IPENZ
ENGINEERS NEW ZEALAND

SUBMISSION TO THE ROYAL COMMISSION OF INQUIRY INTO BUILDING FAILURE CAUSED BY CANTERBURY EARTHQUAKES

9 DECEMBER 2011

1. BACKGROUND TO IPENZ

The Institution of Professional Engineers New Zealand (IPENZ) is the registration authority for New Zealand's engineers of all disciplines. IPENZ is also responsible for managing the disciplinary procedures for engineers who are found to have operated unethically or incompetently.

IPENZ is also the professional body for engineers, with approximately 13,000 Members. The Membership is a broad cross-section including engineering students, practising engineers and senior Members in positions of responsibility in business.

IPENZ supports its Members through the setting of internationally bench-marked qualifying standards for degree qualifications in engineering, assessment of foreign qualifications, provision of continued professional development, and provision of awards and scholarships that recognise achievement.

IPENZ is a member of the New Zealand Construction Industry Council and has contributed to the New Zealand Construction Industry Council's submission.

2. THIS SUBMISSION

This submission presents IPENZ's view on some of the major issues before the Royal Commission. The submission does not provide categorical answers but rather sets out issues the Royal Commission may wish to consider and address.

3. EXECUTIVE SUMMARY

IPENZ considers New Zealand's overarching national public policy for the built environment is deficient. New Zealand needs a comprehensive policy statement supported by a cohesive regulatory system giving effect to the policy statement through a suite of instruments including legislation, regulation, recognition and support for industry self-regulation and information supply.

Important policy gaps must be filled at the policy level, rather than at the technical standard development level as has been historically the case.

New Zealand needs to determine the acceptable likelihood of an earthquake event in which various types of buildings would fail to protect people. This likelihood should then be converted into minimum building standards and incorporated in design loads.

Decisions must also be made on the acceptable likelihood of an earthquake event in which various types of buildings would fail to be serviceable. IPENZ suggests the need for minimum standards to be developed.

IPENZ notes decisions also need to be made on how to manage buildings that were constructed to standards that were subsequently superseded. IPENZ considers a robust minimum national standard and maximum time for compliance need to be set. IPENZ would support a tiered system with tighter timeframes for more deficient buildings.

Another policy gap relates to the acceptable risk from loss of building strength due to gradual deterioration. IPENZ believes a regular structural "warrant of fitness" regime may have merit. IPENZ recommends analysis be undertaken to establish whether implementation of such a scheme would have sufficient public benefit.

IPENZ also believes building users' and the public have the right to know the likely performance of buildings they intend to enter. There may be sufficient public benefit for implementation of publicly displayed information and this requires analysis.

IPENZ notes the continued need for a performance-based building code within a risk-based regulatory approach.

Improvements to the Building Act and its implementation are also important. IPENZ believes New Zealand should move towards a national consent authority with regional offices. This would result in an authority with in-house knowledge and institutional knowledge to handle complex structural engineering. It would also increase consistency, helping ensure quality assurance.

New Zealand needs to ensure consistent and high standards, and documents are required to both set out requirements and provide guidance. The Department of Building and Housing must ensure the development of construction-related New Zealand Standards is at least partially funded by the Building Levy.

There should also be clear ownership and development protocols, including that:

- Policy documents are developed and owned by the Department of Building and Housing.
- Documents that give effect to the policy and are mandated should be New Zealand Standards, funded through the Building Levy.
- Guidance documents should be developed in expert professional communities to an agreed protocol so they can be co-owned and co-branded as "endorsed" advisory documents by the Department, professional bodies, and the relevant learned societies.

4. EXPLICIT CENTRAL GOVERNMENT POLICY FOR BUILDING AND CONSTRUCTION

IPENZ considers New Zealand's overarching national public policy for the built environment has been deficient for many decades. The present policy is inadequate. There are real doubts, for example, at the appropriateness of implicit standards for ensuring sufficient protection of life. Maintenance of building serviceability has not been recognised as a policy issue, and there is debate about the means of selecting the appropriate geo-hazard or climate hazard event to design for.

In short, IPENZ contends the oft-changed, complex legislative and regulatory environment fails in part because there is insufficient underpinning public policy rationale.

All New Zealanders regularly access and use buildings they do not own. Walking down the street in the potential fall-zone for debris makes us all stakeholders in the quality of

the buildings we pass. The recent earthquakes in Canterbury have shown the policy needs to differentiate between building types, with residential dwellings posing much lower risk to life than commercial buildings, although both building types can be subject to significant economic loss when loss of serviceability occurs.

There is a public benefit in requiring all building owners (at the very least those of commercial buildings) to attend to the condition of their buildings on an ongoing basis. Recognition of the existence of this public benefit is important and needs to be manifested in building and construction policies. These policies also need to set out the expectations of New Zealanders.

A clear policy statement needs to be drafted and given effect to through a suite of instruments including legislation, regulation, recognition and support for industry self-regulation and supply of information.

