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

2/99

AEES Newsletter

Contents

PRESIDENT'S PERAMBULATIONS

We provided our member mailing list to the New Zealand organizing committee for WCEE 2000 and you should have received from them a registration brochure for the World Conference on Earthquake Engineering to be held in Auckland in Jan-Feb 2000. This is a great opportunity to attend a World Conference without the added burden of long distances and expensive travel costs. I would encourage you to attend if at all possible.

Even closer to home and sooner is our own 1999 Annual Conference in Sydney on 29-30 September. Bijan Samali and the local committee are closer to establishing the program and I look forward to seeing you there. Emeritus Professor Bob Park has accepted our invitation to be a keynote speaker and he will address the topic "Seismic design of reinforced concrete structures in regions of low/moderate seismicity".

There have been some recent developments in the preparation of the joint Australian/New Zealand revised Standard for earthquake loads. A meeting of working group representatives was held in Wellington on 30 April and 1 May and this established the broad thrust of the document. Expressions of interest in being involved in developing an initial draft under contract were invited in May and negotiations are under way to settle a contract involving a consortium approach. The Australian members of the committee held a teleconference on 30 June and developed our requirements for the contract brief. The intention is to have a draft Standard available for committee review by the end of this year.

I trust you will enjoy this Newsletter and urge you to make your contribution to future issues.

Bill Boyce

Your Society - AEES

Executive:
President: Bill Boyce[1]
Secretary: Russell Cuthbertson [2]
Treasurer: Dr Steven Jaume [2]
Immediate Past President: Prof Graham Hutchinson [3]
Secretariat: Barbara Butler [3]
Committee:
John Wilson (Vic)
Col Lynam (Qld)
Peter Gregson (WA)
Vagn Jensen (Tas)
Michael Neville (NSW)
Dr Mike Griffith (SA) and
Kevin McCue (ACT)

[1] Kinhill Pty Ltd, Brisbane, Qld
[2] QUAKES, University of Queensland
[3] Civil & Environmental Engineering, Melbourne Uni

The Society website/email list

Dear AEES Members,
The AEES web site is at www.aees.org.au We used an online form for registrations for the September AEES conference and this method seems to have been very successful.
We are always looking for suggestions on other things to be included such as:

- 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 other things do *you* think could be included?
If any of our readers/members have an interest in contributing to the development of the Web site, send email to "vaughan@seis.com.au"

Cheers, Vaughan Wesson

The AEES email list is operated by the Seismology Research Centre, Melbourne. If you would like to register please notify Vaughan Wesson vaughan@seis.com.au

NUGGETS FROM THE NEWSGROUP - A REGULAR FEATURE BY CHARLES BUBB

The newsgroup is sci.geo.earthquakes and the discussion below was initiated by our Treasurer Dr Steven Jaume and ably responded to by Roger Musson. Roger is a seismologist with the British Geological Survey, Edinburgh who is very active on this newsgroup. I find that his posts are always worth reading. The discussion between Roger and Steven was still going strong last time I looked. Now read on:

Steve Jaume: Has anyone here read the two recent papers by Anderson and Brune (in SRL and BSSA) on the failure of earthquakes in the Western US to knock down precariously-balanced boulders? What do you think about it?

Roger Musson Ok, I'll bite. The most interesting part of that work (to me at least) is the implication that *most* (and maybe all?) probabilistic seismic hazard calculations handle the ground motion uncertainties incorrectly.

Jaume: For the readers unfamiliar with this topic, a probabilistic seismic hazard estimate generally consists of three inputs: 1) an earthquake source (either a fault or a "zone" where earthquakes are common, 2) an estimate of how often earthquakes occur in the various sources in the region, and 3) an estimate of the ground motion as a function of earthquake magnitude and distance from the earthquake *and the uncertainty of this estimate*. It's this last part, the ground motion uncertainty and how you include it in hazard estimate, that is a big headache.

