DISCUSSION PAPER: TRAINING AND EDUCATION OF ENGINEERS AND ORGANISATION OF THE ENGINEERING PROFESSION

SUBMISSION TO CANTERBURY EARTHQUAKES ROYAL COMMISSION

27 JULY 2012

INTRODUCTION

This is a joint submission made by the Institution of Professional Engineers New Zealand (IPENZ) and the Association of Consulting Engineers New Zealand (ACENZ). Collectively we represent the views of New Zealand's professional engineers and consulting engineering firms. Background information about IPENZ and ACENZ is presented in Appendix 1 of this submission.

IPENZ acts as a professional body and is the Registration Authority under the Chartered Professional Engineers of New Zealand Act 2002. In this submission the term "IPENZ" is used to designate the views of the professional body and where reference is made to performance of the functions of the Registration Authority the term "Registration Authority" is used.

CONSULTATION

A draft version of this submission was provided to IPENZ and ACENZ Members for review. Comments from IPENZ and ACENZ Members are incorporated into this version of the submission.

SUBMISSION

In this submission IPENZ and ACENZ (we) present our responses to the questions posed in the Discussion Paper, supported by rationale where appropriate.

RESPONSES TO TOPICS COVERED IN PART 1: LEGISLATION – THE CHARTERED PROFESSIONAL ENGINEERS OF NEW ZEALAND ACT 2002

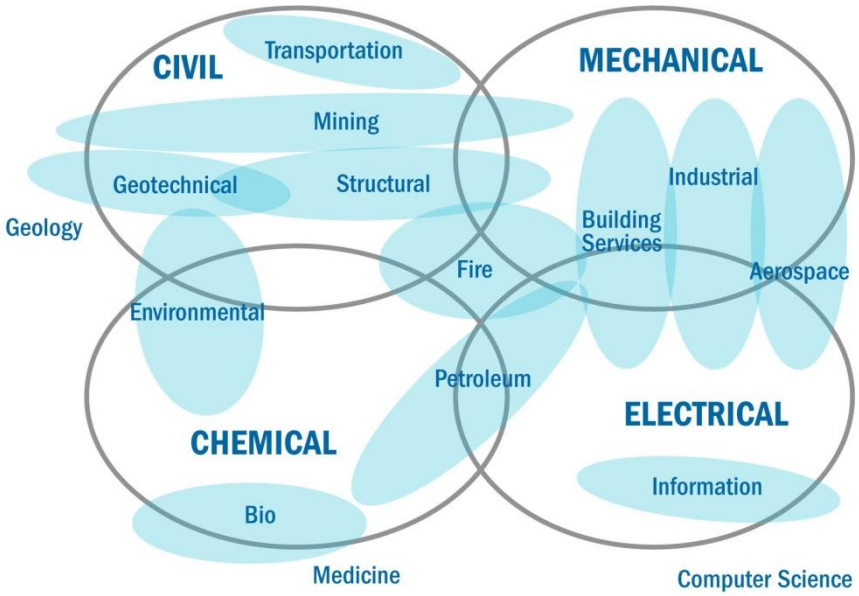
Question 1: What additional information, if any, should the CPEng Register disclose about a CPEng and how would this information improve, or potentially improve, earthquake building performance? What are the advantages and disadvantages of providing this additional information?

The Chartered Professional Engineer's (CPEng) Register currently discloses the registrant's name, address, registration date and date for next assessment. We do not think providing more information on registrants would improve earthquake building performance. Structural engineering work for commercial buildings is largely procured from companies who assign suitable engineers, usually working as multi-disciplinary teams, to the work. Similarly, peer reviewers are selected by people with sufficient relevant knowledge. Inclusion of a general field such as "structural" would not improve building performance as it does not guarantee the CPEng registrant working as part of the design team has the competence needed for a specific task.

There may be a public benefit in specifically classifying and naming sub-groups of CPEng registrants who hold specialised competence, such as those able to assess buildings after emergencies. There is also likely to be public benefit in a multi-competence level registration system (with each level having a different title).

Rationale

Since 2003 applicants for CPEng registration (or for periodic re-assessment for continued registration) define their own practice area for the purposes of assessment. This practice area can be quite specific and describes the engineering activities applicants' include in the portfolios of evidence they submit for assessment to demonstrate their current competence. Engineers are also asked to specify which of 17 broad fields of engineering they consider their practice area best aligns to. This assists the Registration Authority in identifying suitable assessors, and in obtaining data for a statistical overview of the register. The 17 fields include 16 fields identified by the Asia-Pacific Economic Cooperation (APEC) Engineer multilateral agreement, plus engineering management. Fields are regarded as different to the "disciplines" of engineering in which engineering education occurs and fields are generally more specific than these. The civil educational discipline for example, can prepare graduates to enter a range of fields, including structural and geotechnical engineering. The following diagram gives a conceptual representation of engineering practice fields. However there are, and potentially will always be, differing views among engineers as to the exact scope and overlap of each engineering field.



Including engineering field information on registers is not an internationally universal practice. The Engineers Mobility Forum which governs the International Professional Engineers register does not require fields to be specified within the 15 national sections. The APEC Engineer's register initially required specification but discontinued this in 2005. Internationally there are about equal numbers of national registers requiring and not requiring fields to be specified. The Registration Authority is not aware of any country in which practice area level information is published on a national register.