In the context of the above, and focussing on earthquakes, the components needed are:

- Decisions made on the acceptable likelihood of an earthquake event in which various types of buildings would fail to protect people (leading to potential loss of life or serious injury). These decisions need to be made using cost/benefit analysis and taking into account value judgements such as the importance of heritage and public tolerance of risk.
- Decisions made on the acceptable event likelihood after which buildings should remain serviceable, or reusable with only minor repairs
- Establishing the acceptable risk associated with older buildings, constructed to superseded standards
- Establishing the acceptable risk from loss of building strength due to gradual deterioration, or by damage arising from earthquake events
- Determining the building users' and the general public's right to know about the likely performance of (or the condition of) buildings they intend to enter
- Establishing principles on which the regulatory system for achieving the above is to be based.

Action is required to address important policy gaps. It appears that historically decisions which should have been taken at a policy level have been taken at a technical standard development level. This is inappropriate and IPENZ would welcome action being taken at the national public policy level.

5. GIVING EFFECT TO THE POLICY

In the section above, six key policy components were noted. Actions need to be taken in relation to each of these components, as set out below,

5.1 PROTECTION OF PEOPLE

Once the acceptable likelihood of an earthquake event in which buildings would fail to protect people (leading to potential loss of life or serious injury) is established as a policy, this needs to be converted into useable minimum standards. In turn, those standards need to be translated into design loads.

There is currently a loadings standard but it was initially developed when there was no clear policy statement; revisions may thus be needed. As loading standards are mandatory and set out the minimum requirements for the public benefit, IPENZ

considers they need to form a quantitative element of the Building Code suite of documents (most likely as a compliance document called up from the Building Code). This document might be a New Zealand Standard, developed by a process that includes consideration of regulatory suitability as an important criterion.

5.2 Retention of Building Serviceability

Retained building serviceability is not sufficiently considered as part of the current regulatory system. It may be appropriate to develop the relevant quantitative minimum standards for serviceability in conjunction with the minimum load standards for protecting people.

Ductility is used as a means to better protect people but can lead to permanent deformation of, or damage to, the building. Thus, the need to retain serviceability may suggest a higher standard, and the evaluation needs to determine whether increasing the cost of new buildings solely for serviceability is justified.

5.3 Buildings Constructed to Superseded Standards

The present earthquake-prone buildings policy is an attempt to deal with this issue. In 2003 IPENZ advocated for 67 per cent of current Building Code as a minimum national standard. At that time this was seen as an optimum level. In 2011 an appropriate level may be different and it will certainly be much higher than 33 per cent of current Building Code.

The policy requirement (a minimum standard and a maximum timeframe for compliance) needs to be investigated using cost-benefit analysis and taking into account value judgements such as the importance of heritage and public risk tolerance. Analysis of the minimum national standard needs to consider both the regulator's perspective (durability over the life of the building), and the building owner's perspective (investment viability), as well as the value of life and location. IPENZ is of the view that a robust minimum national standard and maximum time to compliance need to be set in the public's interest. Not setting these sufficiently well and allowing local discretion has led to inconsistent territorial authority decision-making between 2004 and 2011, with the most common approach being to allow very generous timeframes.

It is also important that compliance with the minimum standard and the timeframe be linked so buildings that are further from complying with the minimum national standard are required to be strengthened within a shorter timeframe. IPENZ would support a tiered system with tighter timeframes for more deficient buildings.

5.4 Durability of Structural Performance

An issue not considered well in the present policy and regulatory regime is the question of the durability of structural performance. The Building Code envisages buildings retaining their structural strength throughout their nominal 50 year life, with a tacit assumption the building owner will do necessary maintenance. Only specified systems (which are things internal to the building) are subject to regular building warrant of fitness checks. The Building Act does allow for a dangerous (or insanitary) building notices to be issued to a building owner, but this process is unlikely to be applied for slow deteriorative change.

There can be loss of structural performance for two types of reason:

- Gradual deterioration caused by inadequate protection from weather or sun leading to corrosion, wear and tear leading to damage to structural protection systems or other reason
- A damage event such as earthquake or climatic event that uses up some of the building strength.

Road vehicles which suffer falling performance due to deterioration or damage events provide a useful regulatory analogy. For vehicles it is accepted there is a public benefit in having regular checks by experts identifying for deteriorative change (the warrants of fitness process). There may be similar public benefit for buildings and whether this is the case should be assessed by policy analysis. If this were selected as a way forward then an appropriate timeframe for assessments should be selected. Given the longer economic life of buildings the frequency of assessments might be quite long 10 yearly for example.

For damage events, vehicles are required to be brought back to the minimum standard. For buildings, at present owners have a responsibility, and are encouraged to have their building checked. Whether there is real damage is much less obvious than for a car, and it is not clear what size seismic or climate event should lead to a check being required. IPENZ considers this issue needs careful consideration to ensure the right level of regulatory intervention is made. One would assume that, using a risk-based approach, the need arises only for building types in which catastrophic structural failure in an earthquake leading to loss of life is possible. However, defining a line between buildings not to be covered by the policy (such as timber frame houses) and those to be covered, (such as reinforced concrete multi-storey buildings) is not straightforward.

New knowledge is vital to the ongoing improvement of building performance. Buildings can only ever be constructed according to best knowledge at the time. Subsequent knowledge leads to new understanding and can result in the realisation that a design or method previously carried out could lead to unforeseen consequences. In the vehicle industry such an event would lead to a vehicle recall. In the building sector, the only present protection is that the engineer who designed the building (however long ago) remembers, and thinks about all his/her previous work, and voluntarily contacts the building owner, raising his/her concern. Whilst IPENZ is aware this does happen, and IPENZ encourages its members to do so, the process relies on high levels of professional dedication.

