



AEES Newsletter

The Society - David Rossiter (Treasurer)

The AEES subscription year is from 1 Dec to 30 November. If you have not yet renewed your subscription for this year, please send your subscription to AEES (Hon Sec, ASC GPO Box 378, Canberra ACT 2601) or renew through the IEAust's annual subscription system by marking AEES your preferred Society. And if you change address please advise me or the Secretary as many newsletters are returned.

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President's Report to AGM 1994

Charles Bubb

We have just completed the first half of our third annual seminar on Earthquake Engineering.

Although only half way through I feel sure you will agree with me that this Seminar also will be a success at its conclusion.

Of course, we still have to produce the printed Proceedings and that will be a daunting task for our small group here in Canberra. Any suggestions or offers of actual help would be greatly appreciated.

In hindsight, the double task of producing and distributing the Newsletters throughout the year as usual and arranging this Seminar was a heavy load for the small Canberra Group.

For this and for other reasons we again found it difficult to engage distant Committee members. Again, priority had to be given to those members organising the 1995 Pacific Conference on Earthquake Engineering in Melbourne.

Later in the AGM we will again be seeking Committee members throughout

Australia to contribute ideas and assistance from a regional background. Such content for the Newsletter is much needed.

Turning to the status of our Society, I can inform you that the Review of Technical Societies by the Institution of Engineers Australia has continued and it is becoming clear that the Institution has very big plans for the Societies. They will fall into different categories depending on whether they can respond on the level of the current National Committees of IEAust or not.

My own view at the moment is that the relationship we currently have, and the basis on which we have become a Technical Society of IEAust, suits us and our quite diverse membership very well. That is very much a matter for the coming year.

The big feature for 1995 is the Pacific Conference on Earthquake Engineering - our first International Conference and we will have a separate progress report on that shortly from John Wilson.

So I once again report to you that the Australian Engineering Society is alive and well and prospering.

I now call on the Hon Secretary and Treasurer to present their separate reports to confirm this view in a little more detail.

AEES'93&94 Conference Proceedings

The main function of our Society is the Annual Seminar. If you can't attend then you can keep informed about the latest developments in Earthquake Engineering and Engineering Seismology in Australia by purchasing the Proceedings. Order the '94 Proceedings now from the Hon Sec* (\$30.00 incl post and packaging). Back issues are available for \$25, or \$45 for both '92 and '93 Proceedings:

* (McCue, GPO Box 378, Canberra ACT 2601)

AEES SEMINAR 1994 Kevin McCue

The theme of this year's Seminar held in Canberra at the Institution of Engineers building on 14-15 November, was *Survival of Lifelines in Earthquakes*. Sixty delegates from all over Australia attended the 4 session

Seminar and 48 stayed for the dinner. The afternoon-next morning session layout seemed to work well, giving people time to travel to Canberra on the Monday morning and return home on the following afternoon.

After a thought provoking welcome from Charles Bubb (President's column), the seminar proper started and fittingly ended with papers on Canberra. Bob Gibbs gave the opening address in place of the ACTEW Chief Executive Mike Sargent who was called away at the last moment. He looked at vulnerable lifelines such as the power, water and sewerage services to Canberra (who will forget the picture of the Telecom Tower broken in half!!) while Greg James - ACTSES discussed the evolving ACT Emergency Plan.

Of course the geographical content was not limited to Canberra. Bill Boyce from Kinhill mentioned bridge design and construction in Papua New Guinea and Bruce Bolt UC Berkeley discussed the Northridge Los Angeles earthquake, particularly its effects on bridges (Ed - very timely).

Other authors discussed: the near catastrophic effects of the 1989 Newcastle earthquake on electricity transformers and how they were rebuilt (Rod Caldwell - Pacific Power); and the buckling of the NTGAS pipeline in the 1988 Tennant Creek earthquakes (Jim McDonald - East Australia Pipelines) and how such lifelines can be designed for minimum disruption. Hasso Constantin from Telecom discussed the effect on phone circuits and how overload is managed in an emergency like the Newcastle earthquake or a simulated earthquake in Canberra. Surprising the amount of flexibility available to the communications carriers to regulate the volume of ingoing and outgoing calls (or dump them as we saw in WA - last Newsletter). Recent earthquakes at Cessnock and Eugowra and the resulting quality database of strong motion records were discussed by several speakers including Kevin McCue, Trevor Jones and Gary Gibson.

