The Editor AEES Newsletter
Kevin McCue
AGSO, GPO Box 378
Canberra ACT 2601

fax: 61 (0)2 6249 9969

AEES is a Technical Society of IEAust The Institution of Engineers Australia and is affiliated with IAEE

2/98

AEES Newsletter

Contents

The Society

Vaughan Wesson and Barbara Butler

Dear AEES Members,
The AEES is in the process of constructing a Web site. We are looking for suggestions on things to be included on the site. Ideas include:

- copies of the newsletter
- details about relevant up coming conferences
- details of interesting recent publications
- significant research projects in earthquake engineering (in Australia?)
- links to other relevant Web sites

What do *you* think of these ideas?
What other things do *you* think could be included?
Does anyone out there have an interest in contributing to the development of the Web site (there are very easy to use tools available for this)?
All ideas welcomed.
Cheers, Vaughan Wesson

The Australian Earthquake Engineering Society email list. Operated by the Seismology Research Centre, Melbourne.

The Chairman/Treasurer's Column

There has been much activity in the area of the development of seismic loading standards over the past few months.

• AS3826-1998 "Strengthening Existing Buildings for Earthquakes" has recently been published. This Standard should be of considerable use to local government organisations involved with retrofitting existing low-rise structures to make them less vulnerable to earthquake damage. The implementation of the Standard depends on each local authority however it will bring consistency across this sector of the profession. The Standard was developed with input from engineers, builders, NSW Department of Public Works, other authorities including Newcastle City Council and the University of Newcastle.

• Standards Australia, responding to the Federal Government's Closer Economic Relations Policy with New Zealand, has embarked on a program of developing joint Australian/New Zealand standards. In the structural engineering sector, the loading standards have been the first to be "harmonised". Over the past two years, a joint earthquake loading committee was formed and divided into a number of working groups examining particular aspects of earthquake resistant design including seismicity, soil effects, building configuration, analysis techniques and design and detailing aspects. Progress has not been swift primarily because of lack of funding for travel and expenses and a reliance on voluntary input of expertise. The next meeting is scheduled to coincide with the Australasian Structural Engineering Conference to be held in Auckland late in September.

• On a broader front there is a move by the APEC nations to develop harmonised loading standards for the region. This work is being co-ordinated by a committee chaired by Emeritus Professor Len Stevens from The University of Melbourne. The most recent meeting of member countries was held in Singapore in July and was sponsored by the Department of Industry, Science and Tourism. Your Chairman was selected by DIST as one of two Australian representatives. The overall strategy is to align and influence the relevant ISO loading standards. At the July meeting agreement was reached on the principles that should be adopted for the regional earthquake loading standard. Considerable further work is required and progress will depend on the availability of funding.

• We would like to draw your attention to a very informative and relevant publication titled "The Earthquake Hazard Centre Newsletter". This Centre is a non-profit organisation supported by the Commonwealth Science Council and is based at Victoria University in Wellington, New Zealand. The editor is Andrew Charleston and more information may be found on their web page at:

http://www.ehc.arch.vuw.ac.nz

• We would like to thank our colleagues in Perth who have very professionally organised the 1998 AEES Seminar with a stimulating and interesting program. We look forward to meeting you in Perth on the 4th and 5th of November.

Your Society - AEES

Executive:

President:	Prof Graham Hutchinson[1]
Secretary:	Vaughan Wesson[2]
Treasurer:	John Wilson[1]
Immediate Past President:	Charles Bubb
Secretariat:	Barbara Butler[1]

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Peter Gregson (WA)
Vagn Jensen (Tas)
Michael Neville (NSW)
Mike Griffith (SA) and
Kevin McCue (ACT)

[1] Civil & Environmental Engineering Department, The University of Melbourne, Parkville, Vic 3052
[2] Seismology Research Centre, Bundoora, 3083

THE 1998 AEES SEMINAR AND AGM - PERTH WA

The Organising Committee is:

Peter Gregson	AGSO Mundaring
Rupert Grayson	Aust Institute of Steel Construction
Peter Gow	Contract and Management Services
Julian Yates	State Emergency Services
Mike Dentith	University of WA

The Venue:

