

No. 39, JULY 1984

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OF GEOTECHNICAL ENGINEERING



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5. CONCLUSIONS

Useful, and more importantly, continuous information is considered to have been gained from the seismic techniques employed. The non-continuous nature of the weathering-resistant zones or core-stones appears to have assisted in providing seismic refraction data at depth. The high energy input system employed for the seismic investigation, namely a drop weight device, is considered to have greatly facilitated the interpretation. One obvious limitation of the seismic approach is an inability to accurately define the thickness of the weathering-resistant zones and limited direct drilling is considered essential in this regard. It is considered that cost-effective investigation can be carried out in granitic terrain using the seismic approach coupled with check drilling to provide continuous information across the area of interest.

ACKNOWLEDGEMENTS

The permission of Kampel Abramowitz Yawitch and Partners Inc. to publish this case history is gratefully acknowledged.

NITRR DICTIONARY OF ROAD AND TRANSPORT TERMS  
(Up to September 1982)

The above dictionary of terms including soil and rock profiling terms was published as a supplement to the AEG (S.A. Section) Newsletter November 1982. If you would like a copy please write enclosing a R3-00 postal order or cheque in favour of "Geotechnical Division SAICE" to

The Editor: Ground Profile  
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INTERNATIONAL SYMPOSIUM ON REINFORCED EARTH  
MEXICO 1983

Copies of the proceedings of the above conference in one volume of 112 pages in soft cover are available at a cost of \$25 from

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2ND INTERNATIONAL CONFERENCE  
SOIL DYNAMICS AND EARTHQUAKE ENGINEERING

We have received the call for papers for the above conference which will be held on board the QE2 during June 1985. For further information and copies of the bulletin please contact the Editor.

1ST INT. CONF. ON GEOMECHANICS IN TROPICAL  
LATERITIC AND SAPROLITIC SOILS  
February 1985

We have Bulletin No. 2: For further information please contact the Editor.

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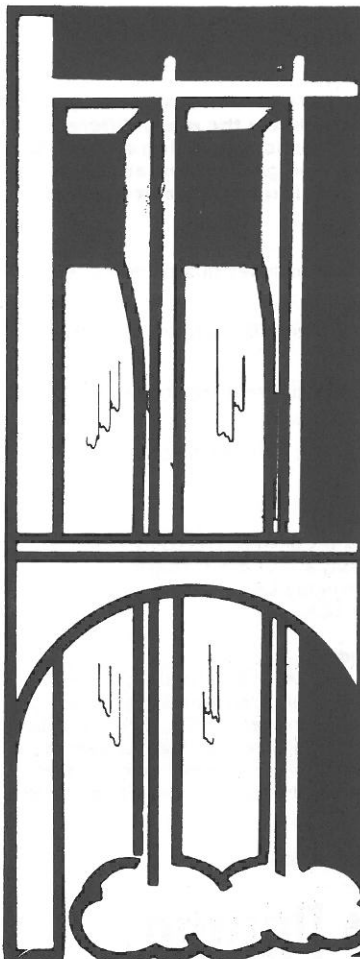
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# MATERIALS FOR DAMS '84

**12-14 DECEMBER 1984  
Loews Hotel, Monte Carlo**

Conference languages: English and French  
Study tours will follow the conference

**This conference has been organized to provide a valuable opportunity for engineers and experts to discuss the many different aspects of materials used in dam construction, covering earth- and rockfill, concrete, geomembranes and geotextiles, and the various additives for soil and cement. Subjects include:**

**CONCRETE** — roller compacted concrete; additives; quality control; testing; repairs

**EARTH & ROCKFILL** — impervious elements; filters; hydraulic fill; repairs

**MAN-MADE MATERIALS** — textiles; bituminous membranes; placement; sealing

**TAILINGS** — fill methods; safety; monitoring; instrumentation

**The Chairmen are:**

Dr. P. Bertacchi, ENEL, Italy

J. Cotillon, Secretary General, International Commission on Large Dams

Prof. J. Laginha Serafim, Coimbra University and COBA, Portugal

Dr. A. Penman, Building Research Station (retd.), UK

Dr. J. A. Veltrop, Harza Engineering Co., USA.

