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INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGISTS

1 NOTICE OF MEETING AT GEOENG 2000 IN MELBOURNE

There will be an inaugural meeting of the Australasian IAEG Group (which has been formed under the umbrella of the AGS and the NZGS) at the Geoeng 2000 conference in Melbourne. The meeting will take place at 5.30pm on Tuesday, 21 November 2000 in a room at the Conference venue (the Melbourne Exhibition and Convention Centre). There will be an address by representatives of IAEG, a presentation describing the progress of the Australasian Group, and a meal and social evening afterwards.

2 DATA BASE OF PRACTITIONERS

An initiative of the Australasia IAEG Group Steering Committee is to compile a list of engineering geologists for the region. The objective is to establish a data base of practitioners, with a view to advancing the aims of the IAEG in the Australasian region, arranging informal meetings, forming working groups, networking and promoting a common interest in engineering geology.

It is intended that the list will be published in the Australian Geomechanics Society Journal and the New Zealand Geomechanics News; the list will also be circulated to all contributing engineering geologists following compilation. We look forward to your response, it will be to your benefit to complete this form and send it off, so put pen to paper now.

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We would appreciate it if you could pass this on to other engineering geologists, or alternatively, provide the names and address of others who may be interested: Please return the completed forms by 30 November 2000 to:

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Front Cover (Andrew Leventhal): View of an operating coke oven in Goa, India, immediately after the pushing of coke. The heat in the underflue (beneath the floor) produced up to 0.6m of settlement in this oven battery. Details of the project are presented in the proceedings of the John Booker Memorial Symposium (Nov 2000), with abridged details in the proceedings of GeoEng2000 (Nov 2000). *(Courtesy of GHD-LongMac Pty Ltd)*

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UPCOMING AGS EMINENT SPEAKER TALKS – SYDNEY, PERTH, ADELAIDE

“Application of Limit State Principles to Geotechnical Engineering”

Speaker: Brian Simpson (Ove Arup & Partners - UK)

SYNOPSIS

Eurocode 7, on Geotechnical Design, is one of a suite of nine European codes for the design of buildings and civil engineering structures. Work on Eurocode 7 started in the early 1980s, and it was published as a draft for development in 1995. A final version is due for publication in 2001.

It is intended that the Eurocodes will be mutually consistent documents, and this has set a major challenge to geotechnical design, since the interface between geotechnical and structural design codes has been confused in many nations, including the UK. The Eurocodes are based on a limit state method, with safety margins generally provided in the form of partial factors.

Eurocode 7 sets out the use of a partial factor approach to geotechnical design in a context of sound geotechnical engineering. It attempts to define the process by which parameter values will be selected for calculation, from the usual sparse and scattered data available to engineers. In separate sections, it then details the application of this approach to typical foundation types, retaining structures and slopes.

This talk will describe the contents of the code and present some of the more important, and controversial, features of its methods. These will be illustrated by examples of both foundations and retaining structures. Likely changes between the 1995 draft and the issue planned for 2001 will be discussed.

BRIAN SIMPSON

Brian Simpson is a director of Ove Arup & Partners and a principal of Arup Geotechnics. He joined Arups in 1971 after researching the use of finite element methods in geotechnics at Cambridge University. He has worked on a wide range of geotechnical and ground-structure interaction problems, with particular interests in numerical modelling, retaining structures and tunnels, and in 1992 presented the British Geotechnical Society's Rankine Lecture on the subject "Retaining structures - displacement and design". Since the early 1980s, he has been involved in the development of Eurocode 7 (Geotechnical Design), having been a member of its drafting panels and vice-chairman of the CEN (Comité Européen de Normalisation) committee on Eurocode 7. He was lead author of a Commentary on Eurocode 7 published by EMAP, and is currently Editor of the journal *Géotechnique*.

TIMES LOCATIONS AND CONTACTS

SYDNEY: Monday 13th November, 5.30 for 6pm.
IEAust, Harrick Auditorium, Milsons Point.
Contact: craig.covil@arup.com.au

PERTH: Tuesday 14th November, 5.30 for 6pm.
IEAust, 712 Murray St, West Perth.
Contact: derek.pennington@arup.com.au

ADELAIDE: Thursday 16th November, 5.30 for 6pm.
IEAust, 11 Bagot St, North Adelaide.
Contact: mjaksa@civeng.adelaide.edu.au

EDITORIAL

This is our ninth issue of Australian Geomechanics. While it is now at least twice as frequent, it is still late. It seems I am never going to be able to boast about getting an issue out on time. This time I have a once in a millennium excuse - the Olympics are to blame! No way am I letting such an excuse go to waste.

This issue is an exhibition of the work of the young members of the Society. The first seven papers and Glastonbury have been drawn from those published in the Fourth Australia New Zealand Young Geotechnical Professionals Conference, held in Perth in February 2000. These highlight the research and practice of members nominated by their organisations to attend the conference. The proceedings contain thirty six papers and shows that the Society has many capable young members. John Small, Nasser Khalili and I organised the first of these conferences in 1994, it was considered a success and it was decided to organise future conferences at two yearly intervals. Since then the organising committees have generally consisted of young members and the process has become self perpetuating. The content of these papers and the fact that the conferences are organised by our young members indicates that the Society's future is in good hands.

The papers by de Ambrosis (the younger), Gourlay and Moyes are drawn from ones presented during a Young Geotechs evening in Sydney – again these point to the secure future of the Society. If the better of our monthly speakers around the country could write up their presentation in this manner, the Journal would provide an invaluable repository of local knowledge for our members. Each chapter should consider this.

Finally, there are several pages devoted to discussion and letters regarding the two papers (Fell and Risk) in the March issue – it is good to see that the geotechnical community has sprung to life on these matters. Several views are put and replies provided.

Garry Mostyn
Editor

AGS National Committee

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From The Chairman's Desk

I am indebted to a colleague for pointing out to me a marvellous mixed metaphor that he attributed to a Manchester United football player. I think it aptly describes how I feel about the current state of our Society: "I can see the carrot at the end of the tunnel".

Incorporation of AGS

With this thought in mind, it is important that I provide a brief update on a significant issue that has been a concern of many of us, and occupied the time of a number of members of your national committee over the past few years.

You will recall that as a Society we voted on and approved a Constitution not so long ago. The motivation behind this development was always to place our Society in a stronger position than it had previously been, and in particular to provide us with more autonomy and an unequivocal measure of financial independence. In addition to drafting and approving a formal constitution, we subsequently applied as a Society for incorporation as a non-profit organisation within the ACT. Unfortunately, this application for incorporation hit a number snags in the ACT Registrar General's Office. These stem essentially from several ambiguities and omissions in our Constitution, as presently approved by the membership. In order to overcome these difficulties, we have taken advice from lawyers experienced in this field, and I understand that the outcome of our consultations will be a number of suggestions for revision of the Constitution. Importantly, our lawyers are liaising with the ACT Registrar General to ensure that we "get it right" this time. The process is not yet complete, but once the necessary amendments are known I anticipate that they shall be widely circulated and put to all our Chapters for approval at either their next Annual General Meeting or at a Special General Meeting. So please be prepared to consider these important changes in due course.