Location:	Hotel Grand Chancellor, Perth WA
Date/Time:	4 & 5 November 1998
Theme:	*Meckering 30 Years On - How Would We Cope Today*

Topics:

- Engineering aspects including - retrofitting and upgrade
- Unreinforced masonry - risks; design practise
- Seismology hazard related topics
- Disaster management - responding to an earthquake
- Offshore earthquake hazards (Tsunamis)
- Update on the Australian/NZ code

AGM: Monday 17:15 at Conference Venue

Conference Dinner: 'Moorings' Barrack Street Jetty

Excursion: An optional full day excursion on 6 November to Meckering, Northam and York to inspect the fault scarp, earthquake museum and AGSO's Mundaring Observatory.

On October 14 it will have been 30 years since a magnitude 6.9 earthquake struck Meckering WA, 130 km east of Perth. Most building in the township were destroyed or damaged. Faulting disrupted infrastructure including the Eastern Goldfields water supply, transcontinental railway, roads and phone lines. The fault scarp was 37 km long with a maximum displacement of 2 m vertical and 2.4 m horizontal. The earthquake was felt in an area of 700km radius and caused damage in many towns and in Perth. Fortunately the earthquake occurred on a public holiday and there were no deaths and only 20 injuries. The damage bill was in excess of $4M. To quote a Meckering resident: *It is amazing how in a few seconds, everyone's lives can be changed. We do not know what to do about houses. Nobody is allowed to build in Meckering until given the okay by the authorities who are making tests everywhere.*

How would we cope today?

The Aitape PNG Earthquake and Tsunami

On Friday 17 July at 6:40 pm coastal peoples of northwest Papua New Guinea region between Wewak and Vanimo and centred near Aitape felt a strong earthquake, so strong that many were unable to stand for several tens of seconds. Night was falling quickly as it does in the tropics but visibility was still a good kilometer or so and villagers observed the sea retreat. Some of the Aitape populace ran for the hills but the fishing villagers along the narrow dune fronting the Sissano Lagoon had nowhere to go.

The tsunami that then wiped those villages and several thousand inhabitants off the dune and into the lagoon leaving an occasional concrete raft or a few wooden piles was estimated to have averaged over 10m high, about the height of many of the coconut trees. Reporters also said that there were perhaps three large waves, the first the highest.

These observations were later all verified by a team of earthquake and tsunami investigators from Japan, the United States, Australia and New Zealand who measured wave heights along the beach (mostly debris heights in surviving trees), more than 18 measurements averaging 10.5m in the Sissano Lagoon region with individual heights up to 15m. There was some evidence that the wave height was about 3 m near the PNG/Irian Jaya border but it was less than 1m at many places between there and the lagoon and at Aitape. At Wewak only 150 km away no one noticed anomalous waves and several people we spoke with did not even feel the earthquake. The tsunami was recorded as far as Japan where the amplitude was only 10 cm or so, and nothing was recorded in Hawaii.

PNG is earthquake country and previous tsunamis had occurred along this coast in living memory, but not on this scale - not 10 m or more. (Everingham, 1970 noted that the 1888 submarine eruption of Ritter Is volcano in Vitiaz Strait generated a 10 m tsunami). The earthquake was rated magnitude 7.0 a major earthquake but on the low end of the tsunami generating scale so what was special about this one? One international agency even had the epicentre onshore causing some commentators to speculate that a large offshore submarine landslide must have occurred. The uncertainty in the epicentre location is at least ± 50 km.

So was it a special slip source, a freakish seafloor topography or a submarine landslide that caused PNG's largest tsunami and worst natural disaster in recorded history?

The immediate Australian disaster response phase was almost over when AGSO, with funding from AusAID sent AEES members Kevin McCue and Malcolm Somerville to join the PNG Geological Survey's Horst Letz in instrumenting the region to monitor aftershocks. Their mission was to record enough aftershocks to help locate the mainshock rupture so as to constrain the models for tsunami generation. Could such a wave series strike other parts of coastal New Guinea or was a local phenomenon responsible. What is the risk in PNG? and what engineering and planning methods can be embraced to ensure that such an event never recurs?