What Jim Brune has done over the past few years is find places where there are "precariously-balanced boulders" that have been that way for several thousand years (i.e., have been through many earthquakes) but
not been toppled over. He's developed ways of estimating how much ground motion it should take to topple the boulders. When you compare that estimate to ground motion estimates from seismic hazard maps, these precariously-balanced boulders shouldn't be there (i.e., they should have been knocked over by an earthquake). The implication is that, at least for very long time windows, the seismic hazard calculations
overestimate the ground motion. John Anderson has relooked at how the uncertainty is included in seismic hazard calculations and suggested a "fix" that may prevent an overestimation of the ground motion.

For me, their work raises a number of questions. The first is, where does the uncertainty in the ground motion come from in the first place? Is it mostly due to inherent variations in the earthquake source mechanism that generate the ground motion in the first place? Is it mostly due to the rock type the seismic waves travel through? Is it mostly due to the local differences in near surface geology at different sites? Or some combination of them all? I suspect that knowing answers to these questions would help figuring out the right way of adding the uncertainty into the calculations.

Another issue for me is, what happens if all the seismic hazard calculations are re-done using Anderson and Brune's suggestion, and all the ground motion values decrease? What impact will this have on building codes, etc? Remember, the earthquake hazard really hasn't changed, just the way it is estimated.

Oh, and on a more personal note, if you ever get a chance to go out chasing precarious boulders with Jim Brune, be prepared for a workout. The guy's as old as my dad and he still ran me into the ground one day on Broken Ridge.

Musson: Well, it's a mixture of these and more. The data set from which the attenuation equation was calculated will have scatter in it from being composed of many different event types, different paths, and so on. So the data may fit the model to varying degrees. But even if you had multiple measurements from near-identical earthquakes at the same site, you would still get scatter in the recorded results because of the chaotic nature of earthquake motion (interference and so on). The problem is, according to Anderson and Brune, that the uncertainty value (sigma) is used in the hazard calculations as if it were modelling only the latter effect, when in fact it is largely dominated by the former. And since I argued much the same thing about six years ago (and it was regarded as highly controversial) I have some sympathy. The problem is, it's hard to know how big sigma should be if diversity in the data set were ruled out. In the Seismology Research Letters paper, A&B suggest a very low value indeed.

I get the impression that a lot of people are unhappy about the strong effect sigma has, when it itself is such an artificial and uncertain thing. Yes, you can even attempt to model uncertainty in the uncertainty, which is really getting a bit incestuous. Exactly how this should be dealt with is another matter. Some of the solutions proposed seem to me to suffer from arbitrariness.

Jaume: Yes, I've also found that a lot of people are unhappy about the strong effect of sigma in seismic hazard calculations. Here in Queensland (Australia) you can easily change the PGA (peak ground acceleration) by a factor of two or more, depending upon whether you use the sigma in the previous hazard study (which was pretty much unconstrained) or one from a recent attenuation model using Australia data. Malcolm Somerville (Australian Geological Survey Organization) and I have had more than one discussion about what the appropriate sigma to use is; we both agree the sigma used in previous work was too low, but don't agree on what it should be for the revision.

Musson: One of their (Anderson and Brune's) suggestions is to restrict the model to faults only, and remove the area sources. That wouldn't decrease all the hazard values, just the ones away from the fault lines. But then you miss out on the Northridges of the world.

Jaume: You'd do more than miss out on Northridge's - you'd miss almost all intraplate earthquakes! While there are some well-defined faults in intraplate regions, they are the exception not the rule. Some other means of dealing with the problem is needed.

Musson: There is one point that seemed to be to be a serious weakness until I read the paper more carefully; and you have to read it very carefully indeed. At first reading, the argument from the boulders seems far too deterministic. You cannot say, if earthquake X happens at distance Y then this boulder WILL topple. There is a similar fallacy involving ancient buildings - because this monument is still standing, therefore there has not been an earthquake. Doesn't work like that.

Therefore the argument is only good if you can demonstrate that all boulders in a given place have not toppled; you have to examine non-precarious rocks and show that it is not the case that they have been toppled by past earthquakes leaving one or two survivors.

On close reading, I think A&B do have that sort of evidence, but they are certainly hiding that particular light under a bushel; no doubt holding it back for the next publication.

