



AEES Newsletter

No 1/93

The Society

Treasurer's report - David Rossiter
Membership of the Society is in excess of 170 although renewals for 1993 are still being processed. Accounts are healthy and the AEES Executive has agreed to spend up to \$1000 for publication of the Seminar proceeding which we hope to recover through sales.

Reminder: We would encourage IEAust members paying their IEAust renewal to pay their AEES renewal by marking the AEES as their preferred Society.

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President's column - Charles Bubb Newcastle and Australian

Building Practice Over the holiday period I came across the Swiss Re 1990 publication *Newcastle: The Writing on the Wall* in the IEAUST Library. It was written by Herbert Tiedemann of the Swiss Reinsurance Co. Many aspects are covered, not limited to Newcastle, and the publication is worthy of study as it brings another viewpoint, a European one, to the event. Although general, it concentrates heavily on brickwork. Shortly afterwards, I received the CIVENG TRANS of IEAUST for December 1992 and immediately read the paper *The Design, Detailing and Construction of Masonry - The Lessons from the Newcastle Earthquake* by Professor A W Page of the University of Newcastle.

There were many interesting points in common, for example, the emphasis on the poor bond between mortar and brick and the poor workmanship seen in many of the damaged masonry buildings. Page states 'well designed and constructed unreinforced masonry should have

performed better at this level of seismic loading.'

However, in this note, I want to highlight some differences between the two reports and comment on them.

Maximum intensity Page states 'The central areas of Newcastle suffered up to MM8-9.' The IEAust Report and AGSO allow a maximum of MMVIII. However, Tiedemann will have none of this and insists that 'The highest intensity given by our estimate is MMVII', and later 'even MMVII as maximum intensity is to some extent an exaggeration'.

The difference lies in his statement 'One must avoid interpreting very high vulnerability as high intensity'.

Evidently, he considered that damage to even Masonry D structures was confined to those which were particularly vulnerable because of various specific parameters.

Is it possible therefore that we have set the maximum MM Intensity for Newcastle too high? Page certainly adds some evidence for one modern brickwork structure which was extensively damaged in the earthquake. Bond strength was virtually zero, with the wall having very low flexural or shear capacity (See Page, Figure 3).

It is obvious that a high intensity should not be assigned because of the damage to that particular building.

Cavity wall construction Tiedemann singles out for extreme criticism a favourite form of masonry construction in Australia - namely, the cavity wall. He states 'The *cavity walls* well anchored (*sic*) in Australian design practice are to be blamed for most of the damage and the heavy losses'. (Tiedemann, Fig 8).

He goes on to say, 'the following statement can be made with certainty: 'had the respective buildings in Newcastle been built with solid 9.5"

brick walls, earthquake damage would have been negligible'. (In essence, he considers the cavity wall ties inadequate either immediately or eventually).

Now, Page does not rule out the use of cavity walls but, of course, states that the effective tying and support of masonry, both structural and non-structural is essential. However, he does find there was "...blatant abuse of tying systems and other workmanship faults in 'engineered' and 'supervised' structures in Newcastle ...". In general, he finds that 'in Newcastle bad practices in masonry construction have been widespread' and 'It is also reasonable to assume that similar practices occur in other parts of Australia'.

Page gives 8 important principal lessons for masonry learnt from the Newcastle disaster and hopes that these will be noted and measures taken to ensure that all future masonry construction is of an acceptable standard.

I do not think that we can follow Tiedemann's advice and eliminate the cavity wall from Australian building practice. Our only alternative therefore is to follow the detailed advice given by Dr Page to produce good quality unreinforced masonry to withstand moderate seismic forces - 'it must be well designed, detailed and constructed'.

I would add - and well supervised - for in this field, it may well be true that: What is not seen to be done is not done.

Secretary's report AEES AGM & Seminar 1992 The proceedings are taking shape with contributions received from 11 of the speakers. An attractive cover has been designed and all but 2 of the papers have been edited by a professional science lexicographer B Hince. **Intensity** has proven a very useful indicator of the severity of ground shaking over the years but it is not amenable to quantitative manipulation (though all of us do so when pushed hard enough). The lack of strong motion instruments in Newcastle in December 1989 has not prevented the question: *What was the ground motion in Newcastle during the earthquake?* This has led to several assessments of the MM intensity, and more; duration, frequency content, maximum velocity and acceleration. All of these hinge on the estimate of the MM intensity which begs

the questions; should Newcastle buildings be classified C or D and what percentage of each was damaged?