Peter Hughes discussed how one might proceed with a study of the vulnerability of

Melbourne lifelines while John Wilson described the impressive Earthquake Engineering programs being undertaken at Melbourne University

The show was rather stolen by the only woman speaker and professed ignoramus on earthquakes - Maree Callaghan, Mayor of Cessnock. Putting the case for the people in an emergency such as the Cessnock earthquake, she castigated the 'authorities' for their non-appearance and the 'experts' for their lack of advice in the hours and days following the earthquake. This theme became a recurring one throughout the discussion sessions.

Election Return of the old guard. There being no other nominations, Charles Bubb, Kevin McCue and David Rossiter were declared elected to the Executive; as President, Hon Secretary and Hon Treasurer respectively.

The newly elected Committee in order of nomination is: Graham Hutchinson, John Wilson, Mike Griffith, Russell Cuthbertson and Gary Gibson - fittingly a strong Melbourne team in the lead-up to PCEE'95.

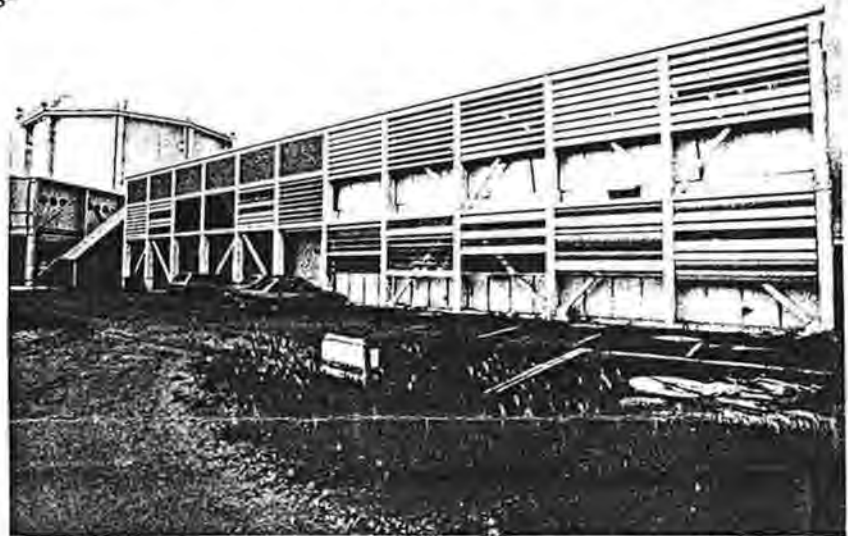


Photo: Courtesy of ANSTO

Seismic strengthening at HIFAR

As part of an ongoing investigation of the safety of the HIFAR facility at Lucas Heights, one of the adjacent buildings was upgraded by retrofitting external crossbracing as shown in the figure above. According to the NSB report, "this strengthening program was expanded to include the assessment of the anchorage capacity of plant items not in the original program, the work is scheduled for completion by the end of 1994."

The photo and report are from a Nuclear Safety Bureau report with permission.

Recent major or damaging earthquakes worldwide

The recent Kobe earthquake is described on pages 4 & 5. At magnitude 8.1, the Hokkaido Japan earthquake of 4 October 1994 is only the second great shallow earthquake worldwide (magnitude 8 or greater), since the May 1989 earthquake on the Macquarie Ridge south of New Zealand. (The other was at Guam on 8 August 1993). Several large aftershocks occurred northeast of Honshu up to a few weeks before the Kobe earthquake.

Australian Earthquakes, ML ≥ 3.0 August - December 1994

(from ASC, MGO, SRC-RMIT, SADME, TASUNI, UQ & UCQ)

August Damage claims from the Cessnock earthquake had totalled \$30M by mid-September. Brick buildings bore the brunt of the damage but only one may have to be demolished. The focus was very shallow and there were no aftershocks above magnitude ML 2.0. An earthquake swarm commenced on 30 July at Eugowra NSW. Minor damage was reported and the residents were most alarmed because hundreds of earthquakes were felt in the town.