Many tens of small earthquakes were recorded in the first few days after the instruments were installed and the recorders will stay in place for a month. Future actions include an aerial mapping program which has already started to identify both the tsunami runup and safe new village sites. A research vessel will be commissioned to use sonar methods to identify possible submarine fault scarps and avalanche debris or scouring, and map the bathymetry between fault and shore in more detail.

Next issue we hope to tell you of our findings so that the tsunami modellers can work with fewer uncertainties to explain this event leading to better hazard analyses in PNG and elsewhere.

Everingham, I.B., 1970 Tsunamis in the Papua New Guinea Region, 1888 - 1973. BMR Report.

NUGGETS FROM THE NEWSGROUP - A REGULAR FEATURE BY CHARLES BUBB

Date: Wed, 03 Jun 1998 17:11:08 +1100
Forwarded-From: klangone@inc-net.com
Subject: Historical Earthquakes
The same is quite true for the Boston area. Our events of note were: 1638*, 1727 and 1755.

It's very hard to bring home the reality of seismic risk when there's been no activity in a long while. Buildings and ground conditions in Boston would make for a nasty disaster if the magnitude of those historical events were to occur again.

Of course we don't really understand what causes the earthquakes in this area anyway (I don't think they're all caused by isostatic rebound... :)...

* though the approx. epicenter was supposedly in S. Canada some people in the field believe it to have been in central New Hampshire, which would have given Boston a good ride.

An additional problem is the relative age of New York's building stock which is a lot older than its Californian counterparts, and many parts of the city have been around long before any form of comprehensive code has been in effect. How does one retrofit a city like New York?

A good example of a city with a moderate seismic background and long return periods is Lisbon. There is plenty of historical evidence to support that the Azores-Gibraltar fault broke catastrophically not only in the well known 1755 EQ, but in 1356, 382 and 60BC. There is also a large instumental event in 1969. All these are very powerful EQs located a considerable distance offshore and contrast with the more sparse close-range seismic activity which has large destructive EQs only in 1531 and 1909. The return period is so erratic...

The point I am trying to make is that most people in Lisbon today -and elsewhere- believe the 1755 event was a sort of one-off apochryphal event which is not going to happen again.

This is of course, nonsense

Patrick

From: "Kathleen Langone" <klangone@inc-net.com>
Newsgroups: sci.geo.earthquakes
Forwarded-From: jones@gps.caltech.edu, lucy_jones@caltech.edu

MW Musson wrote:
Martin Cline <cline40@home.com> wrote in article

If someone predicts that an earthquake will happen in California based on some sort of theory, and posts the prediction in a newsgroup, does that constitute practicing geology in California? If so, what are the associated liabilities to the person that makes the prediction?

A question still untested is this - if someone predicts an earthquake in California and it doesn't occur, can he be sued for the disruption caused by his prediction?
Roger Musson

Actually, the answer is clearly yes. Jim Whitcomb was sued back in 1977 for damaging property values with a prediction/test of the dilatancy diffusion hypothesis. He predicted a M4.5 in the San Fernando Valley for 6 months in the future. The lawsuit was dismissed because the plaintiff could not show that property values had actually been damaged. The earthquake did not occur but I don't think that was an issue in the suit.

In response to this, the State of California set up the California Earthquake Prediction Evaluation Council, a panel of experts to evaluate predictions and advise the Governor as to the reliability of predictions. Part of the legislation establishing the Council states that if a prediction is presented to the Council for evaluation, the predictor is protected from litigation. The Council still exists and has been part of the process of issuing advisories for foreshocks and aftershocks. The appropriate mechanism for someone who believes they have a valid earthquake prediction and wants the government to act on it is to present it to the Council who will advise the Governor. It does require that the method be explainable so the council can evaluate the scientific validity. I believe that the predictor is protected from litigation even if the Council calls the predicition unreliable because presumeably no one will spend money on the predicition after the Council has rejected it. The reason behind this was to encourage people to go forward with prediciton research and not let fear of litigation prevent useful research or dissemination of a prediciton.

Lucy Jones
USGS, speaking for myself

Charles

The AEES subscription year is from 1 Dec to 30 November. It is difficult and expensive to send each member an individual reminder that fees are due so please help us by sending your subscription for 1997/98 to AEES (attn: John Wilson, Civil and Environmental Engineering Dept, Melbourne University Parkville Vic 3052) or renew through IEAust's annual subscription system by marking AEES your preferred Society. If you change address or if you know a member who is not receiving the newsletter please advise the Secretary, many newsletters are returned.