IPENZ recommends analysis be undertaken to establish whether there is sufficient public benefit for implementating a regular structural warrant of fitness regime. The question of suitable means to evaluate building structural strength is discussed below.

5.5 The Public Right to Know

There is currently no mandatory requirement to supply the public with information about buildings. Building warrant of fitnesses in regard to specified systems are publicly displayed, but often in an obscure way that means few members of the public understand. For structural strength there has been a tacit assumption the regulator and construction industry participants have “got it right” on behalf of the general public and thus there was no need to tell.

This contrasts with two other regulatory systems that protect health and safety. The vehicle system has been described above, and vehicle warrants of fitness must be publicly displayed. A system also exists for food, with prescribed regulations for ensuring the food is safe and for identifying ingredients. This system is based on the principle people have the right to know what they eat.

New Zealand needs to resolve whether, in this earthquake-prone country, people (as building users) also have the right to know a building's structural strength before they enter it. If there is a regular re-inspection regime then display of information could be relatively straightforward.

5.6 REGULATORY PRINCIPLES

IPENZ considers that even after the Canterbury earthquakes New Zealanders will demand buildings of unique shape and form, and this inevitably means unique structures to carry the loads. There will be an ongoing demand for irregularity in building structure, which makes structural strength more difficult to achieve. In this context prescriptive regulations are not suitable.

IPENZ is of the view that for new building work, retention of a performance-based building code rather than a prescriptive one is the correct regulatory approach. The Building Act and the Building Bills before Parliament contemplate three means to demonstrate compliance:

- Acceptable solutions. These are prescriptive and are unsuitable for structural elements of commercial buildings.
- Verification methods. These are normally analysis methods which are relatively standardised ways to determine whether a design complies with the Building Code. They are intended to be applied by competent professionals.
- Alternative solutions. To be accepted, the normal approach is for a competent designer to attempt to "get it right first time", but to use peer reviewers (who ideally are at least as competent as the designer) to cross-check.

The latter two of these approaches require a much more competent regulator than for acceptable solutions.

IPENZ considers the most appropriate model for the building regulatory system is a mixture of performance-based legislation/regulation, and a risk-based approach forassessing the validity of designs or construction activity. This would be supported by occupational regulation to ensure competent people can be identified and due weight given to their work or review comments.

IPENZ therefore supports the model Building Act developed and published by the New Zealand Construction Industry Council during 2011 (Appendix 1). IPENZ also supports inclusion in the overall regulatory framework of appropriate processes for dealing with building deterioration, and information publication regimes as might be determined as appropriate through rigorous public policy analysis.

In addition to clear, cohesive Government policies New Zealand needs high quality regulatory and support systems. IPENZ's views on a number of aspects of the regulatory and support systems are set out below.

6. KEY ELEMENTS OF THE REGULATORY AND SUPPORT SYSTEMS

6.1 THE BUILDING CODE

As set out earlier, IPENZ continues to support a performance-based building code, accompanied by relevant compliance documents.

6.2 THE CONSENTING PROCESS

For structural engineering work, IPENZ considers the correct regulatory approach to be a risk-based one. The level of expertise required to ensure a design's compliance with the Building Code changes with structural complexity. The higher the risk, the greater the extent of checking, and the higher skill level required.

The producer statement system is used as a primary means for determining compliance with the Building Code in consent applications. In practice implementing the system could be improved:

- Producer statements for professional level structural engineering work are not always authored by Chartered Professional Engineers. Some Building Consent Authorities have supplementary lists of engineers who have not been subject to stringent competence assessment as Chartered Professional Engineers are.
- The means and extent of peer review of alternative solutions and designs assessed through verification methods has been inconsistent. IPENZ notes some Building Consent Authorities contract their own peer reviewers who report directly to them while others allow the applicant to choose their own peer reviewer. The former option is preferable as it avoids a perception of a lack of independence.
- The building officials receiving peer review reports may not have sufficient competence to fully comprehend the issues and whether the designer's revisions have resolved the concerns of the reviewer.
- Building Consent Authorities are seeking to use the producer statement as a device to transfer liability whereas it is primarily a technical quality assurance instrument.
- Some Building Consent Authorities are too reticent to make the designer's observations of construction a condition of consent, which may mean critical observation does not occur.
- Some Building Consent Authorities are not providing information to IPENZ (as the Registration Authority) on poor quality work submitted by Chartered Professional Engineers. The way in which the Building Act 2004 and the Chartered Professional Engineers Act 2002 interact creates a model of co-regulation. IPENZ manages a list of competent engineers which supports decision-making and risk management under the Building Act. This information flow is vital for IPENZ to be able to take steps to coach, educate or reassess and, as last resort, to discipline those producing work of low quality.
- In practice, issues at the consenting stage often seem to stem from inappropriate choice of structural design philosophy and if this is not right the design is compromised. However, it is also acknowledged that late architectural changes can be incompatible with the structural design philosophy and proposed load pathways, and the engineer is left with little choice but to continue. Whilst IPENZ would not support it being made mandatory, early discussion with the regulator (or peer reviewer) on the design philosophy and load path selection prior to detailed design would be helpful as a good practice methodology that all in the sector might adopt.