Since producer statements were introduced in the 1991 Building Act, it has been the practice for those signing these producer statements to declare they have the necessary competence themselves or that those they supervised to do the work had suitable competence. Professional engineers led the producer statement system development and routinely apply it.

Prior to the Building Act 2004, building consent authorities (BCAs) operated their own systems to decide who could author an engineering producer statement. The Building Act 2004 required BCAs to become accredited, with accreditation requiring BCAs to have written policies on producer statement authors. The accreditation body, International Accreditation New Zealand, say that producer statements should be accepted from CPEngs who declare they have the necessary competence, or they supervise engineers that fully meet the accreditation requirements. Nevertheless, some BCAs request that CPEng provide additional information such as the practice area in which they were most recently assessed.

Publishing practice fields and practice areas in the CPEng Register has not been endorsed by the Registration Authority and Chartered Professional Engineers Council (CPEC) to date because:

- Engineering services for commercial buildings are procured commercially. This means a consumer approaches a company, not an engineer. There is guidance available to link consumers to suitable engineering companies, such as the search facility on the ACENZ website. Once contracted, the engineering company selects a suitable engineer (or engineering team) for the work. They are able to do so far more accurately than consumers can. Consumers can, as

a quality check, go to the Registration Authority's website to confirm the assigned engineer is a CPEng.

- The regulatory sign-off is normally done by a single engineer on behalf of a team. While the signing engineer may have overseen the quality assurance process, he/she may not be the most expert on some elements of the work. The team approach assures the specific elements are correctly carried out and interactions are properly considered so the integrated engineered system achieves the desired outcome.
- Fields overlap and many engineers are multi-disciplinary in their competence which is hard to represent simply. Amusement devices are an example of regulation where a project has structural, electrical and mechanical components.
- Field information is at best a loose guide and is not suitable for a regulator to assure itself that a suitably competent engineer has undertaken work.
- Peer reviewers are selected by people with sufficient knowledge to seek out a specific narrow specialised competence. The selection process would not be assisted by a general field descriptor.
- Competence is demonstrated within rather than across a field, so a field is not a statement of an engineer's competence. A structural engineer might be competent on steel and wooden structures but not competent on certain types of reinforced concrete.
- Current competence can change between regular re-assessments depending on the projects undertaken and new knowledge or skills acquired.
- Self-certification of the area of competence is most commonly used in professional occupational regulation when the competence assessment standard is generic across all fields. Where different competence assessments are conducted in different fields and the body of knowledge is strictly defined, then registration within a scope of practice is possible. Specialist medical registration is an example. This would not be possible for engineering.

New Zealand's engineering registration system has historically operated a generic register (as do others professions such as accountancy, architecture and law). This reflects the belief that professionals are sufficiently able to self-certify the boundaries of their competence, and New Zealand's small scale, where the profession is multi-disciplinary in nature.

It is an ethical requirement (within the CPEng Code of Ethical Conduct, and the ethical codes set by IPENZ for its Membership and for other non-statutory registers) for engineers to work within their competence area. They may not undertake work they are not qualified to perform and may not knowingly permit engineers for whom they are responsible to practice outside their areas of competence.

Sub-section of the CPEng Register

There is a precedent for creating a specifically named sub-section of the CPEng register. This is achieved via an operating practice, rather than legislation. Under the Building Act 2004, only a Recognised Engineer can verify dam classifications, and audit dam safety assurance programmes. Recognised Engineers require a specific set of skills and a level of competence above the minimum CPEng standard to perform these functions. Whereas a person could become a CPEng 5 to 7 years after graduation, Recognised Engineers generally require more experience and

need to have been working in the dams safety sector to have acquired the prescribed competence.

We are of the view that where there is a demonstrated public benefit in identifying types of registrants with specific competence, a regulatory solution already exists within the Chartered Professional Engineers of New Zealand Act 2002. There is provision for the Registration Authority to establish classes of CPEng, which it could do for engineers with a specific set of prescribed competence. Currently the Registration Authority cannot assign titles other than CPEng to those classes. If the required competence for the particular purpose was significantly different to the minimum CPEng standard, a different title to CPEng should be used (see below).

In relation to the selection of appropriate (volunteer) engineers to assess an earthquake or other natural event's impact, the Registration Authority can readily filter the register, with input from its engineering professional societies, to identify those engineers with specific competencies to undertake such roles. It would thus be possible to create a specifically named register (or a specific class of CPEng) of those engineers whose competence includes demonstrated proficiency in the prescribed skills (such as of damaged building evaluation).

Multiple Competence Level Registers

An alternative is to recognise more explicitly within the occupational regulatory system additional levels of competence. The Building Act's Recognised Engineer is an example. If it were proven there was a public benefit to justify the cost, a register (with differentiated title) might be added at a higher competence level than CPEng within the CPEng Act. This would, for example recognise a select group of engineers recognised as suitable peer reviewers for very complex buildings.

IPENZ is a signatory to international multi-lateral agreements cross-linking its competence standards to international best practice at each of the three levels, professional engineers, engineering technologists and engineering technicians. IPENZ administers registers at all three levels as we believe this is in the public interest and as other engineers (not just CPEng) play key roles in building and construction. For example, for geotechnical measurement work it is often more appropriate for a skilled engineering technician to undertake the measurements and for simpler structural work in timber-framed homes to be undertaken by engineering technologists. Hence multiple-tiering of engineering occupational regulation is common.

However, the international agreements do not presently encompass benchmarking at a level above CPEng although there are a small number of countries we are aware of where there is a higher level register.