September Swarm activity continued at Eugowra NSW during the month with 10 events of magnitude ML>0.9. Of the Australian earthquakes tabulated below, those on 4 September at Chillagoe and 27 September in the Snowy Mountains were reported felt. Other felt events included a magnitude 1.7 at Gungahlin, a northern suburb of Canberra at 13:44 UTC on 6 September, a magnitude 2.5 at Albury NSW at 0528 UTC on 8 September, a magnitude 2.7 at Peterborough SA on 12 September (UTC), an earthquake on 16 September which knocked things off shelves at the Casino on Christmas Island, and a magnitude 2.4 on 28 September (UTC) which was felt in Burra SA.

October Earthquake activity continued at Tennant Creek and three events were recorded with magnitudes greater than ML 3. A minor resurgence in the earthquake swarm activity at Eugowra NSW occurred over the October holiday weekend and between 10 and 20 events per day were recorded by field seismographs in the area. The largest event had a magnitude of ML 1.9. Swarm activity decreased to low levels later in October.

November Dozens of earthquakes struck Myrtle Spring SA but it was difficult to find anyone who had felt them except for one person at Woomera (!). Seismologists from the Mines & Energy SA Department installed seismographs in the epicentral region to monitor them more closely. Another

sequence of more than 60 earthquakes occurred near York WA, many of which were felt locally. The aftershocks at Tennant Creek continue with 2 above ML 3.

Date	Time UTC	Lat °S	Long °E	ML	Place
Aug					
6	1103 51	32.9	151.3	5.3	Cessnock NSW
10	2037 00	34.2	139.1	3.2	Eudunda SA
19	0219 36	33.4	148.4	3.0	Eugowra NSW
19	1809 51	33.4	148.4	3.2	"
19	2352 10	33.4	148.4	3.3	"
21	0215 07	33.4	148.4	3.0	"
21	0553 51	33.4	148.4	4.0	"
22	0331 49	22.0	126.3	3.4	Tobin Lake WA
31	2048 30	19.9	133.3	4.5	Tennant Ck NT
Sep					
01	0625 30	22.9	130.5	3.1	NT/WA border
04	0108 02	17.0	144.5	4.0	Chillagoe Qld
04	1301 28	30.7	124.2	4.3	Zanthus WA
04	2144 05	30.3	138.0	3.0	Lyndhurst SA
12	0449 54	19.8	133.5	3.2	Tennant Ck NT
12	1203 01	22.5	136.4	3.9	Lucy Ck NT
18	0408 51	33.8	148.2	3.1	Grenfell NSW
23	1406 51	19.7	134.1	3.6	Tennant Ck NT
27	0758 34	36.2	148.6	3.1	Snowy Mtn NSW
Oct					
09	1501 26	16.6	128.1	3.6	Warmun WA
11	1034 34	33.3	121.3	3.9	Salmon Gums WA
11	1448 47	19.8	134.2	3.9	Tennant Creek NT
17	1741 14	19.8	133.9	3.4	Tennant Creek NT
19	2007 44	35.2	123.6	3.3	SE Esperance WA
20	1010 49	19.8	133.9	3.0	Tennant Creek NT
Nov					
02	0902 27	19.9	134.2	3.1	Tennant Ck NT
03	1338 49	26.0	111.6	2.8	Offshore WA
04	2200 14	28.6	135.6	2.8	E Lake Eyre SA
06	2330 06	32.3	138.3	2.8	Hawker SA
11	2000 41	19.8	134.2	3.3	Tennant Ck NT
18	1210 23	37.3	146.0	2.9	Lake Eildon Vic
23	2053 30	32.0	116.8	3.0	York WA
24	2003 22	32.0	116.7	3.0	York WA
29	0949 27	25.8	129.3	2.6	NT/WA border
30	1953 19	30.3	138.1	4.2	Myrtle Spring SA
30	2014 2	30.4	138.0	2.7	Myrtle Spring SA
30	2023 55	30.4	138.0	3.4	Myrtle Spring SA
Dec					
2	1942 36	23.6	130.1	4.2	Lake MacKay NT
3	0855 10	19.8	133.8	3.0	Tennant Ck NT
5	1946 53	30.4	138.0	3.0	Myrtle Spring SA
5	1957 14	30.4	138.0	3.1	Myrtle Spring SA
5	2029 40	30.4	138.0	3.3	Myrtle Spring SA
5	2049 38	30.3	137.9	4.0	Myrtle Spring SA
5	2102 39	30.4	138.0	3.8	Myrtle Spring SA
5	2116 34	30.4	138.0	3.5	Myrtle Spring SA
7	0532 43	30.4	138.0	3.0	Myrtle Spring SA
9	1553 14	30.4	138.0	3.2	Myrtle Spring SA
12	0203 5	30.4	138.0	3.1	Myrtle Spring SA
22	1024 15	19.9	134.0	3.8	Tennant Ck NT
24	0818 37	11.2	139.3	3.5	C York Qld
24	1628 0	19.8	134.0	3.6	Tennant Ck NT
27	1910 14	23.6	130.2	3.0	NT/WA Border

