GENERAL INFORMATION

MICROZONING PUBLICATION

The New Zealand D.S.I.R. Bulletin 213 entitled "Microzoning for Earthquake Effects in Wellington" will be available from the Government Printer early in 1975.

LETTER TO THE EDITOR

Dear Sir,

"Who Says, Earthquakes Don't Happen Here"

The Editorial by Dr. R. D. Adams in the June 1974 Bulletin should not go unchallenged. In this editorial, Dr. Adams has endeavoured to show, what he considers to be, the "inappropriateness of the present N.Z. model by-laws relating to earthquake zoning". Anyone who sets out on such a task should make sure that, when he quotes, he quotes accurately and not in a manner likely to mislead his readers.

Let us examine some of his statements:

(i) "The half of our population that lives North of Waikato, and the small percentage remaining in Otago, think in common that they live in parts of N.Z. that are earthquake free."

(ii) "..... even the arch-proponents of the present earthquake zoning regulations who have claimed Dunedin's immunity from quakes".

(iii) Referring to Christchurch. "No damage was reported, but this was a further reminder that Christchurch, too, was not immune from earthquakes."

(iv) "Surely people in Auckland, Christchurch and Dunedin deserve the same protection? (as Wellington) ....." or do they still think, Earthquakes don't happen here".

The repetitive use of such expressions as those underlined above is misleading to the uninformed reader.

It is obvious that Dr. Adams is attempting to make the point that people in Zone C areas consider themselves "earthquake free" and these areas are not protected under the present zoning code. He knows, or at least he should know, that the 'arch-proponents of the present zoning regulations' have always stated that earthquakes of moderate intensity can be expected from time to time in Zone C, and that the seismic design requirements in Zone C are substantial. The ratio of the earthquake design coefficient for private buildings in the three zones is 6:5:4 - a small differential when all the circumstances are examined.

Far from being denied the same protection as Wellington, we in Dunedin might consider our relative protection is at least twice that of the Capital City, if not more.

Dr. Adams makes much of the sharp quake felt in Dunedin in April of this year and states "there was no clue in the local geology, or in the pattern of past earthquakes, that this earthquake was about to happen." Certainly we did not know it was "about to happen", but we were aware that it was a probability at some time. In actual fact, there have been at least two other 'local' quakes of a similar nature, felt predominantly in the Kew and Forbury area in the past 30 years.

Dr. Adams also makes much of the cost of the damage in this quake which he estimates at $250,000, mainly in damage to old chimneys, and states that it is the most costly quake since Inangahua in 1968. In this time, construction costs have more than doubled so that a $ for $ comparison is not valid. In any case, that additional sum could very soon be spent on one or two modern buildings if a higher coefficient than necessary were required in their design.

We must also remember that Dunedin has had no recent "shake down" of old chimneys and was "ripe" for the removal of many hundreds of old dilapidated chimneys, with badly weathered lime mortar well overdue for repairs. With these old chimneys repaired it is an interesting speculation as to whether a quake of similar intensity would have been rated as even M.M.4. It should also be noted that no building designed in accordance with the present By-law suffered more than very minor damage.

Dr. Adams states quite correctly that if the Bay of Plenty quake of magnitude 5.6 had been 6.6 the effect on Auckland would have been thirty times as great; if 7.6 it would have been 1000 times as great.

Having suggested that the quake could have been 1000 times as great, he then suggests it might also be shifted closer to Auckland "as close as Dunedin's earthquake". Thus he, by inference, completely ignores all evidence, statistical, geological or gravitational, and does not take probability into account at all. It is disturbing to think of the expense involved if this attitude were applied to engineering structures generally, where the whole philosophy of design is based on probability.

One can sympathise with the seismologist who is living in a world where the time scale is 1,000,000 years, but we, as

engineers, have to accept the responsibility of building structures which are as safe, for their life span of say 100 years to 300 years, as can reasonably be expected without bankrupting society in general.

Far from the claim that "this year's earthquakes have again shown the inappropriateness of this present N.Z. model by-laws", I would think that they have followed a pattern fairly well envisaged by engineers in the Dunedin area some 18 years ago.