**Participating organizations include:**

Balfour Beatty, UK; Carlisle SynTec Systems, USA; COBA, Portugal; Coyne et Bellier, France; Electricité de France, France; ENEL, Italy; Entreprise Bachy, France; Exxon Co., USA; GTM International, France; Harza Engineering Co., USA; International Engineering Co. Inc., USA; Motor Columbus, Switzerland; Skanska, Sweden; Rhône Poulenc Fibres Bezons, France; Société du Canal de Provence, France; Société Ingema, Morocco; Sogréah, France; VCLA Ingénieurs-Conseils, Canada; Vriens Diving Co., Netherlands.

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For full details of the conference and a registration form,  
see **Water Power & Dam Construction** or write to:  
The Editor, **Water Power & Dam Construction**, Room L305 I,  
Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS, England  
Tel: 01-661 3622. Tlx: 892084 BISPRS G (EEP)

OVERSEAS PUBLICATIONS RECENTLY RECEIVED BY THE  
GEOTECHNICAL DIVISION

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SWEDISH GEOTECHNICAL INSTITUTE, LINKÖPING SWEDEN

- Jan A Berntson : Pore pressure variations in clay soil in the Gothenburg region. Report No. 20, 1983.
  - Ulf Bergdahl and Ulf Eriksson : Estimation of Soil Characteristics from Penetration Test Results - A literature survey, Report No. 22, 1983.
  - Leif Viberg : Geological Aerial photo interpretation of coarse tills. Report No. 23, 1983.
  - Alf Lindmark and Bengt Rosen : Radon in soil - Exhalation, Seasonal variations, permeability.
- 

SOILS AND FOUNDATIONS: Japanese Society of Soil Mechanics and Foundation Engineering. Vol 24 No.1, March 1984.

For further information please contact:

The Secretary (Mr. R.J. Scheurenberg)  
Geotechnical Division SAICE  
P.O. Box 221  
RIVONIA  
2128 tel: 011 803-3200

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INTERNATION CONFERENCE ON ADVANCE IN  
UNDERGROUND PIPELINE ENGINEERING

ANNOUNCEMENT & CALL FOR PAPERS

The Pipeline Division of the American Society of Civil Engineers is pleased to announce specialty conference on Advances in Underground Pipeline Engineering to be held August 27-29, 1985 in Madison, Wisconsin.

The conference will address analysis, design, construction, operation and inspection of pipelines with metal, concrete, clay, plastics, fibreglass, ductile iron, and asbestos. It will also address pipeline control systems.

Persons interested in submitting a paper should send an abstract of approximately 500 words by July 1, 1984 to:

Professor Jey K. Jeyapalan  
Department of Civil and Environmental Engineering  
University of Wisconsin-Madison  
Madison, WI 53706  
USA  
Phone (608) 262-7240

CONSTRUCTION ON DOLOMITE

The Geotechnical Division of the SAICE has pleasure in announcing that the PhD thesis ENGINEERING CONSTRUCTION ON DOLOMITE by F. von M. WAGENER is now available in A5 bookform. The proceeds from the sale of this book will be donated to the Divisions' Jennings-Award fund.

According to Drs. A.B.A. Brink and A.A.B. Williams the work can be regarded as a state-of-the-art of building on dolomites in South Africa. It is recommended reading for any practitioner, geological or engineering, who is faced with the challenge of building on soluble rocks.