IPENZ recommends the producer statement system be retained, but the robustness of the quality assurance processes around it be improved. One of the best ways to achieve this will be to reform the building regulator (see below). In parallel, the separate resolution of fair and equitable distribution of liability needs to be resolved, but kept separate from the issue of "engineers' certificates" in the form of producer statements, signed by a person with technical capability.

6.3 Engineering Involvement Towards Issue of Code Compliance Certificates

There are two issues in regard to the construction phase. The first is the designer's role throughout the construction phase. Some designs are more difficult to implement than others, and the designer may identify critical aspects needing monitoring during construction, as an aid to the Building Consent Authority and to the constructor.

The second issue is in regard to enabling post-construction consenting of design changes or variations where necessary (and with controls). Post-construction consenting of work done under urgency (designed as it is built) is not recognised and sufficiently well handled under the Building Act 2004. Post-construction consenting can be required where, for example, design mistakes are detected during construction and decisions are made on how to proceed. It is not feasible for construction to cease while the design is corrected and approval of the Building Consent Authority is thus needed. We believe the Building Act 2004 needs amending to enable post-construction consenting where necessary (with controls).

6.4 Buildings Built to Superseded Standards

New Zealand has a substantial legacy, with buildings constructed according to standards of the day that have subsequently been superseded.

New Zealand makes considerable investment in its natural hazards research platform. However, almost all the funding goes into hazard identification, with very little going into the practical aspects of mitigating risk in older buildings. It is time to redress this imbalance. The cost/benefit ratio for research into how to minimise injury and loss of life, let alone improve building serviceability, is compelling.

A variety of strengthening methods have been attempted throughout New Zealand, and it is only through the large scale testing and learning from events such as those in Canterbury that success or otherwise can be observed.

IPENZ recommends the central regulator continue to provide funding to gather information and carry out supplementary research on strengthening methods of older buildings. International best practice should also be adopted where appropriate and New Zealand needs to link with those undertaking research overseas. The information base can then be used to ensure suitable guidance notes and standards are developed.

6.5 Durability of Building Performance

As set out above, there are two possible ways to implement a regime. One is a periodic structural warrant of fitness regime in which evaluations are performed to determine an assessment of the actual rather than a building's designed structural strength. The other is to establish a requirement that inspection and re-evaluation is carried out for any event over a trigger level.

In both cases, there needs to be agreed codes of practice/guidance notes as to how to carry out such inspections. The Department of Building and Housing needs to continue working with the professional bodies and relevant technical societies to develop these codes of practice/guidance notes. IPENZ considers this work (and subsequent maintenance of the documents) is a legitimate use of Building Levy funds.

As well as inspections of this type, there is also a need for an agreed procedure for the rapid building evaluation in the response phase following an event. The New Zealand Society for Earthquake Engineering guidelines were applied in Christchurch. This experience has led to a number of issues to be addressed including:

- Ensuring that rapid building evaluation under emergency response conditions interfaces properly with the Building Act
- Establishing clarity that it is an "interim building stability evaluation" and is simply a first part of a larger process leading to detailed evaluation (if necessary) of the actual building strength after the response phase is over
- Understanding that this process is light-handed (triage only), and its outputs are interim
- Recognising and acting on the need to better document the process and deliver training and moderation to those identified as likely to be called up for such duties
- Establishing clear agency responsibilities, and making funding available from the appropriate levy revenue stream to enable the capability to deliver the improved system to be developed and maintained on an ongoing basis
- Providing clear public information, delivered by a skilled engineering communicator about what the system is and is not, particularly in regard to the meaning of any colour codes used.

IPENZ is prepared to have a continuing role, as professional engineers will look to IPENZ to contribute, and needs that role to be incorporated into the overall response system.

6.6 The Role of Occupational Regulation

As set out above, given the unique nature of most structural designs for commercial buildings, a risk-based process for assessing the quality of design work and construction is appropriate. One important way of managing the risk is to ensure those performing work are suitably competent, through occupational regulation.

Occupational regulation in New Zealand is based on protection of title – suitable competence must be proven to hold the title. A building regulator or purchaser of engineering services can then be assured those people on a register have gone through a reasonable process of demonstrating their competence to the prescribed standard. A building regulator will then give higher weight to evidence of compliance with the Building Code provided by a person on a register than another person.

In its report to the Royal Commission IPENZ described the occupational regulation system for the engineering community in detail. To avoid duplication this detailed description is not repeated here.

6.6.1 Occupational Regulation of Professional Engineers

IPENZ considers the current arrangements for the professional engineer component of the engineering community is appropriate. Since 2003 these arrangements have been consistently achieving better outcomes than the previous occupational regulation.

In the Annual Report by the Chartered Professional Engineers Council on the Performance of the Registration Authority the Council found that:

- The Registration Authority had fulfilled its obligations under the Chartered Professional Engineers of New Zealand Act (2002) for the 12 months ending 31 December 2010.
- The Registration Authority continued its promotion of the Chartered Professional Engineers register as a quality mark to the purchasers of professional services, employers, professional engineers, recruitment agencies and regulators. IPENZ

expects to continue doing so over the coming year. The Council remains concerned that for the Chartered Professional Engineers qualification to become established and accepted throughout New Zealand as the premier mark of engineering competence, better ongoing promotion of the regime and education for users is required.