Seismic Design Coefficients for Samoa by W. H. Boyce M. EERI, M AEES

Cameron McNamara Consultants, Milton, Australia

A probabilistic seismic hazard analysis has been carried out for Samoa using data from NGDC and the Esteva-Villaverde attenuation relationship. A plot of acceleration coefficient contours has been produced and it is concluded that reasonable design coefficients are 0.20 for Western Samoa and 0.15 for American Samoa.

INTRODUCTION

As part of the design process for a Hydro-power project in Western Samoa it was necessary to determine appropriate design loadings to account for earthquake effects.

Current practice in Western Samoa is to design structures to the requirements of the New Zealand loading code (SANZ, 1984) using Zone B coefficients although there is a 1974 recommendation from the New Zealand Department of Scientific and Industrial Research to use Zone A coefficients. Practice in American Samoa is to use UBC Zone 3. The Applied Technology Council guidelines (ATC, 1984) give an acceleration coefficient of 0.20 for American Samoa.

It was deemed necessary to carry out a seismic hazard analysis for the site to determine acceleration coefficients for use in the design of the project. There were severe constraints on time and cost and the analysis was carried out within these constraints. These constraints are common for engineering consulting work but are often not recognised by the wider engineering, scientific and general community.

SEISMIC HAZARD ANALYSIS

The seismic hazard analysis was based on the probabilistic method of Cornell (1968) and McGuire (1976), encompassed in the computer program EQRISK. The method requires the following information:

- earthquake source zones
- magnitude-frequency relationship for each source zone

$$\log N = a - bM \qquad (1)$$

where N = number of earthquakes with magnitude M or greater for unit time

- maximum magnitude earthquake in each source zone (this truncates the magnitude-frequency relationship)

- attenuation relationship to give peak ground acceleration as a function of magnitude and distance

The output from the above process is Peak Ground Acceleration (PGA) as a function of Average Recurrence Interval. The value for the chosen recurrence interval becomes the coefficient used to determine the design response spectrum.

EARTHQUAKE DATA

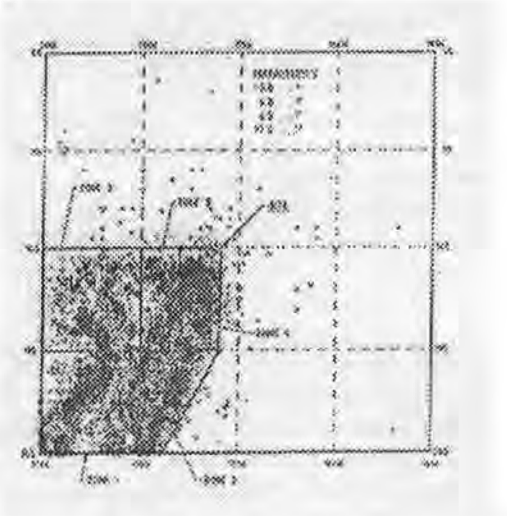
Earthquake data for the region was obtained from the National Geophysical Data Center (NGDC) of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce in Boulder, Colorado. As a practical issue although the data was requested by airmail and was so requested by NGDC the data arrived by sea and this curtailed the time available to consider and assess the data, carry out the hazard analysis and prepare a report to a matter of a few (hectic) days.

The NGDC files contain data from 1900 to the present. The NGDC data was supplemented by reference to recent work by Abe (1981 & 1984) and Abe and Noguchi (1983 a,b) who have carefully recomputed magnitudes of large earthquakes occurring between 1897 and 1980.

Earthquake epicentres are plotted on Figure 1 and the five source zones used in the analysis are also plotted on this Figure. In the event the only zones contributing to the result were 4 & 5 together with the background seismicity.

MAGNITUDE - FREQUENCY RELATIONSHIPS

The most intense activity near Samoa occurs in the Tonga-Kermadec trench where the Australian (or Indian or Fijian) plate forms a subduction zone with the Pacific plate. Samoa lies near the north-eastern tip of this trench. Activity in the five source zones in this trench was combined to determine the slope of the magnitude-frequency relationship. The relationship for each zone was then based on its activity rate for magnitude 6 or greater with a slope parallel to that of the combined source zones. Confirmation of this approach was provided by McGuire (1977) when the reference was found after the study had been completed.