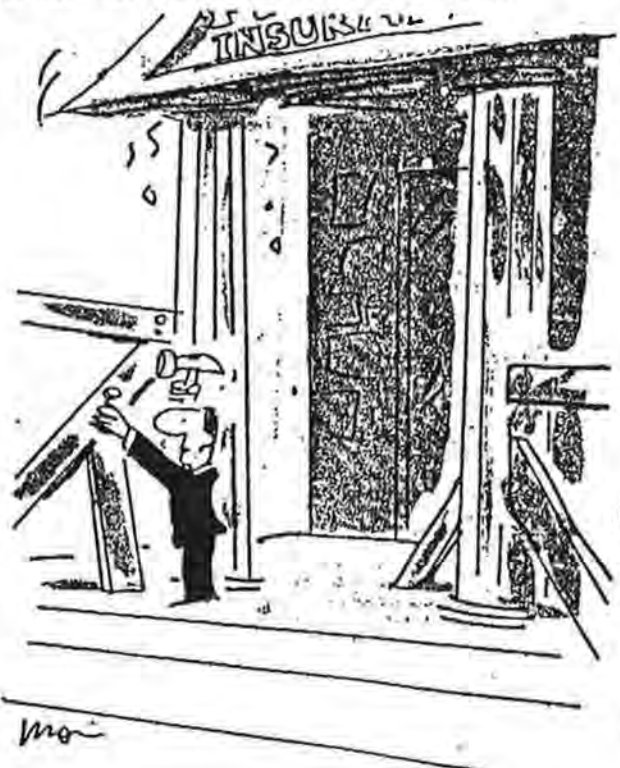
The Mercalli scale has its roots in northern Italy with additions from California (Wood, Neumann & Richter) and New Zealand (Eiby). I have selected a few quotes at random from Richter's (1958) book Ch 11, which is essential reading for anyone using intensity:

- the distribution of the macroseismic effects of earthquakes can be represented by the drawing of isoseismals, or lines of equal apparent intensity of shaking.
- the intensity assigned at a given place is often loosely called an 'average' but in statistical terms what is wanted is the mode, not the median or mean; the intensity to be selected is that which represents the largest number of observations, after special circumstances and obviously divergent instances are allowed for.

- the general rule is to expect higher intensity on unconsolidated ground.

- A NZNSEE study group has revised the MM scale (see the Bulletin of NZNSEE, Vol 25 No 4, Dec 1992).

Earthquake raises cultural awareness Strange as it may seem, Canberra art buffs have benefitted from the 1989 Loma Prieta Ca., earthquake in the shape of an exhibition of paintings at the National Art Gallery entitled 'Rembrandt to Renoir'. Their normal home at the Museum of Fine Arts in San Francisco was damaged so badly in the earthquake that they had to be removed for its renovation. The timely cartoon was in the Financial Review 4 Nov 92.



Advertisement

• **"UNCOVERING THE MYSTERIES"**
A PRACTITIONERS WORKSHOP ON THE 1989
NEWCASTLE EARTHQUAKE FOR
AUSTRALIAN URBAN COMMUNITIES

Three years ago, Newcastle suffered the consequences of Australia's most devastating earthquake. The Workers Club and other buildings collapsed, Newcastle citizens died or were seriously injured and many lost their livelihoods or their homes. This natural event was responsible for the greatest single insurance loss in Australia's history with socio-economic effects that are now seen to be far reaching.

Where is Newcastle at to-day? What positive lessons have been learnt during the reconstruction of the City? What are the consequences for the Australian community if such an event were to strike other highly urbanised regions?

The workshop's aim is to provide a forum for continuing "information exchange" on the potential earthquake peril for our nation. The time is now most appropriate for all practitioners to "have their say" through comment, question and exchange of ideas on such diverse topics as:

- *Local Authorities and Designers, Building Planning and Legal Responsibilities
- *The Engineer's Role in Response and Disaster Management
- *Geological and Soil Controls for Urban Area Development
- *What restrictions does an earthquake Code of Practice impose on building designers and what are the local authorities' responsibilities?
- *Socio-Economic effects on a community, health and trauma response - who pays?

THE INTERNATIONAL CONNECTION: Professor Haresh Shah, Dean of the Faculty of Civil Engineering at Stanford University USA (on the edge of the San Andreas Fault) will discuss engineering Code requirements and controls in the Californian context and the importance of the Australian efforts to the worldwide community.

This workshop should be attended by:
LOCAL AUTHORITY MEMBERS and STAFF, all DESIGNERS, ENGINEERS, ARCHITECTS, PLANNERS to both government and private sectors, EMERGENCY SERVICE workers, administrators and managers, INSURERS, INSURANCE BROKERS and LOSS ADJUSTERS LEGAL REPRESENTATIVES to Local Authorities and private citizens HEALTH and TRAUMA COUNSELLORS and all other INTERESTED persons.