December Earthquake activity hotted up in December with epicentres concentrated in Central (article continued page6)

The Kobe Earthquake Japan - 16 January 1995

At 20:45 UTC on 16 January (4:45 am on 17 January local time) a large earthquake occurred near Kobe in southwest Honshu Japan. About 5000 people were killed by collapsing buildings during this earthquake, a great disaster but not a *great* earthquake. Its magnitude was Ms 6.8, the same size as the 1968 Meckering WA or 1988 Tennant Creek NT earthquakes. Only 60 people were killed in Los Angeles California during the Ms 6.8 earthquake at Northridge almost a year ago to the day.

Kobe is in zone A of the Japanese hazard map, the highest rating, yet there are fewer earthquakes near Kobe than in almost any other onshore area of Japan. The damage resulted because of the proximity of the epicentre to a major urban area which had not suffered a damaging earthquake since 1944 when it was rebuilt after being comprehensively bombed during the war. Other factors contributing to the severity of damage included the density of buildings, the foundation conditions (extensive liquefaction occurred), the construction materials, the age of many buildings and the general unpreparedness for earthquakes and firestorm.

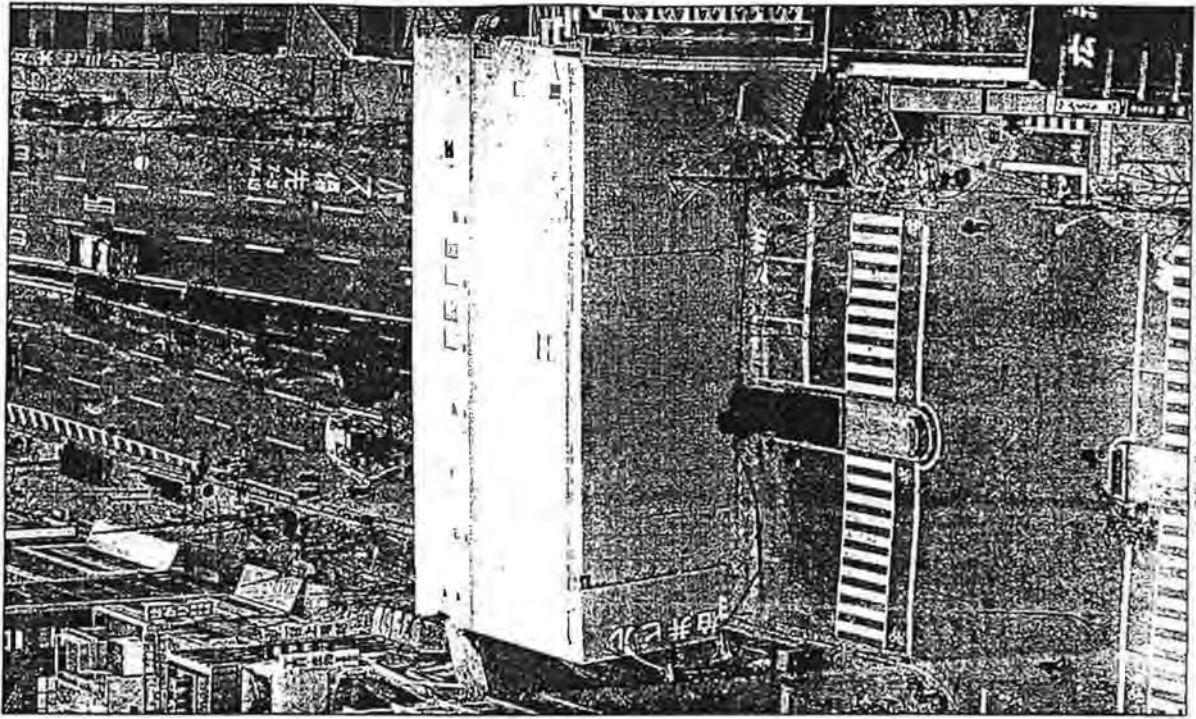
Many of the modern high-rise buildings designed to resist earthquakes apparently survived intact. Foundation failure due to liquefaction led to some classic failures, high rise buildings lying on their sides across roads (see figure opposite) and railways suspended in mid air, the supporting embankments gone. The most notable structural failures were the elevated freeways which were thrown to the ground when their supporting columns snapped off at the base. Elevated roadways near Northridge California also performed badly during the Northridge earthquake.