By inspection of the NGDC data it was reckoned that earthquakes had been detected for the following periods:

Magnitude	Period
>7	1904 - 1986
6 - 7	1930 - 1986
4 - 6	1963 - 1986

In calculating the cumulative exceedances per annum the above time periods were used for the respective magnitude ranges. The number of large earthquakes in the NGDC files was considerably in excess of the numbers provided by Abe (1981 & 1984) and Abe & Noguchi (1983 a & b). The Abe & Noguchi values were used to determine the slope of the magnitude frequency relationship.

Background seismicity was arrived at by considering the number of earthquakes of magnitude 6 or greater in the surrounding area outside the source zones and again using a slope equal to that of the combined source zones.

Parameters of the magnitude-frequency relationships used in the study for each source zone and the maximum magnitude earthquake for each zone are set out below:

Zone	a1.	b	Focal Depth (km)	Mmax
1	13 400	1.25	500	9
2	8 000	1.25	100	9
3	8 000	1.25	500	9
4	13 400	1.25	50	9
5	340	1.25	50	7.5
Back ground	10	1.25	50	7

a1. is number of events per year of magnitude 3 or greater

ATTENUATION RELATIONSHIP

Numerous attenuation relationships have been published and many of these are listed by McGuire (1976) and Campbell (1985). No relationship has been developed for the Samoan region and in this study the results of Esteva & Villaverde (1973) were adopted. Esteva & Villaverde took the natural logarithm of the peak ground acceleration (PGA) as a normally distributed random variable with mean μ and standard deviation σ and produced the following results:

$$\mu = \log_e [5600\, e^{0.8M} (R + 40)^{-2}] \qquad (2)$$

$$\sigma = 0.64$$

where M = magnitude
R = hypocentral distance (km)
PGA has units of cm/sec^2

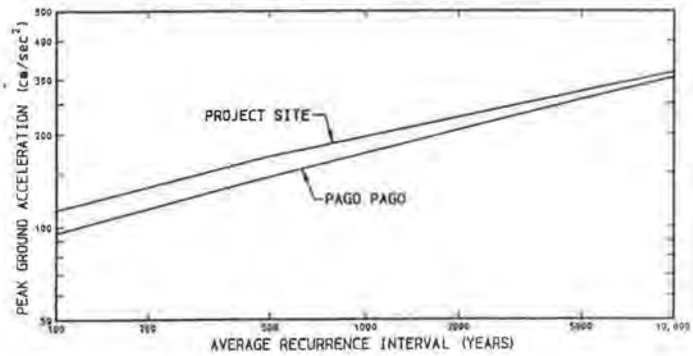


Figure 2 Peak Ground Acceleration Versus Average Recurrence Interval

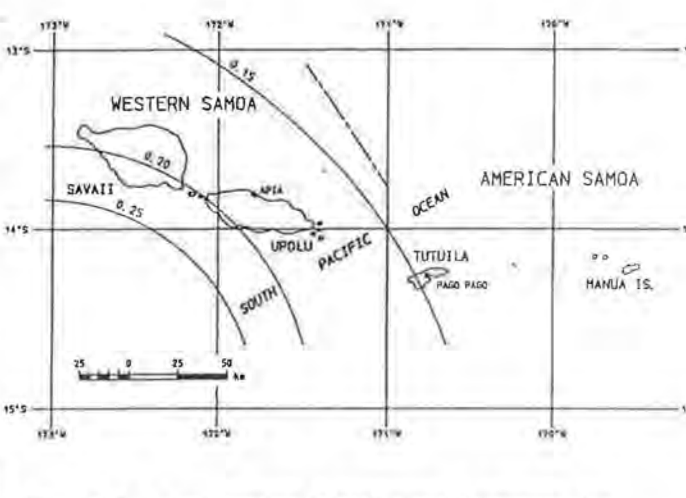


Figure 3 Acceleration Coefficient Contours for Samoa (500 year average recurrence interval)

RESULTS

Results of the hazard analysis are shown in Figures 2 and 3. In Figure 2 the PGA is plotted as a function of average recurrence interval for the project site (and also for Pago Pago). Based on this figure an acceleration coefficient of 0.17 (being the value corresponding to an average recurrence interval of 500 years) was selected for the design of structures connected with the project.

