Franklin et al., 1978)


Slake durability test

- Determining Hardness and Abrasiveness of Rocks

(a) Los Angeles abrasion test

(b) Schmidt hammer test

Schmidt hammer test was revised by Dr. Adnan Aydın and accepted by ISRM in 2008 → Its upgarded version was published in IJRMMS

Shore scloroscope

(c) Shore Hardness

1978 version of the SM concerning the measurement of Shore hardness were revised in 2006

↓

Only the updated version of this SM has been included in the Blue Book (Altındağ et al., 2006)

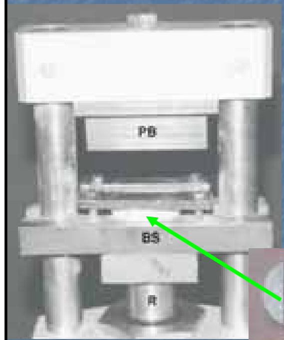
- Determining Sound Velocity

- Determining Point Load Strength

This SM replaced original document published in 1972.

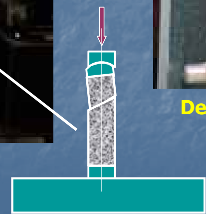
- Determining the Indentation Hardness Index of Rock Materials

- Determining Block Punch Strength Index



(Ulusay et al., 2001)

- Determining Uniaxial Compressive Strength and Deformability of Rock Materials



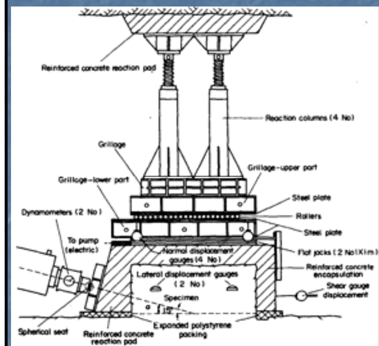
UCS test

Determination of deformability properties

- Determining the Strength of Rock Materials in Triaxial Compression (1983: revised version of 1978)

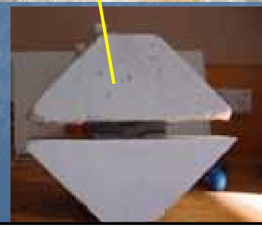
- Determining Shear Strength

(a) In-situ shear test



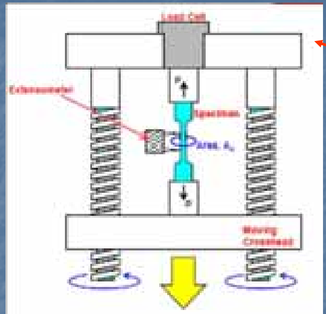
(Franklin et al., 1975)

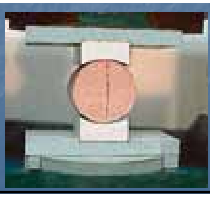
(b) Laboratory direct shear test



(c) Torsional shear test

- Determining Tensile Strength of Rock Materials





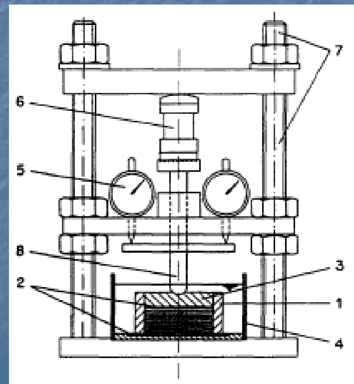
(a) Direct tensile strength

(b) Indirect tensile strength by Brazilian test

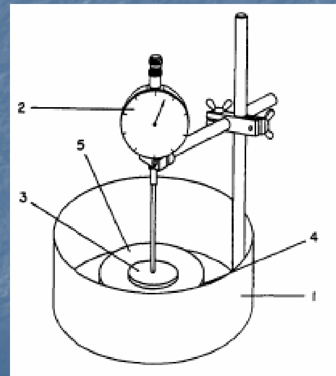
- Laboratory Testing of Argillaceous Swelling Rocks

- Laboratory Testing of Swelling Rocks

Measuring of axial swelling stress

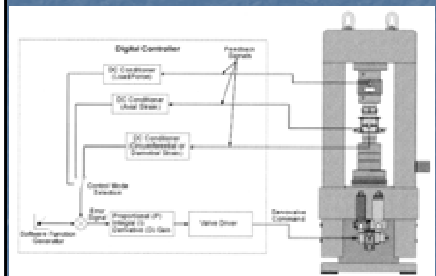


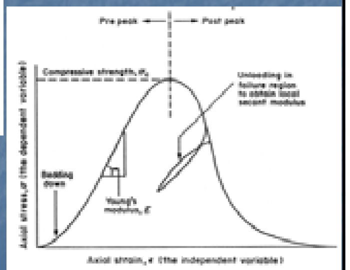
Measuring of axial swelling strain



(Einstein et al., 1989)

- Complete Stress-Strain Curve for Intact Rock in Uniaxial Compression

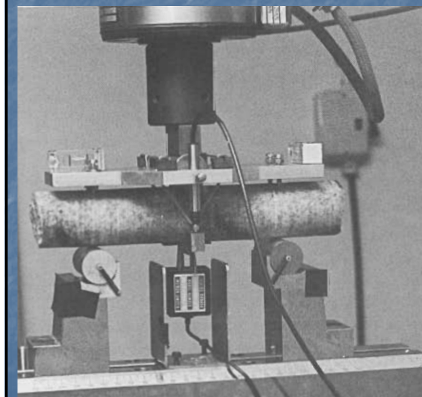




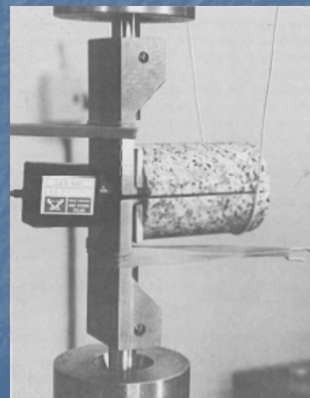
(Fairhurst & Hudson, 1999)