The modified Mercalli scale is a subjective measure of the intensity of ground motion - Japanese seismologists have rated the intensity as follows: Kobe MM IX-X, Osaka MMVI-VII, Kyoto MMVIII. The shaking was barely felt in Tokyo about 450 km away. The only known measurement of strong ground motion was between Kobe and Osaka where the horizontal acceleration was 0.3 g.

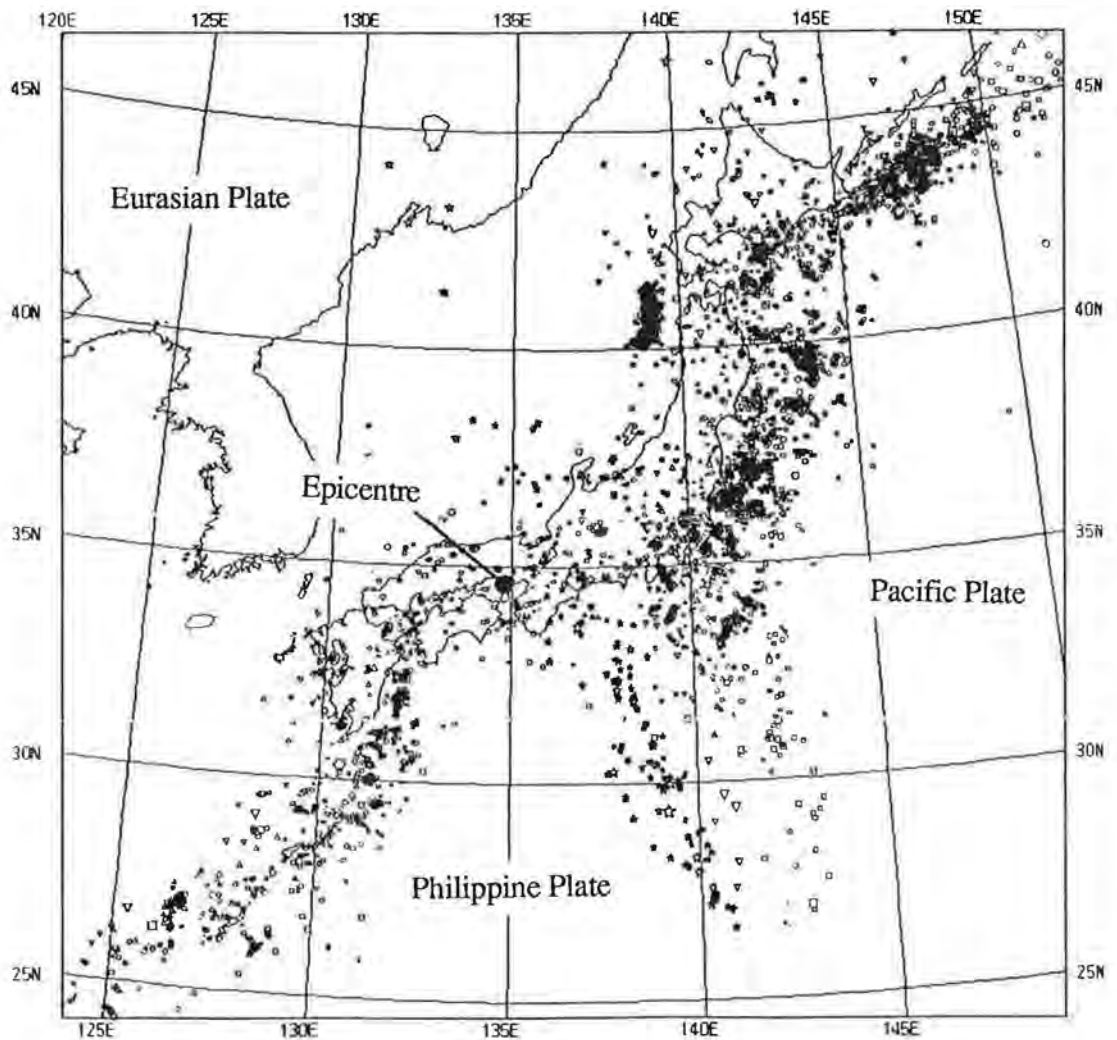
Japanese geologists are mapping a fault scarp formed during the earthquake on the northwest coast of the island Awaji-Shima, southwest of Kobe. Movement extends along the Nojima fault for at least 9 km and the maximum displacement was 1.5m in a right-lateral sense. The fault mechanism determined by seismologists in Japan and the US is right-lateral strike-slip on a NNE trending fault. Kobe is along the strike of the fault which is the direction of greatest shear-wave energy release.

Thousands of aftershocks have been recorded on a 60 km long zone although none were large enough to be widely recorded in Australia. The aftershock sequence will probably last several months whereas the Tennant Creek NT aftershocks are still continuing more than 7 years after the mainshocks.

The AEES Committee consulted by phone on sending a self-funded representative to Japan to investigate the effects of the Kobe earthquake and then contacted Dr John Wood, President of the NZNSEE. As a result, AEES member Dr George Walker has joined a NZNSEE reconnaissance team in Kobe. He left on Sunday 22 January to fly to Tokyo and then travelled on to Kyoto where the 12 member team is based, normally about an hours train-ride from Kobe. We will reproduce his report in the next newsletter.