As an extension to the study the PGA at a grid of sites was determined and the acceleration coefficient plot shown in Figure 3 was produced. This should be regarded as a first pass at zoning the countries. Based on this plot it would be reasonable to use an acceleration coefficient of 0.20 in Western Samoa and 0.15 in American Samoa. The basis for the value of 0.20 for American Samoa is not given in the ATC document. The background seismicity used in this study produced a coefficient of 0.146.

It should be noted that the acceleration coefficient should be used in conjunction with the ATC Guidelines (1984) to determine design forces for structures. For earth dams the coefficient should be used in conjunction with references such as Seed & Martin (1966), Seed (1979), Ambraseys & Sarma (1967).

CONCLUSIONS

The following conclusions derive from this study:

- The probabilistic method of Cornell & McGuire can be used to produce a consistent set of acceleration coefficients for design purposes.

- The data files of NGDC supplemented by the Abe and Noguchi results are adequate to determine magnitude-frequency relationships in highly seismic areas.

- Since background activity has such a marked effect for sites outside source zones it deserves greater attention than has commonly been given to it.

- Based on this study, reasonable acceleration coefficients for design in Samoa are 0.20 for Western Samoa and 0.15 for American Samoa.

ACKNOWLEDGEMENTS

The reference to Abe and Noguchi's work was provided by Euan Smith of the New Zealand Department of Scientific and Industrial Research.

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UNIVERSITY OF WOLLONGONG

SHORT COURSE

Geotechnical Earthquake Engineering

Integrating Engineering Seismology and Geotechnics

6 - 8 October, 1998

Department of Civil, Mining and Environmental Engineering
Wollongong, NSW, Australia

Geo-Environment-Mine Engineering (GEME) Research Centre

Introduction:

Understanding the performance of earth structures under seismic conditions requires a holistic approach which combines the principles of engineering seismology with the fundamentals of soil mechanics and soil dynamics. This course will present an integrated approach which will appeal to geotechnical engineers, engineering geologists earth scientists and other professionals concerned with the safety of:

(a) infrastructure systems, and
(b) individual structures such as dams, foundations and retaining walls.

Objectives:

The course will highlight understanding of the physical phenomena concerned with earthquake occurrence, associated effects on earth masses and geotechnical structures and implications for geotechnical analysis and design. Lectures will focus on:

(a) fundamentals of engineering seismology, interpretation of strong motion data and seismic risk analysis
(b) behaviour of soils under dynamic and cyclic loads
(c) proven methods of analysis for stability and permanent ground deformations
(d) performance evaluation of geotechnical structures
(e) significant recent developments

Course Leader:

The course leader and main lecturer is Dr SK Sarma, Reader at the Imperial College of Science Technology and Medicine, University of London, United Kingdom. He is a key member of a pioneering group in engineering seismology which has been at the forefront of research. Dr Sarma has established an international reputation and his slope stability and seismic analysis mtheods and related computer programs are used throughout the world. He has worked on significant consulting projects and won several awards. He presented two successful short courses in Australia between October 4 and 8, 1994 and since then there have been several requests for his return visit.

Topics:

- Principles of Engineering Seismology, crustal deformation and faulting
- Vibrational characteristics of ground during earthquakes
- Effects of surface geology on ground motions; attenuation laws
- Seismic risk analysis, calculation of design ground motions at a site
- Strong motion instrumentation and interpretation of strong motion data
- Ground response spectra
- Vibration of elastic systems
- Application of strong motion response spectra for design pruposes
- Behaviour of soils under dynamic and cyclic loading; the estimation of excess pore water pressures generated during earthquakes; liquefaction
- Detailed presentation concerning the use of Sarma's (1973 and 1979) methods of limit equilibrium analysis including the use of inclined slices
- Extensions of limit equilibrium approaches to seismic bearing capacity and earth pressure problems
- Displacements of sliding blocks for seismic design of earth dams and embankments
- Recent developments and the use of advanced concepts and techniques.