In this regard I should acknowledge the wonderful efforts being made on our behalf by Tony Phillips, the father of our original Constitution. He remains our trusted Henry Parkes, and his continuing assistance to me on this matter should not go unacknowledged.

GeoEng 2000

In the last issue of AG I mentioned that the highlight of 2000 was GeoEng2000. I believe it is most appropriate that I remind you yet again about this major international event being organised and hosted by your AGS. As I have stated previously, this conference has all the hallmarks of being a landmark in geotechnics, perhaps the best and most comprehensive in a lifetime. We expect a large number of overseas delegates, and this will be a rare opportunity to rub shoulders with many of the luminaries in our discipline. I am advised that to date local registrations have been a little slow. Perhaps this is due to the distraction caused by the international sports carnival being held in Sydney during September. With that out of the way, I ask that you now turn your mind to registering for GeoEng. It is THE main event for 2000!

Best wishes and adieu!

John Carter

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Contact Val Lee on 02 6270 6558 or fax 02 6273 4825 for application forms, etc.

AUSTRALIAN STANDARDS COMMITTEE CE/9 HANDBOOK – TESTING OF SOILS FOR ENGINEERING PURPOSES

Standards Australia Committee CE/9 is embarking upon a project over the next 12 months to produce and publish a handbook to explain the application and performance of the AAS 1289 series of tests on soils for engineering purposes. This will be in relation to Codes such as AS 1726 – *Geotechnical Site Investigations*, AS 3798 *Guidelines on Earthworks for Commercial and Residential Developments* and AS 2159 *Piling – Design and Installation*. The handbook will be developed under a sub-committee of CE/9.

The aim of the handbook is to assist engineering staff in the selection of suitable tests for the work involved and to provide a training tool for educational institutions, technicians and engineers.

The sections or chapters of the handbook will follow that of the AS 1289 groups of test methods (ie. Sampling and Preparation of Soils, Soil Classification Tests, Soil Compaction and Density Tests, etc). They will provide background information, additional explanations and technical advice on the test methods and identify some of their limitations as well as referencing documents relating to the test methods. It is envisaged that this handbook will become a significant publication in the area of soils testing for engineering purposes.

Those wishing to make contributions to the handbook or wanting further information regarding the handbook should contact Mr Adam Fitzhenry at Standards Australia:

Telephone: (02) 9746 4700

Email: adam.fitzhenry@standards.com.au

LETTERS TO THE EDITOR

The Editor,

RE: LANDSLIDE RISK MANAGEMENT CONCEPT AND GUIDELINES REPORT BY AGS SUB-COMMITTEE, AGS JOURNAL VOL 35 NO 1 MARCH 2000

I am writing to you with my comments on the above paper. The comments arise as the result of work I have been carrying out for the National Parks and Wildlife Service on Risk Assessments for the various lodges and infrastructure development in the Kosciuszko National Park following the Thredbo Landslide. Can you please pass them on to the committee responsible for issue of the report for their consideration.

My comments follow:

In Section 1.0 when talking about the deficiencies of the 1985 approach it appears to me that a significant shortfall of this earlier approach was that it did not consider the consequence of any identified hazard. That is, whilst the purpose of that paper was to define the risk of instability at a site, the word "risk" was used as a synonym for likelihood because it did not take into account the consequence of that landslide. Therefore the 1985 approach was a method for determining the likelihood of a landslide.

In Section 3.1, Scope Definition, I believe that any risk assessment which omits injury to persons or loss of life as a consequence should also carry a warning that it is an incomplete assessment. I say that because, if we are aware of a situation with the potential to pose a serious risk to a person's welfare i.e. tolerable, high or very high risk as defined by the guidelines document, then I believe that the duty of care in our legal system will require us to inform of that risk. I don't believe our legal system will allow us to avoid that duty by limiting our scope in the risk assessment. The duty of care is likely to still apply if the client specifically requests that injury / loss of life be omitted from the assessment. I believe it to be worthwhile to have a legal opinion on this aspect.

In Section 3.5.3 the recommendation is made that risk for loss of life should be quantified. However, the paper also recognises that in general any such quantification will require significant judgement to assign probabilities to the various elements of the probability product chain because of the difficulty of obtaining numerical data in most situations. As stated in the paper this approach can only be called (at best) a semi-quantitative approach.

I believe that any attempt to quantify what is in effect a qualitative judgement will have the effect of conveying a degree of accuracy to the assessment which it does not have. Further, having to assign quantitative estimates of likelihood to the assessment process will add a further degree of difficulty for no further gain in accuracy.

As an alternative and as a means of avoiding the above situations, I suggest that a qualitative scale of consequence can be used which addresses the varying prospects for injury / loss of life. That is, in Appendix G, the table which gives the qualitative measure of consequence can be modified to include the varying prospects for injury / loss of life.

I developed one such table for use in our work for the NPWS in which I assigned a likelihood for loss of life to each consequence level (see attached). The same likelihood descriptions for loss of life have been used as for the qualitative measure of likelihood. In the modified table I have assumed that the likelihood for injury is similar to that for loss of life. I have found that this approach can work successfully and that it is easily understood by non-geotechnical personnel. This same table has also been adopted by Wollongong Council for their internal use.

A possible criticism of this approach is that the description of consequence contains a probability term. However, I don't believe this to be a serious drawback because the table can in this instance be considered as combining vulnerability and consequence.

The Qualitative Risk Matrix in Appendix G.

I must admit to being confused by the dual notations on some of the risk levels in this table e.g. a D1 risk classified as an M-H risk level. Does this mean a risk level intermediate between M and H or does it mean that it can be either? In the latter case I presume that it is the assessor who decides which one to assign?

You would be aware that the risk analysis matrix given in AS/NZS 4360 : 1999 (the Standard) has only four risk levels. The Standard also gives a legend to describe these levels. I have tried to compare the risk levels of the matrix in the Standard with those of the matrix in the Guidelines document. However, I find that the wording which is provided in the Standard to describe the levels is very confusing. As a result I have found it difficult to compare the risk levels in the two matrices. I have interpreted the risk levels L, M and H in the Standard to compare respectively with levels VL, L and M of the Guidelines document. However, this requires one to interpret the legend for Level H of the Standard to mean that "senior management attention" allows for the possibility of no action by them to reduce the risk. This may not be what is intended because why would you bring a situation to senior management's attention if they are not going to act on it?

If the above interpretation is correct then the E risk level of the Standard encompasses both the H and VH levels of the Guidelines document. I can understand why the Standard would group these two risk levels into a single unacceptable risk level. However I would still favour the use of the five risk categories as defined in the Guidelines paper. Notwithstanding, can the Committee offer comment on the earlier comparisons as I believe a correlation to the Standard is important. Was the Guidelines risk matrix discussed with any member of the Standards Committee?