Jaume: Yes, Jim Brune and co-workers have been at this for a number of years. There are some earlier papers plus one recently submitted that address these issues, not to mention a few reports in the gray literature. At some point Jim should write a more comprehensive article that brings all the pieces together.

In general, I believe the question of how uncertainties should be included in seismic hazard calculations is still open. My feeling is that until we have a good handle on just where the sigma that drops out of the ground motion inversions comes from, this will continue to be a problem.

Steven C. Jaume' (Disclaimer: These opinions don't belong to the University of Queensland or anyone else for that matter.)

Charles

The AEES subscription year is from 1 Dec to 30 November. It is expensive to send each member an individual reminder that fees are due so please help us by sending your subscription for 1999/2000 to AEES (attn: Barbara Butler, 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.

Shakeup at AGSO

Australia's premier GeoScience Organisation has undergone major changes. Completion of several large projects has led to some 89 staff redundancies with the Minerals Division taking most of the job cuts. The subsequent reorganisation has elevated GeoHazards to Division status where it joins the traditional fields of Minerals and Petroleum. Dr Wally Johnson leads the new Division.

These changes will impact on Earthquake Engineering practice in Australia in a positive way because both the earthquake hazards and Cities projects have been strengthened. David Stewart takes on leadership of the Newcastle '99 and Botany projects of the Cities project, and Dr Doug Finlayson joins the earthquake group. Doug will be working on the Rabaul tomographic experiment, to map the magma chamber underlying Rabaul harbour funded by AUSAID, and the Philippine seismic network re-equipment project funded by JICA.

Dr David Denham and Peter Gregson, foundation members of AEES, have retired after long and illustrious careers in BMR/AGSO. Dr Malcolm Somerville has resigned due to ill health and Vic Dent has taken early retirement. On the positive side, Craig Bugden has been recruited from UCQ, and Dr Jim Leven from the Minerals Division.

Note that AGSO has become a Prescribed Agency from 1 July 1999 and Dr Neil Williams becomes CEO instead of Executive Director.

1999 Earthquakes in Australia

The largest earthquake in the first quarter of 1999 was at Appin NSW. Minor non-structural damage was reported near the epicentre and the event was felt throughout Sydney with a single report from Newcastle. None of the other listed events caused damage but many of them were noticed as were micro-earthquakes near populated centres (see the report on Canberra's recent earthquakes). The focus of the 6 Feb earthquake near Mt Gambier, built on a volcano that was active less than 5000 years ago, was near the base of the crust which is most unusual.

DD	UTC	Lat	Long	ML	Place
Jan					
12	0308 22	27.75	126.0	3.7	Gt Vic Desert WA
13	0940 00	38.16	146.37	3.5	Moe Vic
18	1450 42	27.78	126.34	4.2	Gt Vic Desert WA
22	000723	33.97	116.94	3.2	Kojonup WA
22	1515 43	33.76	139.08	3.5	Burra SA
23	0441 10	19.59	111.21	4.0	Indian Ocean WA
23	2256 14	21.46	115.55	3.4	Onslow WA
26	0536 55	33.92	139.20	3.2	Eudunda SA
Feb					
02	2359 13	26.24	140.12	3.2	Haddon Corner SA
06	0507 29	38.32	140.70	3.4	Mt Gambier SA
11	1245 24	17.18	144.80	3.4	Chillagoe Qld
21	0651 36	28.77	142.96	3.3	Bulloo Downs Qld
Mar					
01	0128 52	25.80	137.59	3.5	Pangunna Lake NT
05	0346 26	18.69	114.28	3.5	Indian Ocean
06	1530 28	23.07	117.27	3.6	Paraburdoo WA
06	2354 40	28.51	139.07	4.1	Mungeranie HS SA
10	0006 37	33.97	148.12	3.2	Grenfell NSW
14	0013 31	34.00	147.08	4.4	W Wyalong NSW
17	0158 10	34.23	150.77	4.8	Appin NSW
17	0721 20	30.98	138.87	3.1	Blinman SA
22	0122 22	16.69	127.31	3.5	Warmun WA
25	1226 08	20.36	146.75	3.4	Ravenswood Qld
27	2209 27	30.83	124.44	3.0	Zanthus WA
29	1512 49	15.12	128.37	3.0	Kununurra WA

URM Research, Adelaide University

Mike Griffith

Shaking Table Tests of Unreinforced Masonry Wall Panels *Australian Journal of Structural Engineering, IEAust,* Volume 1, No.2, pp. 113-120, (1998).

