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N.Z. GEOMECHANICS NEWS

No. 37

DECEMBER 1988

A NEWSLETTER OF THE N.Z. GEOMECHANICS SOCIETY

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C O N T E N T S

THIS IS A REGISTERED PUBLICATION

"NZ Geomechanics News" is a newsletter issued to members of the NZ Geomechanic Society. It is designed to keep members in touch with recent developments. Authors must be consulted before papers are cited in other publications.

Persons interested in applying for membership of the Society are invited to complete the application form at the back of the newsletter. The basic annual subscription rate is $24.00 and is supplemented according to which of the international societies, namely Soil Mechanics ($11.00), Rock Mechanics ($12.00) or Engineering Geology ($9.00) the member wishes to be affiliated. Members of the Society are required to affiliate to at least one International Society.

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EDITOR'S NOTES

At the joint meeting of the National Committee of the Australian Geomechanics Society and the Management Committee of the New Zealand Geomechanics Society in Sydney, during the recent ANZ Geomechanics Conference, it was agreed:

> "... that each Society has authority to republish material contained in a publication of the other Society without seeking authority from that Society but giving due accreditation to the source of the material."

At the time of going to press, copy for this issue of Geomechanics News has been sent to the Editor of Australian Geomechanics News for his review and use at his discretion. I anticipate a reciprocal move in the near future and I hope to be including material which I (as Editor) judge to be of interest to New Zealand readers.

Certainly this will make my job of collecting copy for each issue easier but, of course, I must ensure that our own journal is not "swamped" by our Trans-Tasman colleagues. So I shall continue to encourage and exhort potential authors or correspondents to supply the local material. Remember, our exposure will be (possibly) increasing four-fold!

In general, however, I perceive a trend of diminishing communication within our profession. At a recent gathering I caught the remark ... "the age of the conference is over". The speaker was of the opinion that, in this economic climate, neither practitioners nor researchers will have the time and resources either to attend or (more importantly) to organise the meetings. I believe that those charged with organising the next ANZ Geomechanics Conference and the next International Symposium on landslides have already demonstrated that drive and enthusiasm can overcome the latter. It is up to the rest of us to refute the former contention.

Communication through publications or conferences means shared knowledge and experience. These, however, are marketable items and, as pressures of competition increase, so does the tendency to hoard. The loser is the end user!

A recent article in "Construction Today" comments on the findings of an inquiry into the collapse of a supermarket in Burnaby, British Columbia. To quote this article: "The influential report blamed ... the oversight ... on cut throat competition and unrealistically low design fees in the local market." Who are the losers with this project? Almost everybody associated with the project! The winners are those of us who learn from the experience of others. Communication amongst ourselves remains the prime weapon against fate.

NEWS FROM THE MANAGEMENT SECRETARY

This issue of NZ Geomechanics News follows our last management committee meeting for the year. My report includes a number of items discussed at that meeting.

NEW MEMBERS

The following new members were endorsed and welcomed to the society at the management committee meeting.

Mr R. Irwin	(ISSMFE)
Dr I. Stewart	(ISRM)
Mr P. Mulvihill	(ISSMFE)
Mr J. McShane	(ISSMFE)
Mr W. McGlynn	(ISSMFE)
Mr R. High	(IAEG)
Miss A. Tully	(IAEG)
Mr M. Molyneaux	(ISSMFE)
Mr J. Scott	(ISSMFE)

This large number of new members is very encouraging.

1989 CONFERENCE

The 1989 IPENZ Conference is to be held in Dunedin and only one paper was received for the Geomechanics Session. This paper "Unforseen Physical Conditions" by Dr Arrigoni promises to be part of a very interesting session. This paper will be followed by a session on the Australian Geomechanics Society Guidelines for Geotechnical Information in Contract Documents.

1992 CONFERENCE

The NZ Geomechanics Society will be hosting two major conferences in 1992. We are recently awarded the 6th International Symposium of Landslides (ISL) and this will be held in Christchurch.

This is a prestigious international conference which should attract a large number of overseas visitors.

This conference will immediately follow the 1992 ANZ conference which is also planned for Christchurch.

Mr David Bell has been appointed convenor of the ISL Conference organising committee and Dr Elder the ANZ Conference. We have already had offers of support from IPENZ, NZNSEE and the NZ Geological Society. The support of our South Island members will be important to the success of these major ventures.

NEXT NZ GEOMECHANICS SOCIETY SYMPOSIUM

It is proposed to hold the next Geomechanics Society Symposium in Auckland. A tentative title for the symposium is "Groundwater in Geotechnical Engineering". We need an energetic organising committee to run this symposium, anyone willing to help should contact me at Box 950, Hamilton.

NZGS GUIDELINES FOR SOIL AND ROCK DESCRIPTION FOR ENGINEERING USE

After much debate and discussion the last remaining issues on this contentious document were resolved at the recent management committee meeting. The 'final' version of this is due for publication and distribution early in the New Year. This document has been prepared by a sub committee chaired by Stuart Reed. The preparation of the document was a time consuming and difficult task and all members of this sub committee deserve our thanks.

CIVIL ENGINEERING ADVISORY COMMITTEE

This committee chaired by Professor Taylor is the umbrella group for all IPENZ technical groups. In recent times, the committee has presented submissions on 'Resource Management Law Reform' and has monitored the progress of the President's task committee on Building Quality. Other topics include modifications to the Engineers Registration Act and the Building Industry Commission which is looking at a new building code.

As you can see there are a large number of changes to the framework in which our professions operate. I would encourage all our members to watch progress closely and present submissions on areas of concern.

The pace and quantity of new legislation means it is not feasible for the NZ Geomechanics Society to present reasoned submissions on behalf of members.

1989 MANAGEMENT COMMITTEE

We have received a good number of nominations to the 1989 committee and an election will be necessary. This will be held later in 1988 and I encourage you all to participate by voting.

A Merry Christmas and a Prosperous New Year to all members of the Society.

Chris Graham
MANAGEMENT SECRETARY

AN ADDRESS BY THE AUSTRALASIAN VICE PRESIDENT OF ISSMFE

(Notes of concluding remarks at the
5th ANZ Geomechanics Conference, Sydney,
August, 1988)

Friends and Colleagues,

The opportunity to say a few closing remarks is another of my privileges as Australasian vice president of ISSMFE. Endorsement of this conference as a Regional Conference implies that I am the ranking dignitary of the meeting giving me the opportunity to address you at this closing session. This is a great pleasure and privilege. There are few occasions available to a vice present to talk with the members of the Region, and I do not wish to let this one pass.

After the last few days of working together with you I believe it is no longer necessary to address you as "Distinguished Guests Friends, Colleagues, Ladies and Gentlemen". By working together we have become colleagues at least, and many of us are now friends.

There is no more than a year till my term of office ends at the close of the XII ICSMFE in Rio de Janeiro next August. The time is approaching when my successor has to be chosen. Just as hosting of the A/NZ conference is, by general agreement, split 2:1 between AGS and NZGS, so is the selection of the Regional vice president for ISSMFE. This time the responsibility lies with AGS, but this does not mean that the choice is limited to Australians. Any member of either Society is eligible for consideration. Thus if any of you have ambitions to be my successor, or know of any member who is well qualified to serve the Region, approach your National Society and arrange for the nomination to be properly made.

To be chosen as vice president is an honour of which I am deeply conscious. But on the obverse of the medal of honour there is obligation. The obligations, to my mind, include ensuring that Regional concerns are understood and properly represented at management meetings of ISSMFE. To understand Regional concerns it is necessary to meet people from the various parts of the Region and to attend, from time to time, management committee meetings of both AGS and NZGS. To represent the Region at the centre it is necessary to attend Board and Council meetings of ISSMFE with some regularity. Merely writing letters is not enough. I hope in this regard you have found me an adequate vice president.

ISSMFE clearly recognises the financial implications of these responsibilities and makes available to its vice presidents such financial support towards travel and other expenses as it can reasonably afford. But a very substantial residue remains and in considering nominating candidates you should ascertain their willingness to contribute from their own resources and what other support they can hope to draw upon during their term of office. And when it comes to selecting a vice president the National Society responsible needs to remember that the privilege of selection carries with it the obligation to support. It is for such reasons that I suggest that the choice should be made with care, and with the benefit to the Region the dominant consideration. I would also suggest that these considerations apply with equal force to all three vice presidencies.

Within the Region there is a variety of National awards and honours. Two of those awarded by AGS, the Hugh Trollope Medal and the John Jaeger Award, were presented during this conference. But there was no corresponding NZGS award which was similarly presented! Even in terms of the 2:1 AGS/NZGS division adopted in other aspects of Regional affairs this seems a bit lopsided. Perhaps NZGS could arrange for its Geomechanics Lecture to be given at A/NZ conferences as a matter of course. This would at least restore the balance. What I believe would be a better course would be to establish an Australasian Award to be presented at Regional conferences, and I have suggested this to the two management committees. They have shown a cautious interest in the idea, and at a joint meeting on Monday evening agreed on some tentative steps which, I hope, will lead to the creation of a suitable award and its initial presentation at the next A/NZ Geomechanics Conference.