Further, if the above interpretation is correct then the H level of the Standard would be equivalent of what we would generally accept as a tolerable risk.

Review of the risk matrix in the Standard shows that a hazard with an almost certain likelihood and minor consequence (i.e. an A2 hazard in the Standard) is tolerable. A B3 hazard is also tolerable in this matrix. In contrast the Guidelines document defines both these hazards as having an unacceptable risk.

At the low likelihood end of the matrix, the Standard considers a D5 hazard as unacceptable whilst the Guidelines document defines it as M-H, and an E4 as tolerable whilst the Guidelines document defines it as L-M.

That is, from the above it appears to me that the Standard has "skewed" the acceptability criterion in the direction of consequence - if the consequence is not great then it is prepared to consider the situation acceptable notwithstanding that other numerically similar risk levels (along the same matrix diagonal) but with a more serious consequence are defined as having an E level. This same "skewing" is apparent with the E4 hazard which the Standard considers to be tolerable whereas other hazards along this same matrix diagonal are considered acceptable.

The Guidelines document tends to follow a consistent pattern for risk rating along the diagonals except that it does allow some reduction in the risk level at the low likelihood end of the matrix.

I would be interested in the Committee's comments on the reasons why the risk matrix was structured in the manner shown in the report, particularly at the high likelihood end. In the document we have prepared for the NPWS I have structured our matrix by skewing it in the manner shown in the Standard at this end. I believe this to be more in keeping with what the general public might accept. For example from a personal point of view I would be prepared to accept the risk from an A2 hazard on the basis that any damage would likely be only of nuisance value. The alternative of this risk being classified as an unacceptable risk could result in large costs to clients.

In closing I'd like to take this opportunity to congratulate Bruce and the Committee on the publication of the paper. I believe it to be an excellent document and one which will aid enormously in the preparation and understanding of slope stability risk assessments.

Yours faithfully,

GHD-LONGMAC PTY LTD
Laurie de Ambrosis
Manager

LETTERS TO THE EDITOR

Alternative Table for the Definition of Vulnerability and Consequence.

Qualitative Measures of Vulnerability and Consequences

Level	Descriptor	Description
1	CATASTROPHIC	Almost certain fatality, or structure completely destroyed or large scale damage requiring major engineering works for stabilisation.
2	MAJOR	Likely fatality or extensive damage to most of structure, or extending beyond site boundaries requiring significant stabilisation works.
3	MEDIUM	Possible fatality or moderate damage to some structure, or significant part of site requiring large stabilisation works.
4	MINOR	Unlikely fatality and limited damage to part of structure, or part of site requiring some reinstatement stabilisation works.
5	INSIGNIFICANT	Rare fatality and little damage.

Note: The "Description" may be edited to suit a particular case.

Note: The likelihood of human fatality has been added as an assessment criterion when compared to the Guidelines.

Dear Editor,

Re: Land Risk Management Concepts and Guidelines & Hillside Building Guidelines

I would like to congratulate the society for the publication of the latest guidelines which are a continuation of the "risk" and probabilistic approach to the assessment of slope stability pioneered by Dr Barry McMahon in 1971 [Ref: 1]. I also note that Dr McMahan's work was developed by myself to the urban environment in 1975 [Ref: 2] and later by a NSW committee of the society in 1985 [Ref: 3]. It is pleasing to see the way in which the "risk assessment" approach to the evaluation of slope stability has now been accepted nationally.

As such, my consulting practice has naturally adopted the latest guidelines and is incorporating the same in the various geotechnical reports issued by the firm.

However, in the course of implementing this policy it has become apparent that the guidelines need further development; this is because the latest publication really only provides guidance for the assessment of a "particular development" in a "specific" situation, whereas many geotechnical reports are written in an environment where the style, or details of a proposed development are not known. It is also difficult to apply the guidelines to the slopes behind cliff-top and coastal bluff areas where several conflicting mechanisms are occurring. Perhaps therefore the society could consider devoting one of its technical meetings / seminars to an open discussion of the guidelines to identify those areas of the guidelines that need further refinement.

Further, whilst the latest publication refers to the importance of "hazard zoning", there is little guidance [other than in the most general of terms] as to how such hazard zoning should be carried out. In this regard, I refer you to my 1975 paper in which a basis for hazard zoning as applied to town planning was suggested; I also note that this suggestion was further developed in 1983 [Ref: 4]. Also, as land stability issues are often associated with coastal processes, perhaps the more developed hazard identification / classification system for town planning could also embrace the work of coastal engineers [e.g. Lex Nielsen - Ref: 5].

I now refer to the suggestion by the society that the task of developing appropriate hillside building guidelines should be the subject of a "funded program" [i.e. carried out by a paid consultant, or group] and in this regard make the following observations:

1. In the society publications to date, no reference has been made to the work of Ingles in the 1970's on hillside building guidelines [Refs: 6 & 7], nor to his latest paper [Ref: 9] which addresses desirable hillside building practice & landslide risk zoning in Tasmania.
2. Whilst the Thredbo inquest paid particular attention to the Hillside Building Guidelines published by myself and Peter Burgess in 1976 [Ref: 8] the latest publication does not refer to these guidelines although the 1985 Society guidelines [Ref: 3] substantially embraced them.
3. Whilst the society as a whole has not provided extensive technical information on hillside building practice since 1985, a number of consulting firms [including my own] have regularly appended notes on hillside construction to their various geotechnical reports since the late 1970's, with some firms issuing very extensive notes.

In view of the above, I suggest that the society convene at an early date a committee to formulate a "draft set" hillside building guidelines based on what is currently available within the technical community. These draft guidelines could then be published in "draft form" [similar to the draft codes produced by Standards Australia] and form the basis for a series of "seminars / workshops" by the various state groups. These seminars would then naturally lead to a formal set of published guidelines.

In this way the finally published guidelines would have wide "technical consensus" with the significant expenses associated with the workshops, etc., being the subject of the "funded development".

Sincerely,

A F Shirley.
SHIRLEY CONSULTING ENGINEERS PTY LTD

LETTERS TO THE EDITOR

References:

1. McMahon B K [1971] "Statistical Methods for the Design of Rock Slopes"; Proceedings of 1st Aust. & NZ Conference on Geomechanics - pp. 314-321.
 2. Shirley A F [1975] "The Theoretical and Practical Aspects of Land Stability Classification" – Proceedings of 2nd Aust. & NZ Conference on Geomechanics - pp. 303-307.
 3. Walker et al [1985] "Geotechnical Risks Associated with Hillside Development" – Australian Geomechanics News No. 10 December, 1985.
 4. Shirley A F [1983] 'Town Planning in Geologically Complex Areas' - Paper presented to the 78th Annual Conference of the Local Government Engineers Association (NSW) - ACEA. Conference Session 22 March 1983.
 5. Nielsen A F, Lord D B & Poulos H G [1992] "Dune Stability Considerations for Building Foundations"; Civil Engineering Transactions CE34 June, 1992, I.E. Aust..
 6. Ingles O G [1974] "Unstable Landforms in Australia" Water Research Foundation Report No. 42.
 7. Ingles O G [1976] "Is there a Planning Process to Mitigate The Problem of Landslip?"; Water Research Foundation Workshop on Unstable Landforms - 1976.
 8. Burgess P J & Shirley A F [1976] 'Some Guidelines to Preferred Practice in Hillside Construction' Australian Geomechanics Journal - 1976.
 9. Ingles O G & Pedersen A M [1999] "Recognition and Responsible Development of Unstable Land"; Proceedings of the 1999 Australian Disaster Conference 'Disaster Prevention for the 21st Century'. pp. 27-32.
- cc A Leventhal, B Walker
 B McMahon, O G Ingles.

