



# Before Beginning

*The Birth of the New Zealand Society  
for Earthquake Engineering*



A. L. Andrews

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## President's Introduction

On behalf of the New Zealand Society for Earthquake Engineering, thank you Latham for taking the time to pass on to our members your memories of the beginnings of this world recognised professional Society.

Recollections of historic events are lost forever if they are not recorded and I applaud the contribution you have made to ensuring that this important history of the Society's formation is not lost.

*Graeme Beattie  
President*





## Foreward

The recording of the early history of events leading up to and the founding of the New Zealand Society for Earthquake Engineering (NZSEE) is in my view extremely important. Latham Andrews, as a founding member, has drawn upon his recollection of events and those of others to augment the few relevant records still available and produced a fascinating account of the formative period of the Society's history. This is not a history of the Society, as such, nor a history of earthquake engineering in New Zealand. Full histories will come later and this memoir will form an important part.

The early decision by the Society to develop a relationship with the Earthquake Commission (EQC) (formerly the Earthquake and War Damage Commission) showed tremendous foresight and has had very positive and lasting results. The synergy created is of great benefit to engineers and earth scientists as well as to New Zealand communities and has assisted in developing our international reputation in the earthquake engineering field.

The NZSEE is to be congratulated on its initiative to publish 'Latham's Story' which, as I recall, started out originally with the aim of merely leaving a record of these early events in the archives of the Society before they were lost forever.

I am sure this memoir will be of great interest to all members of the Society.

*George Butcher*  
*12 June 2008*





## Preface

Informal activities, through the 1960's, of the Society's forerunner, the Earthquake Group of the Consulting Engineers Division, New Zealand Institution of Engineers, went largely unrecorded, as did some unexpectedly tiresome problems with preparation for launching the Society. Of records that were kept and survive, scarcely any have much relevance for this history. So, after agreeing to write it, I have been obliged to rely on my memory and on anecdotal recollections from a very few others who were aware of most that transpired. That is not a happy state. Discomfort it engendered might well have influenced me to procrastinate, and indeed I have procrastinated. But advancing years and a health scare or two have persuaded me to get on with the job more expeditiously.

What is wrong with relying on clear recollections? In the first place, people, much more knowledgeable than I am about durability of recollection accuracy, say that clarity of old memories is often illusory. I cannot do much about that. As sole survivor of the small group most intimately involved with founding the Society, I cannot get a consensus opinion about how we did anything, so, perforce, there is no available check for my own recollection. In the second place, I, like all other people, retain more vivid images of what I have done than what my colleagues have done, so an account I write risks being biased. I have tried to counter this – readers must judge whether it is likely that I've succeeded. Over all, I can do no better than assure readers that I firmly believe in my memory, and that I have done my best to suppress egotism.

To set the scene we need to look at developments in sciences that feed engineering understanding, and to describe the state of ignorance prevailing before the 1960's, in the professions and in the universities, about earthquakes and their effects. New knowledge and understandings mostly uncovered in the 1950's and in the 1960's, later here than abroad, prepared the way for swift progress in the 1970's. Everything came together, and we enjoyed triumphs. Our story, then, commences with the aftermath of the 1931 Hawke's Bay earthquake, when its engineering implications could not escape attention, such was the magnitude of the disaster.



I have chosen to offer the tale more or less chronologically arranged, in a relaxed manner perhaps unusual for histories of this kind, and to avoid, as far as is possible, detail of a technical nature and cluttering by references. Notes are appended, some extensive, for material which I think useful or interesting, controversial even, but which might distract readers were they in the main text. They are identified by numbers in parentheses at the points in the text to which they refer. I have abandoned chronology for the Earth sciences section because, for most of the forty-year period we consider, structural engineering on the one hand and geology and geophysics on the other, had small reason to communicate; this was a condition that changed.

This story ends with the Society in being, and with one or two things from our early days recounted, things that I think are interesting and that might otherwise escape notice. I wrote what follows simply to preserve a record, the continuation from which is well documented, and is accessible in records of the Society.

My good friend and consulting engineer colleague, George Butcher, has given me invaluable help. Others to whom I owe gratitude for assistance include Ivan Skinner, former Head of the Engineering Seismology Section, Department of Scientific and Industrial Research; consulting engineer David Hopkins; risk and emergency management consultant Dave Brunson; Hugh Cowan at the Earthquake Commission; our Secretary, Derek Wilshere; Bob Norman, a former Commissioner of Works; Bill Stephenson of GNS Science; staff of the Standards Association of New Zealand; and staff of the administrative office of IPENZ.

*A Latham Andrews  
Lower Hutt  
12 June 2008*



# Abbreviations

CED	Consulting Engineers Division of NZIE. q.v.
DSIR	Department of Scientific and Industrial Research, now GNS. q.v.
EQ&WDC	Earthquake & War Damage Commission, now Earthquake Commission (EQC).
GNS	GNS Science.
IAEE	International Association for Earthquake Engineering.
IPENZ	Institution of Professional Engineers New Zealand, formerly NZIE. q.v.
MIT	Massachusetts Institute of Technology.
MWD	Ministry of Works and Development, formerly PWD. q.v.
NCEE	National Committee on Earthquake Engineering.
NZIE	New Zealand Institution of Engineers, occasionally referred to in the text as “the Institution”.
NZSEE	New Zealand Society for Earthquake Engineering, often referred to in the text as “the Society”.
PWD	Public Works Department.
WCEE	World Conference on Earthquake Engineering.

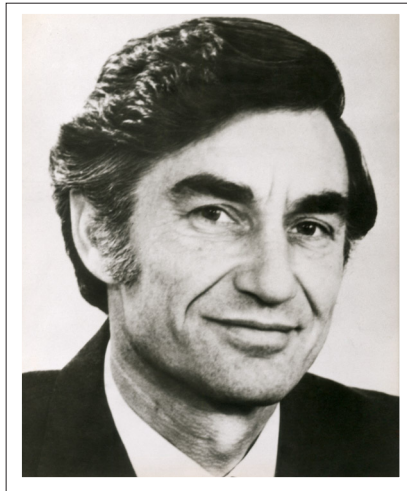




## Overview

The 1960's decade was of singular importance for activities undertaken to improve safety against earthquake attack for new buildings in our country and a springboard for launching effective work here in the seventies. The decade began with a revelation of Newmark's idea, empirically determined, that quantified ductility in building frames might usefully solve a design dilemma uncovered by investigation which, with reliable recordings of strong ground motions available, had shown calculated elastic frame responses to be much greater than had been expected – much too great to be accommodated in the elastic design scheme then prevalent.


It ended with publication (in the Society's Bulletin) of a seminal paper by John Hollings, expressing ideas for design to control a favourable (from a survivability point of view) hierarchy of failure modes in framed structures. From these two things *capacity design* evolved, a procedure developed famously by Paulay and Park at the University of Canterbury.