You have just received, and accepted with acclaim, the invitation by NZGS to host the next A/NZ Conference in Christchurch in 1992. I have discussed its suitability for endorsement as a Regional Conference of ISSMFE with the Secretary General and have his agreement in principle. The obligations inherent in endorsement have yet to be spelled out, but I am sure they will be the minimum necessary and will be quickly agreed. Just as I received from my predecessor a Regional conference endorsed by ISSMFE so I intend to hand on to my successor a similarly well conceived and endorsed event. In this regard he will inherit a double crown since NZGS will be hosting the VI International Symposium on Landslides in association with the A/NZ conference. This symposium is also endorsed by ISSMFE through its Technical Committee on Landslides.

In organising these two meetings NZGS will, no doubt wish to draw heavily on the experience of AGS in organising this conference. I would urge AGS to get some notes down quickly, before memories fade, of the aspects which they feel were the most successful and those which proved the most difficult to organise. I would particularly recommend to NZGS the adoption of a symbol for both their meetings and believe that the one devised by AGS for this conference is really rather brilliant! Simple in form, it summarises the Regional nature of the meeting so very effectively.

I also wish to congratulate AGS on their efforts to develop a Society symbol. You will notice that the logo, so elegantly printed in gold on the cover of the Proceedings is a development of that used on the banner above me, and on letterheads of the Conference. By incorporating the symbols of the three International Societies it emphasises the link between them and AGS, and is, I understand the future symbol of AGS. I suggest it would be timely for NZGS to develop a symbol for themselves.

Much of my effort as vice president has been direced towards improving the cohesion of the geomechanics community in Australasia. Such things as symbols are a powerful means to this end. They help create a sense of belonging in the individual and provide a public image round which we, as a group, can gather and from which we can better explain (and publicise) our important place in the development of our nations.

Finally I wish to congratulate Harry Poulos and his team on their success in organising this conference on behalf of all of us and the International Society. As I indicated at the opening session on Monday my standing as vice president is closely linked with the success of the Regional conference held during my term of office. I feel my status is secure!

But congratulations are not enough! I wish to express my thanks to Harry and his cohorts on the organising committee. And to AGS and its parent organisations for the financial and administrative support they provided. Nor should the contribution of NZGS and of the other two vice presidents be left out. I am sure all of you will support me in showing your appreciation.

So, Friends and Colleagues, God Speed till next we meet in Christchurch in 1992.

J.H.H. Galloway
AUSTRALASIAN VICE PRESIDENT, ISSMFE

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REPORT OF THE SOIL MECHANICS VICE CHAIRMAN

The 5th Australia-New Zealand Conference on Geomechanics titled "Prediction vs Performance" was held in August at Sydney as an ISSMFE and IAEG Regional Conference. Dr G.R. Martin as the NZGS nominee, presented a State of the Art paper on Geotechnical Aspects of Earthquake Engineering. Dr Martin was however unable to accept an invitation to address Branch members, although subsequenlty a full copy of his paper has been received. Copies can be made available on request.

NZGS ran a session at the conference titled "Failures as a Yardstick for Prediction Ability" - 6 papers covering aspects of the Wheao, Ruahihi and Maniatoto Power schemes, the Matahina Dam, the Abbotsford Landslide, and the Kaimai Tunnel. Seven other papers were also presented by NZGS members in other technical sessions.

At the Lausanne Symposium on Landslides, D. Bell on behalf of NZGS presented a submission to hold the 1992 ISSMFE International Symposium on Landslides in February of that year in Christchurch. We have now received approval to proceed with this project. This will be held sequentially with the 6th ANZ Conference in Christchurch. The success of this submission is due in no small part to the hard work put in by Messrs D. Bell, R. Parry, G. Salt and M. Selby. While this steering committee has the full backing of the Management Committee, sustained support by members at large will be required to ensure the conferences match the quality of the submissions made. IPENZ will underwrite the Landslides Symposium but the ANZ Conference will be sponsored financially by the NZGS.

Earlier during the year, following an invitation from Prof. K. Ishihara, Chairman of the ISSMFE Technical Committee on Earthquake Engineering (TC-4). Dr J. Berrill was nominated to this committee by the Management Committee.

Revised draft statutes for the ISSMFE have been prepared by the British Geotechnical Society. The principal stated aim of the society is "the promotion of international co-operation amongst engineers and scientists for the advancement of knowledge in the field of geotechnics and its engineering applications". The statutes are relatively straight forward and clearly set out the obligations of ISSMFE and member societies. Copies may be obtained on application.

No information has been received from NZ representatives on any ISSMFE Subcommittees.

M.J. Stapleton

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REPORT OF THE ROCK MECHANICS VICE CHAIRMAN

ISRM is implementing an effective recruitment campaign for supporting membership of the society. Supporting Members are societies, associations, companies and other collective bodies, provided they are interested in stimulating and supporting scientific progress and pay an annual fee to the society.

ISRM is proposing to publish a listing of national standards pertaining to rock mechanics and rock engineering including testing standards, ground anchors and shotcrete. They wish to receive from our National Group a listing of all such standards.

Ian Johnston's Regional Report presented in Madrid, Spain during September 1988 contained two items of interest within the ISRM commissions that have their Presidents resident within this region.

The Commission on Interpretation of Hydraulic Fracture Records, (Mr J. Enever) has made substantial progress with a highly successful workshop held at the recent Minneapolis Symposium - the proceedings are to be published in the International Journal of Rock Mechanics and Mining Sciences.

The Commission on Rock Boreability, Cuttability and Drillability, (Dr W.E. Bamford) is liaising with the International Tunnelling Association's Working Group on Research into Rock Cutting during Tunnel Boring. Contacts have also been established with the Permanent International Association of Navigation Congresses with regard to co-operation in characterising dredgeability of rock.

Nominations are open for the Manuel Rocha Medal for an outstanding doctoral thesis in rock mechanics or rock engineering.

The ISRM Council Meeting held in Spain reappointed the following six commissions:

Case Histories (Banks)
Interpretation of Hydraulic Fracture Records (Enever)
Rock Boreability, Cuttability and Drillability (Bamford)
Rock Failure Mechanisms in Underground Openings (Maury)
Swelling Rocks (Einstein)
Testing Methods (Hudson)

and started new commissions in:

Communications (Sakurai, Japan)
Performance of TBM's in Weak Rock (Kovari, Switzerland)
Rock Joints (Stephansson, Sweden)
Scale Effects in Rock Mechanics (A. Pinto de Cunha, Portugal)

Bernard Hegan

205:8

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INTERNATIONAL SOCIETY FOR ROCK MECHANICS
REGIONAL REPORT FOR AUSTRALASIA

(submitted to ISRM Board Meeting, Madrid, September 1988)

ORGANISATION

The Australasian region of the ISRM is, in terms of size and population, the smallest with only two countries, Australia and New Zealand, making up the membership. However, despite its relatively small size, it is believed that the region's contribution to rock mechanics is far from small.

The National Groups of the countries forming the region, i.e. the Australian and New Zealand Geomechanics Societies respectively, are different from the majority of the other ISRM national groups because they are also the national groups of our two sister societies, the ISSMFE and the IAEG. This arrangement offers some major benefit with regard to co-operation between these geotechnical disciplines which are perhaps absent in other parts of the world. For example, technical, organisational and administrative meetings, symposia and conferences held throughout the region tend to reflect the broad interests of the three major societies, with all three generally represented. This has provided an important channel of communication which has led to a much greater mutual understanding and technical exchange between the three major geotechnical disciplines.

It may also be worth mentioning that there are effective means of communication between the two national groups of the region through regular correspondence and joint meetings on the occasions of the Australia-New Zealand Geomechanics Conferences.

ISRM PUBLICITY/PROMOTION

The ISRM receives, along with the other international societies, regular publicity through the publications of the National Groups. In Australia, this is in the form of "Australian Geomechanics", a biannual publication which presents local, national and international news of the Society, and periodic detailed reports of its activities. It also contains technical papers, letters and opinions, information and reports of conferences, new products, and a range of other items. A similar publication in New Zealand is called "Geomechanics News".

The ISRM "News" is also regularly distributed throughout the region as soon as it is received. However, a small criticism heard in both countries is that the "News" has often been a little late in arriving in the region.

It may be concluded that the ISRM receives regular publicity throughout the Region and is well represented at all levels of activity.

ISRM COMMISSIONS

Two of the ISRM Commissions have their Presidents residents of the region. The Commission on Interpretation of Hydraulic Fracture Records, under Mr J. Enever, has seen some substantial progress over the last 12 months. A highly successful workshop was held at the recent Minneapolis Symposium and it is understood that arrangements to publish the proceedings in the International Journal of Rock Mechanics and Mining Sciences are in hand. A compendium of experience is well underway, with plans for a draft to be circulated in 1988 and a final version in 1989. The integration of this compendium with a summary of the workshop is indicated as the end point of the current activities of the Commission.