WORKSHOP VENUE:

The University of Newcastle, The Great Hall,
NEWCASTLE

DATES : Sunday 4 April (1.00pm) - Tuesday 6 April (4.00pm) 1993

For further information contact :

Sally Brown Continuing Professional Education,
The University of Queensland, Brisbane
ph +61 7 365 6360 or
FAX +61 7 365 7099

NEWS ITEMS

• **AGSO review** There seems to be some doubt about the future of the review into the Australian Geological Survey Organisation headed by Dr Richards, due to the looming election. The current Director, Prof Rutland has announced his impending resignation to move to the CRC on Global Geodynamics- more news later.

• **PCEE '91 - Proceedings** are available. The 1120 page 3-set volume contains the 87 programmed papers, 3 on the 1989 Newcastle earthquake, and addresses of the keynote speakers on theme issues: Microzoning, Non-structural elements, Areas of low seismicity and reinforced concrete design. Price \$NZ150.00 incl post. from: NZNSEE, PO Box 17-268, Karori, Wellington, NZ.

• The Loma Prieta Earthquake Reconnaissance report is published as a supplement to vol 6 of the journal *Earthquake Spectra*. (Ed Lee Benuska). A video of its effects is available on loan to members of IEAust, from IEAust Canberra.

Recent Australian earthquakes

The following table summarising recent Australian earthquakes (ML \geq 3.0) was supplied by the Australian Seismological Centre, AGSO. The Centre publishes a more detailed monthly list for subscribers and contributors.

January 1993 was a very quiet month for earthquake activity in Australia, with only 3 exceeding ML 3. The Meckering earthquake was felt but caused no damage. A large earthquake occurred on a transform fault on the mid Indian Ocean rift south of Australia on 13 January.
December 1992 The Flinders Ranges and Boorowa events were felt, both had two smaller aftershocks. The 3 Banda Sea earthquakes were felt in Northern Australia. The magnitude 7.0 event being widely felt across northern Australia.
November 1992 The Naracoorte earthquake on 10 November was the largest of a series of events of which 3, including this one, were felt. The earthquakes near Peterborough and Apollo Bay were also felt. The Tasman sea event of 29 November occurred near a seamount with a relief of over 3000 m.

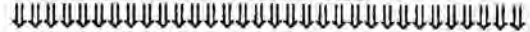
October 1992 The two largest earthquakes in October were near Temora NSW and Lake Tobin in WA near the WA/NT border. Their magnitude was ML 3.9, large enough that one person in a high rise block in Canberra reported feeling the building sway during the Temora earthquake,

but no damage was reported near the epicentre. Small aftershocks continued at Tennant Creek. September 1992 was very quiet seismically. There were no events above ML 3 in Western Australia and only 2 in the rest of Australia. Both were in the Northern Territory, one a continuation of the Tennant Creek series the other the larger ML 5.1 off the coast of Arnhem Land was widely felt in the top end of the NT. Magnitude 2.8 earthquakes on 2 & 26 September were felt respectively in the Jenolan Caves area, NSW and at Aberfeldie, Victoria.

Earthquakes Sep 1992 - Jan 1993

Date	ML	Place
Jan 93		
05	3.7	Arafura Sea
20	3.5	Meckering WA
28	3.1	W Mt Magnet WA
Dec 92		
03	3.2	36 km SE Uluru NT
03	3.1	900 km WSW of Geraldton WA
12	3.5	9 km N Boorowa NSW
15	3.2	40 km N Hawker SA
16	3.2	Mawbanna N W Tasmania
17	3.8	Flinders Rangers SA
20	7.0	Banda Sea
22	5.9	Banda Sea
23	5.9	Banda Sea
29	4.0	Musgrave Ranges SA
Nov		
1	3.2	Lake Eyre SA
2	3.2	123 km N Kununurra WA
4	3.2	15 km SE Peterborough SA
6	3.0	Simpson Desert NT
8	3.3	Apollo Bay Vic
9	3.4	244 km NNE Pt Hedland WA
10	3.0	Naracoorte SA
16	3.2	142 km NNW Halls Creek WA
18	3.1	Tennant Creek NT
29	2.7	Tasman Sea
29	3.0	174 km SSE Nanutarra WA
Oct		
1	3.1	Tennant Creek NT
5	3.0	Tennant Creek NT
10	3.0	Beltana SA
11	3.9	Near Temora NSW
11	3.0	Tobin Lake WA
16	3.7	Offshore southcoast WA
17	3.0	Tennant Creek NT
20	3.0	Musgrave Ranges SA
21	3.2	North of Broome WA
22	3.0	Tennant Creek NT
24	3.0	Tennant Creek NT
27	3.8	NNE Pt Hedland WA
31	3.9	Tobin Lake WA
Sep 92		
23	3.1	70km W Tennant Creek NT
30	5.1	off coast Arnhem Land NT

