The Editor AEES Newsletter
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AEES is a Technical Society of IEAust
The Institution of Engineers Australia

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AEES Newsletter

The Pacific Conference on Earthquake Engineering *PCEE'95* will be held in Melbourne, 20 - 22 November 1995. It will be hosted jointly by the AEES and the NZNSEE for the first time. See you there!

You should have all received at least one flyer about the conference but if you want another, ring Barbara Butler, Melbourne Uni 03 344 6712 or fax me at the number above. The PCEE incorporates the AEES Annual Seminar and the **AGM** will be on the Tuesday night of the Conference, 21 November, prior to dinner in the Great Hall, National Gallery. The venue will be:

- AGM Tuesday 21 November 5:40 - 6:40pm
- Seminar Room 2, Melbourne Uni

The important business items will include:

- Election of new Executive and Committee
- Election of IAEE Delegate (4 years) and
- Choosing a Venue for the '96/97 Annual Seminar.

Nominations for elections close 5pm 20 Nov

A group in Melbourne has indicated interest in steering the Society for the coming 12 months, and 100 years after the 1897 Kingston/Beachport earthquake, Adelaide would be a choice venue for the 1996/97 AEES meeting.

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President's Column — Charles Bubb

Earthquake Engineering ONLINE.

One of our difficulties as an Earthquake Engineering Community scattered across Australia is in communication - keeping informed and keeping in touch with each other. The Newsletter of course is one attempt to keep in touch and convey information. Our annual seminar is another.

More recently some of us have been trying out the IEAust's own bulletin board service called Engineering Online (EOL). We have established a contact point there under IEAust Societies and have also placed on it the previous issue of this newsletter, which can be downloaded.

This makes the newsletter available as text only (no pictures) for downloading by anyone registered as an EOL user. At this stage this facility is only available to those of our members who are IEAust members and (as of 1st October) who are fee paying subscribers of EOL. The current fee is $50 pa.

A special arrangement and a special fee to join EOL would be required for those of our members who are not members of IEAust. The amount of this fee is yet to be negotiated but if there is interest enough among our non-IEAust members then we could enter into negotiations with the EOL Administrator. I understand the fee must necessarily be more than the $50 pa for IEAust members as the IEAust is currently subsidising EOL to some extent.

Would non-IEAust members please let the Secretary know if you are interested.

Why EOL and not the internet? Good question, and the final answer might well be the Internet or something else other than EOL.

But as a first step EOL seems cheaper and easier to access via a local call than most other systems. It is even operating in Malaysia. Also it allows easy (?) communication to and from Internet users. For example I can use EOL to send a message via the internet to the Secretary. He can reply to me via the Internet and the reply will turn up in my EOL mailbox. Also certain select newsgroups are fully available on EOL. The selection is by arrangement with the EOL Administrator at IEAust headquarters. We should soon have some earthquake oriented Internet newsgroups on line for you.

The system EOL uses, called First Class, is primarily for Macintosh users. The next best is to use Windows 3.1 or Windows 95 to access EOL. Anyone still using DOS as I do is left floundering with a Command Line User Interface (CLUI). I am still grappling with this CLUI system and cannot recommend it to anyone. However as almost everyone seems to use Windows or the Mac that should not be a problem to most people. I shall probably give in and use Windows real soon.

So let us try for the time being to use EOL and through it the internet if you are already on it. From what I have seen so far it will be easy enough to transfer/migrate to another on-line service if that proves to be necessary.

The important thing is to get started - so see you online on (Earthquake) ENGINEERING ONLINE.

This will be my last President's Column in the newsletter. After 5 years as President with Kevin McCue as Hon. Secretary and David Rossiter as Hon. Treasurer we have decided not to stand again for those positions and to make way for new candidates.

We each hope to continue to help the Australian Earthquake Engineering Society in other ways. For example, if all agree, I will be available to serve in a new position of Immediate Past President to assist the new Executive. I propose to help in the new field of ONLINE services and with the newsletter. In this way I will hope to keep in touch with our Earthquake Engineering Society as it grows and evolves.

See you all in Melbourne for PCEE95 - our first International Conference.

Charles

The Society — David Rossiter (Treasurer)

The AEES subscription year is from 1 Dec to 30 November. It is difficult and expensive to send each of our 300^+ members an individual reminder that fees are due so please help us by sending your subscription for 1996/97 to AEES now (address above) or renew through IEAust's annual subscription system by marking AEES your preferred Society. If you change address please advise me or the Secretary, many newsletters are returned. If you know a member who is not receiving the newsletter please advise me.