Summary

On balance, there is no compelling evidence that the providing further information on the register for all CPEng will have a net positive benefit.

We believe there may be a public benefit (e.g. assisting better assurance of protection of people and property) in extending the CPEng Act to make possible multiple registers (with differentiated titles) at different competence levels, either higher or lower than CPEng. Amendments should allow the Minister the power to create such registers. The dual approach of allowing multiple competence level registers and use of named classes within these when there is a specific

demonstrated need would achieve a greater public benefit than providing field information for all registrants on the existing CPEng register.

Question 2: Comment, if possible, on the processes that Building Consent Authorities, and any other entities that have significant dealings with engineers, take or should take in reporting substandard performance of engineers to the Registration Authority which could underpin a future case taken by the Authority against a CPEng. What are the benefits, disadvantages and costs of creating mechanisms for reporting and recording poor performance in addition to those already available?

Providing feedback on the performance of registered occupations should be a recognised part of the building regulatory process. Work that is critical to health and safety should be undertaken by a person over whom there is an occupational registration jurisdiction. Where work of low quality is produced, the notice to the registered person requiring amendment of the consent application should be copied to the relevant registration authority. This action would add little cost. The registration authority should deal with such information in a tiered manner as appropriate (examples include warning and education, call-in for re-assessment and the complaints process).

Rationale

IPENZ believes the involvement of a registered person (such as a CPEng) in all engineering work involving substantial risk to public health or safety would be beneficial. This would provide the rigour necessary to give the Registration Authority jurisdiction to enforce disciplinary action through law.

Any occupational regulatory system requires effective feedback mechanisms on registrants work if it is to function properly. Feedback enables the Registration Authority to apply a tiered approach by which involves:

- Communicating with the engineer concerned that he/she is at risk and should take steps to improve his/her practice
- Calling the engineer in for early re-assessment of competence
- Instigating a (disciplinary) enquiry of its own volition, or in response to a complaint.

The Registration Authority has long advocated this approach, but until quite recently the other agencies it relies on have responded to only a limited extent. The Registration Authority is in close contact with the Building Officials Institute of New Zealand (BOINZ) and its members, and spends considerable effort sharing good practice and advising BCAs on possible actions to report substandard performance of engineers. Co-operation has been steadily improving and the Registration Authority has received some information from BCAs which has led to disciplinary investigations.

Incorporating standard reporting regimes should be a requirement for accreditating BCAs. These procedures should cover engineers (CPEng and other approved registers), Registered Architects and Licensed Building Practitioners. They should require BCAs to provide information on poor quality work to the relevant registration authority in the first instance, with escalation to a complaint on more serious matters.

Question 3: Provide well supported views and/or evidence about the potential magnitude of the problem of engineers practising outside their scope of expertise and what regulatory measures might be better employed to deter such behaviour.

We are not aware of this being a significant issue. Anecdotal evidence, however, suggests that in the extraordinary conditions following the Canterbury earthquakes engineers, in trying to be helpful, may have tackled work they would not at other times. The reporting process from BCAs to registration authorities discussed above would assist in identifying such situations, as would the earlier suggestion of identifying classes of CPEng for specific critical work like building assessments.

However, while engineers are assessed in their practice area, they are not registered in one. Nor is the practice area declared on the register. The purpose of the practice area construct is to assess an engineer for competence in doing the work they are currently doing (as corroborated by their portfolio of evidence). Practice areas reflect or follow an engineer's practice as it evolves through a career, but should not be seen as defining or restricting it going forward. Because engineering makes significant use of written standards and team approaches to projects, engineers can self-learn about practice beyond their current work to evolve their practice area by drawing on their broader principles–based education in a wider engineering discipline. If they conduct work at the frontiers of their knowledge, they are expected to ensure good quality review is undertaken to compensate for their lack of competence. Ultimately, what an engineer decides to do as a professional is governed by the influence of the engineer's employer and peers and the engineer's ethical regulation of him or herself. This is at the heart of good occupational regulation in any profession.

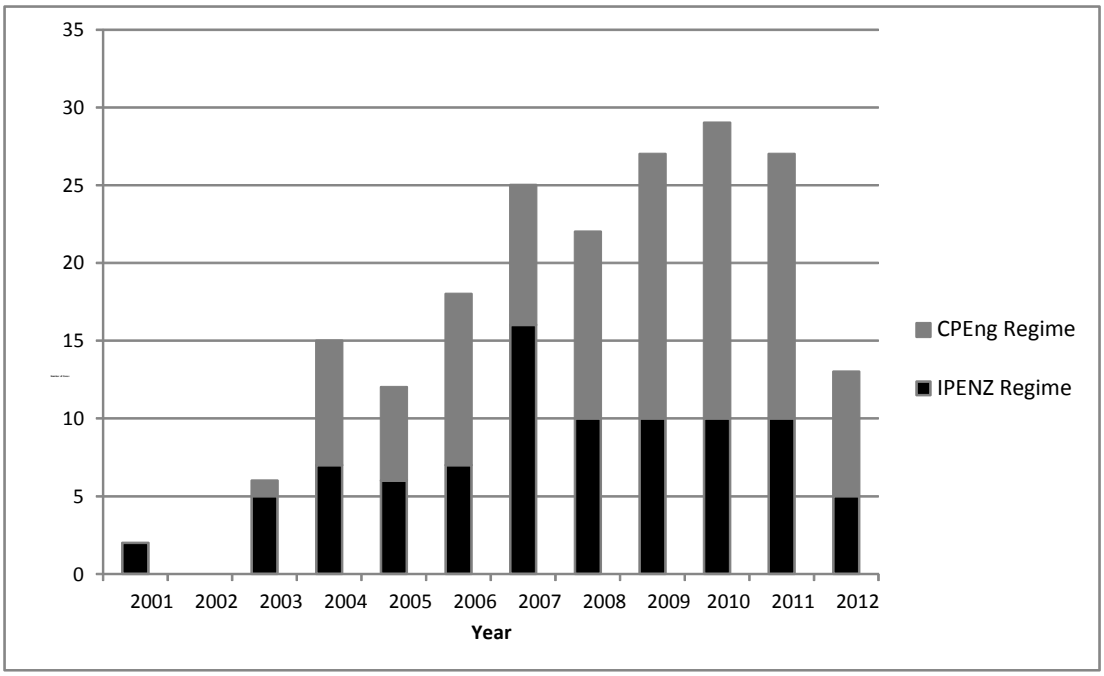
Question 4: Comment on the effectiveness of the current disciplinary procedures. What balance should be struck between deterring adverse behaviour and ensuring people are not deterred from entering the professions?