- Determining the Fracture Toughness of Rock

(a) Test using chevron bend specimen

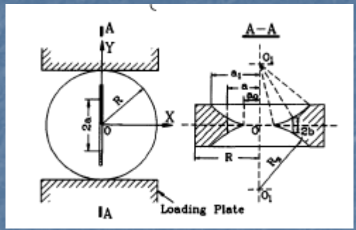


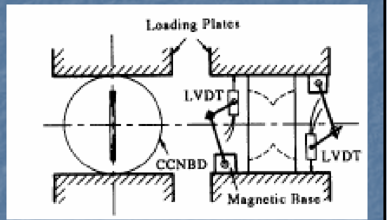
(b) Test using short rod specimen



(Ouchterlony et al., 1988)

- Determining Mode I Fracture Toughness Using Cracked Chevron Notched Brazilian Disc Specimens





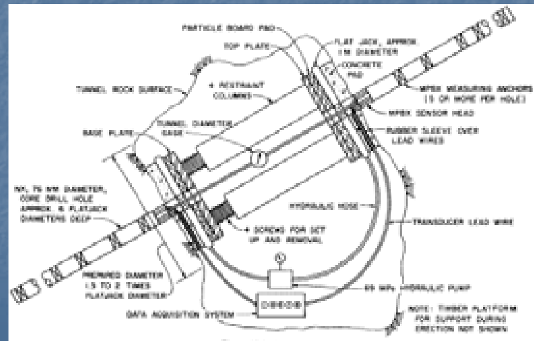
(Fowell et al., 1995)

PART 3. FIELD TESTING

3.1. DEFORMABILITY TESTS

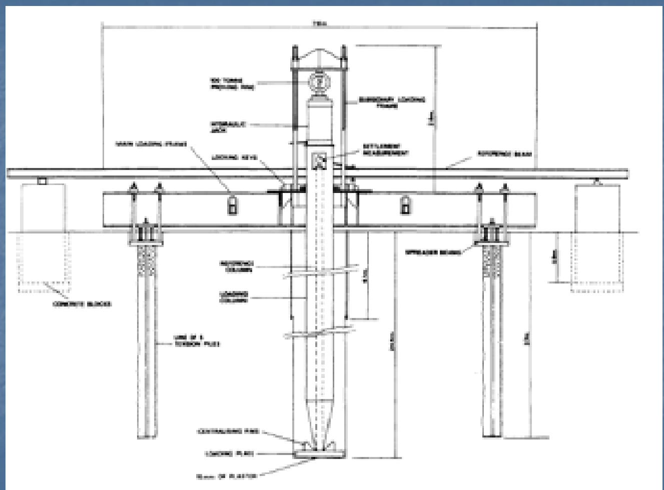
- Determining *In Situ* Deformability of Rock

(a) Plate test (Uniaxial jacking test)



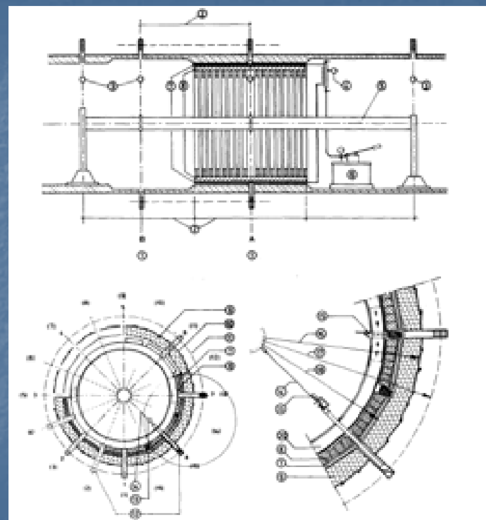
(Coulson et al., 1979)

(b) Plate test down a borehole



(Coulson et al., 1979)

(c) Radial jacking test



(Coulson et al., 1979)

- Deformability Determination Using a Large Flat Jack Technique

(www.masonrysociety.org)

- Deformability Determination Using Dilatometer

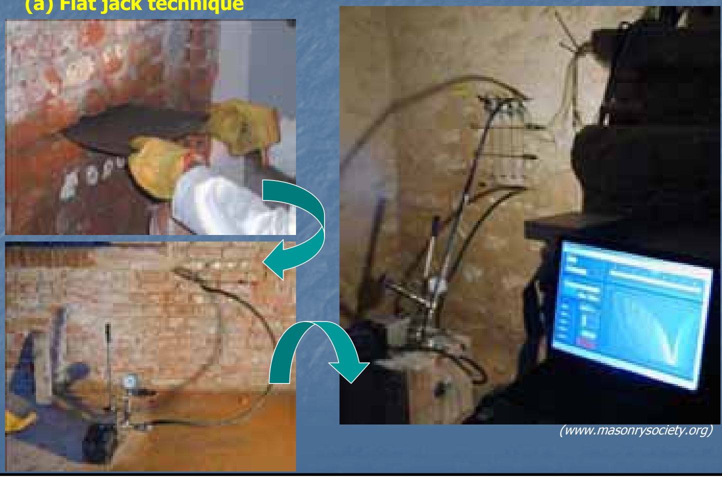
(www.roctest.com)

(Yow et al., 1996)

3.2. IN SITU STRESS MEASUREMENTS

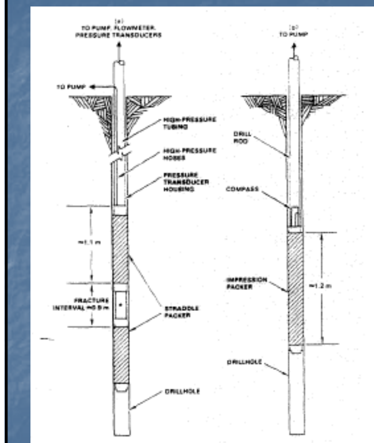
- Rock Stress Determination

(a) Flat jack technique



(www.masonrysociety.org)