Letter to the Editor

In his brief report on the Hanshin Earthquake - 1995 published in AEES Newsletter 2/95, George Walker is keen to dispel a so-called myth in relation to short period buildings and soft soil effects. Even if it is a myth, I don't believe that the Kobe earthquake dispels it. Rather, what the Kobe earthquake shows is that if you have a top-heavy structure with no effective means of carrying lateral forces produced by earthquakes then the structure will collapse in an earthquake. As clearly indicated in Mike Griffith's report (also Newsletter 2/95) this is what happened to traditional houses.

A recent paper by Dowrick et al[1] which reports damage ratios for houses in the M_W 7.8 Hawkes Bay earthquake of 1931 notes, inter alia, that 'the least damage (to houses) was experienced on soft ground.'

Maybe the myth is mythical?

Yours sincerely

W H Boyce — 20 July 1995

Kinhill, Cameron Macnamara

[1] Dowrick et al 'Damage ratios for houses and microzoning effects in Napier in the magnitude 7.8 Hawkes Bay, New Zealand earthquake of 1931. Bull NZNSEE Vol 28, No 2, June 1995.

AEES Local Associations - David Rossiter

AEES has about 350 members spread throughout the world in about a dozen countries. There may be individuals who are interested in forming local groups or associations of AEES. These groups could be formal or informal depending on needs. We have had a strong interest in Melbourne for several years, and recently Bill Buckland of Multiplex in Sydney has expressed interest in seeding a group in Sydney.

Bill has offered to arrange an initial contact meeting for interested persons in the Sydney area. Bill's address is: c/o Multiplex, 1 Kent St, Sydney NSW 2000, phone: 02 256 5000.

Is anyone interested in doing likewise in other cities such as Adelaide, Perth, Brisbane, Darwin, Hobart or offshore - perhaps Singapore or Hong Kong? We will gladly advertise free of charge.

(Ed. - We already have one in Canberra formed from the Executive and we meet regularly for lunch at a great local club or, for a more salubrious evening supper, at David and Cathy's home. Good fun though and David's decanter gets a bit of a nudge!) We might extend this next year when the new executive is installed - if other Canberrans are interested.

AEES Conference Proceedings

You can keep informed about the latest developments in Earthquake Engineering and Engineering Seismology in Australia by ordering the Proceedings* ($30.00 plus $5 post and packaging in Australia).

Back issues of '92 and '93 Proceedings are available at the PCEE for the special PCEE price of $15 and $25 respectively.

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

Earthquakes and Faults in Mongolia

Kevin McCue

The recent Kobe earthquake had devastating consequences for structures and foundations not designed to resist such intense and long duration shaking. The crustal fracture which caused this earthquake was between 30 and 50 km as indicated by the distribution of aftershocks though the observed surface rupture was only about 9 km long.

By comparison the rupture surfaces of the 1968 Meckering WA and 1988 Tennant Creek earthquakes were more than 30 km long.

The duration of strong shaking near the fault is determined by the time taken for the rupture to propagate from the point of initiation (the focus) to the furthest end of the fault. The rupture velocity is, like the P and S wave velocities, a property of the material and is always less than the shear wave velocity in the crustal rockmass which is near 3 km/s.

What then must the shaking have been like during M8+ earthquakes on 9 July 1905 and 4 December 1957 in Mongolia, where the mapped faults extend for more than 300 and 250km respectively? AEES members, Kevin McCue and Gary Gibson, and Kevin's partner Sonja Lenz, a soils scientist, joined an International Field Workshop on the Active Faults of Western Mongolia from 14 - 30 August 1995 organised by the Mongolian Academy of Sciences.

With a changing economy and rapidly developing infrastructure, the Mongolian Government is understandably concerned about the possible effects of further large earthquakes. Dr Ganzorig, head of the Informatics Centre, gathered a group of international experts from diverse disciplines to study parts of the faults so as to advise the Government on further detailed research programs which would help resolve earthquake engineering problems such as: what is the recurrence interval of these large earthquakes? and what would be the effect on modern Russian-built buildings in Ulaan Baatar.

Dr Peter Molnar from MIT, an expert on the seismicity and tectonics of Mongolia, assisted Bayasgalan from the Informatics Centre to organise the fieldwork and discussion sessions. More than half the participants were earthquake geologists, Prof Bob Yeats from Oregon State Uni (USA), Dr Herve Philip from Montpelier (Fr), Dr David Schwartz and Dr Carol Prentice from the USGS, Dr Kelvin Berryman IGNS (NZ), Dr Tom Rockwell and Dr Jim Dolan from the US and Dr Carlos Costa from Argentina. Dr Tom Hanks (USGG) is a seismologist cum tectonicist and Prof Bob McColl and Dr Bastian Koopmans (NL) geographers. There were several other soil scientists, Dr Ezra Zilberman and Dr Rivka Amit with expertise in dating soil horizons and faults in arid regions of Israel and Dr Erik Brown (Fr) a specialist in peeling and dating carbonate concretions in arid regions.