*John Hollings ca. 1965*

The problem the *ductility factor* purported to solve had been deemed economically intractable, so load amelioration that ductile response offered was welcomed, perhaps too uncritically (Note 1). We abandoned stress design for ultimate strength design to suit it, but we did not codify ductility quantitatively until 1976. Instead, the code of 1965 urged designers to detail for “sufficient ductility”, leaving “sufficient” unhelpfully undefined.

Also, in the 1960's, an immensely important development in Earth sciences occurred. Plate tectonics, which revolutionised thinking in these disciplines,



provided for the first time an adequate explanation of the origin of earthquakes and in doing so reminded us all that the link between earthquake engineering, geology and geophysics is vital and must be maintained.

As things stood after the 1931 Hawke's Bay earthquake, there was awareness, disaster generated, that a new approach had to be found. This is the story of its development since 1930, when, essentially, New Zealand had no plan other than a financial one — a disaster fund investment of moderate size — to prepare for, to counter, or to recover from, earthquake devastation. It is also the story of parallel events, decisions and provisions, scientific, political and commercial, that influence our preparedness for and recovery from earthquakes — all these from the point of view of the Society.

## The thirties

A few sets of plans for buildings that were intended to have resistance to earthquake generated effects had been prepared in New Zealand before 1930, using ideas developed principally in Japan. Probably the most notable of these designs was for Wellington's railway station, designed in 1929. In that year, two large damaging earthquakes occurred, the second of them (at Murchison) seriously lethal, both (by good fortune) in sparsely populated areas of the South Island; and there was a damaging shake at Wanganui. These three were vanguard of a fourteen-year procession of seismic violence before we again enjoyed relative quiescence.

Our worst ever destroyer, the 1931 Hawke's Bay earthquake, followed. It literally shook things up on the ground and in the minds of politicians, Earth scientists, relief organisers and engineers. Its story of devastation, death, suffering, and economic loss is well known and needs no repeating here. But the aftermath recovery and rebuilding of urban centres Napier and Hastings is worth study and has importance for our story, because it marked the beginning of the era of uniform code control here, and it raised awareness of the need to plan civil defence. Local government control was suspended by legislation, approved (and, indeed, recommended and welcomed) by affected communities. Commissioners, appointed to replace local government, gazetted a set of rules modelled on Californian counterparts. These were prepared for Hawke's Bay urban reconstruction by a Building Regulations committee, chaired by Canterbury University College's Professor JEL



Cull. Business districts in affected towns were rebuilt under control of Commissioners for whom the Public Works Department (PWD) (*Note 2*) supplied engineers to oversee and approve recovery design and construction. Among these people was Charles Turner who was subsequently to be appointed Engineer in Chief of the Ministry of Works and Development (MWD), and to become Vice-President of the International Association of Earthquake Engineering (IAEE). From him I learned, sixty years later when I was assisting an insurer to set premiums for Hawke's Bay buildings, his opinion that restored urban centres of the earthquake ravaged towns were probably better able to withstand earthquake attack than were most post-1935-pre-1965 developments elsewhere in the land, which were code-required to be resistant.

Cull also recommended that Government should implement uniform code control of building design and construction throughout New Zealand. This recommendation was accepted and it led, in 1932, to creation of a Standards Institute, under the aegis of the Department of Industries and Commerce, and subsequently to the 1935 issue of our first set of model building by-laws, suitable for adoption by territorial authorities throughout the land. Adoption was not mandatory, but the by-law set quickly became ubiquitous because it satisfied the needs of all municipalities and counties. It required design simulation of earthquakes by supposing buildings to be subject to uniform lateral acceleration of either 8% or 10% (depending on their importance) of gravitational acceleration, for which loading allowable elastic stress levels were set. This, known as inertia reaction, was in imitation of Japanese and Californian controls of that time. Interestingly, I think, neither Japanese nor Californian rules were the first to be formulated. Precedence honour seems to lie with Italians, who had mandatory earthquake-resistant building construction rules as early as 1786 (*Note 3*).

What did engineers collectively do about all this? To judge from extant records of the New Zealand Society of Civil Engineers (*Note 4*) which I have searched — a lengthy exercise, and a dusty one — surprisingly little was published that related to earthquakes in that earthquake-ridden decade. There were only a couple of papers, one by Wellington-based consultant Peter Holgate and one by AJ Dickson, then a senior engineer with Auckland City Council. Holgate's paper, which was read to a 1933 meeting of NZSCE, was didactic, impressively supported by calculation, and, although described



by the author as “short”, must have taken hundreds of hours to prepare. It is meticulous. From our vantage point of greater knowledge about the nature and intensity of earthquake generated building responses, its emphasis on calculation precision is not justifiable, given ignorance then prevailing of what earthquakes do. Though the paper provoked a massive amount of discussion at the meeting and, after publication, by correspondence, seemingly only one commentator noticed this. The author deserved, and was awarded, the NZSCE’s Fulton Gold Medal for his presentation. Dickson’s paper touched earthquake resistance too briefly to need further notice here.

S (Sammy) Irwin Crookes, a consulting engineer who also lectured at Auckland University’s School of Architecture, read widely and intelligently before writing his little book *Structural Design of Earthquake-resistant Buildings*. Although published in 1940, it deals with the 1930’s state of knowledge, which, interestingly, opined that acceleration response maxima might be found in buildings with fundamental vibration periods in the range 1 to 2 seconds. This range, provisionally identified by an experienced Japanese observer of damage suffered in the 1923 Kwanto earthquake, perhaps ought to therefore be avoided by appropriately selecting building character at the design stage. We now recognise the range to be well displaced from spectral peaks that later researchers, with better information available to them, have consistently found. But Irwin Crooke’s discussion shows his awareness of the importance that structural dynamics would have in later developments. Appended to his work is a complete copy of 1937 Californian design rules for earthquake resistance. His summary of practice, doubts and expectations is perceptive for its time, and his book was well received and recognised for its value. Among his listed references is one to a 1926 book by CR Ford, an architect with an engineering eye, who surveyed New Zealand, Japanese and American earthquake history, and US and Japanese rules for quake-resistance, all apparently ably, and suggested wise-for-their-time rules for us. I have not been able to find a copy of this work.



## The forties

Wartime. Furious seismicity of the thirties subsided into relative quiescence, after final kicks, in 1942, from two moderately large Wairarapa earthquakes and their aftershocks. By then, all our nation's energies and resources were dedicated to overcoming huge and evil threats to our way of life. In this environment nothing advanced the science and practice of engineering, although two events from the period are important to us.

The first occurred in 1940, a large earthquake in Southern California's Imperial Valley. From it was recorded a clear representation of each of three components of strong ground motion at an intensely affected site. Known as the El Centro record, this became, for ensuing decades, a prime model, a distinction it maintained even though a library of good records was accumulating.