Whilst it is difficult to measure the current disciplinary procedures' effectiveness, there is no evidence to suggest they are deficient. Improvements to the procedures are constantly sought, with the learning from appeals to the CPEng Council being one source of minor improvements to effectiveness.

By international comparison, the Registration Authority appears to be pro-active in seeking out poor quality work. The profession's disciplinary procedures are actively promoted in engineering schools; the emphasis on professional values seems to strengthen rather than weaken engineering graduates' acceptance of self-regulation.

Rationale

The figure below shows that the number of complaints against CPEng has been steadily rising since the Act was passed in 2002, although complaints per 1000 registrants has been relatively constant for the last five years. The number of complaints against IPENZ Members has been fairly consistent during the same period. The number of IPENZ Members (13,000) is much higher than the number of current CPEng (3,000).



Based on population the number of complaints against engineers in New Zealand is proportionately greater than complaints against engineers in comparable jurisdictions. In the United Kingdom for example, the Institution of Civil Engineers (with a membership of approximately 70,000) receives about 25 to 30 complaints per year, five to 10 of which are dismissed with no case to answer. Engineers Ireland with 18,000 Members and 6,000 Chartered Engineers has received 91 complaints since 2002. Forty-three complaints were withdrawn because Engineers Ireland did not have jurisdiction. Thirty-eight complaints have been heard by a Disciplinary Committee.

The proportionately greater number of complaints in New Zealand is not thought to be due to New Zealanders being more litigious than those in the other jurisdictions. Rather it is due to the professional body and Registration Authority's efforts in publicising the complaints process and instigating enquiries of their own volition.

Of the 210 complaints in total from both jurisdictions considered since 2002, 21 have reached a Disciplinary Committee and 15 have resulted in disciplinary orders. One of these was successfully appealed to the Chartered Professional Engineers Council for being too harsh. The decision was subsequently overturned. 115 complaints have been dismissed because there were no grounds or jurisdiction for proceeding.

At about the time of the 10th anniversary of the Act, the governing Board of both the Registration Authority and the professional body committed to review the disciplinary processes for IPENZ and CPEng. These reviews are currently proceeding.

Those who enter the profession are actively educated at their tertiary institution on the ethical requirements of engineers. Furthermore when they enter the workplace they are normally under the supervision of an experienced and competent engineering mentor. The belief that the engineering profession sets and enforces professional standards internally in a self-regulating manner is seen as advantageous to recruitment to the profession.

Question 5 – What are the key issues that arise from a voluntary registration process? How aware are consumers of engineering services of the differences between CPEng and non-registered engineers? What are the costs and benefits of formally requiring registration to enable an engineer to practice? Are there any other ways of increasing knowledge among consumers as to the merits of acquiring services from CPEngs over non-registered engineers?

The registration system under the CPEng Act aims to achieve protection of the CPEng title. Given the multi-disciplinary nature of the profession it is appropriate that this is voluntary. However, some activities are restricted by other regulation to CPEng with the appropriate competence, for example, where their area of practice involves the health and safety of the public. The onus is on demand-side regulators to create a licence by allowing only registrants to perform certain types of work where that restriction has a public benefit. If regulators perform well in this respect the need to inform consumers directly is lessened. We propose providing information (prescribed checklists and information) as set out in Building Amendment Bill (No 4) should include occupational regulation.

Rationale

The CPEng Act operates on the basis of protection of title. It establishes a register of CPEng with the purpose of assisting the public to identify engineers of good quality. Registration as a CPEng requires a minimum standard for independent practice to be met, as defined in the CPEng Rules. The standard for registration is competence based, not experience based. The Registration Authority promotes CPEng as being accessible to engineers with typically five to seven years of professional experience (in line with the international norm). CPEng is thus an entrance level standard.

Just as the Washington Accord provides international benchmarking of New Zealand professional engineering education standards, IPENZ's ongoing membership of the Engineers Mobility Forum (EMF) and APEC Engineer Agreements provides international benchmarking of professional competence standards and assessment practices. These agreements have adopted an international exemplar competence standard for professional registration, which defines the minimum standard for independent practice leading to registration as an International Professional Engineer (IntPE) or an APEC Engineer.