The Editor,

Re: LANDSLIDE RISK MANAGEMENT CONCEPTS AND GUIDELINES
Letter from ANDREW SHIRLEY, Shirley Consulting Engineers Pty Ltd

I write as Chairman of the AGS Sub-Committee on Landslide Risk Management in response to the above letter.

We thank the Andrew Shirley for his contribution. We note that he has found some difficulty in applying the Guidelines to some situations.

In response, we consider it is sufficient to say that the methodology given in the Guidelines enables any situation to be addressed. For situations of "conflicting mechanisms", then each mechanism (that is, each hazard) should be addressed separately using the methodology. The interaction between the mechanisms (hazards) should also be considered. The risk assessment would only be limited by the understanding of the processes thought to be applicable.

Since the methodology given in the Guidelines requires consideration of the consequences of the hazard, it is necessary to have a "notional development" to enable the consequences to be evaluated. At a preliminary stage this may be simply a designated site area. Clearly if the hazard is considered unlikely to affect that area, then the form and details of the development are immaterial. If the hazard does affect that area, then the consequences could be considered in relation to different forms and extent of development, or alternatively the minimum treatment options identified. Clearly, there should be the interaction and reassessment implied by the Figure 1 Flowchart as the design develops.

The general steps for Hazard Zoning are given in Section 6 and should be sufficient for experienced practitioners. Other references may assist and we thank Andrew Shirley for those given. It is important to recognise that past zoning studies may have been titled as "hazard" or "risk" zoning studies, but may be neither under the current definitions.

Andrew Shirley's comments on hillside construction are noted. Appendix J of the Guidelines has been based on the Guidelines for Hillside Construction given in the 1985 paper but they have been revised to be consistent with the Risk Management Guidelines. It is hoped that the IEAust Landslide Taskforce will proceed to formulation of more extensive guidelines covering all aspects of landslides in relation to engineering works, including more detailed discussion of hillside construction. It is expected that the Risk Management Guidelines will form an integral part of such future guidelines.

B F WALKER
Chairman
AGS Sub-Committee on Landslide Risk Management

LETTERS TO THE EDITOR

The Editor,

Subject: Australian Geomechanics Society - Landslide Risk Management Concepts and Guidelines

I refer to our discussion in relation to this matter and make the following comments on the guidelines:

- 1 The definition of landslide in appendix B is very difficult to understand. It is very unclear and I also do not understand why ground subsidence and collapse are excluded;
- 2 While the document expressly deals with risk of loss of life or injury, appendix G is limited to property damage. No example seems to be provided of an assessment for loss of life or injury;
- 3 Most importantly, there appears to be some conflict between the concepts which underlie the document and the legal theory of liability in negligence. In short, the document focuses on tolerable and intolerable risks, which concept does not seem to take into account the capacity (in monetary and other terms) to remove the risk but, rather, appears to be based on the likelihood of the event and its consequences in terms of property damage or loss of life/injury. In terms of the common law of negligence, the practicality and cost associated with remedial options is critical and it is a relevant issue in determining whether or not a duty of care exists at all. In short, if reasonably practicable steps are available to remove even a tolerable risk, then the duty of care will be discharged.

The document, however, seems to work on the basis that if the risk is tolerable, then no steps, in particular, need to be taken.

- 4 It is not clear to me how the document distinguishes between loss of life and capacity for injury in terms of determining "vulnerability". In fact, although the document refers to injury, it seems to me that the actual risk assessment is based on loss of life, rather than injury. Particularly, the basis appears to be the annual probability of the loss of life of an individual (not the risk of injury at all). If this is the case, then the document should not purport to deal with risk of injury.
- 5 Related to my comments above, the consequence analysis in section 3.4 refers to a number of matters other than property damage, injury or loss of life. I think it is important to recognise that while those additional factors may be relevant to a decision to take some action to remove risk, they could never justify a decision not to take some action to remove risk.

That is to say, political effects, loss of business confidence and effect on reputation, as well as the potential for litigation, could not be relevant matters in determining whether or not removing or mitigating the risk is an appropriate action. Just as it is not appropriate for a car manufacturer to fail to withdraw cars from the market for a defect, the car manufacturer could not defend proceedings in negligence by reference to failing to take steps to protect their reputation. In deed, this would be an aggravating circumstance.

Kind regards

Jayne Jagot

Partner - National Environment and Planning Group Mallesons Stephen Jaques Sydney

Direct line (61 2) 9296 2196

The Editor,

**E.H. Davis Memorial Lecture
Embankment Dams - Robin Fell**

This year's E.H. Davis Memorial Lecture by Professor Robin Fell contains much worthy information and valuable insights into the design and performance of embankment dams. However, two sections of the lecture would, I suggest, benefit from further discussion.

Piping Failures.

As pointed out in the lecture, the vast majority of "piping" failures within embankment dams occur on first filling or on raising partially impounded reservoirs. Failure in these cases is rapid and located close to the (transient) level of the rising water level in the reservoir. Hydraulic gradients of $i = 1/50$ or even $1/100$ obtain. Now, piping, by definition, refers to critical hydraulic exit gradients. In 1935, E.W. Lane published his weighted creep ratios using field evidence, demonstrating that an effective hydraulic gradient of about $1/8$ was the cut off value for piping beneath dams, even in the most susceptible soils. Thus, what we have *within* the embankment dam is not a normal piping situation. It is, in fact, the result of porous horizons, usually located at the base of the layers of emplaced fill. Seepage from the reservoir travels along such horizons as a "hydraulic tunnelling" front. If it reaches the downstream face, a concentrated leak develops with subsequent erosion of the embankment. The process has been discussed elsewhere (1).

The above distinction might appear academic, but not so. If one does not define an adverse mechanism with clarity, then follow-on decisions may well be inappropriate. However, as Professor Fell rightly points out, the best safeguards against this sort of "piping" failure are adequate filter design and a suitably high placement water content. To this I would add good supervision during construction and an awareness of the nature of the problem.

Risk Analysis.

Risk analysis presented in the lecture appears to apply mainly to estimating the safety of existing dams. However, the problem with risk analysis in dam engineering is that the number of failures by any one mechanism - apart for the type of failure given above, and possibly the mechanism of sliding on systematic weak seams in the foundation - is typically too small to be of any statistical significance.