Mongolia does not straddle plate boundaries but with its recent earthquake activity could it be called intraplate like Australia? The major fault zones form three sides of a rhombus around the uplifted dome of central Mongolia. The seismicity of the eastern side of the rhombus either will not happen, happened prior to 1800, or is pending. Tom Hanks suggested the name continental deformation zones for those regions which are neither clearly interplate nor clearly midplate and which would include places like Kobe Japan and most of China and Mianmar. The Eastern US which most would rate intraplate has also suffered M8+ earthquakes in the past 400 years.

We walked part of the faults each day, most impressive were the 6m high shutter ridges formed during strike-slip faulting in a hilly terrain, and as well preserved in the Gobi desert as if they had occurred last week. Whilst the morphology was that of a left-lateral strike-slip fault, there were several conjugate thrust fault segments as long and as high as the Meckering scarp. The fine structure of mole tracks (pressure ridges) and tension cracks between the en-echelon strike-slip segments of the 1967 Mogod fault were also still clearly visible and positioned just where Reidel fractures should be.

Debate in the field raged hotly back and forth - an observation and theory - a counter theory and supporting alternative observations. Samples were collected for dating and a short trench dug for sampling, logging and dating. We were lucky enough to see an exposed camel bone which was labelled and tucked into one of Dave Schwartz's dilly bags. At the end of the day the consensus view was that whilst there was evidence of previous faulting, the average slip rate was probably more like 1mm/yr than the accepted estimate of 10mm/yr. Several promising projects were identified for future collaboration to improve this estimate. The possibility for post graduate training of Mongolian geoscientists in Australia is being explored.

Can we, and should we use these earthquakes as a worst case scenario for Australia? If such large earthquakes had occurred in geologically Recent times would they have produced such large fault scarps? and would these have been observed and brought to our notice? There has been no systematic search for Recent faults in Australia, those that have been identified were discovered accidently by geologists mapping ancient rocks for mineral exploration. Perhaps it is time we looked at and more actively studied the prehistoric faults that we do know about.

Reminder: 1995 AEES AGM, Melbourne Uni, PCEE venue, Seminar Room 2, Tuesday 21 November, 5:40 to 6:40 pm

Standards Australia and Standards New Zealand have called the first meeting to harmonise the separate Australian and New Zealand Loading Codes into a single Code. This meeting will be held in Melbourne prior to the PCEE. To know what others are doing in regions of similar tectonics, we have included the following article from the July 1995 NCEER Bulletin.

Geotechnical and Seismological Aspects of New York Seismic Code Provisions

by K. Jacob

*This article describes geotechnical and seismological factors which were considered while developing seismic provisions for inclusion into building codes for both New York State and New York City. The draft seismic provisions for New York State have been presented at public hearings throughout the state and are now in a "receipt of comment" phase. The New York City seismic provisions have been signed into law (Local Law 17/95) and will take effect in February 1996 (see NCEER **Bulletin**, Volume 9, Number 2, pg. 17). Questions and comments should be directed to Klaus Jacob at (914) 365-8440.*

New York State is located in a region of moderate seismicity. For instance, since 1884, four earthquakes with magnitudes between about M=5 and M=5.5 have occurred in the state, and many smaller earthquakes are recorded every year. The greater New York City area alone can expect, on average, one magnitude M=5 earthquake about once every 100 years (the last such event occurred in 1884). The most seismically active regions in the state lie in the Adirondacks and near the Canadian border regions along the St. Lawrence River, followed by the New York City and Buffalo/Niagara/Attica regions. Based on geological considerations and comparison to geologically similar regions elsewhere, the possibility that magnitudes as high as M=7 may occur cannot be excluded for some regions of the state, including those offshore on the adjacent Atlantic coast shelf. This possibility for M>6 earthquakes exists despite the fact that in the short historic record (about 300 years), no larger earthquakes have occurred in the state. But larger events have historically occurred along the Atlantic coast both north and south of New York and in adjacent Canada.