G.M. Klopp B.E. (Hons.) M.I.E.Aust., Postgraduate Student, M.C. Griffith B.S. M.S. Ph.D. M.I.E.Aust., Senior Lecturer, The Department of Civil and Environmental Engineering, The University of Adelaide.

Abstract Shaking table tests were undertaken on fifteen pairs of unreinforced masonry wall panels using sinusoidal base motion. The response of each panel to harmonic in-plane inertia loading was measured. Based on the measurements, the in-plane stiffness values were calculated for each panel and used to study the effect of four parameters on the stiffness of wall panels. The four parameters considered were (i) panel height; (ii) vertical compressive stress on the panels; (iii) number of brick leafs in the panels; and (iv) the frequency of excitation. It was found that the variability in the material properties due to workmanship generally masked most relationships between the four parameters and panel stiffness. An effective Young's Modulus for a one-phase model of unreinforced masonry was determined by calibrating results of a finite element analyses of the walls to the experimental results. This value, 1065 MPa, was well below that commonly used in practice.

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Seismic Analysis of Unreinforced Masonry Buildings *Australian Journal of Structural Engineering, IEAust,* Volume 1, No.2, pp. 121-132, (1998).

G.M. Klopp B.E. (Hons) Ph.D M.I.E.Aust., M.C. Griffith B.S. M.S. Ph.D. M.I.E. Aust.

Abstract Unreinforced masonry (URM) is one of the most popular building materials in Australia, especially for domestic and small commercial structures. However, URM buildings are also one of the most vulnerable of building types to damage from earthquakes. Since the Australian earthquake code, Minimum Design Loads on Structures Part 4 : Earthquake Loads, AS1170.4 - 1993 (1), requires earthquake loading to be considered for most new buildings, eleven existing URM buildings were analysed with respect to earthquake loads as part of a PhD research project at the University of Adelaide to examine several key aspects of the design of unreinforced masonry buildings for seismic forces. The results of this study indicate that the two most likely types of failure due to earthquake loading would be:

(1) shear failure of the wall-to-floor or wall-to-roof connection; and

(2) out-of-plane bending failure of the wall in the top storey.

It was estimated that the in-plane connection forces could generally be met by friction, especially in the case of wall-to-concrete slab details. Typical *positive* wall-to-roof connections and wall-to-timber floor connections were also expected to be adequate. Of more concern was the fact that a wall bending failure was predicted in the top storey of 5 out of the 11 buildings studied.

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On the Seismic Capacity of Typical Dpc and Slip Joints in Unreinforced Masonry Buildings *Australian Journal of Structural Engineering, IEAust,* Volume 1, No.2, pp. 133-140, (1998).

M. C. Griffith[1] and A. W. Page[2]

[1] Department of Civil and Environmental Engineering, The University of Adelaide, South Australia, Australia

[2] Department of Civil, Surveying, and Environmental Engineering, The University of Newcastle, Callaghan, New South Wales, Australia

Abstract Masonry is a widely used construction material in Australia for both domestic and commercial construction. Because of the relatively low seismic risk, the bulk of this construction is of unreinforced masonry. All masonry structures contain a range of flashings, damp-proof course membranes, and slip joints to ensure their satisfactory serviceability performance in the exclusion of moisture and allowing for various forms of differential movement. Since recent changes to the building regulations now require the seismic design of all structures, the performance of typical connections under cyclic dynamic loading must therefore be established to allow the seismic integrity of unreinforced masonry structures to be assessed. This paper presents the preliminary results of an on-going series of cyclic and dynamic tests on such details to establish their performance.