Indeed, in geotechnical dam design, I would suggest that the risk analysis has no place. This is not to suggest that one need not have a check list of potential failure modes, as listed in the risk analysis. However, these risks all need to be checked out on a deterministic, not a probabilistic basis. A dam owner presented with a list of the probabilities of failure should quite justifiably send the designers back to the drawing board, or to the site, to remove these probabilities, particularly since probabilities too often appear to be used to camouflage an inadequate definition of the relevant material parameters which would be required for an adequate deterministic approach.

An example of the above situation arose on a large rockfill dam project in Sri Lanka, in the early '80's. Geomorphologists had identified (erroneously as it turned out) a massive potential landslide in the reservoir. A sort of risk analysis debate resulted from this, with regard to the height of wave which might be generated and the height of wave which could be tolerated overtopping the dam. Then Ranji Casinder arrived on site to head the design team and stated quite simply that no wave overtopping the dam could be tolerated. People lived by and/or did their washing in the river, downstream. This philosophy led to a deterministic (rather than probabilistic) reassessment of the potential slide, with the result that no realistic mechanism for sliding was found to be present. The problem of probable waves overtopping the dam disappeared.

In design, one simply cannot treat loss of life on a probability basis. It would be useful to have other comments on this.

(1) James, P.M. (1996). "A note on the origin of wet seams in embankment dams". *Proceeds 7th Aus. N.Z. Geomech. Conf.*, Adelaide, 1- 5 July, 320-324.

Yours sincerely,

Peter James,
Consulting Geotechnical Engineer

LETTERS TO THE EDITOR

The Editor,

AUTHOR IN REPLY

The author would like to thank P. James for his contribution, and offers the following response.

PIPING FAILURES.

The definition of piping given by P. James is too restrictive and not used by the author. As pointed out in Section 3.2.1 of the paper, piping develops after the initiation and continuation of erosion, and may develop from a concentrated leak, backward erosion and suffusion. The example of a "porous horizon" is only one initiator of piping. Others are given in the paper. It is important to keep in mind all potential causes of initiation, and not to concentrate only on one. Piping can initiate in well constructed dams e.g. from cracks, or hydraulic fracture caused by differential settlements due for example to irregularities in the foundation, or "hang up" of a narrow core on stiff, well compacted filters and rockfill.

RISK ANALYSIS.

P. James arguments regarding the role of risk analysis are possibly reasonable for the design and construction of large, new dams, where one naturally tries to reduce the risks to as low as reasonably practicable.

They are not correct for existing dams, which is where most risk assessment is being applied. Many (or most) existing dams do not meet current standards, and risk assessment is a valuable tool in prioritising the remedial works on these dams within an owner's portfolio. This is done accounting for the likelihood of failure (for all modes of failure) and the consequences of failure.

the value of the risk assessment approach is emphasised by the fact that most large dam owning organisations in Australia, and organisations like USBR in the USA, are using it.

It is correct, as inferred by P. James, that a risk assessment can only be reasonable if it is based on sound engineering.

Sincerely,

Rob Fell

THE GREAT DEBATE

AGS Sydney Chapter – 14 June 2000

“This House believes Soil Testing is a Waste of Time”

It has to be said that there was a certain amount of prejudice in the large audience that assembled to hear Paul Hewitt, Garry Mostyn and Dick Davidson try to defend the motion against a strong attack by Tony Phillips, Philip Pells and John Carter. The Affirmative team knew they were in trouble from the start and stooped to some low and dirty tricks to gain a skerrick of credibility.

Garry Mostyn opened and, in accordance with normal debating protocol, restated the case. This he said, to the surprise of many of those present, was that *“This House believes that most laboratory testing is a waste of time”*. This brought some groans from the negative team, not to mention the audience. He followed this by introducing a series of major projects from the past including the Pyramids, the Colosseum, the Cathedral of Santa Maria del Fiore in Florence and the Eiffel Tower, claiming they had all been built without soils testing and they were all still standing, so testing was clearly unnecessary. Getting into his stride he ridiculed the Liquid Limit test as one of many tests that could hardly be less scientific. As a parting shot he presented the results of a survey he had carried out of the general public. Somewhat surprisingly he found that such worthies as George Speight, Kapil Dev, Cathy Freeman and President Bill Clinton all thought soil testing a waste of time. *“Who”*, he asked, *“would prefer to believe the speakers in the negative team, all with second degrees, when popular opinion so clearly showed them to be wrong?”* He sat down believing his arguments constituted a lay down misère for the affirmative team. He was right, but it was not a winning hand.

Philip Pells led for the negative team and pointed out that *“...it was Humpty Dumpty who said ‘when I use a word it means just what I choose it to mean – neither more nor less’ and we all know what happened to Humpty Dumpty”*. The subject of the debate, he said, was about soil testing in whatever form. He then proceeded to mount a case based on his strongly held belief that engineering must involve rigorous application of the scientific method, which comprises *“observation, hypothesis, testing, theory and control”*. To support his case he quoted from the writings of Henry Petroski and invoked the philosophy of Francis Bacon and Rene Descartes. He then concentrated on where testing fitted into the process, making the point that without testing the engineer had to play God in order to come up with a design. Testing, he assured the audience, can and did throw up unexpected results, without which the engineer would be almost bound to get the wrong answer. He gave two examples to support his case. One, a test from the Thredbo landslide where *“static liquefaction”* occurred in an undrained triaxial test leading to collapse of the sample. This explained why the failure had been so rapid. The other example was of a landslide on the banks of the Siak River in Sumatra, where a sample of the soil, when kneaded in the hand, exhibited all the characteristics of Norway’s quick clays. In neither case was the behaviour of the soil expected and in neither case would it have been discovered without testing.

Dick Davidson spoke next for the affirmative team and carried its argument forward by looking at what real engineers did with real test data. He was able to show that in recent ANZ Geomechanics Conferences, papers concerned with soil testing all came from academics. This, he contended, showed that in the *“real world”* testing was considered to be a waste of time. He referred to a number of major projects that he had been involved with to support the affirmative case. There was the One Magnificent Mile Building in Chicago, a sky scraper, for which an enormous amount of laboratory testing was carried out and the results subjected to great scrutiny. However, at the end of the day, the foundation design parameters were based solely on local experience relating the moisture content of the soil to allowable bearing capacity. Another was the New Waddell dam in Arizona where, despite a large amount of good quality testing of a dissolving tuff, design decisions were taken by Ralph Peck to build a buttress even though testing demonstrated it was not needed. A final case was the evolution of the evaluation of liquefaction potential of sands where early research focused on complex dynamic testing of every conceivable variable, but late in his career Professor Harry Seed changed his mind and advocated that the only reliable method was based on nothing more than the standard penetration test results. Dick argued that these cases showed that even when testing of the highest quality was undertaken, the results tended to be ignored in favour of conservatism and the personal experience of the key decision makers. He went on to argue that a large number of firms that undoubtedly had geotechnical skills did not run their own laboratories. Why was this, he asked. Was it possible that these firms valued testing and yet took so little interest in it that they were prepared to contract it out? Would they be prepared to contract out the analysis component of the work? He rested his case.