The second was 1944 legislation for Government-controlled insurance against earthquake and war damage, which converted a 1941 war-damage-only scheme into one that also catered for earthquake losses. Earthquake damage was a common exclusion in insurance policies available at that time. Compensation for loss was to be funded from an accumulation of levies on fire insurance policies. An earlier attempt to do something similar had failed. Provision to levy to rebuild a national emergency fund, depleted by Government's financial support for restoration in Hawke's Bay, was drafted into a 1931 bill. It was withdrawn when opposition won the day by labelling the measure a property tax, considered to be an anathema by many people; but in 1944 the idea successfully passed into law. An Earthquake and War Damage Commission was appointed to implement the scheme. This Commission has been a generous supporter of activities that seek to alleviate earthquake risk and of the Society in particular. Its support is vital and continues to be given.

When, just after the middle of the decade, I returned from war service abroad to complete my education at Canterbury, there was nothing more revealing in tuition given about earthquakes and structures than the old inertia reaction method of our nation's 1935 code of practice, dressed up a little for a later edition of the code. And neglect of the earthquake bogeyman by our educators and our code writers persisted for at least fifteen more years.



## The fifties

Whatever progress was made in the decade, none of it had discernable effect on day-to-day practice in engineering. The *inertia reaction* method, still the design-code prescribed earthquake-effect simulator, prevailed throughout, despite widespread and growing unbelief in it. Emphasis in engineering was often given to analysing techniques, for want of reliable information about other important issues. Slide-rules in hand, some people (I among them) sought to improve accuracy attainable with popular approximations for analysing multi-storey frames, like the one due to Naito (Japan), by using moment distribution with shear balancing in every cycle. It could take a couple of tedious days to analyse a reasonably large frame intended for what was then considered to be a high-rise building. Many such buildings were being designed consequent upon our nation's recovery from economic depression and from war into a prosperity that propelled us to front-running among nations. But pursuit of accuracy, while perhaps useful in other applications such as determining effects of a lateral load like wind, was surely a futility for an *inertia reaction* earthquake model. That old banality "garbage in, garbage out" is entirely appropriate in this case.

Unknown to most of us, however, important things were happening. At the Department of Scientific and Industrial Research (DSIR), an Engineering Seismology Section was created to investigate and inform Government and industry of everything relevant for defence against earthquakes. Field data needed collecting, so the Section set about designing strong motion accelerographs; and data had to be fed into a suitable analysing engine that could apply it to descriptions of buildings held in the engine and thus discover how the buildings would behave, so the Section set about building an ingenious electronic analogue computer for that purpose.

Late in the fifties, a stuttering start was made with the business of ridding urban areas from the peril, in earthquakes, of collapse, total or partial, of unfit buildings, which could injure or kill occupants and passers-by. As the exercise turned out, it was not so much a start that was made as a consciousness-raiser that was uncovered. The tale is told here because it was the first recorded activity nationally in response to concerns that have deep interest for the Society. Lower Hutt's City Engineer believed the city was empowered by the Municipal Corporations Act, 1954, to require the owner



of a shabby building the Engineer deemed “dangerous and dilapidated” (terms used in the Act), to strengthen or demolish, options the Act gave. Accordingly, he issued an order to the owner, which, contested, led to a magistrate’s court hearing. The building in question was two-storey and of brick construction. It had been seriously injured by differential settlement, which had reduced the equilibrium of parts of it to the edge of instability. Quite evidently, it could not have survived moderately intense shaking unscathed. I became involved. At the hearing, I painted a gloomy picture of the wretched building’s condition and was surprised, but gratified, when the engineer assisting the building owner agreed without reservation. Although no one at the hearing doubted that the building’s condition was too poor for safety of occupants and passers-by if it were to be shaken by quite a minor intensity earthquake, counsel for the owner submitted that such shaking did not occur every day. The Municipal Corporations Act did not spell out exclusion of events as rare as occurrences of small to moderate earthquakes that might contribute to building instability, but he submitted that more everyday things than earthquakes were reasonably implied, and that Lower Hutt could not invoke consideration of earthquake hazard in the context of the law. The magistrate declined to rule, saying that, whatever way he went, there was certain to be an appeal. Therefore he invited parties to consent to his sending a summary of evidence to the supreme court, as a “case stated”, for that court’s ruling. When it came, the ruling favoured the owner who, perhaps finally persuaded by informed opinion that his building was a death-trap, demolished it shortly afterwards. Although this outcome was satisfactory for this single case, it showed that communities continued to lack means to protect themselves — earthquake risk buildings were exempt from the 1954 Act’s strictures (*Note 5*).

Abroad, work by researchers was reported in conference proceedings and in teaching programmes. Among these, in USA in 1956, were a two-week summer programme at Massachusetts Institute of Technology (MIT), and a World Conference on Earthquake Engineering at the University of California, Berkeley. The summer programme at MIT introduced dynamic response theory to practicing engineers. Its main theme was structural resistance to blast loads, for which presenters used material they had developed for the US Army. Responses of buildings to earthquake and wind loads, and of bridges to rolling loads got a useful ride on the blast-theory coattails. Retrospectively known as 1 World Conference on Earthquake



Engineering (1 WCEE), the Berkeley conference was the first of the now well-established series of World Conferences which has been controlled since 1963 by the International Association for Earthquake Engineering (IAEE), to which the Society has been affiliated since 1973. It was attended by VA (Vern) Murphy, a senior structural engineer with New Zealand Railways, who was impressed enough to propose to Government here that New Zealand should fund and host a sequel.

## The first half of the sixties

Japan hosted 2 WCEE at Tokyo in 1960. It was attended by a small New Zealand group, who delivered our offer for 3 WCEE, obtained from Government by Vern Murphy's persuasiveness, and accepted. At 2 WCEE *ductility factor* had its unveiling (in a paper by Veletsos and Newmark), along with other things, many esoteric. The Conference was successful, the more so, said JAR (Johnny) Johnston, then Chief Structural Engineer, MWD, and one of the New Zealand's delegates, because Japanese hosts, after the end of it, were surprisingly uninhibited when showing visitors what they were doing in their design offices about solving earthquake problems, and the visitors benefitted from what they were shown.

The Portland Cement Association (US) published, in 1961, their well-known, although slightly flawed, book for designers in reinforced concrete, perhaps the first readily available and widely distributed text digestible by the run of structural engineers (*Note 6*). Advance copy drafts had limited circulation here a little before the 1961 general release, and methods advocated in the book had been used by some of our colleagues.

An *ad hoc* committee, the National Committee on Earthquake Engineering (NCEE), was appointed in 1962 to run 3 WCEE here in New Zealand, by whom is unclear – it is not on record – but presumably by MWD who selected engineer members and invited DSIR to nominate scientists. Charles Turner chaired. And, in 1963, the International Association of Earthquake Engineers, headquartered in Tokyo, came into being and assumed control of the sequence of future World Conferences.

A taste of a little of the fruit of the Engineering Seismology Section's efforts came our way in a 1964 DSIR Bulletin written by the Section's Head, Ivan



Skinner. This offered earthquake acceleration response spectra, together with standard sets of modal responses, in all 71 pages of charts to assist designers of tower buildings, framed, shear-wall and rocking base, in that age when digital computers and software for them were much less accessible than they are now (*Note 7*).