CLEARANCE OFFER ON CONFERENCE PROCEEDINGS

Barbara Butler has more copies of our early conference proceedings than she can store. We can't sell them so will give them away! Proceedings are yours for the price of postage: fax: 03 9348 1524 or b.butler@eng.unimelb.edu.au

Brief Summary of Research on Ground Motion Modelling at The University of Melbourne

Nelson Lam, John Wilson and Graham Hutchinson

Research has been carried out in the Department of Civil & Environmental Engineering at The University of Melbourne in recent years to model earthquake ground motion properties. The overall objective of the research is to develop an analytical framework for estimating ground motions for low and moderate seismicity conditions. There is an important emphasis in the research on the displacement (long period) component of the ground motion which has been recognized as a major contributor to earthquake induced damage. The ground motion research is fully integrated with various collaborative research projects carried out concurrently in the department on the seismic performance behaviour of buildings, general infrastructures and non-structural components.

Recent research output related to ground motion modeling includes the following :

(i) Generic attenuation functions for generic rock sites have been obtained to predict the ground acceleration, velocity and displacement parameters for any given combination of moment magnitude, site-source distance and crustal classification [Boore & Joyner, 1997]. These attenuation functions were derived by stochastic simulations of the seismological model recommended by Atkinson & Boore [1995,1998] utilizing an in-house developed computer program called "genqke".

(ii) These attenuation functions have been found to be in good agreement with a number of empirical attenuation models derived for rock sites in different regions around the world including Western North America [Joyner & Boore, 1988; Boore, Joyner & Fumal, 1997], Australia [Gaull, Michael-Leiba & Rynn,1990], Europe [Bommer & Elnashai, 1999], China [Huo, Hu & Feng, 1992]. Further comparisons with empirical functions derived from earthquakes that occurred recently in New South Wales are currently being carried out.

(iii) A methodology to construct design response spectra combining acceleration, velocity and displacement predictions has been further developed. Good agreement has been found between the developed model and the average intraplate response spectrum for rock sites obtained recently by Somerville, McCue & Sinadinovski [1998].

(iv) The relationship between the ground motion parameters and the seismicity parameters (expressed in the Richter-Gutenberg form) has been further developed based on a uniform source assumption [Jacob, 1997].

(v) A simple procedure has been developed to predict the site natural period by a simple analysis of a borehole record. Results predicted by the procedure have been found to be in good agreement with field measurements. The increase in the natural period with increasing ground motion intensity (period shift) has also been accounted for in the procedure. Refer to [Lam & Wilson, 1999].

(vi) The procedure described in item (v) has been further developed to predict the maximum response spectral acceleration of soil sites taking into account the effects of resonance. Results predicted by the procedure have been found to be in good agreement with results obtained by the program SHAKE. This soil amplification model is currently being extended to derive displacement response spectra for soil sites.

(vii) Synchronized accelerogram recordings of a micro-tremor at a borehole in Singapore have been analyzed to evaluate the accuracy of various soil amplification analysis methods described in item (v) and (vi). A report of this collaborative investigation with National University of Singapore is currently under preparation.

A number of journal publications have been produced based on this work over the past year, and are expected to be published over the coming months. We can provide manuscripts of the papers for those who are interested (Ed: contact the authors at The University of Melbourne). In addition, the following earlier related publications may be of interest :

1. Lam, N.T.K., Wilson, J.L. and Hutchinson, G.L., (1997),"Introduction to a new procedure to construct site response spectrum", *Proceedings of 15th Australasian Conference of Mechanics of Solids and Materials, Melbourne*, 8-10 December, 1997, 345-350

2. Lam, N.T.K., Wilson, J.L. and Hutchinson, G.L. (1998), "Development of intraplate response spectra for bedrock in Australia", *Proceedings of the 1998 Technical Conference of the New Zealand National Society for Earthquake Engineering*, Wairakei, 27-29 March, 1998. pp137-144.

3. Lam, N.T.K., Wilson, J.L, Edwards, M. and Hutchinson, G.L.,(1998) : "A displacement based prediction of the seismic hazard for Australia", *Proceedings of the annual seminar of the Australian Earthquake Engineering Society*, Perth, 4-5th, November. Paper no. 20.