- The Council considers it is necessary for government agencies, particularly the Department of Building and Housing to assist the Registration Authority with promoting the Chartered Professional Engineers quality mark especially amongst Building Consent Authorities and other Government Departments.
- The Registration Authority continues to administer the New Zealand Chartered Professional Engineers scheme in a manner that garners international respect for all of this country's Chartered Professional Engineers.
- Council concurs with the final comments in the Registration Authority's report. "Building Regulators also fail to appreciate that many engineers practice outside the construction sector (in areas such as transportation, water and waste water reticulation, and communications) where current competence of engineers is vital to the national economy. The Registration Authority considers that there is a significant public good which would be achieved if the coherent multi-level registration system was fully recognised in statute."

More recently, the A*nnual Report by the Chartered Professional Engineers Council for the period 1 July 2010 to 30 June 2011* noted that "During the year the Council initiated a review of all Closed Complaints handled by the [Registration Authority]. The approach taken being consumer orientated and with a focus on the fairness of the outcome. The resulting report has given the Council confidence the [Registration Authority] is working well with complaints and has implemented systems to improve the time taken in their investigation and discipline, when necessary".

IPENZ considers New Zealand is the only country that comprehensively reassesses engineers for current competence. We understand that in all other countries the registration body relies solely on monitoring the suitability of continued professional development as a proxy for ensuring continued competence.

6.6.2 Lower Level Competence

Chartered Professional Engineer is in effect an entry level competence – the minimum standard of competence required to undertake work at a professional engineering level. However, the Chartered Professional Engineers' standard is only one of three globally recognised competence levels IPENZ administers. The others are for engineering technologists and engineering technicians.

IPENZ provides registers at each of the three levels – Chartered Professional Engineers, Engineering Technology Practitioners and Certified Engineering Technicians. The latter two levels of registration do not have statutory backing although the Engineering Associates Registration Act 1961 does allow for a register of persons with suitable qualifications and experience to be engineering technicians. However this is not a modern current competence-based system.

IPENZ is a signatory to multi-lateral agreements cross-linking its standards at the three levels to international best practice. IPENZ has engaged in providing registers at all three levels as this is in the public interest. Maintaining these registers is important as it is not just Chartered Professional Engineers who play a key role in building and construction. For example, for much geotechnical measurement work it is more appropriate a skilled

engineering technician undertake the measurements. Also, simpler structural work in timber-framed homes is within the capability of engineering technologists.

A further reason for maintaining a suite of registers for different competence levels is to support engineers who develop their competence during their working life. Candidates can move up (and occasionally down) the competence levels depending on how their career changes.

The New Zealand Construction Industry Council (of which IPENZ is a member), in its submission to the Building Amendment Bill No. 3 in May 2011, showed support for recognising multiple competence registers as a desirable feature of an engineering occupational regulation system.

6.6.3 Competence Requirements Above the Minimum Chartered Professional Engineer Standard

The competence required to design a complex multi-storey commercial building is almost always above the minimum standard to become a chartered professional engineer. Until now the regulatory system has relied on engineers self-certifying their competence and disqualifying themselves from work beyond that competence. Hence only a small proportion of structural engineers should make themselves available for very complex work.

An important question for the Royal Commission is whether there is a public benefit in creating a register at a competence level above Chartered Professional Engineer. If such a register was created it would be with precedent, as under the Building Act complex dam safety engineering requires a recognised engineer. Recognised engineers are assessed as being slightly above IPENZ's Chartered Professional Engineer standards, with the assessment panels ensuring the engineers demonstrate the competence to undertake dam safety work. In practice whereas a person could become a Chartered Professional Engineer four to five years after graduation, recognised engineers are much more experienced, having built their competence to higher levels.

As set out in IPENZ's report to the Royal Commission, other countries have adopted a design examination for structural engineers that operates above the general professional engineer standard in order to meet the recognition standard as a structural designer. It would be possible to adopt a similar approach in New Zealand. A register with a new title could be established, to which entry requires demonstration of both the general Chartered Professional Engineer competence, and the specific design competence for very complex commercial buildings.

There would be a cost, and the question is whether that cost is justified. There is little evidence that self-certification has failed, and self-certification is certainly cheaper. However, public confidence may be boosted by a more explicit structural engineer standard. The Universities of Auckland and Canterbury have indicated it would be advantageous for a person seeking to become registered at a higher level to undertake post-graduate education. IPENZ notes that the standard would be set using an objective outcomes-based competence assessment system, and individual engineers could then choose how to develop their competence towards meeting the standard.

Whilst the reporting from building consent authorities on the quality of professional engineering work remains inconsistent IPENZ does not have strong evidence with which it could ascertain whether self-certification is failing at a level sufficient to recommend a higher level competence register for structural (and possibly geotechnical) professional engineers.

6.6.4 Allocation of Chartered Professional Engineers to Fields of Practice

IPENZ is aware the views in the engineering world are split on the benefits of a generic registration title such as Chartered Professional Engineer, versus a title endorsed in a field of engineering such as Registered Professional Engineer Queensland (Civil).