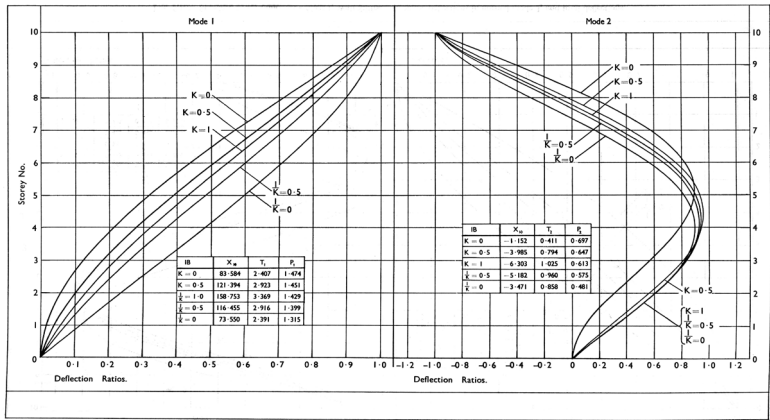



Fig. 5.2.1 Standard tower buildings - Mass 1, Wall Stiffness B. Static deflections in normal modes 1 and 2.

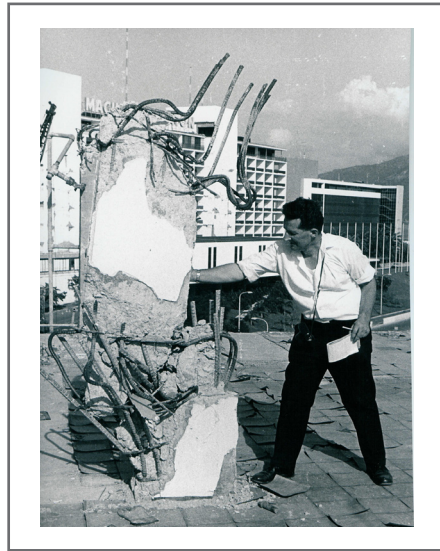
*A page of mode shapes from DSIR Bulletin 166*

The Section continued to develop and produce high-quality strong motion accelerographs of their MO (mechanical-optical) series, which wrote continuous time-based records of strong tremors on film. Deployment of instruments began in the mid 1960's. It was assisted by financial contributions, equal to the value of the hardware, from owners of installation sites. These instruments were acknowledged internationally to rank well in comparison with accelerographs designed and produced in USA and in Japan. They continued in service here for several decades until replaced by digitally recording accelerographs, which generate more readily processed records. A study was begun of separating the functions of load bearing and energy absorption in structures. This evolved to become a study of base-isolation, a possible means of protecting buildings by uncoupling them from damaging frequencies in ground tremors. Skinner had obtained cooperation from Jim Kelly (of the University of California, Berkeley), who joined the Section for a year. They mulled over a base-isolation scheme for buildings



that provided for gravity load support upon rubber bridge bearings (alternate layers of steel and rubber) and lateral shock energy absorption in ductile steel devices functioning like steel shock-absorbers in aircraft arrester gear, which action was familiar to Kelly from his work in USA. Bill Robinson, another pioneer of this enterprise, proposed using rubber bridge bearings with lead cores, and this was the option that was pursued. Strong motion time-based accelerographs and base-isolation for buildings were both outstandingly successful projects and, subsequently, they earned the Section an international reputation (*Note 8*). They also elevated our country into the front rank among earthquake engineering nations, despite our relatively indifferent performances in other respects.

*Ivan Skinner inspects a damaged column at the seventh floor of a building in Venezuela after the Caracas earthquake, 1967.*



Early in the decade a draft of a proposed new loadings code was in circulation. This contained a provision for the first seismic zoning of the country, an attempt to match prescribed levels of lateral load in simulation of earthquake responses for each zone with intensities of earthquake shaking expected to occur there. Zone delineation was guided by tectonic studies undertaken by the Geological Survey and subsequently reported in a paper at 3 WCEE, perhaps with additional information from a study by I.D. Dick, which used extreme-value theory and was also the subject of a paper for 3 WCEE; but measured supporting data were sparse. Dick was then Assistant Director-General of DSIR. His work, the first to give a reasoned time-and-place distribution of earthquake magnitudes in New Zealand, remained the sole source of this information for fifteen years when, with improved



understanding of Earth sciences and with improved data, many new studies were done and results published. Seismic zoning was controversial when it was introduced. It was opposed initially by most seismologists who were aware of the diffuse distribution of earthquakes here (as opposed, for example, to linear distribution that is characteristic of Californian seismicity), and were sceptical about ruling any part of the country safe from “the big one”, and also by other people, geologists among them, many of whom knew about large intraplate earthquakes elsewhere. Two, the New Madrid, Missouri, earthquake of 1811 and strangely two-centred Charleston, South Carolina, earthquake of 1886, have been rated by earthquake historians as possibly the greatest to have occurred in contiguous United States in historic times; both savagely affected regions that would have been thought to be seismically inactive had these earthquakes not occurred. Could such anomalous events occur here, in a zone deemed relatively placid? The code also changed the vertical distribution of lateral acceleration to be used in structural design of a building from uniform to increasing linearly with height from zero at the base, and it provided for the resulting load magnitude to depend on the period of free prime-mode vibration in the structure, for the assessment of which period an approximate formula was supplied. The code was ratified by the Standards Institute and issued as a model building by-law in 1965. Supplementary to it (and closing gaps that critics saw in the model building by-laws) Otto Glogau, who succeeded Johnston as MWD’s Chief Structural Engineer, and his deputy, Gordon McKenzie, prepared a design guide for Public Buildings (PW 81/10/1), which was widely distributed and used.

New Zealand’s 3 WCEE, 1965, was planned for two centres, Auckland and Wellington. It was run efficiently and delegates enjoyed a satisfying technical programme. For them and for their partners, the stimulus of a social event, which included an orchestral concert, among other entertainments, was also widely appreciated. The two-centre format was a novelty that gave delegates a pause for relaxing and for contemplation, gratefully accepted by most, with, thrown in, a sightseeing opportunity on the two-day bus trip between conference venues, marred a little by persistent rain. At this Conference, NCEE chairman Charles Turner was rewarded for his work with NCEE by his election to the office of Vice-President of IAEE, deputy to President John Rinne of California.



Early in 1965, for the Consulting Engineers Division (CED) of NZIE, I convened an Earthquake Group consisting initially of Wellington members who, acutely conscious of the inadequacy of their training and knowledge about earthquake matters, were determined to improve both. I, with those who were helping me, hoped the Group would have a cooperative spirit and frankness akin to that which Johnston had admired in Japanese engineers' offices, and we were not disappointed. Throughout the three years of its life, Group meetings were frequent and well attended. Each meeting was called to hear and discuss an address or a paper presentation by a member or by a knowledgeable invited visitor, or to discuss a matter of common interest – perhaps a design problem and its resolution, or a set of code of practice provisions. We also ran tuition sessions: Robin Shepherd, from the School of Engineering in Christchurch, conducted a week-end seminar, and Ivan Skinner acquainted us with the work of the Engineering Seismology Section of DSIR, that he headed. Everything was done to stimulate zeal for group discovery at a time when reliable guides to learning in this field were rare and difficult to access. Moreover, most of us had been educated by confirmed elasticians, so reinforced concrete ultimate strength design principles and procedures needed instilling. Co-operation was fostered and goodwill prevailed. The Group, later strengthened by additional membership from centres outside Wellington, was the base from which the Society was formed, and it ceased operating when the Society began.