John Carter brought an academic, but no less important, focus to the negative side’s case. He broadened the argument to point out that, without testing, the complexities of soil behaviour would still be a total mystery and we would not

THE GREAT DEBATE

have the strong basis of understanding that we do today. He singled out effective stress as one concept that would not have been derived, without a large amount of patient soil testing. This early breakthrough opened the doors to a long journey of understanding that depended on proper application of the scientific method espoused by Philip Pells. We have a long way to go on the journey, but it is leading to the development of constitutive models that now play an essential part in modern engineering. Critical State Soil Mechanics was clearly at the forefront, but its development depended on the careful analysis of test data on a large number of reconstituted soil samples. In his analysis every parameter is based on test results. For application in industry, the practising engineer needs test data as a reality check on assumptions made in analysis and in the resulting output. John referred to the North Rankin off-shore oil platform, where the design of foundations was based on the results of cone penetration tests in carbonate sands. That the piles did not carry the anticipated loads was a clear indication that more elaborate laboratory testing was needed to establish the differences between the fundamental behaviour of carbonate and non-carbonate sands. He concluded by making the important point that the correct amount of testing was not what an uninformed layman, often a client or project manager, thought was appropriate, but what the experienced engineer knows is needed to have confidence in the outcome. The amount of testing should not be determined by budget, but by the over-riding technical requirements of the job.

The two cases thus concluded, it was up to Paul Hewitt and Tony Phillips to sum up for their respective sides. Paul reiterated the affirmative side's view that soil testing is not a substitute for a knowledge of the soil profile, geology, groundwater conditions, experience, monitoring and field observations. A point with which the negative side did not disagree. He noted that tests such as Philip Pells kneading soil in his fingers in Sumatra was not a laboratory test, but more an excellent example of the importance of experience and precedent – since the nearest site investigation data was 300m away. Paul also argued that the initial laboratory testing for North Rankin was not addressed at establishing the mineralogy of the sands – hence was a waste of time. In this case there was no precedent for understanding the behaviour of piles in carbonate soils.

Tony Phillips felt that the affirmative side had trivialised the debate, by changing the topic and introducing furbies. In fact they had played straight into the negative side's hands. He pointed out that it was not surprising that Garry could only find very few examples of ancient structures that had been built without testing because the others had all fallen down. Indeed it was clear from the photographs that the Colosseum was still in the process of falling down. The examples of reliance being placed on moisture content measurement, or SPT's, did not show that soil testing was a waste of time, so much as that all test data is valuable and needs to be assessed in the light of experience. He made the point that without adequate test data the engineer is vulnerable to claims of negligence.

The motion was defeated in the eyes of the judges, Harry Poulos, Jack Hodgson and Kurt Douglas, and in the eyes of the audience which indicated by a show of hands a large majority in favour of the negative side's case.

Some important issues were raised. Simple commercial pressures are preventing practitioners from doing the amount of testing on projects that they really believe is necessary. The profession has only itself to blame for this since, in the race to win work, it has chopped the testing budget on many jobs to the point where it is almost non-existent. This has to be seen as a retrograde and dangerous course of action for the industry as a whole and a poor example of risk management. After all, how can an engineer who has guessed parameters and got them wrong, defend his actions in the face of a failure? Why should the client have to pay for that failure to do the job properly the first time? Engineering judgement and experience has a large part to play in the design process, but that judgement needs to be based on facts that can only be obtained from testing.

Geodiary

ANCOLD CONFERENCE ON DAMS

OCTOBER 21-27, 2000

Themes:

Dams and the environment
Rehabilitation of dams
Dam safety management
Innovations in dam design and construction
New developments in hydro power
Flood mitigation and other benefits

Contact: Ian Paskins
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AUSTRALIAN UNDERGROUND CONSTRUCTION AND TUNNELLING ASSOCIATION (AUCTA) WORKSHOP

NOVEMBER 18, 2000
University of Melbourne

Theme: Planning for Tunnelling in the Urban Environment
Topics: Underground space planning in Sydney
Urban expansion – planning issues from an engineering perspective
Scandinavian underground space practice
Melbourne's Eastern Freeway extension
Underground quarrying

Paper extracts should be 200 words and describe the key content of the paper

Contact: Alan Robertson
Tel: 07 3367 3388 Fax: 07 3367 1422 Email: tip@uq.net.au

INTERNATIONAL SYMPOSIUM ON SCOUR OF FOUNDATIONS (IS-SCOUR 2000)

NOVEMBER 18*, 2000
Melbourne, Australia

Organised by ISSMGE Technical Committee TC33 in conjunction with Geo Eng 2000.

Contact: AMM Safiullah, Chair Organising Committee, IS-SCOUR 2000
Professor and Dean, Faculty of Civil Engineering
Bangladesh University of Engineering and Technology
Dhaka-1000, Bangladesh
Tel: 990-2-866250 Email: safi@ce.buet.edu

GEO ENG 2000

NOVEMBER 19-24, 2000
Melbourne, Australia

Contact: Mr Max Ervin, Chairman Geo Eng 2000 Organising Committee, C/o
Golder Associates Pty Ltd, 25 Burwood Road, Hawthorn, Victoria 31-5,
Australia.

Fax: +61 3 9818 7990

GEODIARY

YEAR 2000 GEOTECHNICS

NOVEMBER 27-30, 2000

Bangkok, Thailand

Topics: Labrotory and field testing techniques including the centrifuge
Constitutive modelling of soils
Analytical methods in geotechnics
Soil structure interaction – piled foundations, buried pipe lines, tunnels
Cut slopes and excavations
Ground improvement techniques
Environmental geotechnics and natural hazards
Risk and reliability analysi

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Email: bala@ait.ac.th

FOURTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS

MARCH 26-31, 2001

San Diego, USA

November 30, 1999 – Last Date for Receipt of Abstracts
August 1, 2000 – Last Date for Full Manuscripts

SHORT COURSE ON SOIL MECHANICS

A 1½ day short course on Soil Dynamics will be held on March 25-26 in San Diego. The topics will cover dynamic soil properties, elementary seismology, ground motion, amplification, liquefecation analysis of soils, stability analysis of rigid retaining walls, bridge abutments etc

ADDITIONAL INFORMATION

Information such as registration fee, proceedings of the conference, accomodations, social events, spouses' program, exhibition and post conference tours will be sent to persons who have pre-registered, and will be posted at:
<http://www.umn.edu/~conted/conf8767.html>

Contact: Shamsber Prakash, Conference Chairman
308 Civil Engineering, University of MO-Rolla
Rolla, MO-65409-0030 USA
Tel: 1-575-341-4489 Fax: 1-573-341-6553/4729
Email: prakash@novell.civil.umn.edu

INTERNATIONAL CONFERENCE ON TUNNELLING AND TRENCHLESS TECHNOLOGY

APRIL, 2001

Kuala Lumpur, Malaysia

Themes: Tunnelling includes process, operation, ventilation and maintenance
Micro-tunnelling, pipe jacking, directional drilling and rehabilitation
Detection, inspection services robotic development, sewer, services
and structural aspects
Safety, quality and legal aspects