In 2006 a combined EMF/APEC Engineer review team assessed IPENZ registration standards and procedures as being equivalent to those used in their own jurisdictions and to the agreed international benchmark standard. A further review is scheduled for 2012/2013.

At the time the relevant Bill was considered in 2001, the Select Committee decided it appropriate for the CPEng Act to create a supply of competent engineers, with other regulators to create the demand by calling up CPEng for particular roles. The demand side regulator would need to be sure that restricting the task to CPEng had a net public benefit. There are successful examples with the NZ Transport Agency and the Department of Labour (now part of the Ministry of Business, Innovation and Employment (MBIE)). Consistent use has yet to occur in the Building Act regime. Use is inconsistent, partly because developers will only procure the minimum extent of design checking, peer review and construction monitoring specified by the regulator. If the regulator does not require it, the developer will often not procure the service. Furthermore, there is no consistency amongst the plethora of BCAs.

Given the breadth of professional engineering activity, we strongly favour a risk based, public-benefit driven demand side regulation approach. It is disappointing that to date building regulators have been reticent about fully utilising the CPEng quality mark.

IPENZ (as the professional body and as the Registration Authority) has actively worked to create a culture amongst engineers so they are not recognised as professionals capable of independent practice until they have passed a competence assessment at the relevant level. Many CPEng have obtained the status to demonstrate their competence generally, rather than as a requirement to practice. This is similar to Chartered Accountants.

Over the years the Registration Authority has taken several initiatives to promote the CPEng register to consumers of engineering services. The general information booklet *Engineering Edge – Choosing the Right Engineer*, has been circulated widely and is intended as a reference for engineers looking to educate potential clients. The brochure *Chartered Professional Engineer (CPEng) – What to look for when choosing a Professional Engineer*, is targeted specifically at the general public (who occasionally procure CPEng services for things like complex foundations and retaining walls on difficult domestic sections). It has been distributed widely through local authorities.

The Building Amendment Bill (No 4) includes provisions for prescribed checklists and information to be provided to clients. We believe the prescribed checklist should be developed by a central agency (such as the MBIE), and should include advice on accessing professional engineering services. These would encompass the benefits of using CPEng registrants or registrants on other approved registers. It would be promulgated through BCAs to consumers. This would sit comfortably beside information on Licensed Building Practitioners and Registered Architects. Such an approach would be much more efficient than parallel information services from the Registration Authority.

RESPONSES TO TOPICS COVERED IN PART 2: TRAINING AND EDUCATION

Question 1: Should a graduate programme of development (continuing professional development) be prescribed? There are a number of questions underpinning this question:

- **Where would responsibility lie for prescription of a graduate programme?**
- **How would a prescribed programme be quality assured?**
- **Compare the advantages and disadvantages of this approach to the status quo which includes the tacit approval of employers for courses selected (since the employer pays).**
- **How would a prescriptive approach manage the differing needs of engineers in their respective workplaces, if any?**
- **How could competency requirements be provided where those skills are considered valuable by the New Zealand public but have less or no value to an employer? Who would pay?**

Question 2: Comment on, and where possible, provide evidence or well supported analysis on the issues raised above by the Royal Commissions.

We believe the nature of early career graduate employment is unsuitable for a prescribed graduate employment programme. Such a programme is unnecessary in an occupational regulation system using outcomes based assessment. South Africa used to operate a prescribed programme but this was discontinued as quality assurance was difficult. The concept of qualification-assisted graduate development might be pursued by a university but experience suggests there is unlikely to be sufficient demand without government subsidy.

Rationale

Professional engineering education (as exemplified by the Washington Accord) gives the graduate a coherent body of knowledge within an engineering discipline. The emphasis is on understanding engineering principles with examples of how those principles are applied in practice. As far as IPENZ is aware, the evaluation of existing buildings is not part of the body of knowledge one would expect to find in a civil engineering degree that meets the Washington Accord requirements.

The body of knowledge a graduate has when leaving university only partly overlaps the body of engineering knowledge used by practitioners in the field. The latter may well be highly codified, and because such codified knowledge can change, professional engineering education does not seek to cover it coherently. Rather, the graduate is expected to have sufficient knowledge of principles to rapidly assimilate the relevant codified body of knowledge. Typically, a graduate will develop comprehension of a codified body of knowledge that is narrower than across a whole educational discipline.

The principal post-graduation learning mechanism is learning by doing in a supervised environment. Graduates typically take five to seven years to encounter a sufficiently broad range of work experiences to develop the holistic competence for registration. The graduate may participate in formal learning opportunities but much of the learning is through working with experienced engineers. Hence in graduate development the major activity is not formal continued professional development but learning on the job. Over time graduate engineers become accustomed to practices such as quality assurance processes and documenting projects. These practices are not and cannot be taught at university. With some employers, development can be quite structured while with other employers it may not. However, the responsibility for signing off the work done by the graduate engineer is taken by a more experienced engineer. Graduate engineers can also self-learn over time.

To our knowledge no country has a graduate development programme of the same structured type as is used in the medical profession. South Africa had a structured graduate development scheme but this was discontinued because the diversity of employment meant it was not adhered to, resulting in quality assurance issues.

Medicine and engineering are different. The model used in medicine works because there are few written standards and the model of directly passing knowledge to the apprentice is appropriate. Further, in contrast to engineering, the scopes of practice are highly structured, and the trainee learns only in scope. Engineering is inherently multi-disciplinary and learning can be diverse, with this diversity supported by written standards.