In 1966 Robin Shepherd introduced a course in structural dynamics as an elective, available to final year civil engineering students at the School of Engineering, University of Canterbury, thus beginning a long and fruitful contribution by the University to the theory and practice of earthquake engineering. Shepherd also gave invaluable and appreciated support to the CED group. For reasons associated primarily with uncertainty of steel-section supply in our country and with economics, reinforced concrete dominated for commercial, industrial and institutional building construction here then, so it was appropriate for the University to embark on a programme of research to establish and verify design procedures that would provide reliable earthquake-resistance capacity in these buildings. Engineers were by then aware of shortcomings in existing procedures. Before the end of the decade, Bob Park, Tom Paulay and their post-graduate students accepted the challenge, and began the investigation programme that was to bring them world-wide renown.



Turner's NCEE, its first task over, assumed a new role, which kept it alive, as New Zealand's affiliate to the international body, IAEE. From 1966 I attended meetings to report activities of the CED Earthquake Group, so was present at a meeting in April, 1967, which was chaired, in Charles Turner's absence, by Bruce Spooner (Chief Civil Engineer, MWD), when Committee member Lyall Holmes proposed setting up a permanent secretariat to disseminate information, then apparently arriving in substantial volume from IAEE, and to promote and coordinate efforts to improve the quality of earthquake engineering in New Zealand. Put as a motion, it was adopted without dissent, and three of us, Lyall Holmes, Wilf Edwards and I, were deputed to "investigate ways and means to set up such a secretariat to service the committee, and to widen the activities of the committee" and to document our findings to every committee member at least one month before the next meeting. This we did. At that next meeting, Charles Turner, having returned to the chair, ruled the initiative inadmissible because it exceeded committee powers. None of us had seen powers defined, so all were unaware of limits; but challenging the chair's ruling on any ground would have been futile, for seismologist Robin Adams, having presumably consulted his DSIR nominators, delivered the clincher. He told the meeting that DSIR would withdraw its nominees if NCEE persisted with Holmes' plan. In bright winter sunshine, three of us, Lyall, Wilf Edwards and I, lingered on the pavement outside the Royal Society's rooms, venue for the (to us) disappointing meeting, after all others had dispersed, and agreed, subject to financial help being available, to form an independent society. We approached Toby Blackwood, then vice-chairman of EQ&WDC's Board (he was its *de facto* chairman — the Commission's Board operated that way then, with a Minister of the Crown the nominal but always inactive chairman), who gave us a sympathetic hearing, and undertook to have our request for cash support considered. It was, and successfully for us.

If you want support for your plan you must expose it. One result from the spread of knowledge of our plan for an independent society was that it provoked an approach to us from NZIE, to persuade us to abandon independence, and instead to set up as a Technical Group of theirs. We thought about it. NZIE connection might inhibit support for us from people we wanted to attract: scientists, architects, planners, disaster relief people, risk and hazard experts, and the like, few, if any, of whom were likely to have NZIE membership. But NZIE persuaded us otherwise (although we had



misgivings) and promised significant help. I think now that we need not have been concerned and that the NZIE tempters judged correctly, for we had a reasonably good spread of disciplines in our early membership.



*Latham Andrews ca.1965*

## Embryo

So we set about the business of founding as an NZIE Technical Group, sadly without Lyall Holmes who suffered persistent ill-health. Wilf Edwards and I, partners in a modestly sized consulting practice, agreed to share the work chronologically, but flexibly, in order to limit the impact of it on our business. I was to lead for the period to and including the first Society meeting, and thereafter Wilf was to handle development (we had to be, and we were, confident he would be elected for that, of course).

NZIE offered us an Earthquake Symposium at its forthcoming 1968 Rotorua Conference to publicise our anticipated start, asked me to fill the technical content of it with suitable papers (*Note 9*), and assigned chairmanship to Charles Turner. The session attracted more attention than our optimism predicted. It was a great success that boded well for us and was very encouraging.

Having persuaded us into their fold of Technical Groups (for which we would have been a prime acquisition, funded like no others were, with plans to encourage a science, art and practice in an expanding group of disciplines,



and to publish), NZIE set about devising rules, inviting us to share the task, while insisting on priority for its own clauses. Then some difficulties arose (*Note 10*). Most were trivial, and seemed to stem from a concern that we might usurp operations and arrangements that NCEE had. This was baffling because we were setting up to do the very things that NCEE eschewed when it rejected establishing a secretariat to encourage interest in providing means of defence against earthquakes. We were asked for, and we gave, our pledge not to stand on NCEE toes, and specifically not to seek affiliation with IAEE (*Note 11*). There, we thought, the matter should have rested. But it did not entirely. Small niggles persisted, symptoms, perhaps, of lingering suspicion that we might be competitive with NCEE notwithstanding our pledge. Although irksome and occasionally responsible for time-wasting things, they did not affect us much, so we ignored them when we could.

Then it became a matter of interesting those from whom contributions towards making society safer from earthquakes might be expected. We cast the net widely. A suitably high-sounding statement of aims was prepared, copies were strewn as far afield as we thought prudent among organisations and individuals, we made ambassadors of the members of the CED Earthquake Group and sent them forth, and we asked learned societies to publish news of our intentions, together with invitations to join us, in their journals and newsletters. There was also preparation work required for the Earthquake Symposium to be run at NZIE's Rotorua Conference, we needed to be sure that we could publish a bulletin of our own shortly after our start, and inevitable and innumerable loose ends needed tying. Finally, all was done.

## Birth

On 8 April, 1968, a month or two after the Earthquake Symposium at the NZIE conference, we had our inaugural meeting at the Institution's Wellington meeting room, attended by about 40 people. They elected a management committee (see Appendix) for which Wilf Edwards subsequently became chairman, as expected. An addition, a little later, to the management team was Secretary Dudley Tonkin, a volunteer found for us by the Institution, of which he was a Past President. He served admirably.



My last front-line duty was chairing the inaugural meeting. Then I retired to obscurity to work with others on Bulletin promoting and editing and other tasks, principally begging for contributions, and filling any lack of copy with scribblings of our own. Shortly after our inaugural meeting came the Inangahua Earthquake. You use words like *disastrous*, *sad* and *tragic* when describing an earthquake; *fortunate* is certainly not among them; nevertheless we anticipated an easing in our quest for copy in consequence of the event, and we got it – material for the substantial part of two forthcoming Bulletins, one of them bumper-sized and devoted entirely to the Inangahua earthquake. Bruce Falconer (*Note 12*) visited the disaster area, accompanied by a group of his University of Auckland students, and later wrote copiously about it for us. (Many months later, something prodded him to volunteer editorial service, or perhaps his arm was twisted? Whatever, he became editor in 1969.)