4. Lam, N.T.K. and Wilson, J.L., (1999): "Estimation of the Site Natural Period from borehole records", *Australian Journal of Structural Engineering* . Published in Vol.SE1(3) pp179-199 in June 1999.

5. Edwards, M., Lam, N.T.K., Wilson, J.L. and Hutchinson, G.L., (1999): " The Prediction of Earthquake Induced Displacement Demand of Buildings in Australia : an Integrated Approach", *Proceedings of the Annual Technical Conference for the New Zealand National Society for Earthquake Engineering, Rotorua*, pp 43-50.

6. Lam, N.T.K., Wilson, J.L. and Chandler, A.M., (1999) : " Generation of Bedrock Response Spectra for Intraplate Regions" , *Proceedings of the 8th Canadian Conference on Earthquake Engineering,* 13-16 June, Vancouver, Canada.

Other Cited References :

7. Atkinson, G.M. & Boore, D.M. (1995): "Ground-Motion Relations for Eastern North America", *Bulletin of the Seismological Society of America,* Vol.85(1), pp17-30.

8. Atkinson, G.M. & Boore, D.M. (1998): "Evaluation of Models for Earthquake Source Spectra in Eastern North America", *Bulletin of the Seismological Society of America,* Vol.88(4), 917-934.

9. Bommer, J.J. & Elnashai, A.A. (1999): "Displacement Spectra for Seismic Design", *Journal of Earthquake Engineering, Vol.3(1), pp1-32.*

10. Boore, D.M. & Joyner,W.B.,(1997): "Site amplifications for Generic Rock Sites", *Bulletin of the Seismological Society of America,*Vol.87(2), 327-341.

11. Boore, D.M., Joyner, W.B. & Fumal, T.E. (1997): "Equations for Estimating Horizontal Response Spectra and Peak Acceleration from Western North American Earthquakes : A summary of recent work", *Seismological Research Letters,* Vol.68 (1), pp128-153.

12. Gaull,B.A., Michael-Leiba,M.O. & Rynn,J.M.W.(1990): "Probabilistic earthquake risk maps of Australia", *Australian Journal of Earth Sciences*,Vol.37, 169-187.

13. Huo, J., Hu, Y. & Feng Q. (1992): "Study on Estimation of Ground Motion from Seismic Intensity", *Earthquake Engineering & Engineering Vibration,* Vol.12 (3), pp1-15.

14. Jacob, K.H., (1997): "Scenario earthquakes for urban areas along the Atlantic seaboard of the United States", NCEER-SP-0001, National Centre for Earthquake Engineering Research, Buffalo, New York.

15. Joyner, W.B. and Boore, D.M., (1988): "Peak Horizontal Acceleration and Velocity from Strong-Motion Records Including Records from the 1979 Imperial Valley, California Earthquake," *Bulletin of the Seismological Society of America, Vol.71,* 2011-2038

16. McCue, K., Somerville, M. and Sinadinovski, C., (1998): "Response Spectra recommended for Australia" *Proceedings of the Australasian Structural Engineering Conference,* Auckland, 1998, pp439-444.

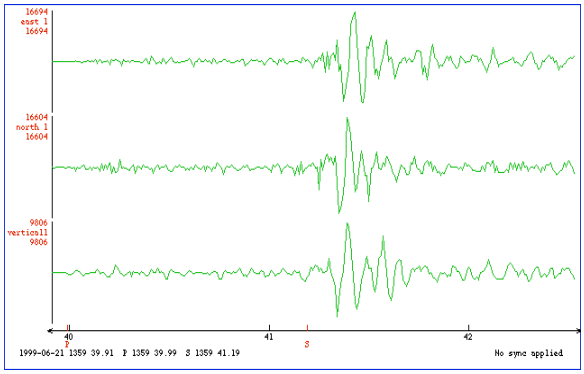
17. Newmark, N.M. & Hall, W.J. (1982): *Earthquake Spectra and Design,* EERI Monograph, Earthquake Engineering Research Institute, California.