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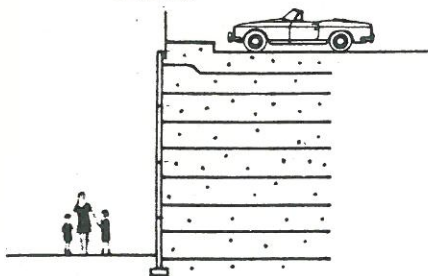
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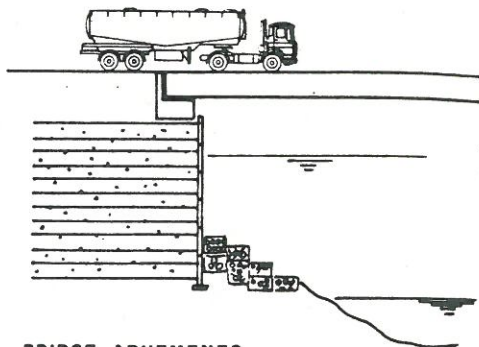
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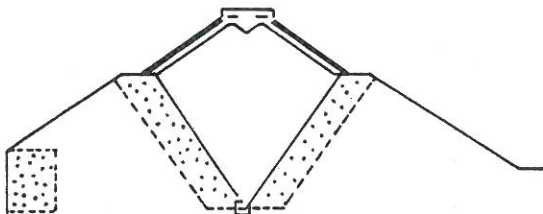
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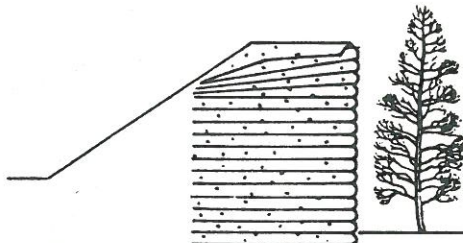
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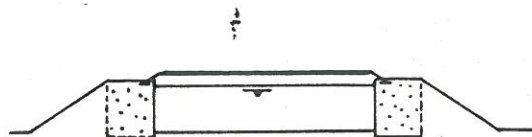
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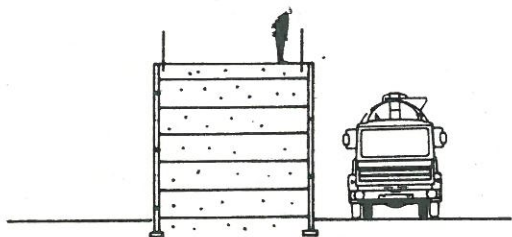


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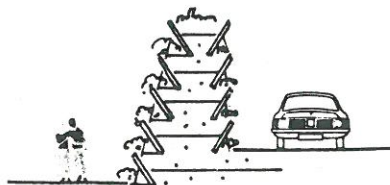


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TECHNICAL INFORMATION FOR INDUSTRY

The publication "Technical Information for Industry" is issued by the CSIR to keep interested persons informed about the work carried out by the CSIR. One of the latest issues deals with:

IN-SITU DEFORMABILITY OF ROCK AND ROCK MASSES.

Any members who wish to be placed on the mailing list for this and future issues in the field of Rock Mechanics should write to:

The Chief Director  
National Mechanical Engineering Research Institute  
P.O. Box 395  
PRETORIA  
0001

or telephone (012) 86-9211 ext. 2128  
Mr. W.L. van Heerden  
Deputy Director

ext. 2140  
Mr. U.W. Vogler  
Deputy Head  
Geomechanics Division

---

THE NEW ZEALAND SOCIETY ON LARGE DAMS

A symposium on ENGINEERING FOR DAMS AND CANALS was held in New Zealand in November 1983. The symposium was prompted by public concern over recent failures of such works and was organised jointly by the New Zealand Geomechanics Society and the New Zealand Society on Large Dams on behalf of the Institution of Professional Engineers, New Zealand.

The symposium addressed three main topics, namely:

Philosophy and Methods of Investigation Used in New Zealand  
The Problem of Design and Construction  
Preventive Engineering.

Papers on these topics were arranged from several contributors and were discussed by the participants.

The proceedings of the symposium, comprising the arranged papers, the keynote address by Professor D. Stapledon and a transcript of the discussions are being published. They will shortly be available from the:

New Zealand Geomechanics Society  
c/o Institution of Professional Engineers  
Box 12241  
Wellington  
NEW ZEALAND

The price is \$NZ50-00 post free with a discount of \$NZ10-00 for members of either New Zealand Society.

