1979 SOUTH PACIFIC REGIONAL CONFERENCE ON EARTHQUAKE ENGINEERING

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CLOSING ADDRESS

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Gentlemen,

We have come to the end of another South Pacific Regional Conference. That so many of you have attended and some have travelled far to come, is gratifying indeed, for this is not the best of times for professional engineers in New Zealand. Nothwithstanding the generous subsidy by the Earthquake and War Damage Commission, for which the Society are most grateful, many participants incurred substantial expenses in order to take part.

Most important to the success of this Conference has been the effort of those who gave so generously of their time in preparing papers, lectures, and contributions to discussions.

The addresses by our invited guest speakers have been particularly valuable to us. In New Zealand we depend to a substantial degree on published material for information on developments in other countries. This dependency can result in a time lag of several years, particularly when the information is initially available in a language most of us do not have any command of, such as is generally the case with Japanese. We are therefore not only grateful for having had the benefit of our guest speakers' valuable personal viewpoint, but for the over-view they gave us of the seismic scene in their countries.

We are indebted to the many who worked long and hard to ensure a smooth running Conference, in particular our Conference convenor, Mr. Meggett, his committee and our Secretary.

Much valuable information has been presented and the papers will be a mine of information for the future. But the task is not done. It is in the nature of research that it seems to have a momentum of its own, and I have little doubt that the valuable work into the response of structures and the behaviour of structural components and assemblies will continue. Hopefully a few enthusiasts will even investigate further what happens below our buildings remembering that the materials, which we at best show on separate drawings, are, whether we like it or not, an inseparable part of the action.

Which then are some of the areas where, in my view, we must urgently increase our knowledge in order to be in balance with our advances in other fields?

Firstly - so that we can better appreciate the risk - there is a continuing need to collect more geophysical, geological and strong motion information and to evaluate the data. Hopefully our scientist colleagues will make available to us their findings at the earlist possible time even though there may be substantial uncertainties. Engineers are used to working with imprecisely known data. Better that we should use the scientists' best guesses rather than make our own assumptions. To ensure a rational result of their co-operation, it is important, though, that all participating specialist groups, and particularly the final decision makers, be clear about the degree of uncertainty, and the extent to which each group has qualified their recommendations to cover the gap between what is factually known and what they believe to be true. Only in this way can we avoid criteria that are either excessively safe and hence economically indefensible or imprudently unsafe.

Hopefully efforts to learn more about ground motions will include the setting up of arrays of instruments that are able to detect types of wave motions other than those we already know to occur in most earthquakes. For instance it would be most important to obtain quantitative information on short length surface waves. Their existance has been reported too often, and by apparently reliable observers, to be ignored. There are eye witness accounts of waves of some 4 metres between crests and 120 - 250 mm vertical amplitude (and on sites of dry sandy soils). If their occurrance had to be considered in the design process this would be a considerable challenge to designers for the suspension system of cars seems better suited to deal with such actions than the support system of framed buildings. Bad news though this would be, I am nevertheless optisimstic that, provided sound basic principles of earthquake resistant detailing are followed, structures will survive. I am referring to those principles which are as a rule hidden away in the fore-words of Codes and in the miscellaneous clauses at the end and which include the tying of foundations and other parts and the use of distributed reinforcement in walls, particularly those in masonry. Considering the consequences of failure it seems prudent to be generous with transverse reinforcement in concrete columns, and not necessarily just in regions where it was determined to be necessary with two place accuracy from the results of a computer analysis probably not tested for sensitivity with regard to uncertainties in input. So for some time to come, earthquake engineering will still be an art.

In parallel with our work on more sophisticated methods I believe that in future we should also attempt to evaluate the likely performance of structures analysed and designed by simple methods. The reason why we have not yet adequately

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answered this important question is because proving that simple methods give good results cannot be done by simplistic methods. Only by evaluating statistically the results of sophisticated approaches can we adequately determine the boundaries of applications for simple methods and the quality of results. The considerable effort required would, however, if successful have been worthwhile when set against the savings in design time that could be achieved to the benefit of the profession and ultimately their clients. To make progress a co-ordinated project by the Society will probably be required.