New Zealand has historically operated in the generic manner, reflecting our belief that engineers are sufficiently able to self-certify the boundaries of their competence and the small scale of New Zealand where the profession is multi-disciplinary in nature. Nevertheless there are proponents for allocation to fields or scopes of work who argue this gives greater clarity to the regulator and consumer.

This matter was specifically considered by the Select Committee hearing submissions on the Chartered Professional Engineers of New Zealand Bill in 2001, and the Committee decided allocation to fields was not in the public interest. IPENZ and the Chartered Professional Engineers Council continue to support this stance because:

- The assignment of fields can be too restrictive given practice fields evolve over time and can change between the reassessments of competence.
- Regulatory sign-off is often done by one engineer on behalf of a team. Thus, the signing engineer may have driven the quality assurance process but not be the most expert of all elements of the work.
- Fields overlap and many engineers are multi-disciplinary. Thus, an engineer classified as “civil” may be competent to do other types of work such as structural engineering.
- Competence is demonstrated within rather than across a field. For example a structural engineer might be competent on steel and wooden structures but not competent on certain types of reinforced concrete.

Where regulators have tried to introduce a field (such as in Amusement Device regulations) this has not worked well and has resulted in competent people being disqualified from doing work for no good reason. Field information is at best a rough guide and should have no regulatory impact. IPENZ considers the market should be allowed to determine how engineers, through their employers, advertise and represent their competence in particular fields. Purchasers of engineering services approach companies who then assign a suitable engineer. The public rarely seeks out an engineer as a registered natural person.

6.7 The Role and Types of Standards/Guidance Documents

To ensure consistent and high standards of structural engineering of complex buildings two types of document are required. The first set out requirements (and are therefore directly compliance documents) and the others are voluntary and therefore provide guidance to be used according to the considered professional judgement of the structural engineer. There are needs for:

- Documents that support the process of consenting and reaching code compliance during new building work
- Documents that support the processes of assessing existing buildings (under both urgency and planned evaluations), after both gradual deteriorative change and damage from a specific event.

The documents might be: formal New Zealand Standards with regulatory suitability that are directly compliance documents; voluntary New Zealand Standards developed by

industry; documents developed by the Department of Building and Housing (which can be either direct compliance documents or purely advisory); or guidance documents developed or endorsed by "industry" normally represented through IPENZ, the Structural Engineering Society New Zealand, New Zealand Society for Earthquake Engineering or the New Zealand Geotechnical Society, or any combination of these.

IPENZ's view is there should be clear ownership and development protocols. These include:

- Policy documents being developed and owned by the Department of Building and Housing.
- Documents that give effect to mandated policy being New Zealand Standards, funded through the Building Levy.
- Guidance documents being developed in expert professional communities to an agreed protocol. This will ensure they can be co-owned and co-branded as "endorsed" advisory documents by the Department, professional bodies, and the relevant learned societies.

IPENZ considers the necessary documents are not being sufficiently kept up to date, and this is a result of the financial model.

Currently, despite being a Crown entity, Standards New Zealand receives no public good funding. This situation makes New Zealand anomalous amongst similar countries and needs to be rectified so standards are co-funded by the Government and industry.

We believe the Department of Building and Housing must ensure the development of construction-related New Zealand Standards is at least partially funded by the Building Levy. Funding also needs to acknowledge the importance of involving relevant professional communities in their development. These communities include the Structural Engineering Society New Zealand, New Zealand Society for Earthquake Engineering and the New Zealand Geotechnical Society, and consist of voluntary members. Those professional communities are formed by individuals becoming members of these technical organisations on a voluntary basis. Such organisations hold the expertise, and in them experts contribute their wisdom in an unbiased manner. They suffer from lack of funding that can be directed to development of guidance documents.

IPENZ notes recommendation 11 of the Royal Commission's *Interim Report* requires Standards New Zealand to "initiate the process of amending current building standards in light of the findings from the Canterbury earthquakes". Appropriate planning and funding of both New Zealand Standards and guidance document development in professional communities is essential to ensure this recommendation's timely implementation.

Standards New Zealand and the Department of Building and Housing need to develop a protocol to ensure New Zealand Standards will have "regulatory suitability".

6.8 The Form of the Building Regulator

The question of whether policy implementation is better done locally (as set out in the 2004 Building Act) or nationally also needs consideration. The argument favouring a national approach is that the purpose of the requirement is to protect building users, and there is a right for all people to be similarly protected. The argument in favour of local standard setting is that the needs of particular communities (such as their economic strength) can be taken into account in setting the timeframe.

IPENZ considers constant and effective regulators are essential for operating the building and construction regulatory framework in New Zealand. The present system has limitations because of the regulators' general lack of staff with adequate technical expertise, particularly in structural engineering. Change is needed to address this.

As noted in its submission to the Department of Building and Housing on *Cost Effective Quality: Next Generation Building Control in New Zealand – Building Act Review* in April 2010, IPENZ considers Building Consent Authorities should be amalgamated towards a national consent authority with regional offices. We believe this amalgamation would enable a national consent authority to build up in-house and institutional knowledge. It would also assist with consistency across the country, helping address the concerns above. In particular it would address many of the critical issues around the quality assurance of structural engineering design work, the acceptance of producer statements, and the monitoring of construction work to ensure structural designs are properly implemented prior to issue of a code compliance certificate.