ISSMF, TECHNICAL-SUBCOMMITTEE ON ALLOWABLE DEFORMATIONS  
OF BUILDINGS AND DAMAGES

Chairman: Dr. Pablo Girault D. Secretary: Ing. Juan J. Schmitter

MEXICAN SOCIETY OF SOIL MECHANICS  
AND FOUNDATION ENGINEERING (SMMS)  
July 1984

To National Societies affiliated to the ISSHFE:

The Technical Subcommittee on Allowable Deformations of Buildings and Damages of the Int Soc of Soil Mech & Fdn Engrg is requesting, by means of this letter, the cooperation of the members of your Soil Mechanics Society, in establishing the values of allowable Distortions of buildings in order to recommend standards for buildings of different types of construction and on different subsoils.

The objective of our Subcommittee is to "pin point" (establish as accurately as possible) the boundaries between allowable and unallowable settlements for buildings of different types on different subsoils. We will restrict ourselves to static movements.

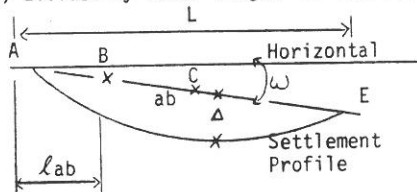
Professor Victor de Mello has suggested that our Subcommittee should work on:

Obtaining, first hand, or reliable information, on angular distortions of buildings and relate them to cracking and damages.

The best source will be levellings of buildings under a known member's supervision.

The immediate objective is to establish reliable (first hand or reliable or verifiable) "histograms of angular distortions vs cracks" (and other damages) due to settlements or heave.

Angular distortions is defined as differential settlement between  $i$  and  $j$ ,  $\int_{ij}$ , divided by the span length,  $l_{ij}$ , after subtracting the angle of tilt of the building  $\omega$ . Values of (maximum relative deflection) divided by total length  $L$  are also useful.



$$(\text{Angular Distortion}) = \frac{\int_{ab}}{ab \ l_{ab}} - \omega$$

A few measurements of distortion sent by your members near the present allowable values (enclosed herewith) and indicating cracks existence or non existence and width of cracks, would held very much verify or modify the present values.

TABLE 1: LIMITING ANGULAR DISTORTION

Category of potential damage (1)	(2)
Danger of machinery sensitive to settlement	1/750
Danger to frames with diagonals	1/600
Safe limit for no cracking of buildings	1/500
First cracking of panel walls	1/300
Difficulties with overhead cranes	1/300
Tilting of high rigid buildings becomes visible	1/250
Considerable cracking of panel and brick walls	1/150
Danger of constructural damage to general buildings	1/150
Safe limit for flexible brick walls, L/H 4	1/150

\*From Bjerruin (1)

Indication of type of Building, Office, Residential Industrial Plant, etc: type of frame: concrete, steel, etc: or brick or concrete block walls, on clay, sand, etc: subsoils, is necessary also.

Recognition to the contributor will be given in the report.

Please send the information to your members as soon as possible and have them reply to:

Pablo Girault  
Chairman Subcommittee on Allowable  
Deformation of Buildings and Damages.  
Av. Volcán = 120  
México, D.F. 11000

This information will have to be summarised by the Subcommittee in Feb-March 1985, so please send it as soon as possible.

Thanks for your cooperation,

Very sincerely yours:

PABLO GIRAULT  
CHAIRMAN

Please address all communications to:  
Chairman,  
Av. Volcán 120  
C.P. 11000 México, D.F.  
MEXICO

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The Editor  
Ground Profile  
S.A.I.C.E.  
Kelvin House  
2 Hollard Street  
JOHANNESBURG

Dear Sir,

RE: GUIDELINES FOR GEOTECHNICAL INVESTIGATION  
OF TOWNSHIPS FOR THE DEPT. OF LOCAL GOVERNMENT

I understand that a committee has been appointed for reconsidering the Dept. of Local Government's guidelines for township investigations and that the Geotechnical Division of the S.A.I.C.E. and the A.E.G. are represented on this committee.