Recent spate of earthquakes, Canberra trembles

On Monday night 21 June 1999 just a few seconds before midnight hundreds of residents within about a 10 km radius of the northern suburb of Ngunnawal were startled by a magnitude 2.5 microearthquake. Near the epicentre sleepers were awakened by what they described as an *explosion* whereas just 8 km away in Aranda only insomniacs (including the editor's neighbours but unfortunately not himself), reported a short shake, like a door banging or a large possum jumping on the deck.

An accelerogram of the second event recorded in Aranda is shown below. The shaking lasted about half a second and the maximum acceleration was 2 mg or 20mms^{-2} (0.3 mm/s at 10 Hz). The previous Friday a

similar sized and co-located event occurred at 4:40 p.m. but was not as widely felt and caused none of the concern raised by the midnight earthquake.



Accelerogram recorded at Aranda, ~8km from the epicentre

These two events would not normally be newsworthy outside Canberra but since January 1998 five earthquakes in and around the ACT have been felt in suburbs of the Capital; an ML4.2 earthquake in the Brindabella Ranges 40 km west of the city on 14 February 1998, an ML 3.0 Orroral Valley earthquake 40km to the south and the ML 3.2 Michelago earthquake 60 km to the south (isoseismal maps are available at AGSO.

Letters to the Editor:

PROACTIVE ACTION BY EARTHQUAKE ENGINEERS ?

This will no doubt be an appropriate year for interested organisations to remind the public about earthquake risk. So many practical lessons were learnt from the Newcastle earthquake of 1989.

It was a real demonstration of how a typical Australian city performs under earthquake conditions. Engineering follow-up and insurance company interest in design improvement were good, and resulted in the accelerated preparation of our brilliant new earthquake design code.

Yet ten years later it strikes me that the lessons haven't really been applied wholeheartedly on the ground. I can't honestly say that I've noticed any difference from the attitudes of ten years ago. Public interest seems to be waning as evidenced by the scaling back/closure of the Mundaring seismic monitoring centre, and often when I raise earthquake considerations on structural design jobs associated building professionals don't take it seriously.

The reality in Perth is that an earthquake of the Newcastle intensity would result in an enormous amount of structural damage and fatalities would be likely. Some of the more glaring structural deficiencies are:

- Low rise buildings with soft storey / eccentric bracing configuration, (which will perform exactly as the ones in Newcastle did).
- Flimsy non ductile parapets.
- Old double leaf brick walls in which the wall ties have long since corroded away.

Based on normal behaviour no one will be able to justify the expense of seismic upgrading until after an earthquake happens, which is of course too late.

To really improve earthquake safety I think a better approach is needed, for example a 'carrot and stick' approach. The carrot could be insurance companies offering an incentive for building owners to have their building checked strengthened and certified as complying with the current earthquake code. The stick would probably need to be public pressure, perhaps some clear public education examples of what can happen with common structural problems that we walk under every day such as those listed above.

Kurt Zink
Email: rimtide2@bigpond.com
15/7/99

EARTHQUAKE ENGINEERS IN AUSTRALIA

I am working with Bill Boyce to gather statistics on *Earthquake Engineers/Seismologists* in Australia, from the point of view that we are a dying breed and need some type of lobbying to prevent Commonwealth/State Governments from further cutting back budgets in this area of "disaster management". The following note is from IEAust's Athol Yates:

'Did you know that in the national survey of IEAust members last year, we identified 525 engineers who practice in Earthquake Engineering and 4659 who have an interest in it. You can possibly get the mailing list/email list of this group if you want to undertake a study into this group. I have attached the results from the national survey and you can search through it to get the earthquake engineering data. At the end of the file is an analysis of the data we hold for the engineering speciality of railway engineering. We can possibly do the same for earthquake engineers. Finally I have just completed a report into determining if there is a shortage of rail engineers. I will post these to you, as it would be possible to do a large study for earthquake engineers if there was money for it.'