COURSES & CONFERENCES



- NZ National Society for Earthquake Engineering Technical Conference & Annual Meeting, Wairakei Resort Hotel, Taupo NZ 26-28 March 1993
- 3rd International Conference on Case Histories in Geotechnical Engineering, 1-5 June 1993, St Louis, MO, USA.
- 10th International Caly Conference, University of Adelaide, SA, 18-26 July 1993.
- Natural Disasters: Protecting vulnerable communities. Institution of Civil Engineers, London SW1P 3AA, UK, 13-15 Oct 1993
- First Egyptian conference on earthquake engineering. Dec 6-9, 1993, Hurgada, Egypt. Egyptian Society for earthquake engineering.
- The 10th European Earthquake Engineering Conference: 28 August to 2 Sept 1994, Vienna, Austria.
- The 5th Pacific Conference on Earthquake Engineering, Australia. 1995. (Date & venue yet to be decided) (copies of flyers available from Hon Secretary)

Earthquake publications

- *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 2324.
- The IEAust Newcastle Earthquake Study is still available at EA Books, PO Box 588, Crows Nest NSW 2065 at the reduced price of \$30.
- The Association Française du Genie Parasismique has sent AEES complimentary copies of the following 4 books which should be of great interest to members:
 - Recent Advances in Earthquake Engineering and Structural Dynamics (Ed V Davidovici).
 - Handbook of Impedance Functions by Sieffert & Cevaer.
 - Seismic Hazard Determination in areas with Moderate Seismicity.
 - Slope Stability in Seismic Areas.
- A number of AGSO (BMR) Bulletins and reports describing earthquake activity in Australia can be purchased from AGSO. The Isoseismal Atlas, parts 1 & 2. (Bulletins 214 & 222) contain maps and descriptions of 149 felt and damaging earthquakes. A third edition with another 80 odd maps is being prepared. The Australian Seismological Centre also publishes an annual report featuring the year's seismicity with summary, glossary and descriptions of the larger earthquakes. Reprints of papers on the Newcastle and other important earthquakes may still be available from the authors. A monthly

summary of Australian and world-wide activity is distributed at cost to subscribers.

Next issue We will again include the Contents page of the latest volume of the journal *Earthquake Engineering and Structural Dynamics* which is the official publication of the IAEE.

Any articles that you the members would like to submit will be gratefully accepted for review by myself (Kevin McCue at the address on title page) or Assistant Editor John Wilson at the Civil Engineering Dept, Melbourne University. (Congratulations on your recent wedding John)

**Membership renewal
to 30 November 1993
or
New application**

Name

Occupation (Please circle the appropriate category)

Engineering

- Civil Mechanical Structural
- Geotechnical Geomechanics
- Other (specify)

Science

- Seismology Geology Geophysics
- Mathematics Physics
- Other (specify)

IEAust Membership No (if applic)
.....

Preferred mailing address

.....
.....

postcode

Country.....

Telephone.....

Fax

\$25 annual subscription fee or new membership fee is due now for year ending 30 November 1993,

\$10 for IEAust members who nominate AEES as preferred Society

please note: could all members - please complete & return this form to the Treasurer at the address at header of first page for our records.

EARTHQUAKE ENGINEERING AND STRUCTURAL DYNAMICS
(Earthquake eng. struct. dyn.)