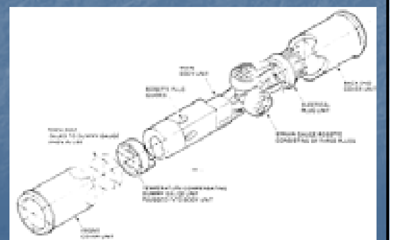
(b) Hydraulic fracturing technique



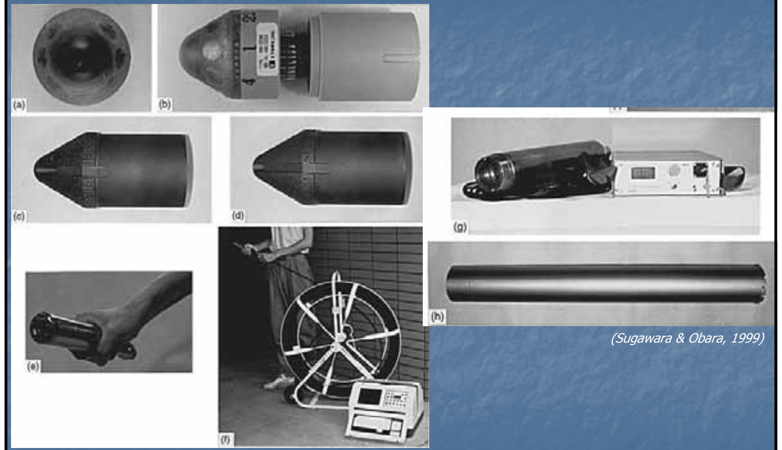
(Kim et al., 1987)

(c) USBM-type drillhole deformation gauge

(d) CSIRO-type cell with 9 or 12 strain gauges



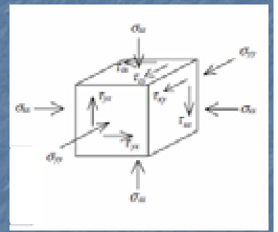
- *In situ* Stress Measurement Using the Compact Conical-Ended Borehole Overcoring (CCBO) Technique

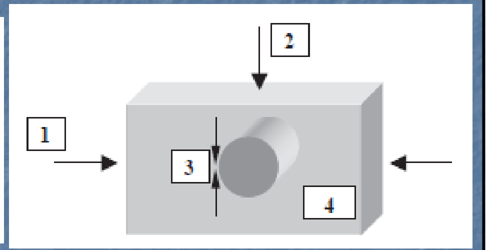


(Sugawara & Obara, 1999)

- Rock Stress Estimation

(a) Strategy for rock stress estimation

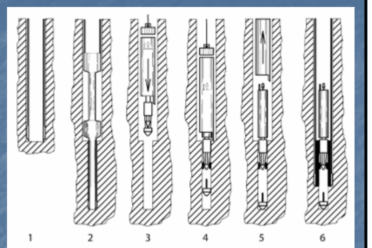


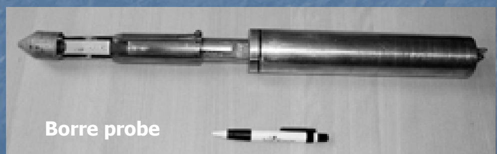


(Hudson & Cornet, 2003)

(b) Overcoring methods

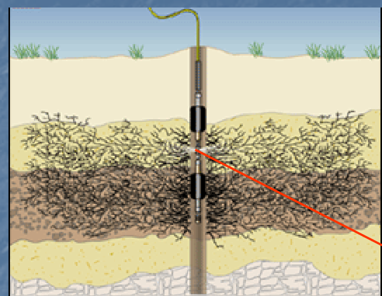
(www.bgr.bund.de)



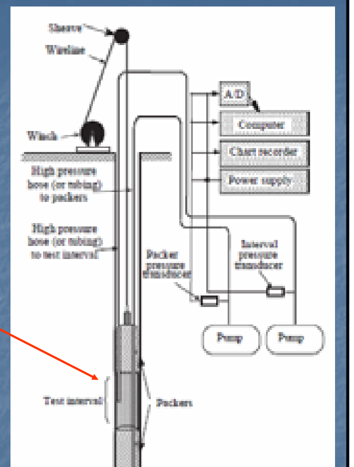


(Sjöberg et al., 2003)

(c) Hydraulic fracturing



(www.arstechnologies.com)



Typical HF test equipment set up

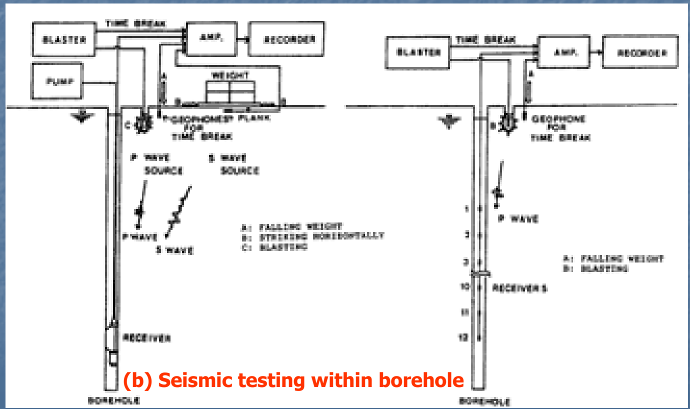
(Haimson & Cornet, 2003)