If a prescribed programme became mandatory, employers may decide not to employ graduates because of the cost to them. The employment market structure for graduate engineers is probably unsuitable for such a structured scheme to work without government subsidy.

IPENZ raised the question of qualification-assisted graduate development in 2003/2004. The concept was that a graduate might be incentivised to undertake a structured development programme if a qualification was awarded. A trial in the information technology sector was unsuccessful as few companies would meet the costs, and students found it difficult to do the qualification in addition to their job.

Nevertheless, there is a working model from Level 6 of the National Qualifications Framework. Through the National Engineering Education Plan project the engineering industry worked with IPENZ, Institutes of Technology and Polytechnics and Industry Training Organisations to design the NZ Diploma of Engineering Practice to follow on from the NZ Diploma of Engineering. Those passing the NZ Diploma of Engineering Practice meet the requirements for registration as an engineering technician. In effect the practical work is in the NZ Diploma of Engineering Practice (assessed as 120 credits in unit standard form) and the knowledge component in the NZ Diploma of Engineering (240 credits in achievement standard form). This model succeeds because:

- The Industry Training Organisation structure supports it
- It attracts both government funding and industry levy funding
- It fits the history of the old New Zealand Certificate of Engineering containing practical work
- Several large companies have pursued it to overcome a chronic technician shortage.

In theory, this conceptual model could be used at other levels. For example, an honours graduate could take an industry-based course towards a Masters in Engineering Practice in which a pass would be seen as meeting the standard for CPEng registration. However, funding would be problematic and the funding used at Diploma level would not be available.

The CPEng standard is outcomes-based. Provided the outcomes-based standard is consistently applied and matches international good practice, the means of preparing for the standard can be left to the applicant. This means applicants can develop their knowledge and skills and integrate these building blocks into holistic competence by any pathway they choose. This caters for immigrant engineers, and for those from diverse careers, not only those with BE(Hons). It allows any person to apply and be registered as CPEng, and does not limit it to IPENZ Members. A prescribed development programme might disqualify some suitable engineers from achieving CPEng.

Nevertheless, if a tertiary institution designed and marketed a suitable qualification then graduates would benefit. Any tertiary institution attempting such a qualification would need to work with the Registration Authority to assure the graduate profile for the qualification matched the competence standard for CPEng, and that assessment was equivalent.

The other possibility is for there to be prescribed requirements for some elements of the CPEng standard. In this case the CPEng applicant would need to provide evidence they had passed a specified assessment such as a written examination. This process would be costly.

IPENZ (as the professional body and not as the Registration Authority) recognises employers operating good practice programmes for graduate development and on-going maintenance of competence of more experienced engineers. The scheme is a quality marking scheme and known as the Professional Development Partners

scheme. Reviews are undertaken every three years, but the scheme is voluntary and therefore there is no rigid minimum standard within it; rather good practices are rewarded through recognition. The number of organisations involved is increasing although it is still small compared to the number of organisations employing significant numbers of engineering graduates. Most large engineering consultancy companies and a number of contracting companies now actively engage in graduate development.

Question 3: Comment on the current process of development of continuing professional development course options. In particular, what roles are taken by employers, engineers, and education providers in determining the appropriateness of content to be taught and the demand for the course?

The major professional development of graduates is through supervised employment, rather than courses. Although there is no one coherent system the present provision of continued professional development (CPD) opportunities is adequate. This is evidenced by few CPEng failing to be able to demonstrate the taking of reasonable steps in this respect when re-assessed for continued registration.

Rationale

Historically, the provision of CPD has been an open market. Universities and independent technical societies, or profit-making companies can all offer CPD if they wish. Engineers can choose from a plethora of options.

In the late 1990s IPENZ initiated as a condition of membership that Members undertook sufficient CPD and a semi-formalised hours recording system was introduced; the guideline was 50 hours per year. However, the scheme recognised participation but not actual learning.

In 2002 the Registration Authority took a different approach for CPEng. The requirement was for candidates to demonstrate they had taken reasonable steps to ensure their knowledge and skills were up to date. This was enshrined as the second part of the standard for continued registration. In effect, candidates undertaking an assessment for continued registration are asked to respond to three questions:

- What has changed in your area of practice since you were last assessed?
- What steps have you taken to learn about it?
- How have you applied that learning?

CPD records provide evidence against these questions. However, the onus is on evidence of knowing what has changed, learning about it, and applying the new knowledge.

In 2004 IPENZ decided to become a CPD facilitator. The goal was not to become a dominant provider, but to shift the culture of CPD towards active learning and participation, and to actively facilitate offerings into gaps in the market. On IPENZ-facilitated courses learning outcomes are defined, and these relate to the relevant competence standards. IPENZ has attempted to increase the amount of CPD that has formal assessment at the end of the learning experience. The take-up by industry of assessed courses as a premium product has been modest.

Technical CPD (such as those outlining changes to good engineering practice) is well-attended. Technical societies are well-placed to deliver suitable expertise but

relatively poorly equipped to organise its delivery so IPENZ acts as a facilitator. Relevant academics and lead practitioners are approached to prepare and deliver programmes.

Employers tend to work with their staff to identify technical learning needs and then scan offerings for a suitable course. Employers may directly provide more generic learning experiences in-house.

By and large, candidates for CPEng re-assessment successfully answer the three questions set out above. If there is a group at risk it tends to be older practitioners in smaller organisations who are winding down their careers and may not keep fully abreast of change. If CPD is marginal in a continuing registration assessment, the term to the next assessment will normally be reduced.