Contact: Conference Secretariat, Tunnelling and Trenchless Technology
The Institution of Engineers, Malaysia, Bangunan Ingenieur, Lots 60 & 62,
Jalan 52/4, PO Box 223 (Jalan Sultan), 42760 Petaling Jaya
Selangor Darul Ehsan, MALAYSIA
Tel: (603) 768 4001, (603) 768 4002 Fax: (603) 7577678
Email: iemactivities@usa.net www.jaring.my/iem/act/tt/html

**REGIONAL CONFERENCE ON
GEOTECHNICAL ASPECTS OF
UNDERGROUND CONSTRUCTION
IN SOFT GROUND (SHANGHAI
2001)**

APRIL 16-18, 2001
Shanghai, China

Paper deadline: November 15, 2000

Contact: Prof. Guobin Liu
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IN SITU 2000

MAY, 2001
Bali, Indonesia

Themes: Site characterisation by in-situ tests
In situ measurement of shear strength, deformation and volume change characteristics
in situ measurement of initial stresses and stress history
in situ measurement of permeability and direction of groundwater contamination
Development of calibration chambers and theoretical interpretation of insitu tests
In situ tests for foundation design and geotechnical analysis
in situ tests for seismic analysis

Contact: Dr. Paulus P. Rahardjo
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<http://ntp.unpar.ac.id/gec>

**ENGINEERING GEOLOGICAL
PROBLEMS OF URBAN AREAS**

JULY 30 – 2 AUGUST, 2001
Ekaterinburg, Russia

Themes: Engineering geology and rational use of urban areas
Engineering geological and engineering environmental site investigations of urban areas
Natural hazards and stability of urban areas
Technogenous changes in urban environment
The use of urban underground space
Protection of historical, architectural and cultural sites
Geoinformation systems of urban geoenvironment
Deadline for summaries and preliminary forms: March 30, 2000

Contact: Secretariat of EngGeolCity-2001, UralTISIZ
79, Bazhov str., Ekaterinburg, Russia, 620075
Tel: (3432)559-772 Fax: (3432)550-043
Email: uraltis@etel.ru Website: www.skyman.ru/~uraltisiz

**NZ GEOTECHNICAL SOCIETY
SYMPOSIUM 2001:
“ENGINEERING IN HAZARDOUS
TERRAIN”**

AUGUST, 2001
Christchurch, New Zealand

Themes: River and coastal erosion, deposition, scouring etc
Slope failures, including landslides, debris flows, avalanches, etc
Active faulting, earthquake shaking, liquefaction
Volcanic activity
Man-made hazards

Contact: Kevin McManus, University of Canterbury,
Private Bag 4800, Christchurch, New Zealand
Tel: (03) 351 6808 Email: k.mcmanus@civil.canterbury.ac.nz

GEDIARY

AGGREGATE 2001 – ENVIRONMENT AND ECONOMY

AUGUST 6-10, 2001
Helsinki, Finland

Themes:

Geology of aggregate production
Classification of aggregate and available production techniques
Prospecting and testing the raw materials for aggregate production
Mineralogical studies and long term durability of aggregate
Environmental influences of aggregate quarrying and processing
Importance of aggregate industry for national economies

Contact: Aggregate 2001
Tampere University of Technology, Engineering Geology
PO Box 600, FIN 33101 Tampere, Finland
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FRONTIERS OF ROCK MECHANICS & SUSTAINABLE DEVELOPMENT IN THE 21ST CENTURY (ISRM 2001 – 2ND ARMS)

SEPTEMBER 11-14, 2001
Beijing, China

Themes:

Rock mechanics testing and characterisation
Physical, numerical modeling & monitoring systems in rock engineering
Rock mechanics & rock engineering related to resources, environment
and sustainable development
Artificial intelligence, information systems and non-linear dynamics in
rock mechanics and rock engineering
New design & construction methods and case histories of major projects

Contact: Prof. Fu Bingjun, Secretary General
ISRM 2001 - 2nd Arms
Institute of Geology and Geophysics, Chinese Academy of Sciences
PO Box 9825, Qijiahuozi, Beijing (100029) CHINA
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Email: egml@igcas.igcas.ac.cn <http://isrm2001.homepage.com>

GHENT ENVIRONMENTAL GEOTECHNICS SPECIALTY CONFERENCE: UNDERWATER GEOENVIRONMENTAL ISSUES

OCTOBER 29 – 31, 2001
Ghent, Belgium

Themes:

Environmental dredging
Underwater ground improvement
In site and off site remediation of dredged material
Chemical and biochemical phenomena related to soft soil mechanics
Laboratory geoenvironmental testing related to soft soil
Land reclamation problems
Waste ponds/tailing dams design

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<http://allserv.rug.ac.be/~wvanimpe/>

2ND AUSTRALIA-NEW ZEALAND CONFERENCE ON ENVIRONMENTAL GEOTECHNICS

NOVEMBER 28-30, 2001
Newcastle, Australia

Submission of Abstracts 29 Dec 2000

Themes: Site investigation and transport modelling

Engineering solutions
Implementation and economic planning and regulatory frameworks

Contact: ICMS Pty Ltd, 3rd Floor, 379 Kent St, Sydney, NSW 2000, Australia
Tel: 02 92903366 Fax: 92902444 Email: geoenv@icms.com.au

**IS KYUSHU 2001 – EARTH
REINFORCEMENT**

NOVEMBER 14-16, 2001
Fukoko, Japan

Themes: Embankments, Wall structures, Foundations and Slopes and excavations

Submission of abstracts (300 words) by September 30, 2000

Contact: Prof. Hidetoshi Ochiai
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<http://www.civil.kyushu-u.ac.jp/geotech/iskyushu/>

**XV INTERNATIONAL CONGRESS
ISSMFE**

2001
Istanbul, Turkey

Themes: Testing and property characterisation of geomaterials
Foundations and retaining structures
Tunnelling and underground space development
Ground improvement and reinforcement
Environmental issues of geotechnical engineering
Design, construction and maintenance of transportation infrastructure

Attention is drawn to a new award for ISSMGE members under 36 years of age on 31 December 2001 who have made an outstanding contribution to the development of geotechnical engineering as judged by a paper from the previous regional conference (Hobart) or to the ICSMGE, with an accompanying CV

**3RD INTERNATIONAL
CONFERENCE ON SOFT SOIL
ENGINEERING**

DECEMBER 6-8, 2001
Hong Kong

Themes: Soft material behaviour, constitutive modelling and predictions
Field monitoring, numerical and physical modelling
Ground improvement techniques and settlement control
Hazard mitigation, environmental and risk management

Contact: Miss May Ho/Miss Ming Li, Conference and Seminar Section,
Hong Kong Institute of Engineers, 9/F Island Beverly, 1 Great George St,
Causeway Bay, Hong Kong
Tel: 852-2895-4446 Fax: 852-2577-7791 Email: conf@hkie.org.hk