The Commission on Rock Boreability, Cuttability and Drillability, under Dr W.E. Bamford has progressed further since the Commission meetings in Montreal last year by means of correspondence and some ad hoc discussions between Commission members meeting in London and Melbourne. Liaison with the International Tunnelling Association's Working Group on Research with particular regard to rock cutting during tunnel boring, has been maintained. Contacts have been initiated with the Permanent International Association of Navigation Congresses (PIANC), with regard to co-operation in characterising the dredgeability of rock.

It should also be noted that there are several others representing the region on other ISRM Commissions.

CONFERENCES/SYMPOSIA

There have been a number of conferences etc. held within the region over the last year on topics such as Dam Safety (Rotorua, N.Z.), Field Instrumentation (Melbourne, Aust.), Slope Stability (Sydney, Aust.), Geophysics (Adelaide, Aust.) Calcareous Sediments (Perth, Aust.), Arid Terrain Prospective (Perth, Aust.), Role of Professionals (Canberra, Aust.). The major conference of the region is the Australia-New Zealand Conference on Geomechanics which is held once every four years. The 5th in this series is to be held in Sydney between 22nd and 26th August 1988 on the theme of "Prediction versus Performance". The ISRM is well represented with sessions on Rock Excavatability, Groundwater Problems, Ground Stresses and Movements, Underground Mining and Excavations, Geotechnics of Weak and Jointed Rock, Mining Subsidence, Open Cut Mining, Earthquakes and Vibrations, and Stability of Slopes.

Other major conferences planned for the future are the 3rd International Mine Water Congress (Melbourne, October 1988) and the 7th International Conference on Numerical Methods in Geomechanics (Cairns, 1991).

CONCLUDING COMMENTS

While the Australasian region of ISRM may be relatively small in terms of numbers, the size and scope of the developments, the range of activities, the extent of innovations and the enthusiasm and competency of the membership, should ensure that rock mechanics will continue to thrive and the region will continue to be an integral part of the International Society.

I.W. Johnston
VICE-PRESIDENT FOR AUSTRALASIA

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LOCAL GROUP ACTIVITIES

1. AUCKLAND BRANCH

To date, the Auckland Branch of NZGS has held 7 meetings, the final meeting being held on 9 November on Subdivision and the Soils Engineer. The other topics discussed have been the IEA Guidelines for the Provision of Geotechnical Information in Contract Documents, Volcanic Soils in Construction, Soil Nailing and Matahina Dam. Technical presentations on Geotextiles and HPDE were also made to members by manufacturer representatives. All meetings were well supported and we were grateful for the continued use of the Engineering School after hours. One mid-day session did however make use of the new IPENZ facilities at Pembroke House.

Formal presentation of Life Membership of the NZGS was made to Prof. P. Taylor in recognition of his contribution to the society and the profession after the joint Geomechanics Structural Group meeting on Soil Nailing.

Currently the Auckland Group is responding to the IPENZ request that Technical Groups comment on the Quality in Building as it relates to Geomechanics.

M.J. Stapleton

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2. WELLINGTON BRANCH

On 25 August a joint IPENZ - Geomechanics Society meeting was held at the Wellington IPENZ venue, at which Mr John Harding and Dr Ian Stewart (both of BCHF) gave well presented talks on (geo)technical aspects of the Wellington Sewage Disposal Project. John introduced the proposed schemes and the various alternative layouts. Ian then described the technical difficulties of tunnelling or crossing the Wellington Fault for the western schemes, which have a treatment plant at Karori Stream, and the difficulty of crossing Wellington Harbour entrance with the preferred eastern scheme, which has a treatment plant in Gollons or Wye Valley. The proposals have major implications for Wellington and it was well worthwhile hearing the technical (rather than political) implications of current proposals.

Further Wellington branch activities will be notified as they are arranged.

R.D. Beetham

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3. CHRISTCHURCH BRANCH

No meetings have been held recently, due primarily to members being involved in preliminary organisation for the 1992 ANZ/ISL conferences, both of which are now confirmed for Christchurch. Local members have been canvassed to assist in organisation and two committees have tentatively been formed.

Liquefaction has received considerable attention in the media in Christchurch recently following a reported statement by the deputy chairman of the Earthquake and War Damages Commission that "much of Christchurch would go down the plughole, because that's what happens with liquefaction". This scenario was gleefully grabbed by the newspapers. Several following articles based on interviews with engineers were sensationalised somewhat, although a television report provided some balance. Recent discussion between geotechnical and structural engineers indicates that there is a considerable lack of understanding within the engineering profession of the likely extent and effects of liquefaction in Christchurch following a major earthquake.

A joint meeting of the geomechanics and structural groups is planned as the first meeting of 1989 to discuss this topic, and other meetings which has been postponed will follow.

Dr Don McG. Elder

205:8

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PUBLICATIONS OF THE SOCIETY

The following publications of the Society are available:

(a) From the Secretary, IPENZ, P.O. Box 12-241, Wellington North:

- Proceedings of the Palmerston North Symposium "Geomechanics in Urban Planning", April 1981. Price $20.00.
- "Stability of House Sites and foundations - Advice to Prospective House and Section Owners". (Published for the Earthquake and War Damage Commission). Price $0.50.
- Proceedings of the Third Australia-New Zealand Conference on Geomechanics. Wellington, May 1980. Price $20.00 for the three volume set to members, $30.00 to non-members.
- Proceedings of the Second Australia-New Zealand Conference on Geomechanics, Brisbane, July 1975. price $25.00.
- Proceedings of the Wanganui Symposium "Using Geomechanics in Foundation Engineering", September 1972. Price $8.00 to members, $10.00 to non-members.
- Proceedings of the Alexandra Symposium "Engineering for Dams and Canals". November 1983. Price $40.00 to members, $50.00 to non-members.
- Copies of all back-issues of "New Zealand Geomechanics News", are available to members at a nominal price of 50 cents per copy plus 50 cents post and packaging per order.

NOTE To reduce stocks, all the above publications costing over $10.00 will now be sold at 1/2 price - while stocks last!

(b) From Government Bookshops and the Secretary IPENZ:

- "Slope Stability in Urban Development" (DSIR Information Series No.122). Price $2.00. (Also available from Government Bookshops).

The following publications of the Society have been sold out:

- Proceedings of the Nelson Symposium "Stability of Slopes in Natural Ground", 1974.
- Proceedings of the Wellington Workshop "Lateral Earth Pressures and Retaining Wall Design", 1974.
- Proceedings of the Hamilton Symposium "Tunnelling in New Zealand", November 1977.

(c) Newer publications, also available from the Secretary, IPENZ.

- Proceedings of the Hamilton Symposium Piled Foundations for Engineering Structures, September, 1986. Price $20.00 to members, $25.00 to non-members.
- From the Institution of Engineers, Australia, Guidelines for the Provision of Geotechnical Information in Construction Contracts. A 20-page booklet. Price $10.00.

Dick Beetham
PUBLICATIONS OFFICER

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GEOMECHANICS SOCIETY AWARD

(November 1988)

(1) Nominations were called in the June 1987 issue of Geomechanics News. No nominations were received.

(2) All N.Z. publications etc., were perused for eligible papers. Some 35 eligible papers were found.

(3) Vice-chairmen of various disciplines were asked to nominate the best 2 papers in their discipline. A short list of 7 papers was chosen.

(4) A committee of 3 comprising Dick Beetham, Les Oborn and Ian Brown was formed to decide the best paper of these 7, following the guideline procedures set out by Graham Ramsay.

The winning paper is:

"Development of Foundation Investigation Techniques" by T.J. Larkin & M.L. Plested, University of Auckland.

Published in RRU Bulletin 73, 1984. Bridge Design and Research Seminar, Technical Papers by 23 Authors, National Roads Board.

The papers were all of a high standard and the winning margin was small.

FORTHCOMING CONFERENCES

1. 1989 IPENZ CONFERENCE

The 1989 Annual IPENZ Conference will be held in Dunedin from 13-17 February. The Conference theme is: "Engineering our National Resources".

2. INTERNATIONAL CONFERENCE DIARY

1989:

February 7-10:
Paris, France: Int. Conf. on Tunnelling and Micro-Tunnelling in Soft Ground.

Helsinki, Finland: ++ International Symposium on Frost in Geotechnical Engineering.

April 3-5:
Nottingham, U.K.: Conference on Geotechnical Instrumentation in Civil Engineering Projects.

May 15-17:
Shanghai, China: 2nd Int. Symposium on Environmental Geotechnology.

May 22-26:
Dusseldorf, FRG.: 8th Int. Strata Control Conference.

June 26-29:
Selangor Darul Ehsan, Malaysia: Int. Conf. on Engineering Geology in Tropical Terrains.

August 13-18:
Rio de Janeiro, Brazil: **XII International Conference on Soil Mechanics and Foundation Engineering.

August 20-September 2:
Pau, France: Symposium on Rock at Great Depth.

September 4-7:
Brighton, U.K.: International Chalk Symposium.

September 10-14:
Edinburgh, Scotland: Conference on Quaternary Engineering Geology.

October 26, 27:
Winnipeg, Canada: Seminar and Workshop on Creep Behaviour of Frozen Soil and Ice.

1990:

August 6-10:
Amsterdam: VIth Int. Congress of the IAEG.