As a geotechnical engineer involved in township investigations I would like to enquire if there is any talk of specific aspects of the investigation such as geological mapping being reserved exclusively for Engineering Geologists or a selected panel of approved Engineering Geologists.

It is my belief that the ultimate aim of the investigation of townships is to facilitate the selection of suitable foundation types for various zones encountered in the township. While the role of the Engineering Geologist in achieving the aim is often vital, this is essentially an engineering assessment and will probably be made in conjunction with a Geotechnical Engineer. This is particularly so when specific recommendations on the design of foundations or performance of the structure are to be made.

In view of the above, it would be unreasonable for the guidelines to exclude the Geotechnical Engineer from the early stages of the investigation process. Property developers should be free to call on the services of a Geotechnical Engineer from the start should they so desire. Any geological mapping which is required may then be done in conjunction with an Engineering Geologist thereby excluding neither party from the work they are best qualified to perform.

I would appreciate it if this point of view could be presented by our representatives on the Township Investigation Committee.

Yours faithfully,

PETER DAY Pr. Eng.

#### EDITORS REPLY

It would be possible for me to formulate a reply to questions posed by Peter Day since I am aware of some of the background to the guidelines. However the Division is represented by Gary Jones on this issue and he would therefore be best qualified to answer. A copy of Peter's letter has been forwarded to Gary. We therefore hope to publish a reply in the next issue of the Newsletter.



# Why should a nice plastics company like Gundle get involved in your dam pollution problems?

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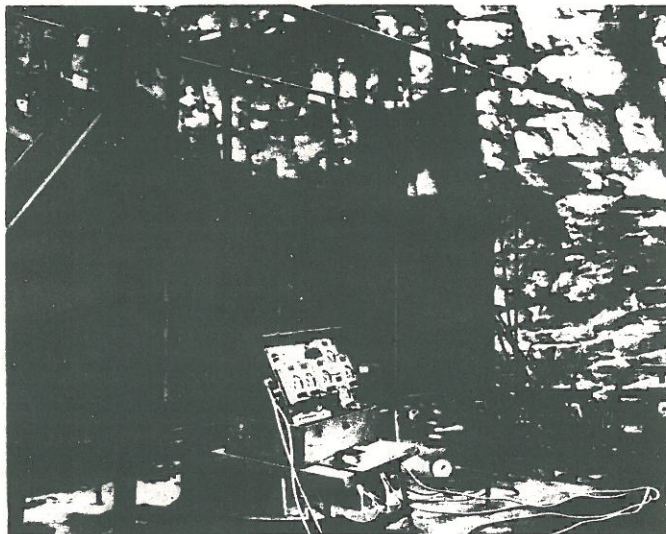
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## IN-SITU DEFORMABILITY OF ROCK AND ROCK MASSES

The Geomechanics Division of the National Mechanical Engineering Research Institute of the CSIR has conducted a great number of different kinds of field investigations on behalf of the civil and mining engineering industries. A team of highly qualified engineers and research workers, familiar with site investigation techniques and experienced in the use of a wide range of available sophisticated equipment, assist industry with the solution of rock engineering problems by planning, executing and evaluating specialised in-situ tests.

This TI reviews two techniques which were recently used by the Geomechanics Division on a number of occasions to determine in-situ deformability of rock and rock masses.

## Introduction

By virtue of their mechanical characteristics rocks, when used for structural purposes, are generally put under compression and among the different aspects of the mechanical behaviour the deformation due to load is of particular importance. Although methods are available to simulate various combined stress states when determining rock deformation in the laboratory, the complex conditions prevailing in nature are best explored by loading the rock in situ.

## Techniques used in recent investigations

### (a) Borehole Jacking Test



Fig. 1: Borehole jacking test by means of a Goodman jack.

A cylindrical jack such as a Goodman jack is placed inside a borehole and its radial loading platens are extended. The expansion of the hole is measured with an accuracy of 0,01mm against the hydraulic pressure in the jack.