6.9 The Role of Professional Bodies and Learned Societies

The model proposed in our submission is best described as co-regulatory – using the regulated effort and commitment of members of engineering professional bodies, to work with the central regulator:

- A co-regulatory model is appropriate for engineering because the professional body has shown the commitment to undertake a robust complaints process, and to place the public interest above self-protection. The independent monitoring by the Chartered Professional Engineers Council in independent monitoring is an important cross-check.
- The co-regulatory model is much more cost-effective because it draws on the voluntary commitment of engineering professionals.
- The network of learned societies working with IPENZ, such as the Structural Engineering Society New Zealand, New Zealand Society for Earthquake Engineering and the New Zealand Geotechnical Society, provide a rich professional community to develop guidance notes, codify knowledge and support engineers' ongoing professional development.
- The co-regulatory model, based around a multi-tiered engineering registration system operating as a single entity creates an environment in which engineers can be rewarded for improving their competence without having to arbitrarily transfer their allegiance from one registration system to another.

Nevertheless, these organisations rely on subscriptions paid by individual members. A weakness is that they are not sufficiently recognised and funded for what is often work in the public benefit. A model in which the central regulatory funded activities within the professional networks to a greater extent than at present would have substantial benefit.

6.10 The Role of Educators and Researchers

The tertiary education and research communities have an important role to play in building and construction. IPENZ considers they need to have direct involvement in the relevant professional communities so their research can be integrated with professional practice, particularly those researching improvements in structural practice. IPENZ advocated to have contributions to improving professional practice included in the 2012 Performance Based Research Fund adjudication as a valid form of research output. This

re-integration of academia with professional practice is a vital success factor going forwards.

In terms of a wider role for educators, IPENZ notes the form of competence standard used by the engineering profession in New Zealand is outcomes-based. That is, it describes the competence independently of the pathways by which the competence is developed. As a consequence holding a degree is strong evidence that a certain level of knowledge has been achieved, but in itself is not sufficient evidence of the competence for applying that engineering knowledge in professional practice. As set out above, IPENZ considers the public interest is benefitted by internationally benchmarked current competence-based occupational regulation. Achievement of the standard exemplifying engineering degree (BE(Hons)) will set candidates on the pathway towards demonstrating the competence for independent practice. Educational efficiency, suggests most candidates will progress through the relatively standardised route of a degree followed by formative experience in employment. Nevertheless, the competence assessment process is open to candidates who have developed their competence by other routes.

IPENZ strongly supports the continuation of New Zealand engineering degrees as clearly meeting the international benchmark standard. In 2009 this standard was lifted and with support from IPENZ the Universities are discussing with Government the necessary degree length to ensure compliance. The possibility of lengthening this to 4.25 years is being discussed as a means to ensure continued compliance.

A further educational issue is whether the present broad-based civil engineering degree is now too broad and whether sub-disciplines should emerge, including one in structural engineering. IPENZ recognises such an approach might make it easier for graduates to develop their competence in structural engineering by increasing the relevant learning within the degree (at the cost of narrowing their education). Given the registration standard is outcomes-based, the net effect of studying a narrower discipline might theoretically be to decrease the time for demonstrating competence in structural engineering, but this is unproven. Candidates who choose post-graduate study in structural engineering will also improve their knowledge to assist their competence development. As the accrediting body under the Washington Accord, IPENZ is not intending to mandate such course design matters.

The concept of qualification-assisted graduate development to registration (i.e. a structured post-graduation development experience leading to a qualification and a pass in a competence assessment) has been adopted at the engineering technician level. IPENZ sees merit in this approach, but considers the emergence or otherwise of such a qualification should be left to market forces rather than being mandated. Engineering graduates need to take personal responsibility to ensure their early employment will allow them sufficient opportunity to develop their competence. Educators have a role to prepare graduates with the skills to be able to do this.

7. CONCLUSION

IPENZ considers New Zealand needs a comprehensive overarching policy statement for the built environment. This would be supported by a clear, cohesive regulatory system with effect given to the policy statement through a suite of instruments including legislation, regulation, recognition and support for industry self-regulation and supply of information.

In summary IPENZ believes the action is needed to:

- Determine the acceptable likelihood for an earthquake event in which various types of buildings would fail to protect people, with this likelihood being converted into minimum standards and design loads.
- Determine whether minimum standards for serviceability should be developed.
- Determine the way to manage buildings constructed to subsequently superseded standards. A robust minimum national standard and maximum time for compliance need to be set.
- Determine the acceptable risk from loss of building strength due to gradual deterioration, with analysis of the impact of implementation of a regular structural "warrant of fitness" regime.
- Determine the best way of providing building users and the public with information about the likely performance of buildings they intend to enter.
- Amalgamate Building Consent Authorities towards a national consent authority with regional offices, enabling the accumulation of institutional knowledge and resulting in increased consistency.
- Ensure the development of construction-related New Zealand Standards is at least partially funded by the Building Levy.
- Establish clear ownership and development protocols so:
    - Policy documents are developed and owned by the Department of Building and Housing.
    - Documents giving effect to the policy and are mandated should be New Zealand Standards, funded through the Building Levy.
    - Guidance documents should be developed in expert professional communities to an agreed protocol so they can be co-owned and co-branded as "endorsed" advisory documents by the Department, professional bodies, and the relevant learned societies.