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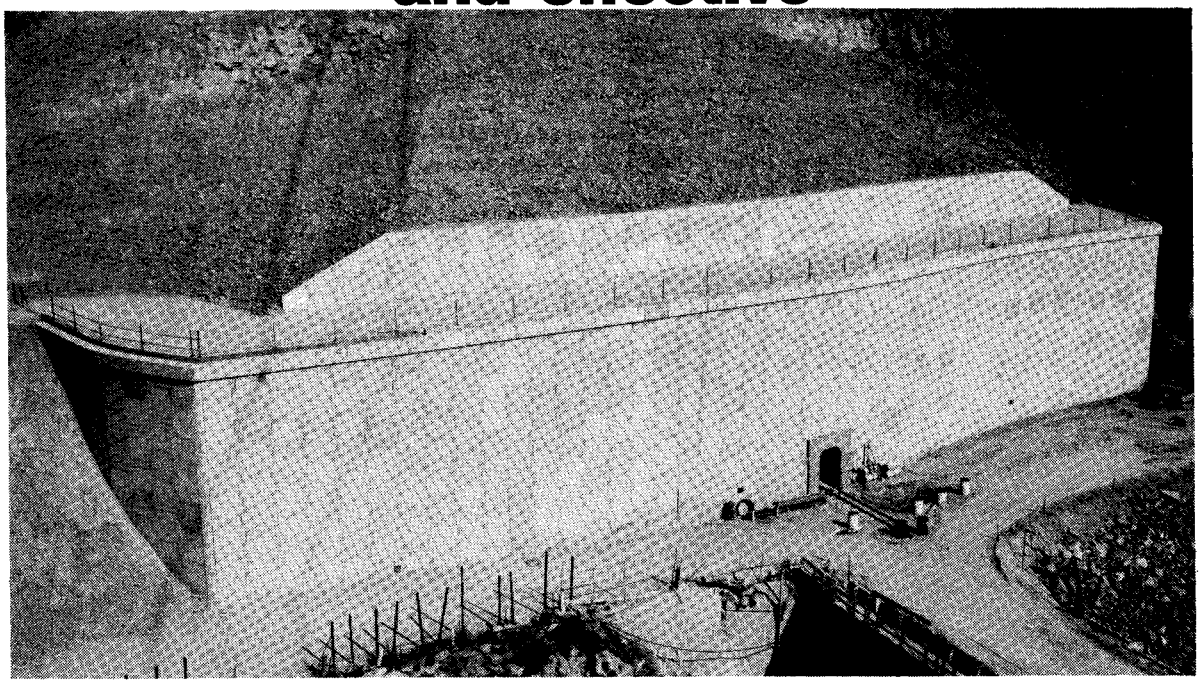

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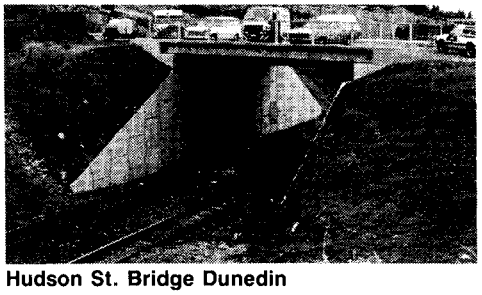

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CORRESPONDENCE WITH THE SOCIETY

The editor believes the following correspondence relating to:

- NZS 4203: Foundation Load Limitation (SM=2)
- Geotechnical Information and Construction Contracts

would be of general interest to the members of the NZ Geomechanics Society:

23 August 1988

The New Zealand Geomechanics Society

RE: NZS 4203 REVISION- FOUNDATION LOAD LIMITATION

As you are fully aware the loading code NZS 4203 is presently undergoing a major revision.

The issue of load limitation for foundation design has been recently addressed by the Loading Code Committee. As no rational basis has been found or presented for the retention of the existing clause 3.3.7.3 of the present code NZS 4203:1984, limiting SM to 2 for the design of foundations to buildings, it is not presently intended that such a clause be included in the revised document.

However, in response to your offer of 26 March 1988, the Committee is willing to accept and consider any submission the Society may wish to forward in support, or otherwise, of the retention of a load limitation clause.

It is the intention of the Committee that the draft loading code be issued for comment a second time to select commentators by November of this year. It would therefore be appreciated that any submission from yourselves be received by early November for consideration.

E.C. Stevenson
(FOR LOADING CODE COMMITTEE)

****

31 OCTOBER 1988

Mr E.C. Stevenson
Smith Leuchars Wellington ltd

NZS 4203 : FOUNDATION LOAD LIMITATION (SM=2)

Thank you for your letter of 23 August 1988 seeking New Zealand Geomechanics Society assistance with this aspect of the NZS 4203 revision. The whole question of soil structure interaction at foundation level is one that interests every geotechnical engineer. It is however a difficult problem to deal with and one which has not been resolved by research and development activities.

I understand that you have received submissions from SESOC (Structural Engineering Society) which background the development to, and argue for the retention of, SM=2. The New Zealand Geomechanics Society also argues that the SM=2 criteria should be retained where ground conditions are appropriate and that it does provide an appropriate level of loading. Associated with this it does also seem to be appropriate that some expansion should be made to elaborate on what soil conditions provide acceptable yield behaviour when they are subjected to loadings which may exceed the design loading. Obviously if there is a sensitive foundation soil which could experience serious loss of strength then design for an SM=2 limit may be unacceptable.

The New Zealand Geomechanics Society is aware that the literature dealing with this subject is limited. It is considered that this reflects the state of knowledge and difficulty related to the subject. Further this reflects to an extent the capability of the engineering profession to consistently perform relevant dynamic analyses and provide definitive guidance of soil behaviour and soil-foundation interaction. There is scope for research effort to develop improved design techniques for handling this aspect. It is likely to be many years before results of any research and development will provide useful techniques which supersede the provision of SM=2.

In order to perform detailed analysis it is necessary to obtain soil parameters representative of the foundation soils and this is an expensive process.

The following provisions and commentary are recommended for inclusion in the code

Code Provisions:

Structure and foundation forces may be limited to SM=2 provided that:

(i) The system is inherently stable when deflected to three times the deflection of the system at SM=2, i.e., the system is self centring (this is generally the case with most wall structures but generally not the case for frames where the centre of mass does not rise significantly with lateral deflection).

(ii) The system shall be capable of accepting a lateral deflection equivalent to three times the deflection at SM=2 without non ductile, shear or compression, failure of any PRIMARY MEMBER of the structure and substructure.

(iii) An evaluation of the soil properties indicates that yielding of the soil would not result in poor structural performance and associated damage.

Commentary:

Limiting structural and foundation forces to SM=2 may result in the structure/foundation system actually experiencing soil stresses in excess of the soil strength. In some circumstances the post yield foundation displacements and energy dissipation during soil yielding results in improvements in structural performance. However, yielding of sensitive soils, soils with a liquefaction potential and collapsible soils could result in poor structural performance. Because of the possibility of poor performance it is essential that the soil properties are evaluated by an experienced geotechnical engineer. A field classification may be adequate in the case of minor structures but in other cases field and laboratory testing may be required.

I trust these comments will assist your committee. The New Zealand Geomechanics Society would be happy to discuss this matter further with you if you wish.

David N. Jennings
CHAIRMAN, THE NZ GEOMECHANICS SOCIETY

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18 July 1988

Mr I.L. McKay
Kensington Swan

GEOTECHNICAL INFORMATION IN CONSTRUCTION CONTRACTS

In 1987 the Institution of Engineers, Australia prepared a document "Guidelines for the Provision of Geotechnical Information in Contract Documents" a copy of which is attached. NZ Geomechanics Society believes it is an excellent document and that the classification of geotechnical data as:

facts
interpretation
opinion

is appropriate.

We have brought this document to the attention of SANZ particularly with regard to the question as to how the concepts fit within the framework of NZS 3910 "Conditions of Contract for Building and Civil Engineering Construction". A copy of their reply is attached.

NZ Geomechanics Society believes the legal implications of the IEA Guidelines in the NZ context requires comment as referred to in the SANZ letter. Your name has been suggested and I would like to know if you could possibly assist with this matter? Your comments would be appreciated particularly as you were the Chairman of the NZS 3910 committee.

I look forward to your reply.

David N. Jennings
CHAIRMAN, NZ GEOMECHANICS SOCIETY

****

4 August 1988

Chairman
NZ Geomechanics Society

GEOTECHNICAL INFORMATION AND CONSTRUCTION CONTRACTS

Thank you for your letter of 18 July and for sending me a copy of the booklet prepared by the Institution of Engineers Australia entitled "Guidelines for the Provision of Geotechnical Information and Construction Contracts".

I have read this booklet with a great deal of interest and am impressed at its commonsense approach. The Australian Institution has made a number of very practical suggestions to minimise risks and avoid unnecessary claims. It has also come down very strongly in favour of full disclosure to tenderers of all known information or relevant reports, with only such qualifications as are appropriate, and with an avoidance of attempts at disclaimer or exclusion of liability.