THIS TEST IS AIMED AT DETERMINING THE LOCAL DEFORMABILITY OF ROCK AT DEPTH.

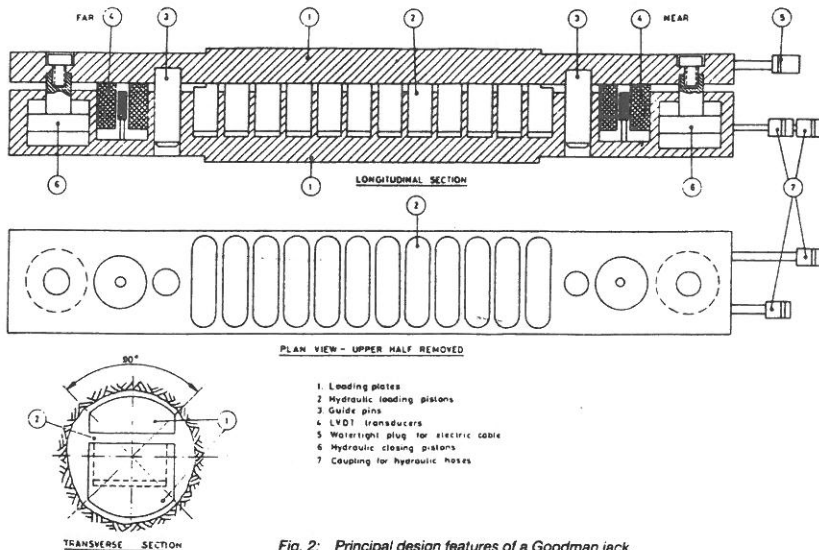
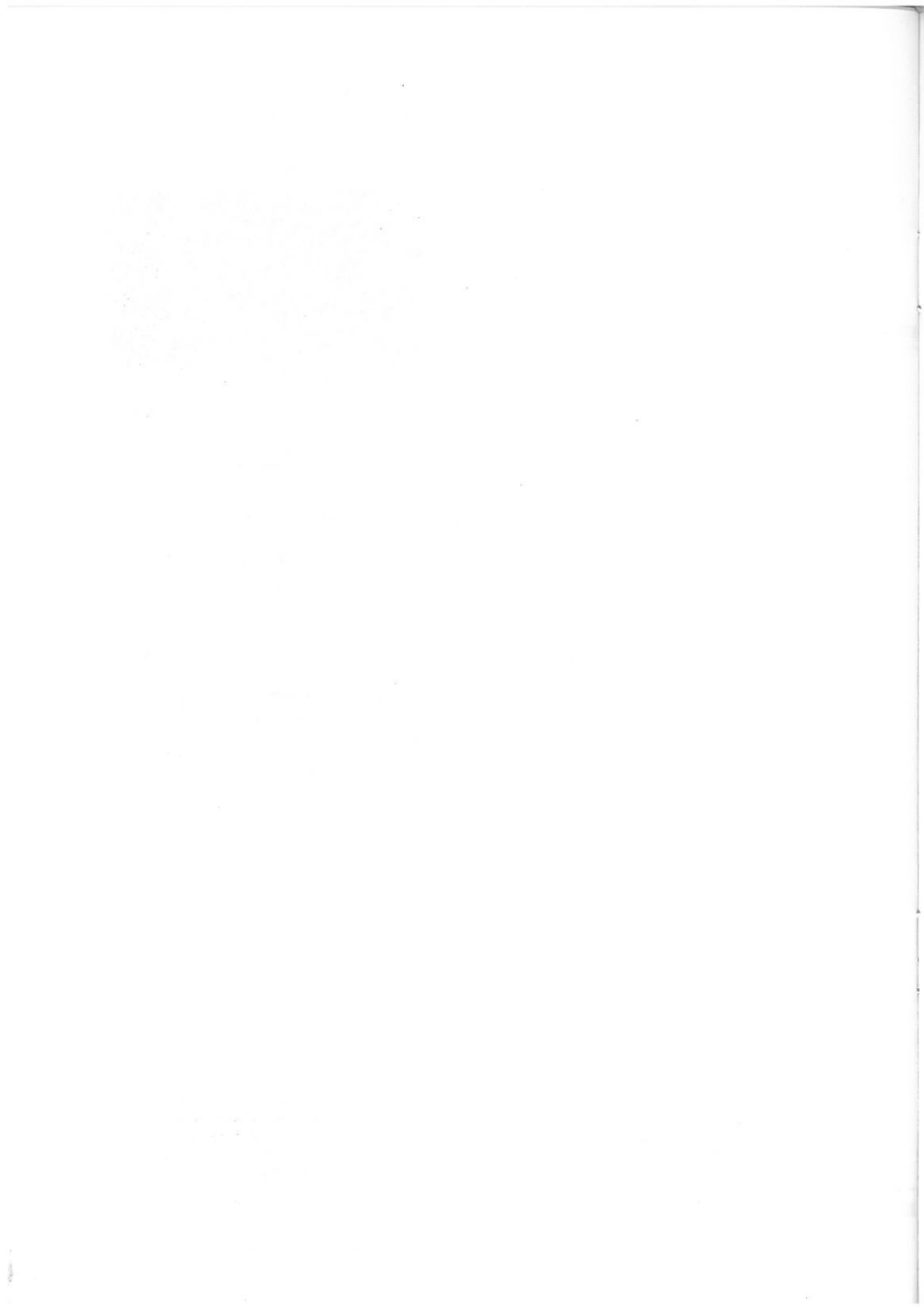