The ground motions associated with earthquakes in the eastern U.S. differ distinctly from ground motions in the western U.S. in several important ways. Eastern earthquakes tend to release higher rock stresses compared to their western counterparts, thereby causing the ground motions to contain more high-frequency energy. The ground motion shaking is felt more intensely in the eastern U.S. over larger distances because the Earth's crust and its rocks transmit seismic waves more efficiently, especially at high frequencies. This stronger shaking, especially at shorter periods and over larger distances is caused by the fact that the crustal rocks in the eastern U.S. tend to be older, more competent, and less riddled with seismically active faults, when compared to generally younger California rocks along the tectonically active San Andreas fault system.

Other differences relate to the geological near-surface conditions: very competent, hard rocks have been exposed at the surface in many regions of the eastern U.S. ever since glaciers retreated from the area about 10,000 years ago. In or near lakes, river valleys and coastal estuaries, very soft sediments have been deposited since glacial times, sometimes almost directly onto the exposed, hard bedrock formations. The contrasts in stiffness between the soft soils and hard rocks often create extreme conditions for frequency-selective amplification of ground motions. On soft-soil sites, ground motions with periods shorter than 0.3 seconds tend to be attenuated (diminished in amplitude), and those with longer periods (>0.3 seconds) are often amplified, sometimes by factors up to 5 or 8. Finally, liquefaction of cohesionless soils, such as sands and silts, can be expected for smaller earthquakes and over larger distances in the eastern U.S. than in the western U.S.

The combined seismological-geotechnical information, some of it collected only in recent years, was carefully considered when reviewing whether the seismic provisions of the Uniform Building Code (UBC), which was used as the primary reference code, needed any modifications. The new seismic information from the eastern U.S. affects seismic load factors, seismic design-spectral shapes, spectral site coefficients for amplification of ground motions on soil sites, and liquefaction potential of soil sites. Accordingly, some of the seismic loads and soil parameters had to be modified from those quoted in the referenced UBC.

The main seismological-geotechnical features of the New York seismic code provisions are:

- The proposed design ground motions are intended, as a first order approximation, to represent ground motions expected to have a 90% probability of not being exceeded in 50 years, corresponding to an average recurrence period of about 500 years. This implies a 10% chance that the motions (and corresponding seismic loads) may be exceeded in 50 years. These values are only estimated

(Continued from Page 19)

targets that can vary slightly across the state, from soil to rock site conditions. With the occurrence of future seismic events, new information may come to light that may require that these estimates be updated periodically. Since the code represents only minimum requirements, some building owners may opt to seek greater protection by choosing design options capable of resisting ground motions and design forces higher than those outlined in the code.

- The seismic code provisions allow the design ground motions to be used either from code prescribed design spectra, or based on site-specific investigations.

- The entire state of New York is divided into four seismic zone catagories (A, B, C, and D) as shown in figure 1. The four catagories are associated with seismic zone factors Z, whose related peak ground acceleration values vary from 0.09, 0.12, 0.15 to 0.18 g, for zones A to D, respectively. For example, New York City is located in seismic zone C, with a seismic zone factor Z=0.15.

- Five rock and soil classes, S0 to S4, apply. These can be determined using the standard soil classification schemes in conjunction with standard penetration test (SPT) blow counts and shear wave velocities for rock. The soil profiles need to be defined from geotechnical information generally to depths of 100 feet or less below grade.

- The five classes of rock and soil profiles are associated with five site coefficients that vary from S0=0.67 for hard rock, to S4=2.5 for the softest soils; thus the code allows for a maximum site amplification of S4/S0=3.75 between soft soils and hard rock. This is a higher ratio than used in most previous U.S. seismic codes that in the past have often failed to realistically quantify the observed differences in ground motions between soft soil and hard rock sites. The site factors thus reduce the code-prescribed seismic loads for structures founded on the hardest rocks, and introduce load penalties for structures founded on the softest soil sites, in accordance with site-dependent damage patterns observed globally during many past earthquakes.

- A liquefaction screening test has been included for sites containing water-saturated non-cohesive soils in the upper 50 feet. These soil profiles are identified based on geotechnical borings that measure SPT blow counts. Two separate criteria for liquefaction screening are used; one applies to buildings that belong to ordinary occupancy categories, and a more stringent one applies to more important buildings in special occupancy categories.