(d) Quality control of rock stress estimation

3.3. GEOPHYSICAL TESTING

- Seismic Testing Within and Between Boreholes

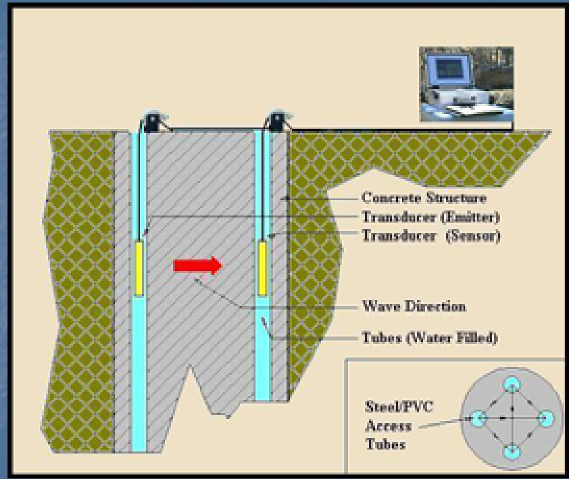
(a) Technical introduction



(b) Seismic testing within borehole

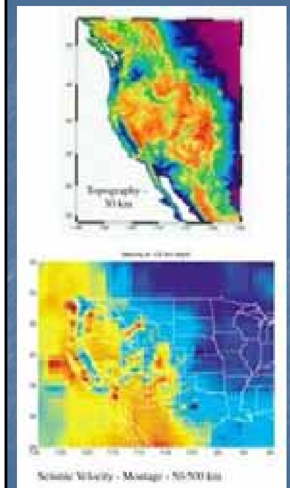
(Sassa et al., 1988)

(c) Seismic testing between boreholes

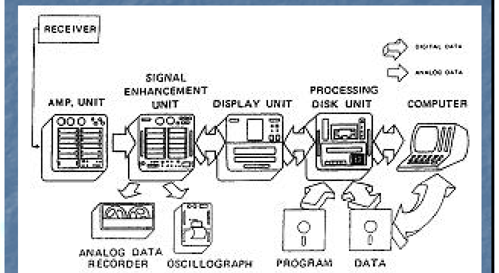


(freeweb.siol.net/slpdoo)

(d) Seismic tomography



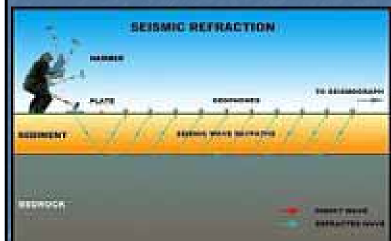
(www.iris.iris.edu)



(Sassa et al., 1988)

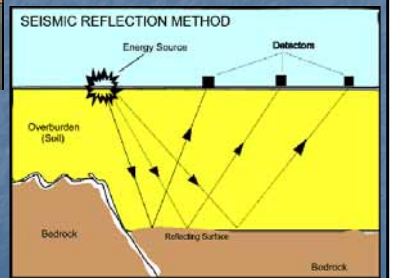
- Land Geophysics in Rock Engineering

(a)



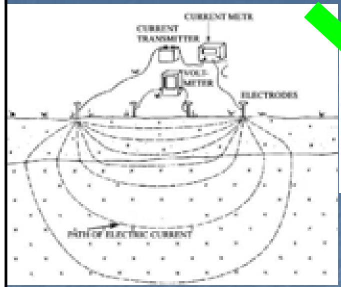
nana24.tarad.com

(b)

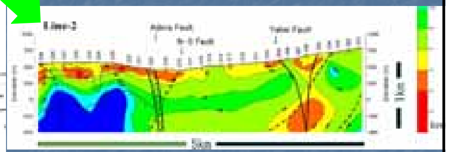


www.geologicresources.com/seismic_reflection

(c) Electrical (resistivity) method

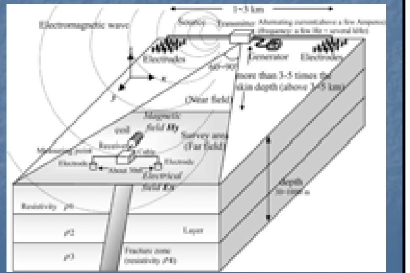


www.isotop.co.il



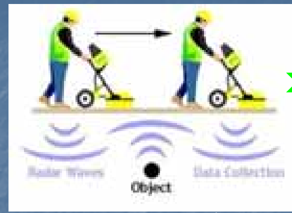
(SEG Japan, 2000)

(d) Electromagnetic method

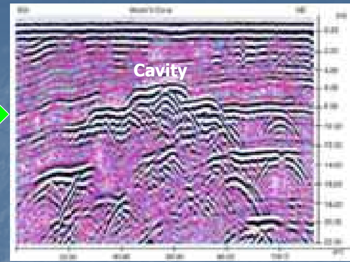


(Takahashi et al., 2004)

(e) Ground penetrating radar (GPR)

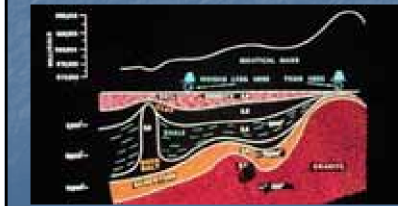


www.worksmartinc.net



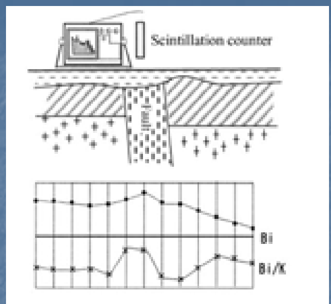
www.highcupwines.co.u

(f) Gravity method



www.lithoprobe.ca

(g) Radiometric method



Gamma ray intensity for Bismuth (Bi) and the ratio of Bismuth and Potassium (Bi/K)

(SEG Japan, 2000)