My own experience in arbitrations in which pre contract geotechnical data and adverse physical conditions have been in issue, would entirely support the views expressed by the Australian Institution. I believe their suggestions would reduce the number of claims and would generally be in the best interests of both principals and contractors.

You have asked me specifically how these concepts fit within the framework of NZS 3910 "Conditions of Contract for Building and Civil Engineering Construction".

What are variously referred to as "latent conditions" or "unforeseen physical conditions" are dealt with in clause 8.5 of NZS 3910:1987. The clause provides for an adjustment to the price where the contractor encounters on the site physical conditions which could not reasonably have been foreseen by an experienced contractor when tendering, and which will substantially increase the contractor's costs. The term "physical conditions" is stated to include artificial obstructions, but not to include weather conditions or conditions due to weather.

The contractor is required to notify the engineer as soon as practicable after encountering such conditions, and where possible before they are disturbed. The notification is to be confirmed in writing. If the contractor proposes to make a claim for additional payment, he must follow the notice as soon as practicable with details of the additional materials, plant, labour and programme of works proposed, the anticipated delay to or interference with the works and an estimate of the claim for additional payment. On receipt of the notice the engineer is forthwith to investigate the conditions and after discussion with the contractor to determine whether they are such as the contractor has notified. To the extent that the conditions could not reasonably have been foreseen by an experienced contractor, and will substantially increase the contractor's costs, they are to be treated as a variation with the consequence that they will become a ground for an appropriate extension of time and adjustment of price.

The Australian proposal goes further than this in endeavouring to define "latent conditions". The basic formula is very similar, although it extends to physical conditions on the surroundings of the site. It refers to foreseeability by "a reasonably competent contractor" rather than by "an experienced contractor", but I do not think the difference in words will mean any practical difference in the test to be applied. The Australian draft adds to this test that the reasonably competent contractor is to be assumed to have examined all the information available to him, whether from the principal or through reasonable inquiries, and to have inspected the site. I think these requirements are implicit in the test in NZS 3910, which refers to the "experienced contractor". An experienced contractor in tendering would be expected to do all the things referred to in the Australian definition. The conditions of tendering in NZS 3910, which are identified as a contract document in the agreement in the second schedule, provide in clause 103 that each tenderer is deemed to have inspected the site, examined the tender documents and other information supplied, and satisfied himself as far as practicable for an experienced contractor before tendering as to the correctness and sufficiency of his tender.

The old NZS 623:1964 similarly used the test "could not have been reasonably foreseen by an experienced contractor". Arbitrators have always interpreted the test as assuming that the experienced contractor has used all the information which prudent inquiry would make available to him.

I would be happy with the wording of the definition in clause 12.1 of the suggested Australian clause, but I do not think it would in fact add anything to what is in NZS 3910. It does, however, spell these matters out very clearly.

The Australian definition also includes "any conditions which the contract specifies to be latent conditions". This could be a useful provision in some cases, as it would enable certain possibilities to be identified and defined, thereby removing any question of argument. One of the problems with this whole area is that one cannot always foresee the unforeseeable in order to provide for it in the contract, so that to some extent general words must be used. There could be value in specifically mentioning those possibilities which are foreseeable as possible, but which are considered sufficiently unlikely to be classified as "latent conditions". By defining them in advance the contractor is given an assurance that he can safely disregard their possibility in arriving at his tender. An example might be "hard rock (as defined) extending over more than 30 percent of the tunnel length".

The requirement as to notice in the Australian draft is very similar to that in NZS 3910, namely that the contractor should give notice when he becomes aware of a latent condition, and where possible before the conditions are disturbed. The Australian draft requires further information as to the work required and estimates of delay and cost to be given, but only if required by the superintendent. The New Zealand standard requires this information to be given in every case in which a claim for additional payment is contemplated, and to be given as soon as practicable. I think either clause would work satisfactorily. Both avoid some of the problems which arose under the old NZS 623:1964.

The Australian draft in clause 12.3 provides for extension of time and for the recovery of additional cost. The same result is achieved in the New Zealand standard by treating the latent conditions as a contract variation. The conditions therefore come within the definition of "Variations" so that an extension of the time can be granted under clause 9.2.1 and the contract price can be adjusted under clause 8.1.5 and 8.2. The practical result will be the same.

Clause 12.4 of the Australian draft excludes from consideration any additional work or extra cost or expense incurred more than 28 days before the date on which the contractor gives the notice required by clause 12.2. There is no counterpart to this provision in the New Zealand standard. The provision is one which is no doubt intended to put significant pressure on the contractor to be prompt in giving the appropriate notice. The earlier clause requires notice to be given "forthwith", whereas the New Zealand standard requires notice "as soon as practicable".

In practice conditions can be encountered which add significantly to cost, but it is not immediately apparent that they will qualify as "latent conditions" of which notice should be given. To qualify they must, under the Australian definition, "differ substantially from those which should have been anticipated", and in New Zealand must be such as "could not reasonably have been foreseen ... and substantially increase the contractor's costs".

An example would be entountering of a high proportion of very hard rock in a tunnelling contract. The contract documents may have suggested to an experienced contractor that there would be some hard rock, but as a relatively small proportion of the whole. It may turn out that most of the tunnel is in hard rock. The mere fact that the contractor encounters hard rock early in the contract will not justify a notice of latent conditions. Only when he has been in hard rock for some time will it be possible to make such a judgement. If it eventually becomes clear that a latent conditions situation has arisen, it would seem fair that the whole of that situation should be considered in evaluating the additional costs, rather than only the cost impact after 28 days before the date of giving of notice. The fact of hard rock conditions and the consequent slowing down of excavation will have been well known to the engineer on a day to day basis from the time hard rock was first encountered.

A possible way of avoiding unfairness, while still maintaining a proper pressure on the contractor to give notice promptly, would be to provide that the engineer shall not be bound to take into account additional costs incurred more than 28 days before the date of the notice. This would give the engineer a discretion, which he would be bound to exercise fairly according to the particular circumstances. His decision would be reviewable on arbitration. A similar provision in relation to time extensions is provided in clause 9.2.2 of NZS 3910:1987 as in clause 11.4 of NZS 623:1964.

Subject to that criticism of clause 12.4, I would be happy with the Australian draft, but do not see it as adding significantly in its practical effect to what is achieved under NZS 3910.

I hope the above comments may be helpful to you.

I.L. McKay

****

6 October 1988

Mr I.L. McKay
Kensington Swan

GEOTECHNICAL INFORMATION IN CONTRACT DOCUMENTS

Thank you for your letter of 4th August 1988. Your comments are appreciated, I was pleased to read that you support the approach of the IEA Guidelines as do many NZ Geomechanics Society Members. My apologies for the delay with this reply but I have only recently read your letter following my return from Australia.

An important part of the Guidelines was the classification of data into Groups of: Fact, Interpretation and Opinion. I notice you have not commented on this aspect but it appears to me that it is important for engineers and contractors to recognise this classification of data.

Adoption of these definitions by the industry would reduce the conflict which can arise through the way information is considered and used. I would be interested in your reaction.

To further promote awareness of these Guidelines I would like to forward your letter to the Editor of Geomechanics News for inclusion in our next issue. Please let me know if you have any objection to this.

Related to this overall subject you may be interested to know that Dr Arrigoni is presenting a paper to the February 1989 IPENZ Conference titled "Unforeseen Physical Conditions - Risk Management". In this session of the conference we had thought we would background the IEA Guidelines document as part of the discussion.

Once again thank you for your views on this subject.

David N. Jennings
CHAIRMAN, NZ GEOMECHANICS SOCIETY

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18 October 1988

Chairman
NZ Geomechanics Society

GEOTECHNICAL INFORMATION IN CONSTRUCTION CONTRACTS

I refer to your letter of 6 October.

The classification of data as being fact, interpretation or opinion is, I think, valid and quite helpful. Each should be understood for what it is. Thus a tenderer should be able to place absolute reliability on the fact of test bores having been made in the locations stated in the documents. As the paper points out the borelogs are interpretative and do not have the absolute reliability of reports of fact. Nevertheless, a contractor is entitled to assume that they have been carried out with the ordinary competence of a person holding himself out as qualified to record accurately what has been found by test bores. I recall one case where the letting of a roading contract was deferred for a couple of years after the preliminary geological work had been carried out because of the shortage of Government finance. During this time the cores were kept in a centrally heated basement, with the result that the logs prepared at the end of the period gave a totally misleading picture. The contractor's claim succeeded.

Opinions are obviously more subjective and would generally be regarded as reliable only within certain limits. From a practical point of view, however, a contractor in tendering has to rely on the information given to him to the interpretation of data by qualified specialists, as he has neither the time nor the ability to have an independent appraisal carried out.

The result is that although the difference between fact, interpretation and opinion may affect the nature and degree of the reliance which a tenderer should place on the information, he will generally have to base his tender on all three if a proper site investigation has been carried out. In general the risk is better taken by the principal, who has control over the amount of site investigation carried out, and will only incur extra liability if in fact extra work and extra cost is incurred. The principal will still only be paying a fair price for what he has got. The alternative of putting the risk on the contractor is to have a contingency built into the contract price, which the principal must pay whether or not the contingency becomes actual.

