Canterbury Earthquakes

Royal Commission

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I, Joanne Macgregor, make this submission. It is further to my earlier submission on behalf of C Lund & Son Ltd made Feb 2012. I would like to respond to the Discussion Paper; Training and Education of Engineers and Organisation of the Engineering Profession (21 June 2012).

I trained as a structural engineer at Canterbury University. I have some structural design experience but I have not practiced as a structural engineer. I have 24 years construction and business experience, in that time I have carried out various roles in commercial construction on and off site.

I have a personal interest in promoting the importance of greater numbers of New Zealand trained engineering technicians and I have participated in a number of industry wide initiatives around the importance of training more engineering technicians.

I have worked with experienced NZ trained engineering technicians. I personally, our business, and the broader building and construction industry have significantly benefited, from the advice, skills and experience of NZ trained engineering technicians. I have experienced first-hand the value they add to the engineering and construction community.

Part 1: Legislation – The Chartered Professional Engineers of New Zealand Act 2002

Q2: Building Consent Authorities (BCA) – Reporting substandard performance of engineers – If a BCA does identify substandard performance, their obligation is, already, to address that before they grant Building Consent. Any actual cases where a BCA do identify and address a significant design deficiency within a consent application should be being notified to a disciplinary body. I believe the practice is now for BCA to rely on independent peer review to identify significant design deficiencies before a consent application is submitted. Independent Peer review will make a substantial difference and will encourage high standards amongst Chartered Engineers. Independent Peer Reviewers should only be those Chartered Engineers that BCA have confidence in and Peer Reviewers should also notify substandard performance by a practicing engineer. The Department of Building and Housing DBH should have a strong presence in a moderating role that focus' on overall performance of the building and housing industry and not on individual BCA, individual projects or individual practitioners.

It is difficult to provide evidence that these suggestions would enhance professional performance. For a building to be judged structurally well designed and well built is the result of many factors and good practice by many parties. Robust Independent Peer Review of the structural design will substantially improve our confidence in the building consent process, reduce the risk of poor design decisions that are made solely for commercial reasons and reduce the risk of poor design decisions as a result of inexperience.

Part 2: Training and Education of Engineers

Any potential omission and shortcomings in the training and regulation of engineers that have been identified through the experience of the Canterbury earthquakes:

There is a shortcoming in the training of engineers at a technical level:

Recent changes to the qualification structure for engineering technicians has delivered significant improvements to the quality of qualifications for engineering technicians (L6 & L7) but actual qualification completions are less than 50% of the estimated demand as opposed to 95% of demand for university BE(L8) graduates (NEEP report).

There is a lack of understanding of the engineering technicians role in good design and good construction practices. Consequently the actual demand for technicians is most likely to be much greater than that estimated.

Engineering technicians are taught and understand construction and building systems, engineering specifications, engineering analysis and design and engineering materials. If they are trained in New Zealand they understand construction and building systems used in New Zealand, they understand our codes of practice and they are familiar with New Zealand's engineering profession and our construction industry in general.

The roles technicians can play include:

-Documentation of the structural engineers design. Preparation of drawings.

-Documentation of all engineering and sometimes architectural disciplines/trades work. Preparation of drawings.

-Design and documentation of less complex engineering soutions, particularly for "non structural" trades in commercial work and non standard solutions for residential work - please refer my February submission.

-Carrying out geotechnical investigation and reporting.

-Materials and Product Testing.

-Investigating product technical information and understanding manufacturers requirements.

-Providing in house technical support to manufacturers and supppliers of building products.

-Construction Monitoring on site for the Principal/Building Owner.

-Implementing and overseeing Quality Assurance plans and programmes in the design office and on site.

-Organising and managing building/construction work for contractors and subcontractors in all areas of construction including all commercial, civil and roading works.

-Planning safe construction, writing construction methodologies and work plans for contractors and subcontractors so that work is carried out safely, to high standards and productively.

-Completing detailed component and workshop drawings for contractors and subcontractors.

-Completion of As Built Drawings.

-Assessment, scoping work and preparing damage reports for Insurers.

-Preparing Maintenance and Inspection Plans for Building Owners.

-Carrying out building inspection for Local Authorities.

-Processing consents for Local Authorities

-Building and property management for Building owners.

The roles senior engineering technicians can also play:

-Supervision of junior design engineers and junior technicians in the design office.

- Site Engineers for Contractors and Sub Contractors.

-Production/Contracts Managers for Subcontractors.

-Project Managers and overall in charge of projects on behalf of the Principal or the Contractor.

-Site Lead (Class 2 and 3) Licensed Building Practitioners.

Our experience of the Canterbury earthquakes has shown us that all these roles play a critical part in achieving high standards of structural design and construction. Our experience of the Canterbury earthquakes has shown us that we will need to pay greater attention to some of these roles – for example higher standards of construction monitoring, more specific geotechnical advice, higher standards of building maintenance and management, better records - maintaining good accessible as built records for the lifetime of a building, better engineered solutions in trades not specified or detailed by structural engineers, better engineered solutions for housing - less reliance on standard NZS3604 solutions for residential projects and better technical advice and guidelines to industry.

We will need much higher numbers of technicians with an appreciation and an understanding of good structural design participating in the building and construction industry to achieve those higher standards. We have good technical qualifications and we can train New Zealanders. We do not need to rely on skilled immigrants who are unfamiliar with the building and construction industry in New Zealand.