- Borehole Geophysics in Rock Engineering

3.4. OTHER TESTS

- Rapid Field Identification of Swelling and Slaking Rock
(Smear test, Taste test, Water reaction test, Anhydrite recognition)

- Large Scale Sampling and Triaxial Testing of Jointed Rock

(Natau & Mutschler, 1989)

www.seikensha.com

3.5. BOLTING AND ANCHORING TESTS

- Rockbolting Testing

www.igh.hr

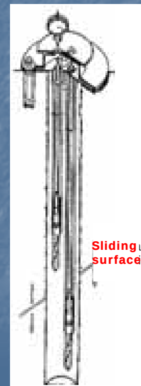
- Rock Anchorage Testing

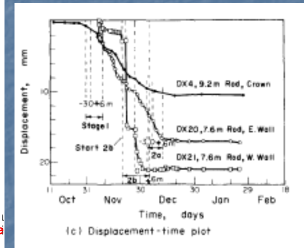
www.vsl-sg.com

PART 4. MONITORING

- Monitoring Rock Movements Using Borehole Extensometers

www.geotrade.com



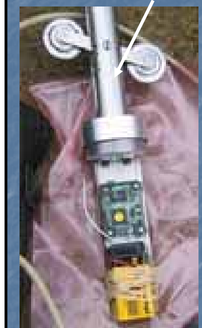


(Hansmire et al., 1978)

- Monitoring Rock Movements Using Inclinometers and Tiltmeters

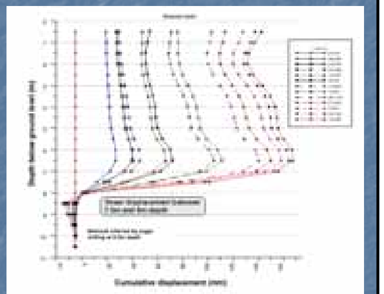
Inclinometers

Inclinometer and its installation



egweb.mines.edu

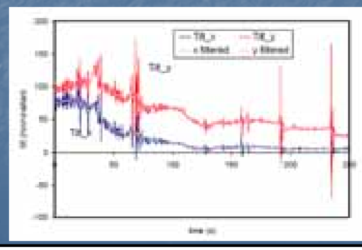
Inclinometer profiles recorded



www.uow.edu.au

Tiltmeter

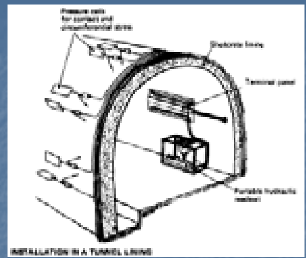
www.aracnet.com



(Frederking, 2005)

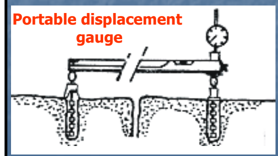
- Pressure Monitoring Using Hydraulic Cells

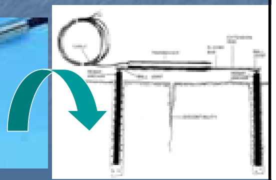
www.geotechsystems.com.au



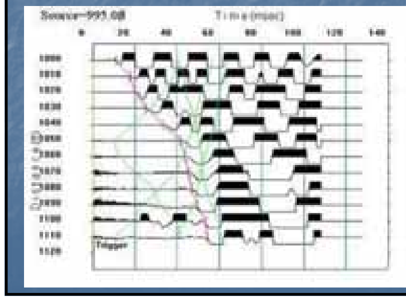
(Franklin et al., 1980)

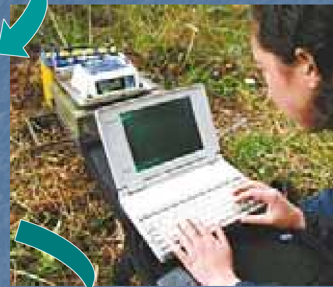
- Surface Monitoring of Movements Across Discontinuities





- Blast Vibration Monitoring





www.heritagegeophysics.com

SOME SELECTED ILLUSTRATIONS OF EXAMPLE SMs

(1) BLOCK PUNCH INDEX (BPI) TEST

(Ulusay et al., 2001)

1. Introduction and history of the suggested method:

Lacharite (1960)
Mazanti & Sowers (1965)
Vutukuri et al. (1974)
Stacey (1980)

→ *To determine direct shear strength of rock specimens*

Taselaar (1982)
Schrier (1988)

→ *Correlations between BPI and UCS without consideration on the size effect*

Gökceoglu (1997)
Ulusay & Gökceoglu (1997, 1998, 1999)
Sulukcu & Ulusay (2001)
Ulusay et al. (2001)

→ *Size effect on BPI and its use in rock engineering*

ACCEPTED AS A
SUGGESTED METHOD
BY ISRM

PERGAMON

International Journal of Rock Mechanics & Mining Sciences 38 (2001) 1113–1119

International Journal of
Rock Mechanics
and Mining Sciences

Draft ISRM suggested method for determining block punch strength index (BPI)

R. Ulusay*, C. Gokceoglu, S. Sulukcu

Department of Geological Engineering, Faculty of Engineering, Applied Geology Division, Hacettepe University, 06532 Beytepe, Ankara, Turkey

Accepted 26 November 2001

1. Introduction

1.1. Rock strength, particularly the uniaxial compres-

from point load testing, particularly for laminated weak rocks [4–7]. It was also suggested that BPI be used as an alternative input parameter for intact rock strength in

- **The uniaxial compressive strength (UCS) is an inportant input parameter in rock mass classification systems and in various design approaches.**
- **A standard UCS test requires high quality core samples**

↓ Limitations

Difficulty in weak, stratified and highly fractured rocks

↓ Alternative test method

POINT LOAD TEST

Presence of thin bedding or schistosity planes

↓

Rock cores divided into small discs

↓

Core length → **Too short to allow preparation of the specimens long enough even for point load testing**