I have no objection to your publishing my previous letter - and this letter also if you wish to.

L.L. McKay

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205:10

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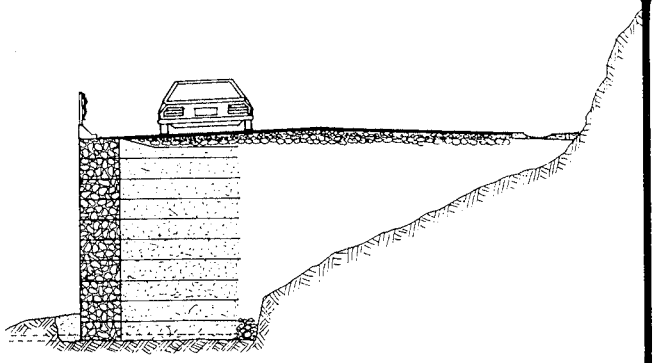

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ARTICLES AND TECHNICAL PAPERS

IS THERE A REAL PERMEABILITY VALUE?

Aidan Nelson
Murray-North Limited

Increasing emphasis is being placed on the quality of clay linings constructed to prevent contaminated leachates coming into contact with groundwater. The coefficient of permeability (k) is one of the most variable of engineering properties and can be particularly sensitive to the method of measurement, with variations of 2 or 3 orders of magnitude, even under laboratory conditions. Physical factors (construction procedures, roots, cracks, etc.) and chemical factors (clay mineralogy and leachate composition) can combine to give a very different in-situ macro-permeability, to the micro-permeability measured in the laboratory.

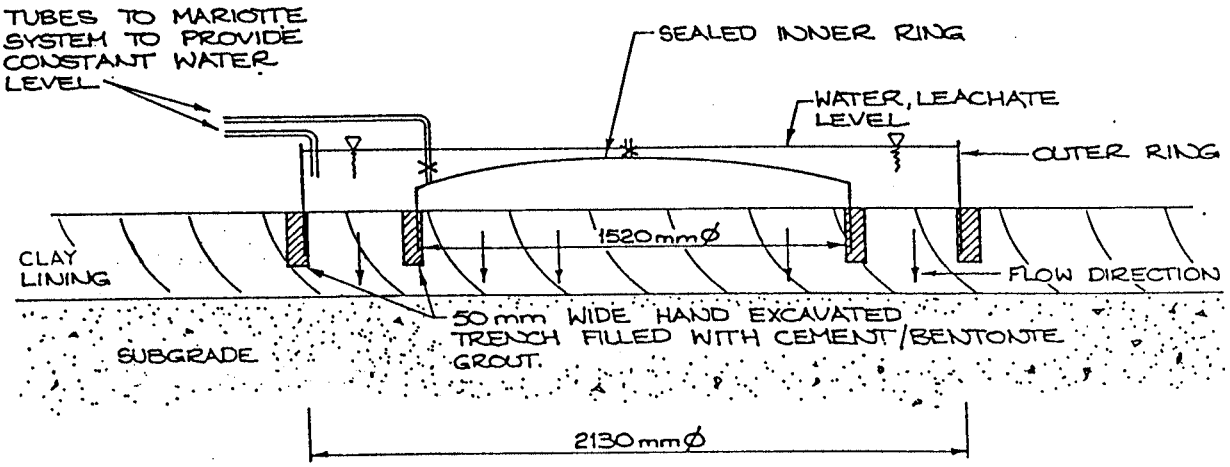
Permeability measurements should therefore be based on techniques which closely model the actual field conditions. Large-scale ponding in the field has been used in the past, but with low permeability linings (10^{-9} m/s or less), it is extremely difficult to accurately account for precipitation, evaporation and boundary effects.

Daniel and Trautwein (1986) developed and tested under field conditions a Sealed Double Ring Infiltrometer (SDRI) which can measure very low field permeabilities. Stevensons Testing Laboratory, at the request of Murray-North Limited, have constructed the SDRI test equipment to the same standard as that used by Daniel and Trautwein. The equipment consists of an outer steel ring of 2.13m diameter and an inner steel ring of 1.52m diameter. The inner ring has a domed lid to prevent evaporation. The two steel rings are sealed into the upper 100-150mm layer of the lining using a specially prepared cement/bentonite grout. A typical cross-section of the apparatus is given in the sketch below.

Tests have been successfully undertaken on a refuse landfill liner using both water and leachate as the permeant. The testing method is applicable to all types of clay linings where greater confidence in the design permeability value is required.

The equipment is available through Stevensons Laboratory, Auckland, on a fixed price per test or daily hire rate basis, plus installation and monitoring costs if required.

Reference: DANIEL, D.E. and TRAUTWEIN, S.J. (1986) "Field Permeability Test For Earthen Liners". Use of In-Situ Tests in Geotechnical Engineering, Proc. ASCE Conference, Blacksburg, U.S.A.



SEALED DOUBLE RING INFILTROMETER TEST DETAILS

SOIL NAILING

(Report on Auckland Branch Joint Structural and Geomechanics Group Technical Session on 10 May 1988)

Simon Woodward
Foundation Engineering Limited

> "For well over a decade now, Engineers in France, Germany and North America have been exploring the special advantages of the techniques of soil nailing. This Geotechnical Engineering process comprises the in-situ reinforcement of soils and has a wide range of applications for stabilising excavations and slopes. It has been researched with large budgets since 1975 by collaborations of contractors, Universities and Government organisations. It has been the subject of International Conferences, Symposia and Seminars since 1979, and has given rise to a rapidly expanding literature of technical papers and articles. There are abundant successful case histories to cite and a wide variety of ground conditions and applications."
>
> - Bruce and Jewell, 1987, Ground Engineering.

Soil nailing has now made its debut in New Zealand and was the subject of a recent Seminar, presented by the designers and constructors of and with reference to, what is believed to be New Zealand's first large soil nailed wall.

With the overall meeting convened by Malcolm Stapleton of Babbage Partners Limited & Company, the Master of Ceremonies for the presentation was Malcolm Deighton, Mainzeal's Architect for the project in discussion.

The speakers covering the various aspects were:

Structural:	Alan Ashley, Smith Leuchars Limited
Geotechnical:	Simon Woodward, Foundation Engineering Limited
Construction:	Rob Irwin, Construction Techniques Limited

Consecutive presentations were made over the period of approximately one hour, outlining the history and philosophy of soil nailing, with particular reference to its use at Mainzeal's new carpark building in Kitchener Street, on the site of the old Professional Club and the adjoining site to the south.

The audience was referred to two papers by Doctors Bruce and Jewell, entitled "Soil Nailing: Application and Practice - Parts 1 and 2", published in Ground Engineering magazine in November 1986 and January 1987 respectively.

The technique of soil nailing is reported to have evolved out of experience with the New Austrian Tunnelling Method and the first recorded application of soil nailing was on a 70 degree cut slope in heavily cemented Fountainbleu sand for a railway widening scheme near Versailles, in which a total of 12,000 square metres of face was stabilised by over 25,000 steel bars grouted into pre-drilled holes up to 6 metres long.

Since that time, many soil nailing projects have been completed, with independent assessments of current activity levels indicating around 50 soil nailing projects per year in France, and about a quarter of that again in each of West Germany and North America.

Elsewhere in the world, development has been much slower for reasons which range from lack of application, or unsuitable soils, to lack of knowledge, or even protectionism of alternative techniques.

The Kitchener Street project entailed a 12 metre deep cut below Kitchener Street in volcanic tuffs and Waitemata Group Residual clays and silts, which was designed to be retained by the use of soil nails. Superficially there would appear to be a number of similarities between nails and pre-stressed ground anchorages, with a tendency in the Profession to regard nails as merely passive small scale anchorages.

However, as outlined in Bruce's and Jewell's papers, ground anchors are highly stressed after installation and ideally prevent any structural movement, while soil nails are not significantly pre-stressed and require a finite, but very small soil deformation to mobilise their resistance.

Anchors transfer load only along the distal fixed anchorage, while soil nails are in contact with the soil over most of their length, leading to a different distribution of stresses in the retained mass.

Because of the high density of installation of soil nails, typically one per 0.5 to 5.0 metres squared, the consequences of one unit failure in soil nails is not so severe and the high interactive mode of operation in soil nails permits lower construction tolerances.

As ground anchors have much higher loads, they require more substantial bearing details at the anchor head to prevent their punching through the lining, and, because of their great length, anchors often require larger scale construction equipment, whereas the shorter soil nails may often be installed by hand.

The principles of soil nailing are, in fact, very similar to those of reinforced earth, in which a mass of earth is reinforced to create a coherent gravity mass. The main similarities between soil nailing and reinforced earth are that the reinforcements are relatively unstressed in the soil and both require subsequent deformation to mobilise the reinforcement forces, which in turn are sustained by a frictional bond between the soil and the reinforcing element. Because the reinforced zone is stable and acts as a gravity retaining structure, the facing can be made thin and plays only a minor role in the overall structural stability.