IPENZ appreciates the opportunity to make this submission. For more information please contact:

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APPENDIX 1: NEW ZEALAND CONSTRUCTION INDUSTRY COUNCIL POSITION PAPER: BUILDING ACT MODEL

CONSTRUCTION INDUSTRY COUNCIL CIC

BUILDING ACT MODEL

CIC Position Paper

18 JULY 2011

BUILDING ACT/REGULATORY FRAMEWORK – PREFERRED MODEL

The NZCIC has recently spent some time discussing the New Zealand Building Act/regulatory framework, and recommends the following model:

1. The continuation of the current performance-based system, with the Building Act and Regulations and the Building Code derived from them, expressed in terms of desired outcomes, but with more quantitative specificity where appropriate/useful.
2. The Building Code should be supported by:
    (i) an up-to-date suite of National Standards which:
    - represent an appropriate mix of international and national Standards, together with joint Australian/New Zealand Standards;
    - provide greater detail in compliance documents at the next level (in conformance with the Government's preferred "stepped-approach" from regulation down to supporting documents at the next level);
    - are, as at present, a mix of acceptable solutions, verification methods and alternative solutions, but with greater scope for the last of these;
    - are suitable for regulatory incorporation, drawing on best international practice for Standards development;
    - are cited in a timely and accessible manner.

    (ii) guidelines, good practice documents and a range of similar documents developed by, or on behalf of, the industry;

    (iii) an effective system for industry-developed good practice and guidance documents to be transferred wholly or in part into recognised compliance documents;

    (iv) an effective system of product certification/assurance;

    (v) an effective system for declaring proficient workmanship (ie constructor producer statements);

    (vi) an effective system for validating alternative solutions, proposed by professional designers and quality assured using verification methods or by peer review (ie designer producer statements);

    (vii) an effective system for prescribing requirements for certification on an ongoing basis of specified systems with clarity as to the competence requirements to perform certification;

    (viii) assured free (electronic) access to all compliance documents cited by the Code.
3. There should be a single means of obtaining regulatory approval for building work, without duplication of steps or stages:
    (i) Designers provide sufficient documentation of designs to owners so those owners can submit those documents in the knowledge they are likely to demonstrate there are reasonable grounds for the relevant regulator to decide designs comply with the Building Code.

    (ii) Builders decide how to construct the designed building, manage the construction process, and at its conclusion provide sufficient evidence so the owners can submit that evidence in the knowledge it is likely (taken in conjunction with evidence collected directly by the regulator) to

demonstrate there are reasonable grounds for the relevant regulator to issue a code compliance/consent checking certificate.

(iii) Where appropriate (eg alternative designs that might be considered difficult to construct) the role of designers observing construction so that they can provide evidence as to whether their designs have been correctly implemented by the builder is recognised and specifically included in the regulatory approval process.

(iv) As well as the process set out in 3(i) and (ii) there is a system to cope with those situations where, for legitimate purposes, building work might be carried out in advance of issue of a modified building consent (designed as built), and in this system the responsibilities of the designer and builder are clearly delineated.

(v) Any registrant on a relevant national occupational register is entitled to present a producer statement, either in support of an alternative design, or to declare the quality of building work undertaken. Other lists of authors are only used where no national register exists.

(vi) The statutory-backed national registration system comprises three occupational groups, each separately administered as a multi-competence level system – engineers (noting the wider application of this system beyond engineering and its international benchmarking), architecture/design (also with international benchmarking), and construction. In addition there should be a further multi-part register for those undertaking work in regard to certification of specified systems but who could not reasonably be expected to register in the other three systems.

(vii) Producer statements and memoranda for restricted building work are consolidated into two nationally-consistent documentation systems, one based on proof of workmanship, the other on providing a standardised means for providing evidence towards alternative solution acceptance.

4. There is a single national regulatory body, but using regional delivery of some services to ensure smooth interfacing with resource consenting. The liability of this body is clearly established (and indemnified by the Crown as required).

(i) Risk-based consenting is applied to work involving alternative solutions, with clear protocols to define the requirements for evidence at different levels of risk.

(ii) There is clear and unambiguous information to allow applications involving only acceptable solutions and applications involving multi-use consents to proceed rapidly.

(iii) The regulatory body delivers services locally as well as centrally, and applies modern technology to its processes to ensure high quality service is perceived by applicants.

(iv) There is consistent national education and training of building officials.

(v) The national regulatory body is charged with taking responsibility for rapidly identifying emerging issues and ensuring these are addressed.

5. Information from the consenting and CCC processes on the quality of work submitted by individuals is consistently provided to occupational registration authorities to assist those authorities run educational and complaints processes to support consistent competence standards.

6. Use of written contracts is the norm so disputes and liabilities are almost invariably decided in contract and not through claims in tort.
7. There is a requirement for clear disclosures of limitations by parties involved in the design or construction process, and the building owner is adequately informed on the ongoing maintenance that might reasonably be required.
8. Clear information for building owners is provided from a single central source.
9. There is a clear means for the industry and the main regulatory bodies to engage, foresight emerging issues, and develop approaches to address these.

NZ Construction Industry Council

18 July 2011