↓

BLOCK PUNCH INDEX TEST, BPI

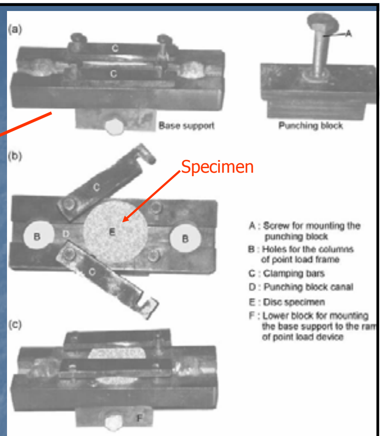
2. Scope:

BPI → **Strength index test to be used for**

(a) indirect determination of UCS
(b) stregnth classification of intact rock

The test measures the size-corrrected BPI value (BPI_s) and strength index in the strongest direction (BPI_{s90})

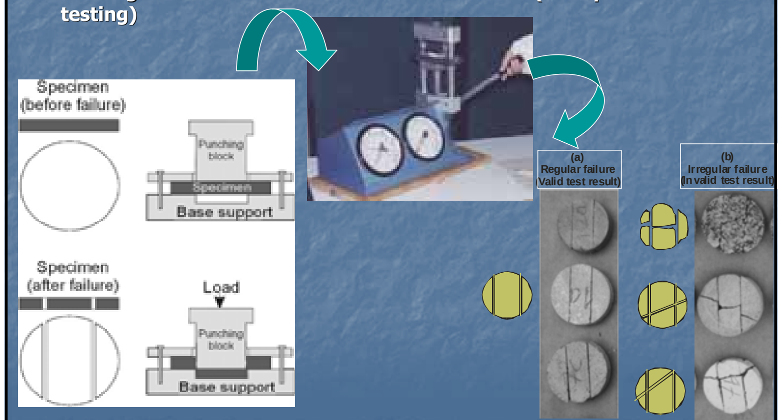
3. Apparatus:



The base support is fitted to the columns of the point load test frame through the holes at its both ends and then it is attached to the ram of the frame by means of a block with a hole at its bottom

4. Testing procedure:

- **Specimen thickness = 5 – 15 mm**
- **Diameter of specimen = 42 mm (BX) – 54 mm (NX)**
- **Loading rate = Failure occurs within 10 – 60 sec (as in point load testing)**



5. Calculations

t :10 mm (reference or equivalent thickness)

Reference diameter (D) : 50 mm (based on previous studies and suggested methods for UCS and $I_{s(50)}$)

Uncorrected BPI: $BPI = (10^{-3} F_{t,D})/A$

Size-corrected BPI:

$$BPI_c = 3499\ D^{-1.3926}\ t^{-1.1265}\ F_{t,D}$$

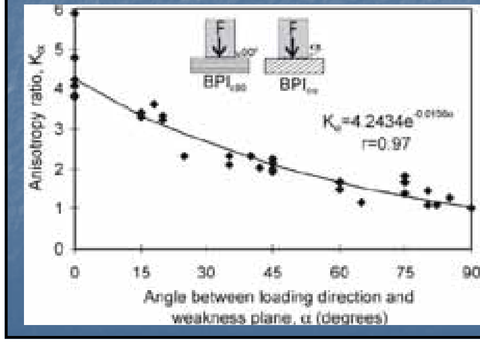
$F_{t,D}$: failure load of a specimen of any diameter and any thickness, recorded from the gauge in kN and converted to MN by the multiplication of 10^{-3}

D and t in mm.

Strength index in the strongest direction:

In the case of a testing, which is carried out on specimens prepared from cores from boreholes inclined at any angle to the weakness planes, if determination of the strength index in the strongest direction (i.e. loading perpendicular to the weakness plane) is considered, an additional conversion on BPIs should be done.

$$BPI_{c90} = 4.24\ e^{-0.0156\alpha}\ BPIc\alpha$$



BPI_{c90}: BPI_c obtained from boreholes perpendicular to the weakness planes (strongest direction)

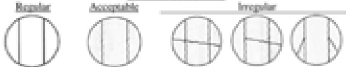
BPIcα : BPI_c of the specimen from boreholes inclined at any angle to the weakness planes.

6. Presentation of results

BLOCK PUNCH INDEX TEST									Date : 10/10/2001
Source location : Core samples from an open pit mine				Lithologic description : Light grey limestone with horizontal and moderately beddings					
Natural water content : All specimens are air-dried.									Tested by : RU - CG
Specimen No	Sampling depth (m)	D (mm)	t (mm)	α (degrees)	$F_{t,D}$ (kN)	*Failure pattern	BPI_c (MPa)	BPI_{c90} (MPa)	Remarks
1	11.50-12.00	46.5	11.8	90	7.0	RF	7.28	7.28	-
2	15.25-15.45	46.6	10.8	90	6.5	RF	7.40	7.40	-
3	16.10-16.20	46.8	9.20	90	5.5	RF	7.46	7.46	-
4	18.55-18.70	46.0	11.0	90	6.8	RF	7.72	7.72	-
5	19.20-20.20	46.4	10.6	90	6.5	RF	7.60	7.60	-

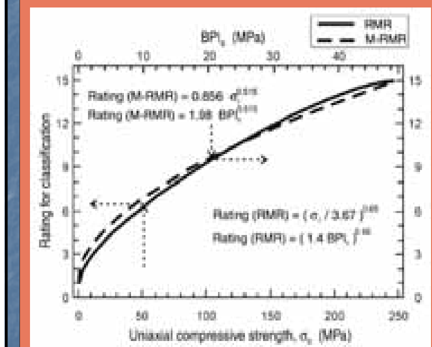
D: diameter; t: thickness; α: angle between loading direction and weakness plane; $F_{t,D}$: failure load; BPI_c: size-corrected BPI; BPI_{c90}: BPI_c in the strongest direction, when α<90°; *RF: regular failure; *IRF: irregular failure