Overall, the ability of engineers to meet the current knowledge assessment suggests that even though it is a market-based system and not a highly structured environment, the combination of tertiary providers, technical societies and IPENZ acting as a facilitator probably makes sufficient suitable CPD available. IPENZ contributes by acting as a central hub to offer training to fill the gaps that develop when there is insufficient commercial incentive for delivery by the market-based system.

Question 4: Should CPEng re-registration, with its associated competence assessment, be required at shorter intervals than the current 5-6 years, and what are the associated issues? Could some other method of competence confirmation be implemented mid-term instead?

A risk-based approach has always been used in setting the term to re-assessment with higher risk cases requiring more frequent assessment (i.e. are assessed at shorter intervals). A formal policy setting terms of two, four and six years based on risk is now in place, and in our view is adequate. We believe that a different style of check mid-term is not justified. Where evidence of poor performance is identified (by a BCA for example) the registrant can be called in early for re-assessment.

Rationale

Prior to 2003 engineering registration was for life, and this was, and still is, the common practice around the world. In 2012, New Zealand is, to the best of our knowledge, the only country that comprehensively reassesses current competency of engineers. In other countries the registration body relies solely on monitoring the suitability of CPD as a proxy for ensuring the candidate is still competent.

In 2003 when CPEng registration commenced, the maximum period to re-assessment was five years. Candidates considered to present a higher risk were given shorter terms of one, two, three or four years. In 2010 as a result of an independent review of the competence assessment process, the maximum period was extended to six years, with the change coming into force from 1 January 2012. At the same time the policy for applying shorter terms was formalised.

In determining the risk an engineer poses, two factors are relevant:

- How well an engineer's competence is assessed against the standard (either as marginally meeting the standard, or meets the standard, or well-above the standard).
- An engineer's assessment history. Past evidence of engineers having maintained competence over a period of time is a good indicator of them being

able to maintain competence into the future. Thus, engineers who have previously demonstrated an equivalent level of competence are likely to be a lower risk than those who have not previously been assessed. Similarly, those who marginally met the standard in the past can be considered a higher risk.

The guidelines are as follows:

Term	Applications for admission to the register	Continued registration assessments
Two years	The applicant meets the standard for registration but only marginally (i.e. one or more of the elements regarded as very important to their practice area were assessed at other than 'consistently demonstrates competence').	The candidate demonstrates that he/she is still able to practice competently, but only marginally (i.e. there were concerns in the initial holistic assessment so an element by element analysis was undertaken; and one or more of the elements were then assessed at other than 'consistently demonstrates competence').
Four years	The applicant meets the standard for registration	The candidate demonstrates (through work samples) that he/she is still able to practice competently, AND EITHER The evidence of having taken reasonable steps taken to maintain the currency of his/her knowledge and skills is barely sufficient. OR He/she has taken reasonable steps to maintain the currency of his/her knowledge and skills but the last term to re-assessment was two years or less.

Term	Applications for admission to the register	Continued registration assessments
Six years	The applicant meets the standard for registration AND EITHER: The assessment panel has identified evidence of the applicant demonstrating competence at a significantly higher level than the minimum standard for registration; OR The applicant was successful in an assessment to an equivalent standard of competence within the last six years; OR The applicant is currently registered on a register recognised as requiring an equivalent level of competence.	The candidate satisfactorily demonstrates (through work samples) that he/she is still able to practice competently; AND He/she has taken reasonable steps to maintain the currency of his/her knowledge and skills; AND The last term to re-assessment was not less than four years.

Assessment panels can recommend terms differing from these guidelines, but such deviations are expected to be occasional.

This policy uses a reward/penalty model to provide further incentives to engineers to maintain their current competence. Engineers who make an effort to stay current are rewarded with less frequent re-assessments. Those who put less effort into keeping up to date will quickly learn that they are subject to greater scrutiny and will be required to invest more time and effort in more frequent re-assessments.

In our view this is the most cost-effective and fair way for the future and better than inserting a mid-term check of a different nature which creates extra work for all engineers – irrespective of how much effort they put into maintaining current competence.

Responses to Topics Covered in Part 3: The Role of Professional Societies in the Engineering Sector

Questions:

Comment on the efficacy and efficiency of the conduct of the engineering learned or professional societies in respect of the:

- **Interactions between structural engineers and geotechnical engineers and others, and between engineers and architects on the construction of buildings;**

- **Engagement by learned or professional societies, both internally and with one another for the purposes of bringing attention to and resolving contentious issues, and achieving improved outcomes across the industry;**
- **The appropriateness and durability of, and risks that could arise through, the engagement of volunteers (society members) to formally inform or develop policy and/or standards of practice; and**
- **The standing of guidance or advice issued by societies, and monitoring and consequences (if any) of non-compliance.**

The various technical societies operating are critical to an effective engineering environment in New Zealand. Many engineers join more than one society. IPENZ draws the societies together on critical issues and works with Government agencies to identify engineering expertise when needed. This input is important and without it advice from the societies may not be appropriately framed and presented.

We believe Building Levy funding should be released to enable professional networks to develop codified guidance/standards.

Should architecture move the balance between function and form more towards function the commonality of learned societies between engineering and architecture will increase.