There are a number of impediments to addressing the shortage of engineering technicians and I urge the tertiary education sector to address this issue above any others and to work together to achieve a better outcome.

The experience of the Canterbury earthquakes has taught us that there is a shortcoming in the regulation of the responsibilities of the Engineering Profession (and Building Consent Authorities) as a result of the performance based Building Act and New Zealand Building Code.

There is too great a reliance placed on the responsibilities of the Engineering Profession.

There is a frustrating lack of control over the introduction of new building systems in New Zealand. Where in the past new codes were written and new practices/systems proven by Government departments such as the Ministry of Works before they were allowed to be used by private practice now it seems that anything goes as long as the marketing and promotional material is convincing enough.

It is far too late in the process to rely on contractors to prove that a new product is “fit for purpose”. In New Zealand we do not have the processes in place to rigourously evaluate new building systems and

there is insufficient information by way of guidelines and evidence for engineers for new products and systems so that engineers can prove their design by carrying out their own specific engineered design – for example - structural solutions relying on adhesives, structural timber solutions using LVL, structural solutions using carbon fibre, solutions for bracing that over rely on generic manufacturers advice and the specifications for new/modern materials for piped services. All of the specifications we get for this type of work place far too great a reliance on following manufacturers guidelines and using "approved" applicators. We need to start evaluating and proving new systems and products using straightforward tests that prove engineering properties and satisfy engineering first principles. This is an area where DBH should have a strong independent presence supporting BCA and the construction industry.

The best recent example of what happens when there is an over reliance on manufacturers to prove and convince us that the products they wish to sell us will perform is that of the introduction of untreated timber for framing by the timber industry. An example of DBH providing good overall guidance to the industry is the E2/AS1 document that was produced as a result of the problems largely caused by the introduction of untreated framing timber.

Specified Systems: Within the NZ Building Code there is a requirement on building owners to provide territorial authorities with an annual statement by way of a Building Warrant of Fitness confirming that their building has been maintained and checked in accordance with the compliance schedules for their building. Building Consent Authorities issue compliance schedules and compliance schedules specify inspection, maintenance and reporting procedures for certain systems whose continued operation is essential for ongoing New Zealand Building Code compliance. Currently those certain specified systems are for fire protection, lifts, signs, emergency warning and egress, emergency lighting and ventilation.

As I understand it, currently there is no procedure and there are no obligations on any party (including the original owner, the current building owner, local authorities, the original design professionals or subsequent design professionals engaged to do work on that building) for confirming ongoing NZBC compliance or otherwise for other systems including Structure, Durability, External Moisture and Internal Moisture. Somewhere between the generic performance criteria of the New Zealand Building Code and the overly prescriptive compliance schedules for certain systems only, we have lost perspective. The processes and responsibilities around ensuring ongoing compliance with the New Zealand Building Code in all areas need to be reviewed and changed.

Q1:Graduate Programme of development

Prescriptive workplace based graduate programmes could be of limited value for most engineering disciplines. The significant investment employers already make in order to employ graduates by way of sophisticated software and computer system resources, IT support and mentoring and supervision by experienced technicians and engineers is already an impediment to employing inexperienced engineering technicians and graduate design engineers. There is a risk that prescriptive workplace based graduate programmes could become an ever greater impediment-not all engineering disciplines currently operate in a market that would pay for those types of programmes.

The current BE (L8) programmes offered by the Universities of Canterbury and Auckland change too often as the Universities attempt to teach and be everything to everybody. Rather than graduate programmes I suggest that strengthening the BE(L8) programmes has more merit.

I would like to suggest the BE(L8) programmes for Civil Engineering follow the example of B Eng (Tech) where a student may study towards a Civil major and also choose a particular specialization in the latter

part of their degree. The specializations offered by B Eng (Tech) Civil major are Structural, Water and Waste Water, Geotechnical, Roading-Transportation and Environmental.

If a student chooses a structural design specialization then it is important that the BE(L8) programme is strengthened so that it takes students through construction systems and the design (all design disciplines not just structural) of a whole building not just the first principles behind engineered structural design of certain elements of a building. Students do not understand the relevance of their lectures when they are only taught the design of certain elements in isolation. That is my experience and it is still the experience of graduates who have recently completed their BE(L8).

If the focus is to continue to be on first principles for BE(L8) students then it becomes vitally important for there to be higher standards and numbers of engineering technicians trained because in New Zealand it is those technicians we are placing a great deal of reliance on to maintain an understanding in the building and construction industry of overall design and overall structural systems (and fire systems, cladding systems and safe egress etc and how those can all be successfully integrated).

If a student can-not secure work in their chosen specialization or perhaps they want to work in a different area then they should be able to return and study towards further specializations and have their degree endorsed accordingly.

Part 3: The role of professional societies in the training, ongoing education and guidance of the engineering profession

Professional societies have an important part to play but their focus is on design practice and their members.

Greater importance needs to be placed on:

-strong technical support for both the design and construction communities. A professional body to represent and perhaps register engineering technicians as competent at a senior level.

-Greater collaboration with commercial sector contractors and subcontractors. The Construction Industry Council is highly regarded and could play an important role in that regard.

-Better delivery of training at both a technical and professional level. Matching the delivery of training with the vocational requirements of the design community and the building and construction industry.

-A stronger presence by DBH in an overall and mature moderating role. It is very important for the DBH to not simply have a punitive role, if the DBH is supportive of the design community in New Zealand then the design community can continue to be innovative and to punch above their weight.

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