I am aware that there is room for modification and improvement in the Earthquake Provisions of N.Z.S.S. 1900 but I do not see that recent events call for abandonment of seismic zoning in N.Z. as Dr. Adams obviously advocates.

G. K. ARMSTRONG
City Engineer, Dunedin

REPLY BY DR. R. D. ADAMS :-

It is heartening to learn from Mr. Armstrong that there are still people in Dunedin who realise that they will be periodically subjected to earthquakes. This has not always been evident. Seismologists repeatedly come across members of the public, asking for advice and information, who claim as a matter of common knowledge that Wellington is in "the earthquake zone", whereas Auckland, Christchurch and Dunedin are not. It is to combat such widely held views that we make factual statements to the effect that Dunedin and Christchurch are not "immune from earthquakes". I am glad that Mr. Armstrong agrees with me that is not so, and I hope that this view will become more widely held.

Mr. Armstrong's comments contain a curious contradiction in stating that Dunedin has had no recent "shake down" of old chimneys, yet claiming that "there have been at least two other local quakes of a similar nature" to the recent Dunedin earthquake "in the past 30 years". The Seismological Observatory has no knowledge of any such earthquakes so close to Dunedin, let alone of any of magnitude approaching 5.

It is quite wrong to assume that intensities were allocated following the recent Dunedin earthquake on the basis of chimney damage alone. Many other factors, such as the reaction of the population, the displacement of goods from shelves, and the cracking of plaster are taken into consideration. In no way can the intensities in Dunedin be assigned a value as low as MM4, and if, as Mr. Armstrong claims, even very minor damage was suffered by buildings designed in accordance with the present by-laws, the intensities should be even higher than the general value of MM6 that has been assigned.

Mr. Armstrong seems very concerned with questions of probability against costs. I strongly query his statement that the cost of damage in this earthquake (about $250,000) would be absorbed in the additional costs necessary to bring "one or two modern buildings" from the standards of zone C to those required in zone A, a transition corresponding to one step of the intensity scale. I have heard the cost of this quoted as less than 10% of the cost of the frame of the structure - a small amount when compared with internal detailing and services such as central heating. I cannot see that this would "bankrupt society in general". Probability cannot be used as an excuse for inactivity. Earthquakes do not occur regularly at evenly spaced intervals and the fact that a particular type of earthquake is due once every 100 years, need not prevent two happening in a single year. In fact, statistics show that earthquakes tend to group in space and time.

The greatest defect in the present regulations is that the only variations are geophysical. These variations, corresponding to one step in intensity, are minor compared with variations that can occur due to local differences in soil conditions, which can span three steps in intensity. This effect was well demonstrated in the Dunedin earthquake, where higher intensities were experienced in the low-lying alluvial areas than on the surrounding hills. I understand that provision is being made for soil effects in the present revision of the by-laws, but as long as this effect is ignored, while smaller regional variations, based on uncertain statistical inferences, are retained, I will continue to claim that the by-laws are inappropriate. To the seismologist, there is little justification for the present geographical divisions, particularly when considering the very large extent of the source and aftershock regions of the very largest earthquakes. In each period of 100 to 300 years, statistics and geology combine to suggest that New Zealand will experience at least one, and possibly several, earthquakes of magnitude 8, which could seriously affect an area comparable with that of one of the main islands.

I contend that rather than doubting whether those parts of the country in zone C can afford to build to zone A standards, we should ask whether they can afford not to?

FIRST INTERNATIONAL CONFERENCE ON INDUCED SEISMICITY

September 15 - 19, 1975
Banff, Alberta, Canada.

ORGANISATION

The First International Symposium on Induced Seismicity (ISIS) is being organised in co-operation with UNESCO, the National Research Council of Canada, and the Department of Energy, Mines and Resources, Canada. International associations involved in sponsoring this meeting include ICOLD, IAEG, IAEE, IASPEI, ISRM, ISSMFE, IUGS and ECEE. Chairman of the Organising Committee for ISIS is Dr. D. I. Gough, Associate Director of the Institute of Earth and Planetary Physics, University of Alberta.

INTRODUCTION

Earthquakes induced by human activities have caused serious concern in recent years. Large reservoirs have triggered seismic