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- 9 AUG 2011

Justice Mark Cooper  
Chairperson  
Royal Commission of Inquiry into Building Failure  
Caused by the Canterbury Earthquakes  
PO Box 14053  
Christchurch Mail Centre

1 August 2011

Dear Justice Cooper

**Royal Commission – Canterbury Earthquakes**

Thank you for your letter of 1 July 2011 requesting my views on various issues relating to the engineering education of structural and geotechnical engineers. Please find attached my submission to the Royal Commission. This has been prepared with major contributions from Professor Pierre Quenneville and Professor Michael Pender, who are the current and a former Head of the Department of Civil and Environmental Engineering at the University of Auckland.

Please do not hesitate to contact me if you require any clarification or amplification of the comments in this submission.

Yours sincerely

*Michael C R Davies*

Professor Michael C R Davies FRSE  
Dean

*Received*

- 9 AUG 2011

**Royal Commission of Inquiry into Building Failure  
Caused by the Canterbury Earthquakes**

**Submission by the Faculty of Engineering at the University of Auckland on  
Structural and Geotechnical Engineering Education**

In his letter to Professor Michael C.R. Davies, Dean of the Faculty of Engineering at the University of Auckland, Justice Mark Cooper invited the views of the Faculty into the matter of engineering education for structural and geotechnical engineers, the weighting given to those subjects in the Civil Engineering degree, how training continues after graduation and the opportunities available or desirable for continuing education programmes.

This submission has been prepared by Professor Davies together with Professor Pierre Quenneville and Professor Michael Pender, who are the current and a former Head of the Department of Civil and Environmental Engineering and specialists in structural engineering and geotechnical engineering, respectively.

At the University of Auckland, structural and geotechnical engineering content is provided within the Bachelor of Engineering (Honours) program delivered by the Civil and Environmental Engineering (CEE) Department. The program is aimed at providing the basic knowledge required for a well-rounded generalist civil engineer in the first three years of study with a possibility for some specialization or to continue to follow a more general programme in the final year of the four year degree. In the fourth year, students may specialise in one of the civil engineering sub disciplines of structures, geotechnics, fluids, environment, and transport. Because the current curriculum contact hours have to be included within a four year degree programme, students are provided with the level of knowledge in a given discipline that would be expected of a student graduating with a degree accredited under the international Washington accord (to which IPENZ is a signatory). Those students who have selected to specialise in structural or geotechnical engineering will have reached the level required to design basic structural elements in any material, understand the intricacies of complex structural systems and design foundations and undertake slope engineering work for regular engineering problems. Graduate engineers are not experts and should be able to understand when they are facing a problem which is outside of their competency level. This is in line with international standards of engineering education.

The "formation" of a professional engineer is a two stage process. The BE degree forms the first stage of the progression of an individual to professional status (i.e. CPEng); the second stage is applying and building on the knowledge gained during this degree through training in industry. We are confident that the BE degrees in Civil Engineering awarded by the universities of Canterbury and Auckland, which are accredited to the standards of the Washington accord by IPENZ, provide the necessary educational background for graduates to become generalist civil engineers or, with additional appropriate education and/or industrial experience, to become specialists within the profession.

It is understood and accepted within the professional engineering community that one's education never ceases and that professional development should be continuous throughout one's career. The opportunities for professional development are various and not necessarily regulated as to their specific content. There are no requirements stipulating that someone working in the geotechnical area needs to attend more courses or seminars in geotechnical engineering, likewise for someone in structures. However, notwithstanding this, practicing engineers will normally seek additional knowledge in the area of their specialization (structures or geotechnical) where there is an opportunity. For their CPD, many practicing civil engineers take advantage of the short courses and evening lectures that are organised by professional groups such as the New Zealand Geotechnical Society (NZGS), the Structural Engineering Society New Zealand (SESOC) and the New Zealand Society for Earthquake Engineering (NZSEE).

It is evident when one considers the maximum level of engineering education of specialist practicing engineers outside New Zealand that a large proportion of engineering experts have taken a post-graduate degree (usually a Master's degree) to complement their studies and acquire significant additional

technical knowledge within their discipline. The engineering Master's degree in North America is normally two years in duration. In the first year, additional courses are taken that are related specifically to the discipline of choice and a dissertation is completed in the second year. In the UK an honours degree is required to enrol on a specialist Master's degree. These are normally of one year duration and consist of at least 50% of high level specialist coursework with the balance being a dissertation, as in North America. In New Zealand, employers do not necessarily require their engineering staff to have obtained a Master's degree but may encourage it. There is also a tendency in New Zealand for students wishing to extend their studies (but not to PhD level) to complete a Master of Engineer degree (ME) which is a "research Master's". The ME, which is open only to the most highly qualified graduates and is demanding in its scope, is awarded for a dissertation and there is no coursework component. New Zealand universities also offer Master's degrees similar in structure to North America and UK programmes – these are generally known as Masters of Engineering Studies (MEngSt) – however, these are not generally well subscribed.

It would be beneficial for the engineering profession to encourage a certain level of proficiency/expertise to be demonstrated by specialist engineers before they are allowed to tackle complex engineering problems. The educational component of such expertise that is beyond current Bachelor's degree programs courses might be delivered to the profession in the form of professional block courses, or through specialist MEngSt programmes. Indeed, it should be possible to change the delivery mode of MEngSt programmes to facilitate block teaching and, thus, allow practicing engineers the opportunity to enhance their formal qualifications as well as the level of their technical expertise. Although some of the courses that would be required are delivered already by the University of Auckland as part of the suite of MEngSt degree programmes, the current lack of demand precludes them being offered on a continuous basis. To ensure such programmes are successful, it is necessary for employers as well as potential specialist structural or geotechnical engineers to recognise the requirement for further specialist technical education.

Together with our colleagues at the University of Canterbury, the Faculty of Engineering of the University of Auckland is willing to participate in the enhancement of the education level of practicing structural and geotechnical engineers. We are fully conversant with educational standards outside New Zealand and are of the opinion that postgraduate level specialist technical education would complement an engineer's more general undergraduate education. This would offer the specialist knowledge required to tackle the advanced engineering problems, typical of the ones that a structural or geotechnical engineer in New Zealand would be faced with when designing or assessing complex structures and other infrastructure for seismic resistance.

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