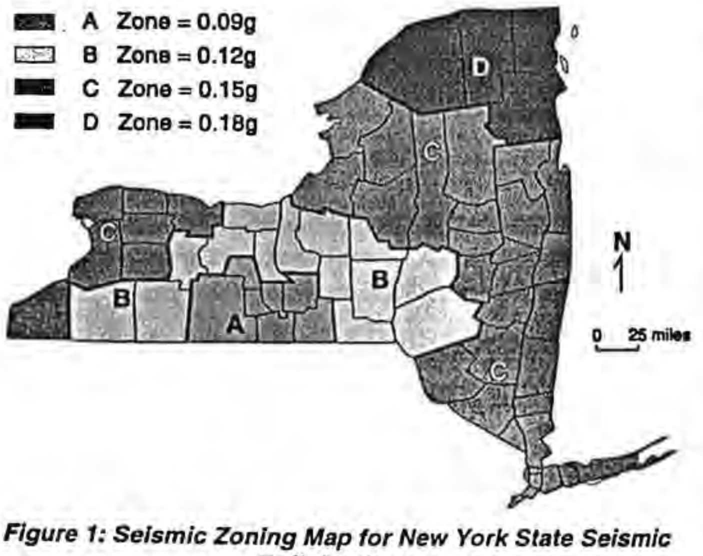

Figure 1: Seismic Zoning Map for New York State Seismic Building Code

The geotechnical/seismic data and other types of information used to modify the code provisions and seismic loads are believed to reflect the current level of knowledge of seismic and geotechnical processes in the eastern U.S. Nevertheless, it must be kept in mind that the information used is based on a limited number of observations. Also, there is no guarantee that the limited past seismic experience can be used as an unequivocal guide to the future behavior of earthquakes in this region. The resulting design motions and seismic loads are believed to adequately represent the seismic and geotechnical conditions for New York, and for the targeted ground motion recurrence period of about 500 years. Therefore, the design motions should provide a nearly uniform and balanced level of protection between the different seismic zones and greatly differing soil and rock conditions that exist in New York.

But, as has already been stated, the provisions represent only minimum requirements. Owners and developers interested in added seismic protection for their structures are not prevented from using more severe ground motions than those specified as minimum conditions in the code. As a guide, it is estimated that doubling the code-specified minimum ground motions changes their average recurrence period by a factor of five, from about 500 to about 2,500 years, and the corresponding non-exceedance probability from about 90% in 50 years to about 90% in 250 years.

Free access to Scientific Data

(extract from Eos, Vol 76 No 31, 1 August 1995)

A resolution adopted by the World Meteorological Organisation reinforcing the free and open international exchange of weather data is being lauded by the US research community. The resolution, which was adopted on June 25 at the WMO's Twelfth Congress in Geneva, settled a divisive issue - at least for now - that strikes at the heart of international cooperation in scientific research.

'The resolution protects the whole scientific community from having an international body adopt a restrictive practice that *could eventually spread to other data sets*,' according to Richard S Greenfield, Director of the NSF's Division of Atmospheric Sciences. In particular the resolution ensures free and unrestricted access to all data and products exchanged under WMO auspices for non commercial use by the research and education communities.

Death to the economic rationalists!

Forthcoming Conferences

- **PCEE -NEXT WEEK!!**
- 10 - 13 Dec 1995 San Diego Ca, *The US National Seismic Conference on Bridges and Highways*. Fax: 1 202 2898107
- 19 - 23 February 1996 Canberra, *13th Australian Geological Convention*, Contact 13AGC Fax: 06 257 3256
- 5 - 8 March 1996 Washington DC USA *Natural Disaster Reduction* American Society of Civil Engineers. Contact: George De Feis Fax: 1 212 705 7975
- 22 - 24 March 1996 New Plymouth New Zealand., NSNSEE Annual Conference, Contact Admin Sec ph/fax: 64 4 293 3059
- 23 - 28 June 1996 Acapulco Mexico, *11th World Conference on Earthquake Engineering*.
Contact: 11WCEE Fax: 52 5 616 1514

Don't forget - next week!!
20-22 November

Pacific Conference on Earthquake Engineering

MELBOURNE UNIVERSITY

On Nuclear Bombs

Below is a seismogram of the recent Mururoa Nuclear explosion recorded on the AGSO/US joint seismographic array at Alice Springs. Its magnitude was measured to be mb 5.6. The top trace is the earlier mb 5.6 Chinese nuclear test recorded at Alice Springs. Lop Nor is 100km further than Mururoa from ASPA.

The recorded ground motion at ASPA from the Chinese test is 10 times larger than during the French explosion which is attributed to the different geological paths traversed by the seismic waves, particularly near the test sites.

The Lop Nor seismic waves have an essentially continental path whereas those from Mururoa have a largely oceanic path. But it isn't that simple; the ground motion from a Mururoa blast recorded at Yellowknife in Canada at a similar distance, is about 8 times larger than that in central Australia. Assessing the yield in ktons is difficult.

The largely continental path between Timor and southern Australia is thought to be why large earthquakes in the Indonesian or Banda Arc shake tall buildings in Adelaide and Perth. That and the radiation pattern of the earthquakes.