Rationale

Professional and learned engineering societies are critical to an effective engineering environment in New Zealand. They provide a rich professional community in which to debate and resolve issues, develop guidance notes, codify knowledge and support engineers' on-going professional development. The societies are generally run by highly committed and competent leaders in the discipline. They can harness real expertise and play an important role in developing and promulgating new engineering knowledge. This is facilitated by the close and strong links between research and practice. Those of greatest relevance to the Royal Commission are:

- The New Zealand Society for Earthquake Engineering (NZSEE) which has members from a range of engineering and scientific disciplines. It aims to foster the advancement of the science and practice of engineering to mitigate the effects of earthquakes on communities.
- The Structural Engineering Society New Zealand (SESOC) is a society within which structural engineers can share common interests and technical information. The society actively pursues issues that are relevant to structural engineering.
- The New Zealand Geotechnical Society (NZGS) which aims to promote study and research within the fields of soil mechanics, rock mechanics and engineering geology, advancing both the practice and application of these disciplines and implementing the statutes of the respective international societies applicable to New Zealand.
- The Timber Design Society (TDS) which aims to foster the advancement and dissemination of knowledge relating to the design of timber structures and elements. Membership of the Timber Design Society comprises professional engineers, architects and scientists.

- New Zealand Concrete Society (NZCS) The Concrete Society of New Zealand (NZCS) encourages and supports the development of a greater knowledge and understanding of all aspects of structural and architectural concrete.

The New Zealand Institute of Architects is a long-established kindred organisation, having its national office in Auckland, and regional branches managed by committees of volunteers. It is separate from the Registered Architects Board which administers the Registered Architects' register.

A distinct characteristic of the engineering societies is that they draw researchers and practitioners together to discuss topical issues and develop guidelines and tools to help engineers and scientists practice effectively and efficiently. A characteristic of such societies is that they are managed by a committee whose membership changes regularly. IPENZ invests a significant amount of Member subscriptions providing a hub to the societies. It operates the Engineering Practice Advisory Committee, comprising representatives from IPENZ and a number of the societies, and facilitates the annual Engineering Profession Forum. All societies are invited to this to foresight issues to develop prioritised work programmes with relevant societies.

IPENZ also plays a strong role in helping the societies develop codified practice knowledge. In some cases societies need less assistance, but others require high levels of support from IPENZ to ensure advice is consistent across engineering fields and takes account of the appropriate regulatory and public policy guidance. Co-operative work programmes leading to co-branding of published documents to demonstrate the collegial nature of development are encouraged. In some instances Government agencies have directly funded nominees of the societies to undertake specific work. An undesirable and perhaps inadvertent effect of this is that it can remove the development of guidance from the broader professional community.

The development of practice guidance and advice generally follows a formal process whereby:

- It is undertaken by subject experts
- Reasonable endeavours are taken to ensure advice aligns with current developments in professional knowledge and industry best practice
- International best practice informs the advice
- The advice is appropriately qualified with assumptions and limitations
- The development process is a deliberative and consultative, normally involving input from the society members and other stakeholders (eg central and local government bodies, industry representative bodies).

Where this process has been followed, the information and advice provided by learned professional societies should be considered appropriate and reliable. Although holding no statutory standing, the advice represents good practice against which engineer's conduct and performance might be measured.

In addition to practice guidance, the learned society conferences and journals are an important quality assurance vehicle in which the practising community debates what is good and bad practice. This might involve discussion of how to apply new research, or discussion about an innovative design feature in regard to how well it performs in practice, or a better means to calculate its performance.

IPENZ Member and society subscriptions are paid by individuals with diverse employment and practice areas, many of which are not regulated. It is not reasonable for all Members to fund the work needed in the fields of structural, earthquake and geotechnical engineering. Furthermore the relevant societies are not sufficiently recognised and funded for what is often work directly for the public benefit. IPENZ believes Building Levy funds (for example) should be able to be applied through an appropriate organisation contracting to the central government regulator, to bring together and make more efficient use of the full professional networks. This would enhance co-regulation of the engineering profession.

In building and construction, engineers work with architects as well as other professions. Joint problem solving should be encouraged across professions with active engagement from all. An important lesson from the Canterbury earthquakes is that architectural form can pose a significant additional risk to structural integrity if it overly limits the structural engineer's flexibility to select suitable load paths and design a resilient structure. The societies might be encouraged to increase their joint activities as a consequence, to share the learning from Christchurch about how eccentric architectural form can lead to structural vulnerabilities if designs are not well-integrated between the disciplines.

CONCLUSION

IPENZ and ACENZ are available to provide further comment if required. For more information please contact:

Dr Andrew Cleland

Chief Executive, IPENZ
Phone 04 474 8935

Email CE@ipenz.org.nz

or

Dr Nicki Crauford

Deputy Chief Executive, IPENZ
Phone 04 474 8932

Email DepCE@ipenz.org.nz

APPENDIX 1

BACKGROUND TO IPENZ

The Institution of Professional Engineers New Zealand (IPENZ) is the lead national professional body representing the engineering profession in New Zealand. It has approximately 13,000 Members, including a cross-section from engineering students, to practising engineers, to senior Members in positions of responsibility in business. IPENZ is non-aligned and seeks to contribute to the community in matters of national interest giving a learned view on important issues, independent of any commercial interest.

BACKGROUND TO ACENZ

The Association of Consulting Engineers of New Zealand (ACENZ) represents the consulting industry for engineering and related professionals that work in the built and natural environment. The organisation has more than 190 member firms which represent about $1.5 billion a year in combined turnover, and that collectively employ in excess of 9,400 engineers, architects and supporting staff.