Col Lynam

Hokudan International Symposium and School on Active Faulting in Japan

Dear colleagues:
It is our great pleasure to announce the Hokudan international symposium and school on active faulting in Japan, January 2000 prepared by the ILP task group II-5 in cooperation with Hokudan town in the source area of 1995 Kobe earthquake, and many other Japanese and international organizations. The meeting, shortly speaking, is an interdisciplinary attempt to review the active faulting and tectonic research in 1990s and to push forward the frontier of the geology of earthquakes. At the same time, important objectives are to feed back the knowledge and ideas to earth scientists, to engineers and planners concerning earthquake hazards, and to spread our ideas and techniques to the developing countries in Asia and Pacific regions.

Here are some special remarks for applicants from outside Japan.

1. The symposium consists a part of the school. All school participants are requested to attend and discuss in the symposium. Your cooperation in public programs is strongly encouraged.

2. There is a limitation for the number of school participants. Only the lecturers and qualified participants can attend the school. Selection of participants is made by the organizing and operation committee based on application. Please follow the general information in chapter 7 and send application by mail in your earliest convenience.

3. If you are only to participate in two-day symposium, there is no need for application and registration.

4. Please kindly forward the information on the meeting to your colleagues and students, and encourage them to apply for the school. Consult the secretariat if you volunteer for a lecturer.

With best regards

Takashi Nakata and Koji Okumura, Operational Committee and Daniela Pantosti and Alan Hull, Organizing Committee.

Call for Participation*

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* Contact Ed for more details if you are interested

Colombia Earthquake of January 25, 1999

The Earthquake Engineering Research Institute (EERI) recently released a Special Earthquake Report on the Quindio, Colombia Earthquake of January 25, 1999. Sponsored by the National Science Foundation, this report is part of the EERI's Learning from Earthquakes project. Sections contained in the report include an Introduction, Geosciences and Geotechnical Aspects, Structural and Nonstructural Damage, Observations on Lifelines, Health Impacts, Emergency Response, Emergency Shelter and Temporary Housing, Recovery and Reconstruction, and Lessons Learned. Figures and images supplement the report and help make more complicated material easier to understand. This report provides an excellent example of a case study. [JJS]

http://www.eeri.org/Reconn/Colombia/Colombia99.html

Russell Cuthbertson

FORTHCOMING CONFERENCES

1999 AEES, 29-30 September 1999 Sydney Australia. 10th Anniversary of the Newcastle earthquake. Centre for Built Infrastructure Research, University of Technology Sydney.

The meeting organisers are Dr Steve Bakoss, Dr Bijan Samali and Barbara Butler. A flyer with registration forms and draft details of the venue, invited speakers and program is included with this newsletter.

1999 SDEE'99, 9-12 August 1999 Bergen Norway 9th International Conference on Soil Dynamics and Earthquake Engineering

The Ninth International Conference on Soil Dynamics and Earthquake Engineering (SDEE '99) is hosted by the University of Bergen in collaboration with the Norwegian Association for Earthquake Engineering. Information regarding registration, accommodation and abstract submission can be obtained from the SDEE'99 Home Page at:
http://www.ifjf.uib.no/seismo/sdee99.html

1999, 1-3 November Disaster Prevention for the 21st Century

Canberra, 1-3 November 1999
National Convention Centre
http://www.ema.gov.au/conferencefr.htm

WCEE 2000
AUCKLAND NEW ZEALAND

Please Note: The New Zealand National Society for Earthquake Engineering will host the World Conference on Earthquake Engineering in Auckland 30 January - 4 February 2000.
Note: Registration forms available from Editor

NEW (&OLD) BOOKS / REPORTS

Australian Seismological Report - 1996 AGSO Sales Centre ph: 02 6249 9519, fax: 02 6249 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

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.

Seismogenic and tsunamigenic processes in shallow subduction zones, eds. J. Sauber and R. Dmowska, Birkhauser Basel, 1999. (reprinted from a recent issue of Pure and Applied Geophysics). US$44.50.

GeoScience Books announced that Catalog 99R - Regional Geology Annual is on the website <http://www.geosciencebooks.com/catalog.html> The catalog contains 585 publications of the U.S. State Geological Surveys and the Geological Surveys of Canada.
You can also visit the Bargain Books list at <http://www.geosciencebooks.com/bargain.html>
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"Civilization exists by geologic consent, subject to change without notice." Will Durant