The main differences between reinforced earth and soil nailing are that reinforced earth is constructed from the base up, utilising preselected and compacted fill materials, while soil nailing is constructed from the top down using natural ground, leading to a different distribution of forces in the reinforcement, especially during construction. Furthermore, in reinforced earth the friction is generated directly on the strip/soil interface, whilst drilled and grouted soil nails generate friction along a larger circumference.

Depending on specific site conditions and requirements, soil nailing can offer an economic advantage of up to approximately 30% over conventional retention systems.

The drilling rigs and shotcreting guns are relatively small scale, mobile and quiet, features which can be of great benefit in densely populated city areas.

The construction flexibility associated with soil nailing allows it to proceed rapidly and the excavation can be shaped easily to handle variations in soil conditions and work programmes as required.

The movements required to mobilise reinforcement forces have been found to be surprisingly small, and comparable to a well braced excavation. Because the system is applied to the soil as soon as possible after excavation, there is minimal disturbance to the ground and adjacent structures.

However, the limitations of soil nailing require cuts of approximately 1 to 2 metres high to stand up prior to lining and installation of the nails.

A dewatered face is also desirable and soft clays with low frictional resistance are likely to require a higher density of longer nails, which may become uneconomic.

The audience was referred to Tables 1 and 2 of Part 2 of Bruce and Jewells' papers, which detailed the vital statistics of a number of reported case histories.

Based on these case histories, Bruce and Jewell developed a series of four derived dimensionless parameters shown below, to enable the formulation of a preliminary design.

	Drilled and Concreted	Kitchener Park
Length Ratio = $\frac{\text{Maximum nail length}}{\text{Excavation Height}}$	0.5 - 0.8	0.7
Bond Ratio = $\frac{\text{hole diameter x length}}{\text{Nail spacing}}$	0.3 - 0.6	0.43
Strength Ratio = $\frac{(\text{Nail diameter}^2)}{\text{Nail Spacing}}$ (x 10-3)	0.4 - 0.8	0.40
Performance Ratio = $\frac{\text{Outward Movement}}{\text{Excavation Height}}$	0.001 - 0.003	0.00042

Shown alongside the range of data summarised from the case histories of Tables 1 and 2 from Bruce's and Jewell's paper, are the ratios adopted for the Kitchener Park design.

Of particular note, are the performance ratios for the various cases given. However, not included in the drilled and concreted ratio range are the values for the PPG Building in Pensylvania and the Cumberland Gap project in Kentucky, which values of 0.00035 and 0.00081 respectively seem to be unconservatively low by comparison to the bulk of the data.

However, the desired performance ratio for this project to satisfy the Auckland City Council's requirements for a lateral deformation of not more than 5 mm to avoid damage to buried services, was also of that same order of magnitude (being 0.00042).

The achievement of such a low deformation posed certain difficulties for the designers, which were believed to have been overcome as discussed later during the presentation.

As in the design of any gravity retaining structure, the stability of the nailed mass must be checked both against external and internal forces.

The reinforcing elements must be installed close enough to ensure an effective interaction within the reinforced zone, as well as having sufficient length and capacity to ensure that the nails neither pull out of the passive zone beyond any active failure wedge, nor break due to the movement of such a wedge.

The reinforced block of soil must be capable of resisting either a sliding or an overturning failure due to the external loads from behind.

The stability of the retaining structure must also be checked against deeper seated overall mechanisms as analysed in conventional slope stability analyses.

The fourth check on external stability and the one of particular concern on th Kitchener Street project, was that of a tilting or bearing capacity failure due to the insufficient strength of the bearing materials. The calculated maximum bearing stress at the toe of the nailed mass was of the order of 340 kPa, whereas the lower bound undrained shear strength of 30 kPa for the cohesive residual silts and clays beneath the mass implied an ultimate bearing capacity of only 240 kPa. The implication of this was that the face would require underpinning to basement bedrock to prevent a bearing capacity failure.

The selected solution was to install the building piles which were at approximately 6 metre centres, prior to excavation and to prop the face by tying it into the piles.

This propping of the cut face raised some interesting similarities with the PPG Building, which had a performance ratio of only 0.0035. On that project, because of the unstable nature of the gravels being nailed, it was necessary to inject grout columns at close centres immediately behind the proposed face. The designers of the Kitchener Park project considered that this contiguous grout curtain could have had a similar propping effect to that of the piles. Because the total deflections on a soil nailing project are made up of an elastic lateral rebound plus angular distortions, it was considered that propping the face at each level during excavation would significantly reduce the angular distortions and hence the net deflection.

At the date of the Seminar, the excavation had reached approximately 11 metres depth in the southern quarter of the main face and, with excavations to a depth of approximately two-thirds and one-third of the total proposed cut height in the northern quarter and central half respectively, measured deflections were as low as 3 mm.

The presentation was followed by quite a lively question and answer session, which had to be cut short to permit the conferring of an Honorary Membership of the New Zealand Geomechanics Society to one of New Zealand's most distinguished Geotechnical Engineers, Professor Peter Taylor.

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J.C. Yonge
Gilberd Hadfield

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The wall, designed by Brickell Moss Raines & Stevens is a maximum of 23 m deep encompassing the basement perimeter (approximately 4,500 m sq.), and is constructed prior to any bulk excavation. Lateral restraint is by either ground anchors or floor slab diaphragm action. On completion of the wall and foundation piles, the excavation and construction of 5 floors below ground will proceed at the same time as the 30 storeys above ground.

The Main Contractor for the project is Fletcher Development and Construction.

The method thus allows a reduction in overall construction time and in addition obviates the need for temporary retaining. Substantial reductions in total costs for a building can be achieved particularly where a deep basement is planned and difficult soils and or water are anticipated.

- For the Auckland Savings Bank project wall thickness varies between 500 mm and 800 mm depending on structural and construction technique requirements. However a wall thickness of up to 1500 mm can be provided if required.

- The completed wall is extremely rigid minimising movement of surrounding ground and providing additional safety during the process of excavation.

- Construction involves low noise level and minimal vibration.

- Unlike sheet piles the wall can be installed through almost any ground and to depths in excess of 50 metres.

There are many other applications for diaphragm walls including "cut and cover" type tunnels, slurry cut-off walls, buttressed type walls which can be designed to be free standing over considerable depths and large diameter (8 to 40 metre) concrete lined shafts. Precast concrete elements may be used in lieu of in-situ placed concrete, if required.

Jointing of panels can be either by in-situ portions to enable full continuity of the reinforcing for shear wall action, or by provision of patented CWS joints to achieve a water stop placement. The ASB project utilises in-situ portions as the shear wall property is an integral component in the overall structural performance of the building.

Design and construction details are available on enquiry from Gilberd Hadfield Pile Co. Limited, Auckland Phone 658-054, or Lemmon Piling and Drilling Limited phone Wellington 684-352.

205:9

APPLICATION FOR MEMBERSHIP

of
New Zealand Geomechanics Society

A TECHNICAL GROUP OF THE INSTITUTION OF PROFESSIONAL ENGINEERS OF NEW ZEALAND

The Secretary
The Institution of Professional Engineers New Zealand
P.O. Box 12-241
WELLINGTON

I believe myself to be a proper person to be a member of the N.Z. Geomechanics Society and do hereby promise that, in the event of my admission, I will be governed by the Rules of the Society for the time being in force or as they may hereafter be amended and that I will promote the objects of the Society as far as may be in my power.

I hereby apply for membership of the N.Z. Geomechanics Society and supply the following details:

NAME: _____
(to be set out in full in block letters, surname last)

PERMANENT ADDRESS: _____

_____

QUALIFICATIONS AND EXPERIENCE: _____

_____

NAME OF PRESENT EMPLOYER: _____

NATURE OF DUTIES: _____

Affiliation to International Societies: (All members are required to be affiliated to at least one Society, and applicants are to indicate below the Society/ies to which they wish to affiliate).

I wish to affiliate to:

International Society for Soil Mechanics for Foundation Engineering	(ISSMFE)	Yes/No	($11.00)
International Society for Rock Mechanics	(ISRM)	Yes/No	($12.00)
International Association of Engineering Geology	(IAEG)	Yes/No (with Bulletin	($ 9.00) $15.00)

SIGNATURE OF APPLICANT: _____

DATE: _____/ _____/ 19_____

NB: Affiliation Fees are in addition to the basic Geomechanics Soiety membership fee of $24.00 which is reduced to $20.00 if member of IPENZ.

PLEASE DO NOT SEND FEES WITH THIS APPLICATION. AN ACCOUNT WILL BE SENT ON YOUR ACCEPTANCE INTO THE SOCIETY.