In this same year of 1968, 4 WCEE was held in Santiago, Chile. Immediately before it, IAEE's Vice President Charles Turner had the misfortune to be injured in a traffic accident, and was too severely hurt to be able to travel, as he had intended to do, to the conference. In his absence, Professor George Housner was elected to the presidency. All of us here were disappointed. But we knew Housner to be eminently worthy of the office, for he enjoyed huge respect and an enviable reputation for his brilliant and wide-ranging work. And then the sad fiction of supposed rivalry between the Society and NCEE was resurrected – no longer innuendo, but overt at last — and Turner's electoral defeat was attributed to it by a few people. Several of us faced a preposterous reproach of having conspired to promote Housner at Turner's expense. For my part, rejection of that, when it was put to me, was emphatic. Others certainly would have done as I did. So far as I am aware, the topic never again surfaced; so the air was finally clear. The difference that made was palpable and welcome — we were on our way, now with wholehearted Institution support. Some thirty years later I learned from a reliable source that a group of Japanese delegates engineered Housner's success, believing that an academic should follow President John Rinne, who was a consulting engineer.



## Earth sciences (and some golf)

We should have foreseen that our first management committee would lack Earth scientist representation; but if we did, we gave it no thought. One of my early backroom tasks was to write a remedial rules amendment which, unchanged, sets eligibility for election criteria to this day, securing Management Committee representation for Earth scientists, researchers and architects. Permanence was not intended for this rule; it was meant to serve during the Society's settling-in period when we thought our friends from other disciplines could have felt overwhelmed by engineer members (who are rather disparagingly labelled "ordinary" in the wording of the rule). Apparently engineers are less sensitive than I thought they might be, and apparently voices from other disciplines still need protection, for the rule survives.

For almost the entire forty-year span of this narrative Earth sciences and earthquake engineering for structures developed independently, neither having much, if anything, to offer the other. Earth science had no credible explanation for the mechanism that causes critical strain conditions to develop in Earth's crust; it is relief from these strains that ruptures and dislocates rock along fault planes and thus generates earthquakes. Because discovery of whatever is responsible eluded investigators, reliability of several Earth science contributions to engineering was speculative and controversial. Ingenious geophysical theories were proposed to account for creation of strain fields in Earth's crust, each one abandoned after encountering unresolvable difficulty.

Breakthrough came with *plate tectonics*, the theory of the late 1960's that developed from a remarkable intuitive hypothesis about sea-floor spreading that had been proposed some ten years earlier. According to *plate tectonics*, six or seven thin but rigid plates comprise Earth's crust, each one in motion relative to its neighbours, impelled by convection currents in the mantle beneath. Various forms of inter-plate boundaries exist, all seismically active. New sea-floor is created by upwelling mantle lava at oceanic ridges where contiguous plates part, and it spreads at rates on the order of several tens of kilometers per million years from ridges to subduction zones which are found coincident with deep sea-floor trenches at remote plate-collision boundaries; there one of the meeting plates is over-ridden by the other.



Subducted sea-floor is returned to the mantle from whence it came. Some plates carry continents and land fragments, as if by conveyor belt; their lighter, thus buoyant, rock resists subduction, so it remains at the global surface, preserving land masses. Earthquake occurrence and nature, sea-floor spreading and continental drift were all explained. Results from every conceivable test that was applied supported theory so well that one investigator would claim that “there is no serious objection to acceptance of sea-floor spreading and continental drift as facts rather than theories” and that, by 1970, almost all Earth scientists had accepted the theory.

I was fascinated, but I quickly learned that not everyone here was. At the time, a senior geologist friend and I, both almost middle-aged yet neophyte golfers, forbidden week-end play (thus effectively all play) at the club we had recently joined until we had acquired enough competence to play in fields without distracting them, were obliged to join a more tolerant rural club, there to learn how to measure up. We always played together and we discussed many things. I had a layman’s interest in geology so I listened and learned while we were earth-breaking. My friend, who had influence with geologists here and who was in tune with their thinking, was sceptical about *plate tectonics*, and so, he said, were his colleagues. Their stance on this issue might account for the absence of any mention of *plate tectonics* in the two-volume set, *The Geology of New Zealand*, which was painstakingly prepared for publication by the Geological Survey, a division of DSIR, and published in 1978; but, to be fair, there is nothing whatever about structural geology in the work.

Seismographic information should be gathered in every earthquake-prone country. Means for obtaining it in New Zealand were woefully inadequate at the time of the Murchison earthquake (1929), and this was recognised. Complacency that had grown through a period of relative seismic quiescence was shattered. Government was prompted to fund urgent improvement and extension of the existing two-station deployment of horizontal pendulum seismographs, so that, at the time of the Hawke’s Bay earthquake (1931), five stations were operating. Instruments at all but one of these were overloaded; the sole record obtained was from a station at Takaka. Thereafter, progress with establishing a network was less encouraging, but near the end of the 1930’s just enough data was at hand for meaningful research to be commenced into assessment of magnitudes, seismicity of



major towns, improvement of epicenter and focal depth determination, and description of crustal structure. The work was tentative, hampered by relative paucity of data, and was curtailed at the outbreak of war, due to shortage of research staff. Postwar, slow progress was made, improving instrument quality and data retrieval, and establishing a few more stations, without much consideration being given to their location, so that, by 1960, there were ten stations very irregularly distributed. Better planned and more ambitious was the augmentation scheme put into operation in 1962, which aimed to cover the country with a network of twenty-five stations, spaced reasonably regularly at from 120 to 150 km, of which twenty were operational by 1969.

## Wrap-up

This story ends in 1969, after the most momentous fourteen years of the twentieth century for all with an interest in earthquakes and in engineering to mitigate their effects. We learned for the first time important useful information about the physical nature of the planet we live on from *plate tectonics*, a theory so brilliantly devised and supported and so elegantly and convincingly presented and explained as to qualify as one of the century's leading scientific achievements. Our own scientific people contributed significantly in other ways. Something of a revolution occurred in engineering practice when we were persuaded to consider the dynamic nature of responses of structures to earthquake motions, to detail to promote ductile dissipation of energy and to abandon elastic design in favour of ultimate strength design. Although many principles we would need were yet to be formulated, a start had been made. Our universities were offering courses in structural dynamics. Success was in the air; even the more humble enterprises of the less talented were often rewarded well. People were thinking.

To expect such a rate of progress to persist would not be reasonable, and, of course, it did not persist. But there was to be great satisfaction for all Society members in the success of developments at the University of Canterbury, from *capacity design* ideas already proposed, to promote reinforced concrete as a suitable material for building to resist earthquake attack. Superb work was done which won deserved acclaim here and abroad. Publication of progress reports throughout the many years of the University project's life enhanced the value and reputation of our Bulletin and strengthened the



Society. We owe much to the sagacity and vigorous application of University staff, and to the industry of their students.