Foundation design is as important as structural design



Earthquake epicentres in Japan, 1980 - 1989

Australia, the sole exception an event on Cape York Peninsula in far-north Queensland. The earthquake swarm at Myrtle Creek near the coal mining town of Leigh Creek in the mid-north of SA was interesting but caused no damage. The aftershock sequence at Tennant Creek continued unabated.

COURSES & CONFERENCES

(copies of flyers from Hon Secretary if available)

- 4th EERI Annual Meeting Feb 8 - 11 1995, San Francisco Ca. USA, Sheraton Palace Hotel Fax 1 510 451 5411
- Wellington after the quake - the challenge of rebuilding cities. 27-29 March 1995 Wellington NZ Earthquake Commission Fax: 64 4 499 0046
- 3rd Int Conf on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, St Louis, Missouri, USA April 2-7, 1995. Abstracts by Jan 31, 1995 to Prof Shamsher Prakash, Civil Engineering, University of Missouri-Rolla, Rolla MO USA. fax: 314 341 4992, e-mail Prakash@novell.civil.umar.edu
- 2nd International Conference on Seismology & Earthquake Engineering. Tehran, Iran May 15 - 17. Fax: 98 21 258 8732
- 7th Canadian Conference on Earthquake Engineering June 5 - 7, 1995 Montreal Quebec. Fax: 1 514 340 5881
- 5th International Conference on Seismic Zonation, Nice, France, Oct 17 - 19 1995. French Assoc. for Earthquake Engineering and Earthquake Engineering Research Institute.
- 5th SECED Conference on European Seismic Design Practice 26-27 October 1995. Somewhere in UK. Contact Rachel Coninx Institution of Engineers Fax +44 71 233 1743