FAILURE PATTERN



7. Notes (the use of BPI):

Estimation of UCS → $UCS = 5.1BPI_c$



Rating chart of BPI_c and UCS for RMR and M-RMR classifications

Classification of BPI_c (Sulukcu and Ulusay, 2001)

BPI_c (MPa)	Strength Class
< 1	Very weak
1 - 5	Weak
5 - 10	Moderate
10 - 20	Medium
20 - 50	High
> 50	Very high

Estimation of tensile strength:

$$\sigma_{tB} = 0.68BPI_c$$

(2) SM FOR THE COMPLETE STERSS-STARIN CURVE FOR INTACT ROCK IN UNIAXIAL COMPRESSION

(Fairhurst & Hudson, 1999)


PERGAMON

International Journal of Rock Mechanics and Mining Sciences

Draft ISRM suggested method for the complete stress–strain curve for intact rock in uniaxial compression

C.E. Fairhurst[a], J.A. Hudson[b]

Accepted 13 January 1999

ISRM SUGGESTED METHODS (SMs): SECOND SERIES

A Second Series of Suggested Methods is being produced by the ISRM Commission on Testing Methods from 1996 onwards. In this Second Series, for each SM two versions are published:

1. A Draft SM written by the Working Group Co-ordinator(s);
2. A Final SM also produced by the Working Group Co-ordinator but with amendments resulting from the Draft SM review by the Working Group Members and other comments received after publication of the Draft SM.

A suite of the new Suggested Methods is currently being published in this Journal. These started with an Indentation Hardness Index SM written by T. Szwedzicki and published in June 1998. Several more will be published in 1999.

Please send written comments on this SM to the President of the ISRM Commission on Testing Methods: Professor J.A. Hudson, 7 The Quadrangle, Welwyn Garden City, Herts AL8 6SG, UK

1. Introduction

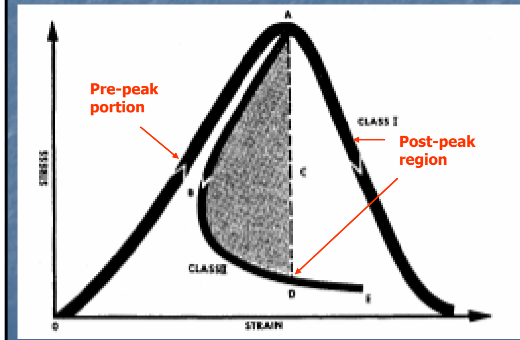
1.1 The subject of this suggested method is obtaining

region, through the onset of significant cracking, through the compressive strength (when the stress-strain curve has zero gradient), into the post-peak fail-

1. Introduction:

The subject of this suggested method is obtaining the complete force-displacement curve for intact rock in a laboratory test.

"Complete stress-strain curve" refers to the displacement of the specimen ends from initial loading, through the linear elastic pre-peak region, through the onset of significant cracking, through the compressive strength (when the stress-strain curve has zero gradient), into the post-peak failure locus, and through to the residual strength.



It is important to understand these two types of curve in order to optimize the control of rock failure.

2. Scope

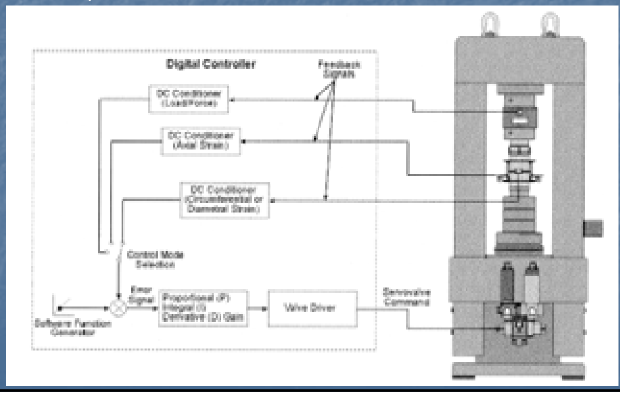
SM describes

- recommended testing and control procedures,
- loading system hardware
- specimen parameters

for conducting lab. tests on intact cylindrical rock specimens for obtaining complete force-displacement data.

3. Apparatus

- Loading system (Servo-controlled system)
- Hydraulics
- Spherically seated platen and specimen platen
- Control system
- Strain measurement transducers
- Data acqusition



4. Specimen perparation *(Similar to those required for UCS test)*

5. Procedure

Attach strain displacement transducers to the specimen and install the assembly onto the lower platen in the load frame

Apply a small preload in force ciontrol. this helps "seat" the specimen to the loading platens.

www.pmi.ou.edu

Follow the procedures recommended for specimens generally exhibiting ductile or brittle bahviors

6. Calculations

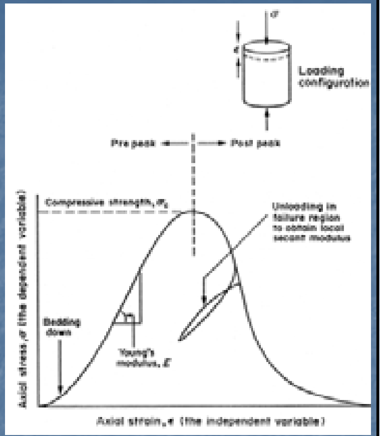
Compressive stress: $\sigma = P / A_0$

Axial strain: $\epsilon_a = \Delta l / l_0$

Diametric strain and circumferential strain: $\epsilon_d = \Delta l / d_0$

Young's modulus (E) is usually associated with pre-peak portion of the complete stress-strain curve. However, it can also be determined in the post-peak region.