Much remains to be done, and the task might never be finished. Finding improvements for what we have should not be beyond the ingenuity and application of members. May the Society continue to offer a forum and to encourage initiative in its members!



# NOTES

## Note 1

Nathan Newmark is justly honoured for the profundity and utility of his numerous contributions in many fields to the science, art and practice of engineering. I mean nothing pejorative about his part in introducing *ductility factor* by this Note. Newmark's idea, a good one for its time, was something of a godsend to those of us struggling with new knowledge about the magnitude of elastic responses in structures to earthquake motions, which was difficult, to the point of impossibility, to cater for in traditional design. Now, however, further consideration ought to be given to behaviour influences that might then have been dismissed as minor.

Newmark and co-workers modelled a conception of elasto-plastically responding structures, each supporting a single mass. For each, resistance to lateral displacement at the level of the mass increases linearly through the elastic phase to the limit of that phase, and is thereafter constant through the plastic phase. The investigators calculated displacement response to excitation represented by several earthquakes, varying elastic stiffness, mass and yield point in the models, and observed that, approximately, maximum displacement to a given earthquake excitation in each case varied only with elastic stiffness of the responding "structure". It was independent of the yield point. Thus peak force (and hence acceleration) response in an elasto-plastic structure is obtainable from the corresponding peak in a fully elastic version of it by dividing this by the structure's *ductility factor*, defined as the ratio of total displacement to elastic displacement in the structure. For many earthquakes that have yielded good strong motion records, elastic acceleration response spectra have been prepared and are (and were then) available. These exhibit peak acceleration to each earthquake as a function of vibration period, and period is a function of mass and of stiffness. So, if we accept that the empirical result which Newmark *et al* obtained is extensible to multi-mass systems, we have all the tools needed to design within much more economically-feasible-to-live-with controls.

Newmark's team's model exploited an analogy between the mass carrying simple structure described here and a mass moving without friction on a level track and tethered in restraint of motion by an elasto-plastic spring. Such a model does not allow for descent of supported load that accompanies



lateral displacement (when you force a structure to slope by pushing it sideways, its height reduces). In a real structure, then, there is a loss of potential energy for every increment of displacement away from the original undisplaced position. To reverse displacement caused by a pulse energetic enough to cause significant yield, a returning pulse needs the sum of the displacing energy in the first pulse *plus* twice the potential energy loss that accompanied it. Doubling is needed because the potential energy released in the drop feeds an increment to deflection and so increases the energy needed by a correcting pulse, which must also re-lift the load to its original elevation. Disparity between the energy of the displacing pulse and the energy needed by a pulse that counters it fully is significant when the ductile component of displacement is not small, and this sets a strong bias favouring further displacements in the same direction as the initial one. Should intense white noise shaking persist, displacements incrementing in the favoured direction will overwhelm reversals at an ever accelerating rate. Perhaps studies of all kinds and sizes of building frames and loadings have already indicated a vanishingly low probability that, in the largest conceivable earthquake, intense shaking will persist for long enough to collapse any building that is well designed according to our criteria. I know of no such result having been obtained.

Incidentally, the model that justified code use of *ductility factor* suppressed not only the displacement bias, but also elastic softening in structures, a phenomenon that is due to presence of gravity load.

### **Note 2**

The Public Works Department (PWD) was subsequently renamed Ministry of Works and Development (MWD).

### **Note 3**

An Italian set of rules issued in 1786 for rebuilding earthquake devastated towns was said to have been prepared with “great sagacity” by the committee that prepared the next set in 1860, who observed that construction in compliance with it survived later shaking of severe intensity. As a succession of earthquakes occurred in the region, a corresponding succession of sets of rules was issued, each set lapsing as the memory of the event that provoked it dimmed.



#### **Note 4**


The New Zealand Society of Civil Engineers was formed in 1912, and it absorbed a pre-existing Institute of Local Government Engineers in 1913. In 1937, having admitted to membership engineers of other disciplines, mechanical, electrical, and so on, it changed its name to reflect this greater diversity of its interests, becoming the New Zealand Institution of Engineers (NZIE), a name that applied through the remaining period of this story, but was changed in 1982 to the current one — Institution of Professional Engineers New Zealand (IPENZ).

#### **Note 5**

About Earthquake Risk Buildings and the Society's published building assessment guide:

Much information about people's tolerance of risk from hazards has been gathered and studied to quantify risk tolerance, notably by the Royal Society, London. Levels tolerated are found to vary surprisingly widely across the spectrum of risks, often unaccountably, and therefore unpredictably. For example, people accept a hugely higher risk from recreational boating than they do from flying on a commercial airliner. That, perhaps, is understandable, but not many of the great tolerance disparities are so easily explained, which is why it is important to consult those at risk about their attitude to the condition. The level people are required to tolerate is, or should be, their choice whenever feasible. In a democracy, this is often expressed or implied by representatives of the people, e.g. by parliamentarians, and it is manifested (in the parliamentarians' case) by legislation or by budgeting. Thus, for example, provision for expenditure to make a road safer should be a measure of the willingness of drivers and passengers to be exposed to risk of travelling on the unimproved road, all other things being equal.

I have made the point before now, to an assessments drafting committee, that we should never advocate an assessment procedure that asks for a better building than the legislation does, no matter how fervently we disagree with the legislation. A former President of the Society, Otto Glogau, acted in an exemplary manner, in my opinion, when, in 1974, as Chief Structural Engineer, MWD, he helped prepare material for the first effective legislation empowering territorial authorities to require strengthening or demolition of



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risky buildings. Otto was dissatisfied with the draft bill, believing it to be too lenient, as many of us did; but he recognised that nothing better could be done in the face of parliamentarians' opposition, from both major political parties, to what he and we thought more sensible, and so tougher provisions. The bill became law (the Local Government Act, 1974), legislation that was technically empowering, but much too weak to be useful. Otto didn't often "cop flak", but he took a bit of quite unjustifiable rubbish from disappointed engineers then.

I believe the Society's tasks are to ensure that people who are making a choice understand the associated risk. We must then devise assessment rules that implement their choice. This, I concede, is necessary because it cannot be done in legislation. But legislation establishes intent which must be observed strictly when we draft advice for engineer assessors. I am aware that some Society members think differently.

#### **Note 6**

Perhaps because there were no competing texts, Blume Newmark and Corning's *Design of Multistory Reinforced Concrete Buildings* (PCA) was instantly popular. It was good enough to retain its high reputation with many people even after a conspicuous failure to recognise joint shear as a problem was exposed (a defect that did nothing to detract from Newmark's contribution, which is clearly recognisable). In the book, illustrations of reinforcing systems show column ties and beam stirrups distributed throughout clear spans and nothing whatever, other than member longitudinal reinforcing, in beam-column joints. This is a pattern that once was ubiquitous, and it was suitable for frames that were strongly dominated by gravity loading. It was a text book regular. At 3 WCEE, a document critical of neglect of joint shear in the book was, for a time, in surreptitious circulation. Attributed by some to steel industry interests, it was indicative of US commercial activity, steel structures having been favoured over reinforced concrete ones in the US before issue of the book. The critical document was presumed to have been written to help preserve that state. Although the PCA book was almost certainly intended tip the balance towards reinforced concrete, it had almost no noticeable effect on US preference. Steel was still the better material in official minds, at least until the Northridge earthquake, when its reputation suffered.