Fig. 2: Principal design features of a Goodman jack.

The two opposing loading platens in the form of 90° segments of 203mm length have radii of 38,1mm. The jack thus fits exactly into a borehole of NX size (76,2mm).

During any test series hundreds of sets of data are usually collected. A computer program has been developed to process these data and provide printouts and graphs in order to simplify interpretation.



Both test methods may be used independently from each other at specific sites to satisfy specific requirements. There are, however, also cases where the two test methods may complement each other when used simultaneously at the same site. This is the case if the rock mass properties vary substantially at a site from one test location to the other. Under these circumstances the few plate loading tests that were carried out may not provide sufficient information for design purposes and additional information between the locations of the plate loading tests is necessary. Although they are not really designed for testing rock mass conditions, borehole jacking tests may play a part in such cases and help to satisfy the need for further information in a quick and relatively inexpensive manner.

## Information

The CSIR is available to assist industry in investigations whenever such investigations require specialised scientific and technical knowledge.

For further information on geomechanics research at the CSIR, please contact:

The Head  
Geomechanics Division  
National Mechanical Engineering  
Research Institute  
CSIR  
P O Box 395  
Pretoria 0001

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Telex: 3-21287 SA

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## Forthcoming conferences/symposia/courses at the CSIR Conference Centre and regional CSIR centres

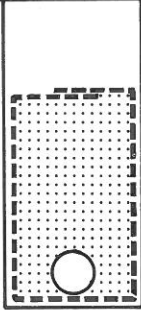
DATE	THEME	VENUE
August 6-9	Annual Transportation Convention 1984 Department of Transport	Pretoria
August 14	C1.3: Search Strategy Design (course) Centre for Scientific and Technical Information, CSIR	Pretoria
August 21-22	C9.2: DIALOG Online Training (course) Centre for Scientific and Technical Information, CSIR	Pretoria
August 27-31	Training for Technical Writers, Technical Writing Module 3 (course) Production Engineering Advisory Service (PEAS), CSIR	Pretoria
September 3-7	Training for Technical Writers, Technical Writing Module 3 (course) Production Engineering Advisory Service (PEAS), CSIR	Pretoria
September 4	C1.4: Search Strategy Design (course) Centre for Scientific and Technical Information, CSIR	Pretoria
September 6	C3.1: Patents and Patent Information (course) Centre for Scientific and Technical Information, CSIR	Pretoria
September 17-21	Training for Technical Writers, Technical Writing Module 3 (course) Production Engineering Advisory Service (PEAS), CSIR	Pretoria
September 18-19	Research for Development 1984 (conference) Associated Scientific and Technical Societies and CSIR	Pretoria
September 26-27	C6.2: Setting up a Small Library (course) Centre for Scientific and Technical Information, CSIR	Sunnyside Park Hotel, Johannesburg

Please contact your local CSTI/CSIR representative for more information.