Not one paper at the Conference dealt with economics as its primary subject. If with regard to the cost of earthquake engineering there are many opinions but few facts available, it is because any viable cost analysis is a time consuming process which must compare many solutions. This requires a team effort by engineers, architects, and services engineers. They will need to examine for particular situations, not just the effect of a given level of protection on the cost of structural members but the building as a whole. Least quantified at present seem the cost repercussion of architectural and services decisions when a given level of seismic safety and damageability is to be maintained. Availability of such data would, I am certain, allow an effective public relations effort to be made by putting the cost of earthquake protection into perspective in relation to the effect on costs associated with non-structural decisions.

A further task that is likely to take on increasing importance is the evaluation of existing buildings and ways of strengthening them. I am not so much referring to old brick buildings, the bulk of which are probably not worthy of a great investment, but to the many more modern buildings with a long future economic life. For many of these, I believe we will have the unpleasant task of having to advise society to be high seismic risks. We have little choice; the truth will either come from us or the next intense earthquake!

The effectiveness of strengthening methods to achieve reduction in life hazards and even more so of those that aim to minimize damage, are largely unproven. Full scale testing is expensive, so the sooner we start and the more diverse the methods employed, the sooner we are likely to obtain answers to these questions - for this large green shaking table here on which we all live has been ominously quiet in recent years.

Gentlemen, with these few thoughts for the future I would like to close this Conference and to wish you all a pleasant journey home.

CONFERENCE REPORT

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Our 1979 Conference, billed "second regional" but in fact the third such, was as successful, more or less, as each of the earlier two.

The Society has, so far, managed to avoid the dichotomy which plagues many of its overseas counterparts. Having been founded on the initiative of a group of consulting engineers who, in the mid-sixties were meeting regularly but informally for discussion and who had developed a rapport with researchers and academics, it has always appreciated the importance of good communication. Although material for this conference ranged over the whole gamut of topics which interest researchers - zoning, earth sciences, analysis techniques, novel structural systems, response of "floor" mounted units, instrumentation and sociological and political matters - most (but not all) authors were conscious of the value of relating their material directly to the problems that practicing engineers must face.

In 1971 Conference had an educational job to do, or so it seemed to me. In 1975 Conference gave us a chance for talking about the way we were faring in comparison with people in other seismically active regions where design evolution differed from ours slightly but significantly. There was no such theme, conscious or unconscious, for this Conference. It may well be that an occasion for a natural theme of the sort we have known will never occur again. There was little or no controversy of the friendly and enlivening sort that we had in 1975.

So this was a quiet Conference, smoothly organised, no surprises, authoritative papers, predictable discussion, competent chairmanship at every session. I do not think that anyone would have been spurred by anything he learned to hurry back to his office for a reassessment of his design procedures or initiation of new ones. It was not that sort of Conference.

We learned that Indonesia has more rationally based zoning than we have (not too surprisingly, since most of us know that our zoning owes as least as much to politics of the parish pump variety as to science). We were reminded that Japanese experience is greater than is our own (or, for that matter, than is anyone's) and that the Japanese continue, with dismaying frequency, to have severe tests applied to their work.

In a featured address, Professor Paul Jennings of Caltech predicted that future research will be less preoccuplied with general principals than research has been hitherto (fundamentals having been established, presumably to everyone's satisfaction?) and more concerned with matters of detail. Refinements to analytical techniques might be justifiable when improved descriptions of site excitation become available. Field observations are needed to complement laboratory studies. At present the more esoteric aspects of this subject seem to have direct interest for people working with nuclear power plant design rather than for designers of ordinary buildings.

Professor Aoyama, from the University of Tokyo, whose contribution was also featured, gave an account of the history of earthquake

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