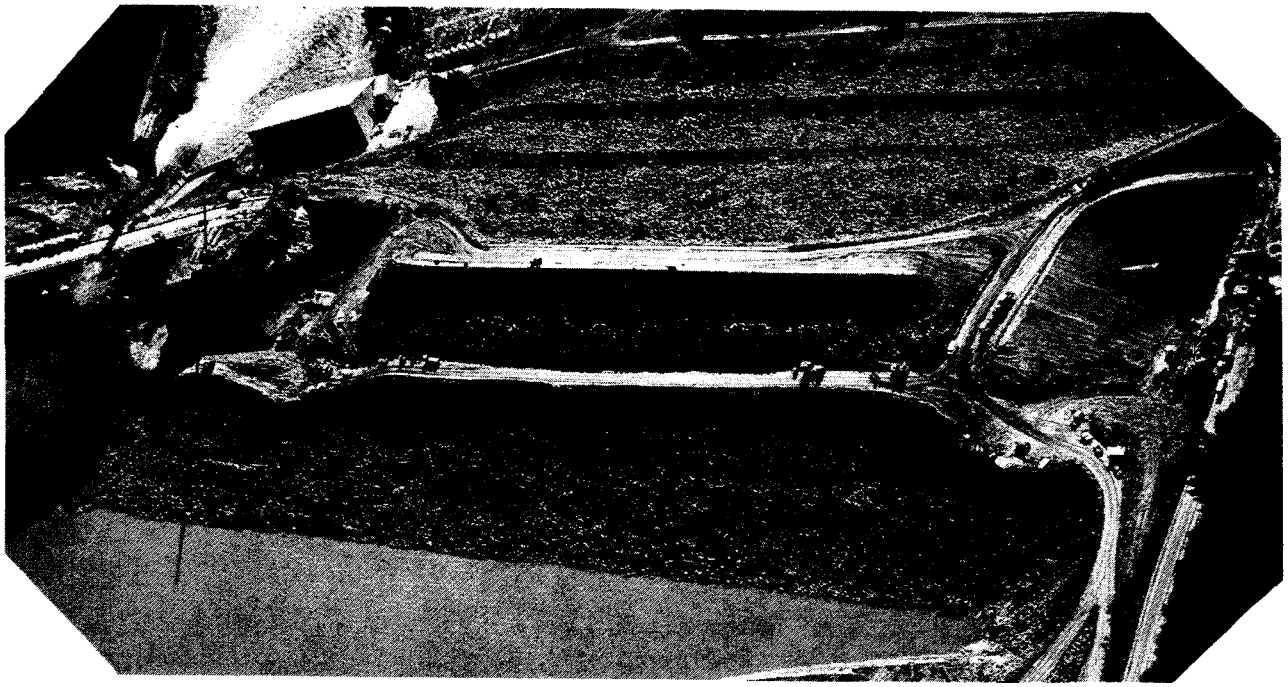
Nomination:

I _____ being a financial member of the N.Z. Geomechanics Society hereby nominate _____ for membership of the above Society.

Signed: _____ Date: _____/ _____/ 19____

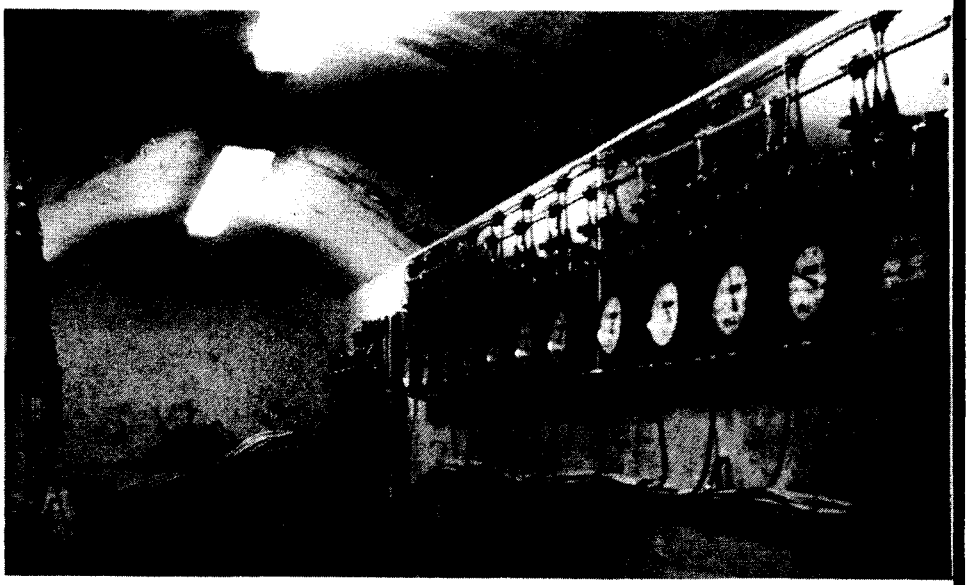
205:6

MATAHINA DAM REPAIR REQUIRED
RELIABLE, ACCURATE INSTRUMENTATION



MATAHINA DAM SITE 1988

A total of 50 GEOTECHNICAL INSTRUMENTS pneumatic and hydraulic piezometers and readout equipment were supplied by Ground Engineering to Electricorp Production for the Matahina Dam repair.
The instrumentation was installed by WORKS to monitor pore pressures within the dam core during reconstruction, dam filling and to serve as a long term surveillance system.



GAUGE HOUSE IN THE GALLERY WITHIN THE DAM ABUTMENT

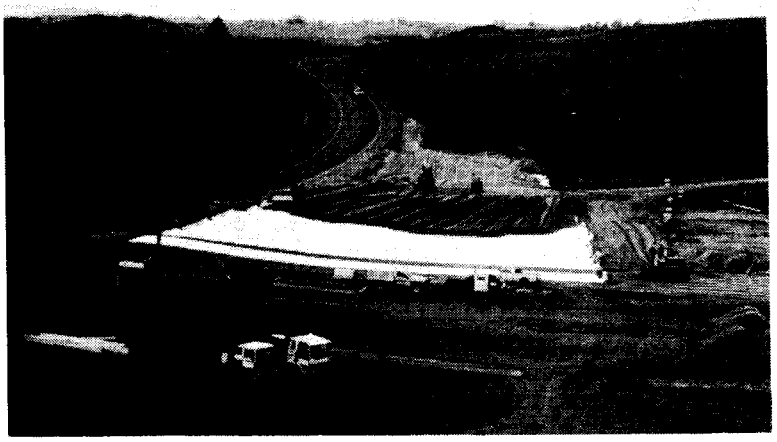
AUCKLAND
P.O. Box 18-294
Auckland, N.Z.
Telex 21759
Fax (09) 594-698
Ph (09) 598-215

GROUND ENGINEERING

CHRISTCHURCH
P.O. Box 8031
Riccarton
Fax (03) 430-742
Ph(03) 484-205

WELLINGTON
P.O. Box 38-731
Petone
Fax (04) 682-225
Ph (04) 682-226

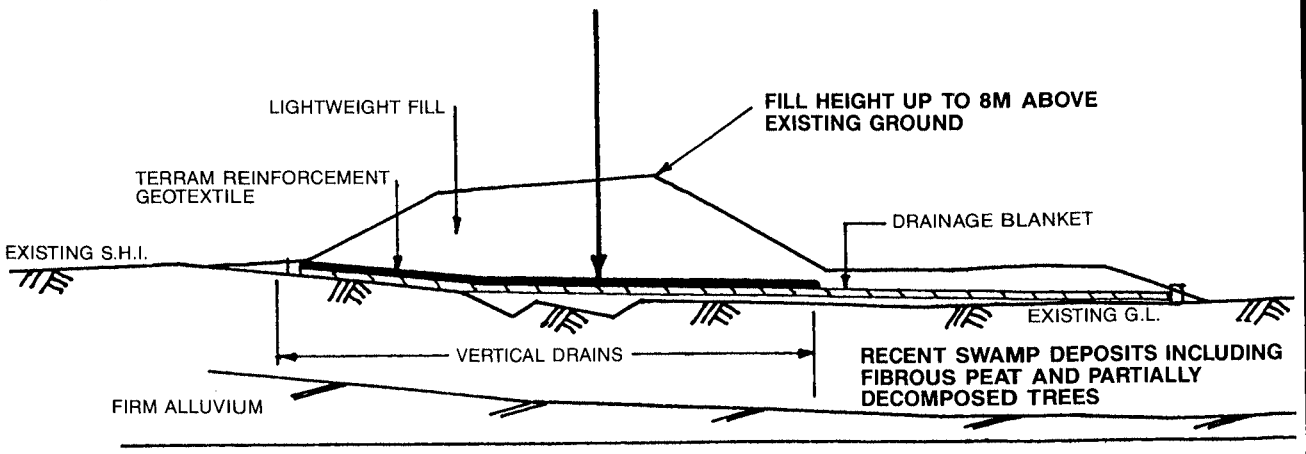
600KN/m BREAKING LOAD IN A FABRIC?



When you need a reinforcing layer

Use the geotextile designed for the job

YES! TERRAM WB60/5 WOVEN GEOTEXTILE



TYPICAL CROSS SECTION

Realignment of State Highway 1 at the Pokeno rail overbridge necessitated construction of an 8m high fill embankment over a soft swamp. TERRAM WB60/5 woven geotextile was used by Works Consultancy Services to provide a reinforcing layer in the base. The fabric has stabilised the embankment and has enabled project time constraints to be met. Instrumentation to monitor performance of the project was also supplied by Ground Engineering Ltd. This includes piezometers installed beneath the embankment and strain gauges fixed to the geotextile.

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