### **Note 7**

Bulletin 166 of the DSIR introduced to many New Zealand practitioners the modal analysis method for finding peaks of elastic responses in buildings to earthquake excitation. This was done with care, lucidity and economy. The Bulletin offered earthquake acceleration response spectra for simple resonators, which designers were to use for many years before Standards New Zealand published spectra. It also featured a library of shapes of the three gravest free-vibration modes for a well-chosen variety of standard building types, a wide enough spread to give a high-rise building designer a chance of selecting a match for what he wants. It also gave detailed clear instructions for finding periods and response factors, from them peaks of elastic modal responses, and of combining these to establish probable peaks of total elastic responses. Had the beginnings of the age of easy access to digital computers not been round the corner, libraries of mode shapes and acceleration spectra would surely have grown to meet the needs of the design industry.

### **Note 8**

Reported to a May 2007 conference in Istanbul was a survey of base-isolation installations in buildings world-wide at that time. David Hopkins, who attended, supplied the following:

More than 5000 buildings were base-isolated, including:  
2700 in Japan since 1985  
550 in Russia since the 1970's  
490 in China since 1991  
100 in USA since 1985, 31 in Italy since 1981  
24 in Taiwan since the 1999 Chi-chi earthquake  
19 in Armenia since 1994 and  
11 in New Zealand since 1972.

### **Note 9**

I persuaded four or five people to write for the Symposium — Cedric Power, Graham Cooper, John Hollings, Robin Shepherd (2) and I wrote and presented there. My paper, cobbled together hastily, won the NZIE's Freyssinet Award in 1971, which it did not deserve, being clearly inferior to John Hollings' 1969 paper, the one that was so influential in sparking



capacity design. That Hollings paper was an eligible competitor according to the rules of the award, as were many other papers.

#### **Note 10**

Among the irksome things: The Institution's rules for us forbade us from issuing any public statements in our own name; all were to be routed through the Institution's office for approval, then those deemed fit would be issued by the President of NZIE or his nominee. Air Commodore Reg Stevens, then NZIE Secretary, while totally loyal to his office, gave us almost the equivalent of a conspiratorial wink when we inserted a clause directly negating it. I believe I can recall one of our people using the latitude our clause gave, but the Institution clause denied, when commenting on some aspect of the 1968 Inangahua earthquake, although I cannot be sure. However, I am certain that comment from the Society was not sent through the Institution channel, but was publicly broadcast when we ran our 1971 Conference, for I was involved. This event was notable and was noticed by media. It was attended by two men famed for their contributions to our discipline – George Housner, then President of IAEE, from California Institute of Technology, Pasadena, USA and Emilio Rosenblueth from Universidad Nacional Autonoma de Mexico. I was interviewed on National Radio about it.

The Institution's rules also forbade our calling our management committee chairman our President – we lived with that one for years. Past office bearers lists now (but retrospectively) promote those old-time chairmen to presidential ranking.

#### **Note 11**

Affiliation with IAEE was settled on us, without our initiative or encouragement, in an unexpected way which, in view of some people's scepticism about our denying an aspiration to affiliate, had a touch of ironic humour. When, in 1973, I chaired the Society's Management Committee, Alex Stirrat phoned me from MWD to say that he could see no reason for separate existences of the Society and of NCEE, the chairmanship of which had devolved on him after Charles Turner's retirement. Why not a merger, he said, with inclusion of the word "National" in our title to show what had occurred? I accepted. For years thereafter, before someone deleted it, we had an additional "N" in our acronym – we were the NZNSEE. Nothing else



happened from the merger – we were never told what NCEE was doing or proposed to do, so we did not change anything other than the name, and have reverted to our original name now.

### **Note 12**

Bruce Falconer, who did not participate in the Society's pre-formation activity, but who was our first appointed Bulletin editor, deserves a Note here for the astonishing diversity of his career in engineering, remarkable in those days, when people were much less inclined to move between places of employment than they are now. He graduated PhD from Imperial College, London, and then crammed an impressively large assortment of posts and responsibilities into the first half of his working life, for the rest of which he was a gentleman farmer at Karaka, west from Papakura. His academic qualification immediately set him apart, obtained as it was at a time when the University of New Zealand's highest offering in our field was BE (Hons.). He was employed from early 1950's in PWD (with an interruption to participate in one of MIT's foreign students' summer programmes) until 1957, when he joined an architectural practice as its structural engineer, a practice he left after a few years to establish a short-lived consultancy of his own. He then took, c.1963, employment with the Heavy Engineering Research Association and then with UNESCO, after which he went freelance globe-trotting, an earthquake-hound in search of ravaged places (Agadir and Skopje). Returning to New Zealand in the late 1960's, he lectured at Auckland University before, in 1970, accepting a three-year term of office at the Asian Development Bank (Tokyo), his last work related to engineering. We should not have expected lengthy tenure as our editor from him, but he did the job well.





# APPENDIX

The National Committee on Earthquake Engineering in 1967

*Engineer Members:*

CWO Turner, BW Spooner, OA Glogau, WP Edwards, IL Holmes,  
VA Murphy, Professor NA Mowbray.

*DSIR Representatives:*

H Fyfe (Geology), RI Skinner (Engineering seismology), RD Adams  
(Seismology), RD Northey (Soil mechanics).

*NZ Institute of Architects:*

J Blake-Kelly.

*EQ&WDC:*

O Hall.

*CED Group Reporter – strictly not a Committee member:* AL Andrews

Earlier, JAR Johnston and J Bennett (EQ&WDC Secretary) would  
have been members of this committee, replaced respectively by OA  
Glogau and O Hall (Bennett's successor at EQ&WDC).

*Some members of the CED Earthquake Group:*

There was a list, of course, but it has not survived, perhaps not  
archived when, long ago, the CED ceased to exist. About thirty  
people participated in Earthquake Group activities, among them:

Des de Terte, Martyn Spencer, Sam Smith, Robin Shepherd, Noel  
Rowley, Cedric Power, John Moss, Doug Mackenzie, John Hollings,  
Wilf Edwards, Graham Cooper, Ken Climie, Tom Clendon, George  
Butcher, Don Bruce-Smith, Latham Andrews.

*First Management Committee, NZ Society for Earthquake Engineering:*

Wilf Edwards (chairman), John Hollings, Doug Mackenzie, Alex  
Stirrat, Jack Gill (EQ&WDC), Robin Shepherd, Ivan Skinner, Stu  
Mitchinson.



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