AEEES & NZNSEE

Pacific Conference PCEE '95
20-23 November 1995
Melbourne Vic Australia

- International Conference on Natural Disaster Reduction March 5-8, 1996 Washington DC USA Organised by ASCE, George L. De Feis Fax: 1 212 705 7975
- 11th World Conference on Earthquake Engineering, Acapulco Mexico, 23-28 July 1996. Abstracts by April 15, 1995.

Recent publications

- *GIS and their applications in Geotechnical Earthquake Engineering*. ISBN 0-87262-973-2 ASCE Ed J David Frost & Jean-Lou A Chameau.
- *Earthquake tremors felt in the Hunter valley since white settlement* can be purchased for \$18.50 (+ \$1.50 postage) from Hunter House Publications, PO Box 536, Raymond Terrace, NSW 2324. (see review NZNSEE Bull. 2 1993)
- AGSO (BMR) Bulletins and reports on earthquake activity in Australia can be purchased from the AGSO Sales Centre. The Australian Seismological Centre publishes an annual report featuring the year's seismicity with summary, glossary and description of the larger events (1980 to 1992).

- Australian Seismicity (1900 - 1992) and Earthquake Hazard maps; 1:10M scale in colour (available from AGSO Sales Centre, GPO Box 378, Canberra ACT 2601 Fax: 06 249 9982, \$21 incl postage in Aust.)

AGM '94

Charles Bubb opened the meeting at 17:30 with 26 members present. Apologies from Dr Denham and Prof Boreham. The Presidents report is on page 1.

The minutes of last year's meeting were distributed, inadvertently omitting the President's report which was published in the AEEES Newsletter 1994/1 Page 3. The Secretary noted that Prof Boreham's 'Intensity Review' group had met once but decided to await the outcome of a similar review being held in the US and publication of the Australian Isoseismal Atlas Vol 3, before making a decision to change current practice of using the Modified Mercalli scale.

The Secretary also reported that Prof Hutchinson's proposal to host the 2000 WCEE had been discussed by the Executive who decided to await the outcome of hosting the PCEE'95 before committing the Society to an even bigger function. Prof Hutchinson agreed.

The meeting agreed that the minutes were a fair record of last year's meeting.

The Secretary reported that the executive had met monthly on average, had published 4 newsletters since the last meeting and organised the 1994 Seminar, AGM and dinner.

No responses were received from AEEES Committee members concerning the letter from Prof Esteve of the WCEE organising Committee, distributed by the secretary.

The Treasurer reported that membership had risen to 353 although a number of members were non-financial. The accounts were currently being audited and some \$14 000 raised by membership fees, sale of publications and holding of Seminars was currently held in the bank accounts.

John Wilson reported that 7000 copies of the PCEE'95 flyer were distributed. A bank account has been established with a float of \$1400.

The committee is banking on break-even costs at 200 attendees. The meeting agreed that underwriting of the risks would have to be shared by both Societies or the meeting would not proceed. Abstracts are due at the end of December and completed papers by June 30. Keynote speakers Prof Bolt, Prof Priestly, Prof Page and Dr Pender had accepted invitations to attend, sponsorship was being sought.

Election of Executive: (see P2)

Other business: Newsletter Graham Hutchinson suggested that the Executive explore the possibility of hiring temporary secretarial assistance to assist with preparation, printing and distribution of the Newsletter.

AEEES Response team Dr George Walker recommended that AEEES send a team to the epicentral area of large damaging earthquakes in the region (Ed - We have not had time to act on this recommendation so Dr Walker had to join the NZNSEE team to Kobe).