- **Tangent modulus (E_i)**
- **Average Young's modulus (E_{av})**
- **Secant Young's modulus (E_s)**



7. Reporting of results

Lithologic description, rock anisotropy, source of sample, specimen information, general information.

THE BLUE BOOK CAN BE REQUESTED FROM

"ISRM TURKISH NATIONAL GROUP"

Assoc. Prof. Dr. AYDIN BILGIN

(Middle East Technical Univ., Dept. of Mining Engng., Ankara, Turkey)

(abilgin@metu.edu.tr)

OR

"ISRM"

Dr. Luis Lamas

(Secretary General of ISRM, LNEC, Lisbon, Portugal)

~~(secretariat.isrm@lnec.pt)~~

New email: secretariat@isrm.net


INTERNATIONAL SOCIETY FOR ROCK MECHANICS (ISRM)

"THE COMPLETE ISRM SUGGESTED METHODS FOR ROCK CHARACTERIZATION, TESTING AND MONITORING: 1974-2006"

FOR YOUR ORDER PLEASE CONTACT

WORKING GROUPS FOR "NEW AND UPGRADED SMs"

(1) Mode II Fracture Toughness Test

Co-ordinator: **Prof. Dr. Ove Stephansson** from GFZ, Germany

Three sub-groups were established:

(1) Punch Toughness Shear (PTS) Testing
(2) Shear Box Testing
(3) Triaxial Compression

→ **Will be submitted to the Commission in mid of 2009**

(2) Upgraded SMs for determining shear strength both in field and laboratory:

Co-ordinator: **Dr. Jose Muralha** from LNEC, Portugal (jmuralha@lnec.pt)

(3) SM on creep test:

Co-ordinator: **Prof. Dr. Ömer Aydan** from Tokai University of Japan (aydan@scc.u-tokai.ac.jp)

(4) Upgraded SMs for the quantitative description of discontinuities in rock masses:

Co-ordinator: **Prof. Dr. John P. Harrison**, Imperial College, UK (j.harrison@imperial.ac.uk)

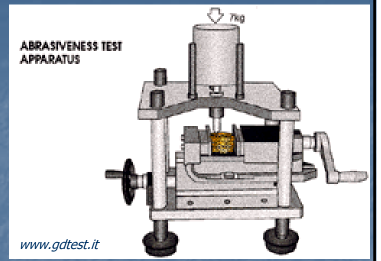
(5) Upgraded SMs for sonic velocity tests:
Co-ordinator: **Assoc. Prof. Dr. Adnan Aydın** from Lester Hall Univ., USA (aaydin@olemiss.edu)

(6) SM for monitoring rock movements using GPS system:
Co-ordinator: **Prof. Dr. Norikazu Shimizu**, Yamaguchi University of Japan (nshimizu@yamaguchi-u.ac.jp)

(7) SMs on Representation of geo-engineering data and geotechnical data and case histories in electronic form (RISMEF)
Coordinator: **Prof. Dr. Zuyu Chen** from China Institute of Water Resources and Hydropower Research, China (chenzuyu@iwhr.com)

THE DOCUMENTS WILL BE SUBMITTED TO THE COMMISSION IN LATE 2009 AND/OR IN 2010 AND 2011

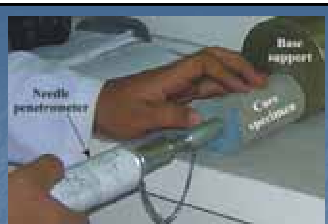
(8) SM on Abrasivity Test
(It is most recently established in April 2009)
Coordinator: **Dr. Robert J. Fowell**, UK)
(R.J.Fowell@leeds.ac.uk)

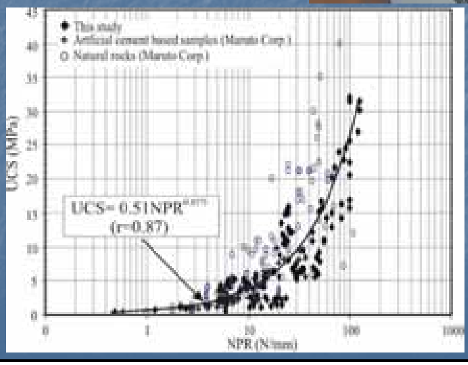


- The Commission also intends to establish a WG on the **NEEDLE PENETRATION TEST**

Field application

Laboratory application





(Erguler & Ulusay, 2007)

Evaluation Procedure for the New SMs or Updating of the Current SMs

Submission of a new SM or updated SM to the Commission

↓

Appointment of a reviewing group which will consist of 3 people to assess a new SM or updated SM

Acceptance ↓ **Revision** → **Author(s)**

Circulation of the SM document to the Commission members for comments

↓ **Final acceptance by the Commission and ISRM**

Submission to IJRMMS for publication as ISRM SM


ON BEHALF OF THE ISRM, THE COMMISSION ON TESTING METHODS KINDLY INVITE THE ROCK ENGINEERS TO JOIN TO AND/OR ESTABLISH WGs FOR NEW SMs AND/OR TO UPGRADE THE CURRENT METHODS
Prof. Dr. Reşat Ulusay President (Turkey)
Prof. Dr. O. Stephansson (Sweeden-Germany)
Dr. Robert J. Fowell (UK)
Prof. Dr. Xia-Ting Feng (China)
Prof. Dr. Hasan Gerçek (Turkey)
Prof. Dr.Yuzo Obara (Japan)
Dr. Eda F. de Quadros (Brasil)
Dr. A.K. Dhawan (India)
Dr. J.L. Yow Jr (USA)
Prof.Dr. Gyo-Cheol Jeong (Korea)
Ex-Officio Members:
Prof. Dr. John A. Hudson (ISRM President, UK)
Dr. Nuno Grossmann (Vice President, Europe) (Portugal)


THE END