**THE 14TH SOUTHEAST ASIAN
GEOTECHNICAL CONFERENCE:
GEOTECHNICAL ENGINEERING
MEETING SOCIETY'S NEEDS**

DECEMBER 10-14, 2001
Hong Kong

Themes: Managing risk
Environmental Geotechnics
The value of geotechnics in design and construction
Theoretical advances and scientific innovations
Professional practice
Specialty session on slope engineering

Contact: Miss May Ho, Conference and Seminar Section
Hong Kong Institution of Engineers, 9/F Island Centre, 1 Great George St
Causeway Bay, Hong Kong
Tel: +852 2895 4446 Fax: +852 2577 7791 Email: conf@hkie.org.hk

GEDIARY

**ADVANCING ROCK MECHANICS
FRONTIERS TO MEET THE
CHALLENGES OF THE 21ST
CENTURY**

SEPTEMBER 24 – 27, 2002
New Delhi, India

Topics: Engineerin geology, site investigations and field testing
Stress-strain and strength characteristics and rheological behaviour of jointed rocks
Numerical & physical modelling and solutions in rock mass
Underground works in weak rocks including tunneling
Design and construction of large caverns
Techniques for improving quality of rock mass
Surface excavations in rocks
Foundations of large dams and other large structures on rocks
Deep drilling technology and innovations
Environmental issues of underground excavations and storage of contaminates

Contact: Mr ARG Rao, *Treasurer*
Indian Group of ISRM c/o Central Board of Irrigation and Power
Malcha Marg, Chanakyapuri
New Delhi 110 021, India
Tel: +91-11-611 6567 Fax: +91-11-611 6567
Email: cbip@nda.vsnl.net.in www.cbip.org

EDITORIAL POLICY

Australian Geomechanics is published quarterly, in March, June, September and December, by the Institution of Engineers Australia, it is edited and produced by the Australian Geomechanics Society. It provides a journal and news magazine for matters of interest to the Australian geotechnical community. The statements made or opinions expressed do not necessarily reflect the views of the Institution or the AGS.

The Editorial Panel of Australian Geomechanics seeks contributions for future editions. The following comments are offered to assist would-be contributors.

Contributions can include: refereed technical papers; technical papers or notes; or news items and reports.

Technical papers can be refereed to ensure that they are of a standard similar to those published in international geotechnical journals. Authors should aim for a maximum overall length of no more than 3500 words, although shorter papers or technical notes are particularly welcome. Authors should indicate if they want their submission to be refereed, the status of the paper will be indicated on publication.

Refereed technical papers should be original and:

- Papers on geotechnical engineering, engineering geology and environmental geomechanics. Papers should be topical, practically oriented and preferably of national interest. Case studies describing innovative geotechnical work are particularly encouraged.
- Papers on geotechnical or geoscience research undertaken in Australia or of relevance to Australian geomechanics. These should clearly indicate their practical relevance and limitations.
- Authoritative reviews of aspects of geotechnical practice or aspects of geotechnical education.

Technical papers or notes can be:

- Items as above but submitted for rapid publishing. These will not be refereed but will be reviewed. They will be accepted at the discretion of the editorial panel. The intention is to provide a source for rapid dissemination of technical material to the geotechnical community.
- Discussions on papers published in previous editions.

News items and reports can be:

- Items describing significant projects, instructive failures, conferences, courses or other matters of general interest to the Australian geotechnical community.
- Geotechnical book reviews.
- Letters to the Editor.

It is preferable for contributors to submit formatted text, tables and figures in electronic format using WordPerfect or Microsoft Word on IBM compatible hardware. Contributions are preferred by email or on 3.5" floppy disk in either of these formats. **All contributions should be followed by a hard copy (i.e. laser printed or ink on paper).**

Submitted material should be presented in the following format :

- Single column format on A4 paper.
- Left and right margins of 20 mm.
- A top margin of 30 mm and a bottom margin of 25 mm.
- 10 point character size of Times font with single (normal) line spacing.
- A single blank line between paragraphs, and after headings. Two blank lines before internal headings.
- No indent at the beginning of paragraphs.
- Main headings numbered 1, 2, 3... etc. in 12 point Times, bold, upper-case and centred in the column.
- Sub-headings numbered 2.1, 2.2, 2.3 ... etc. in 10 point Times, bold, upper-case and left justified.
- Items in bulleted or numbered lists should not be separated by a line, but should be indented by 10 mm.
- Formulae typed and numbered (1), (2), (3) ... etc. and centred in the column.
- Captions for figures and tables should be placed beneath the item and numbered Figure 1, Table 1 etc., and referred to in the text as figure 1, table 1, etc. Figures and tables should be centered in the column.

EDITORIAL POLICY

- Do NOT use page numbers, these will be added later.
- In text citation according to the Harvard system of author (year) or (author, year) as appropriate. Multiple references should be separated by semicolons (author1, year1; author2, year2)
- References should be listed at the end of the paper in alphabetical order using the Harvard system: Author (year) title, publication, volume, pages, publisher with a 10 mm hanging indent and no blank line between each.
- Underlining should be avoided and symbols shown in italics.

FIGURES AND TABLES

Where possible figures and tables should be placed at the correct position in the text. Figures should be scanned. Failing this place them together at the back of the text. These should be sharp black on white and of the correct size for incorporation into the finished document. The width of these must be less than or equal to the width of the text column (165 mm). Do not use colour unless you have discussed it with the editors.

Photographs should preferably be good contrast black and white gloss prints and of the correct size for incorporation directly into the copy. Please ensure that all such items are clearly marked to indicate position in paper.

Authors will remain responsible for the integrity of their material and for permission to publish.

Material will be accepted at any time and published in the next available issue.

EDITORIAL CONTACTS

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The Editor is Garry Mostyn, and the Editorial Panel consists of Nasser Khalili, Gareth Swarbrick, Kurt Douglas, Philip Pells and Tim Sullivan. Production Editor is Ben Mostyn, and Sue Mostyn is the contact for advertising.

All members of the AGS National Committee have defined roles in providing papers and reports. Contributors are encouraged to liaise with their state representatives. Contact details for these are listed the first issue each year.

ADVERTISING RATES

Every three months, Australian Geomechanics reaches nearly 1000 professional geotechnical engineers and engineering geologists spread throughout Australia. Most of these are associated with significant field work and computing. As such Australian Geomechanics provides a very targeted delivery for advertising.

Advertising rates are:

	One issue	Two issues	Four issues
Colour			
Inside front or back cover or back cover	\$800	\$1400	\$2000
Black & white			
Full page	\$400	\$700	\$1000
Half page	\$200	\$350	\$500
Quarter page	\$150	\$250	\$350

The prices quoted are for advertisements supplied with either camera ready art for single colour ads or 4 colour separated negatives for colour.

Inserts into an individual mailout of Australian Geomechanics can be accepted at the rate of \$50 per A4 leaf, with a minimum charge of \$500.