Registration and Accommodation:

Mr James Cook, Conference Convenor
Unicentre,University of Wollongong
Northfields Avenue
Wollongong, NSW, 2522, Australia
Ph: (02) 4221 8095 Fax: (02) 4221 8001
E-mail: James_Cook@uow.edu.au

Technical Enquiries:

Professor RN Chowdhury
Dept Civil, Mining & Environmental Engineering
University of Wollongong
Northfields Avenue, Wollongong, NSW 2522

Tel: 61-2-42213037, Fax: 61-2-42213238

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Please send to me the following publications at the special price listed, plus postage.

- Proceedings of the 1992, 1993 and 1994 Conferences $20.00 / pack of three
- Proceedings of the 1995 Pacific Conference on Earthquake Engineering 3-Volume set $90.00
- Proceedings of the 1996 Adelaide Conference $12.00 each

Invoice and publications to be sent to:

Name ....

Address ....

....

City ....State.........

Postcode ....

Forthcoming Conferences

(Flyers for some conferences are available from Ed)

• **1998, 29 Sep - 2 October, Auckland, New Zealand.** The Australasian Structural Engineering Conference 1998 Contact ph: + 64 9 360 1980 fax: 64 9 376 1980 e-mail: asec@conventionmgmt.co.nz

• **1998, 4 - 5 November, Perth WA.** The AEES Seminar and AGM. See article page 1.

• **1998, 8 -12 November Hobart Tasmania.** ASEG 13th Int Conference and Exhibition. e-mail: wsm@latrobe.edu.au

• **1999, 15 - 17 February Hobart Tasmania** The 8th Australia New Zealand Conference on Geomechanics. Conference manager email: travel@southcom.com.au http://www.ieaust.org.au/conference.htm

• **1999, 04 - 09 July Sydney NSW.** XIX Pacific Science Congress, University of New South Wales. e-mail reply@icmsaust.com.au

• **1999, 19 - 30 July, Birmingham, England, UK.** The Tsunami Symposium will be held in conjunction with IUGG99. The 22nd General Assembly of the International Union of Geodesy and Geophysics (IUGG will be held at the University of Birmingham. Register your name and address at: http://www.bham.ac.uk/IUGG99

• **2000, 30 Jan - 4 Feb, Auckland New Zealand.** 12th WCEE/PCEE.

NEW BOOKS / REPORTS

Australian Seismological Report - 1995 AGSO Sales Centre ph: 06 249 9519, fax: 06 249 9982

Acceptable Risks for Major Infrastructure. Eds P Heinrichs and R Fell, Balkema 1995. Proceedings of the Seminar on Acceptable Risks for Extreme Events in the Planning and Design of Major Infrastructure. Sydney NSW Australia, 26 - 27 April 1994.

Report on the January 17, 1995 Great Hyogo-Ken Nambu (Kobe) Earthquake. Lam Pham & M Griffith. CSIRO DBCE 95/175(M).

Isoseismal Atlas of Australian Earthquakes - Part 3 AGSO Record 1995/44, $50 + pp. AGSO Sales Centre phone: 06 249 9519, fax: 06 249 9982

Fundamentals of Earthquake Prediction by Cinna Lomnitz: John Wiley & Sons.

The Geology of Earthquakes by R.S. Yeats, K.E. Sieh, and C.R. Allen: Oxford University Press, 576 p., price $65.00.

Paleoseismology, edited by James P. McCalpin. Academic Press, 576 p., price $89.95.

Earthquakes and Geological Discovery by Bruce Bolt. W H Freeman and Co., 1993.

Risks and Realities, Centre for Advanced Engineering University of Canterbury, Christchurch New Zealand. This book mainly presents the results of an investigation into the vulnerability of lifelines serving metropolitan Christchurch.

1997 AEES Brisbane Conference Proceedings

The cover of the Proceedings reflects the theme of the Conference: Earthquake Risks in Australian Cities. The volume is available now and at a very reasonable price. To both learn about earthquake engineering issues and support the Society place your orders now with Barbara Butler ($30 + pp).

WCEE 2000 AUCKLAND NEW ZEALAND

Please Note: The New Zealand National Society for Earthquake Engineering will host the next World Conference on Earthquake Engineering in Auckland

30 January - 4 February 2000.