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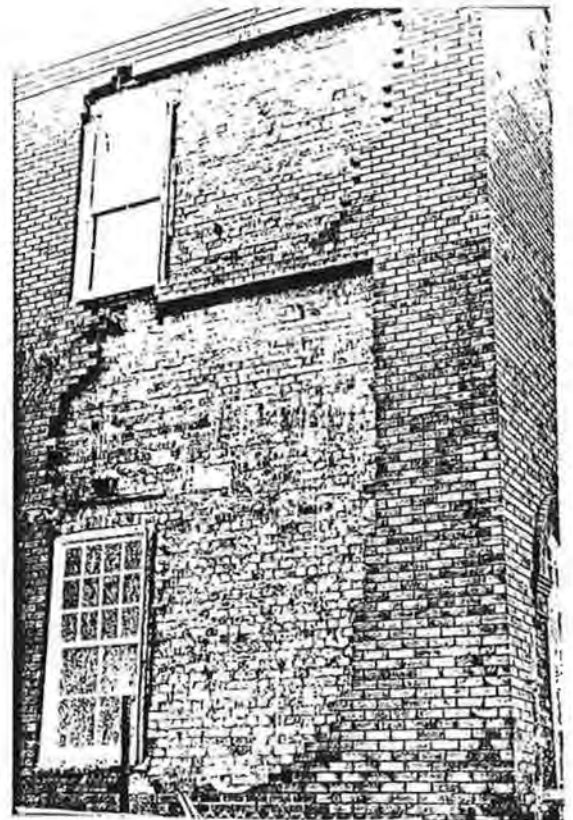
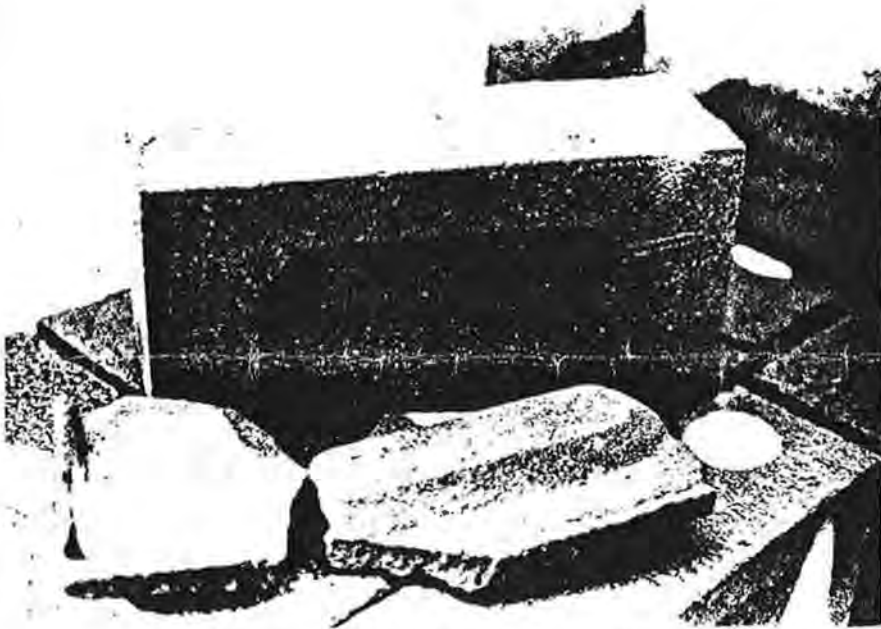
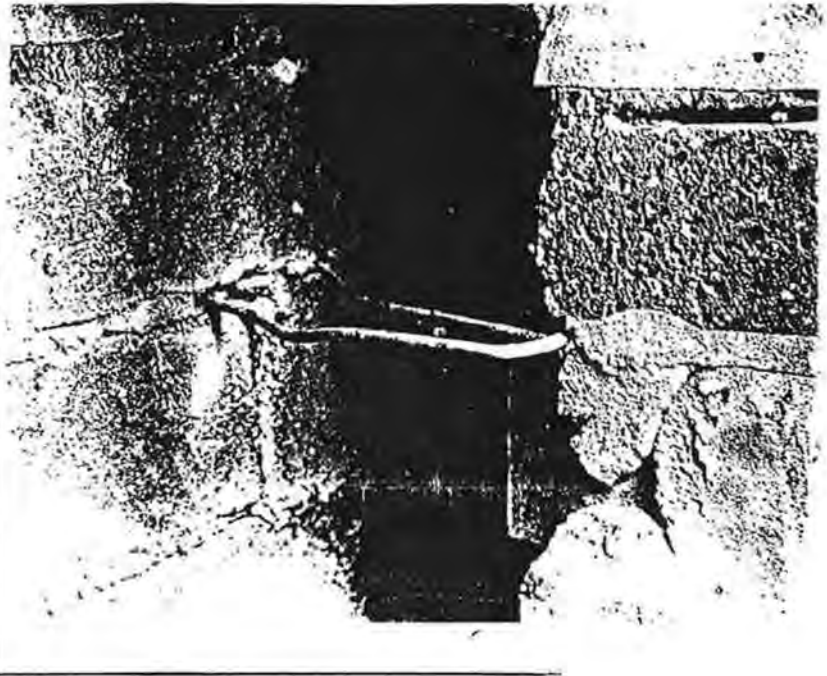


Figure 3 (from Page, 1993)

Figures of Newcastle earthquake damage from Adrian Page's paper referred to in text. (Top) Examples of ineffective tying and (below left) low bond strength, either of which can, in an earthquake, result in the effects at lower right.