# bidim<sup>®</sup>



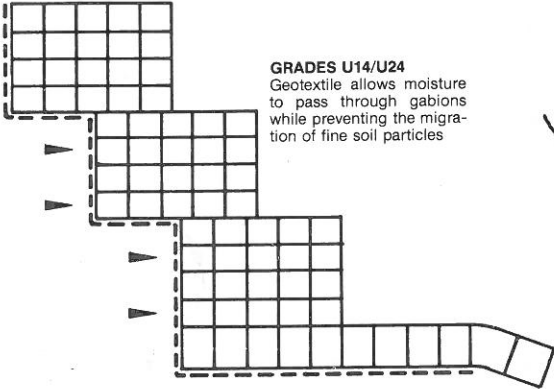
TRANSVAAL ..... 011-6184483  
 NATAL ..... 031-722345  
 E. CAPE ..... 0431-25974  
 W. CAPE ..... 021-534525



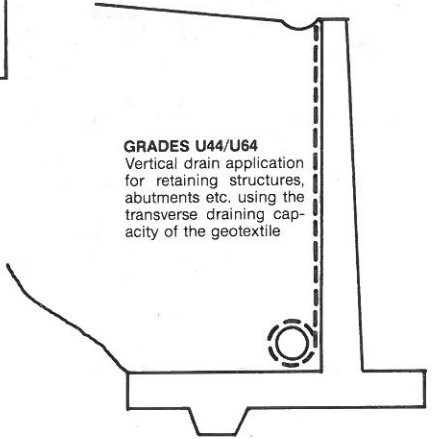
**GRADES U14/U24**  
 Normal permeability  
 $3 \times 10^{-9}$  m/s  
 Normal throughflow up to 220 l/m<sup>2</sup>/sec  
 Simple subsurface drain configuration



**GRADES U44/U64**  
 Transverse permeability  
 $6 \times 10^{-4}$  m/s  
 Transverse throughflow up to 68 l/hr/m width of fabric  
 Cut-off drain application in limited access or where stone is expensive



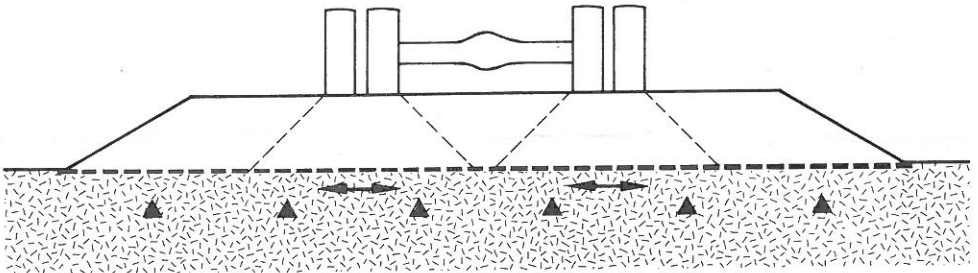
**GRADES U14/U24**  
 Geotextile allows moisture to pass through gabions while preventing the migration of fine soil particles



**GRADES U44/U64**  
 Vertical drain application for retaining structures, abutments etc. using the transverse draining capacity of the geotextile

**GRADES U34/U44**

Geotextile used as an interlayer between base material and subgrade prevents contamination of the selected fill while reinforcing the soil interface. Moisture moving upwards due to applied stress is transported away laterally thus accelerating consolidation.



**NOEL HUNT GEOFABRICS (PTY) LIMITED**  
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