DISCUSSION PAPER: BUILDING MANAGEMENT AFTER EARTHQUAKES

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 for engineers and is also 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.

CONSULTATION

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

SUBMISSION

In this submission IPENZ and ACENZ (we) have responded to selected questions raised in the Discussion Paper where they relate to generic processes, the engineering profession and competency.

The Structural Engineering Society (SESOC), New Zealand Society on Earthquake Engineering (NZSEE) and New Zealand Geotechnical Society (NZGS) are expected to cover other matters in their submissions.

GENERAL COMMENT: THE CURRENT BUILDING EVALUATION FRAMEWORK

The current building safety evaluation procedures were first developed by the Ministry of Civil Defence in 1990; they are based on the United States Applied Technology Council procedures (ATC-20). In 2008 a national reference group updated the procedures (issued as the 2009 NZSEE Guidelines under the auspices of the Department of Building and Housing). Further changes have been proposed since but not yet published. The current 2009 NZSEE Guidelines have a stated focus only on the rapid assessment component of the overall building safety evaluation process.

We believe the use of the term "safety" in referring to the building evaluation process is misleading and should be discontinued. The use of the term "safety" carries an interpretation in the eyes of the general public that does not necessarily reflect likely structural performance in relation to current code requirements or indeed to an event that may exceed code expectations. An initial evaluation will only ever be capable of determining whether a structure has suffered significant damage and any material loss of its pre-event structural capacity. If a structure has suffered damage, an initial inspection may suggest a likely reduction in performance but this will be in relation to its pre-event state, not in relation to new building standards.

Any investigation that does not allow the investigating engineer the time for a thorough inspection of the structure, a review of the as-built drawings and appropriate structural analysis should always be regarded as interim or incomplete.

A post-disaster Preliminary Building Engineering Evaluation Process should be designed to assess firstly whether a building has suffered structural damage and then the relative risk to occupants, passers-by and neighbours. It should not be, on its own, a methodology for determining whether to re-occupy.

An engineer's input can define the relative risk within a building. However, this is not the sole determinant of the safety level of a building. Other factors such as sanitary conditions, state of adjacent buildings and fire risk must be taken into consideration. Whether the building can be reoccupied is a risk-based decision made by the authorities, in considering the needs of the building, its owners/occupiers, the public, and the prevailing legislation which defines the acceptable level of risk. It is not the engineer's role to determine if a building can be occupied or not; only to provide technical information on which this decision is made by others considering all the relevant issues.

We therefore recommend the term "building safety evaluation" be replaced with "building structural evaluation" as this term better defines the nature and intent of the activity being undertaken. This term or simply building evaluation is used in this Submission.

Furthermore, whatever framework is adopted it must be more meaningful and intuitive to the public, building owners and local authorities. The current building evaluation system uses terminology such as Rapid Assessment and Detailed Engineering Evaluation which has no implied meaning to those affected or responsible for the outcomes of the process. Hence it can, and in the case of Canterbury did, lead to confusion about a building's status, and if or what further actions were required.

Use of terms that better reflect the intent of the activity would provide non-engineers with a clearer indication of the expectations following the process. We suggest the following terms be considered:

- Level 1 - Superficial building survey
- Level 2 - Interim building assessment
- Level 3 - Detailed damage assessment

- Level 4 - Residual building strength assessment

The green and orange placards used in the first two evaluation levels need to have their messages clarified and relabelled with more meaningful terms. Of particular concern was the messaging around the “green” placard. Ideally, we would wish to keep the New Zealand system as close to the international system as possible, but given Canterbury was a very large scale trial of the international system we may be able to justify suggesting significant improvements which New Zealand might adopt immediately, prior to influencing the international system. Given overseas trained engineers might come to a major emergency in New Zealand commonality with international practice is desirable. If the placard system was changed everyone including the public would need to be re-educated.

If some difference from the international system is tolerable, a fourth colour of placard to further delineate the green/yellow placard interface might be helpful. We have called this the white placard. For example:

- White after Level 1: no apparent damage identified on a superficial inspection to cause concern. Further evaluation is required. Access may occur on an interim basis.
- White after Level 2: no damage identified to cause concern. Further evaluation is required. Access may occur on an interim basis.
- Green after Level 2: no damage identified that causes concern. Access may occur. Further evaluation is at the discretion of the building owner. (Most likely to be used for non-complex buildings such as residential properties).
- Yellow after Levels 1 or 2: damage identified that causes concern. Further assessment is required. Access may occur on an interim basis subject to the following restrictions: (list of restrictions).
- Red after Levels 1 or 2: building is damaged. Further assessment is required. No access allowed.

The following diagram provides a conceptual model of a revised building assessment system for consideration. Note in the far right column we have listed issues we will refer to later in this Submission.

Authority	Methodology	Outcomes	Issues
CDEM Act (Response)	Level 1 - Superficial Building Survey Level 2 - Interim Building Assessment	Placards Placards	• Training and Deployment of Engineers • Public/user understanding • Information Management
Building Act (Recovery)	Level 3 - Detailed Damage Assessment Level 4 - Residual Building Strength Assessment	Detailed Damage Assessment Report Residual Building Strength Assessment Report Repair Order Demolition Order	• Authority • Leadership • Engaging Engineers • Responsibilities of Building Owner • Information Management

With this system there would be clarity at the end of the response phase. In a building with a green placard normal use could resume. Specific actions would need to be taken for a building with a white placard. In all buildings with white, yellow or red placards, detailed damage assessment, and/or residual building securing, or more detailed strengthening analysis would be needed. These might then lead to a requirement for temporary securing, repair or for demolition. Importantly, at the transition to the recovery phase, the system would make it clear whether actions were a requirement or a recommendation. This system would also provide clarity on the responsibilities of building owners in both jurisdictions and in transition.

SPECIFIC COMMENTS: RESPONSES TO QUESTIONS POSED IN THE DISCUSSION PAPER

NEW ZEALAND'S BUILDING EVALUATION FRAMEWORK

Question 1 – What objectives should the building evaluation framework target; should its main objective be ensuring public safety, or should it incorporate other aims? What would the process look like if other objectives were added? What are the risks associated with focussing on one objective over another?

The building evaluation process's primary objective is to determine the relative risk of structural failure or collapse presented by a building. This risk level informs the authorities, building owners and the public, and helps inform decision-making on whether to re-occupy a building.

A further objective is to facilitate the timely return to business as normal. Emergencies the size of the Canterbury earthquakes can have significant impacts on businesses and the local economy. The first priority of the response is to determine the risk of building collapse for the purposes of victim recovery and the on-going risk to the public. However, once the state of emergency has been lifted there will be significant pressure on authorities to determine whether a building can be reoccupied, whether a building can be temporarily occupied (for

the purposes of relocating the contents or activities of the building) or whether a building is in danger of suffering imminent structural failure or collapse. This is driven by people's desire to return their lives to some semblance of normality either through reoccupying their homes or resuming their business/employment.

Therefore, although life safety will always be the primary driver, a significant objective of the building evaluation process must be to return to a state of life/business as normal in the shortest possible timeframe. The balance between safety, risk and expediency must be managed carefully. Whereas the concept of the building evaluation process is basically sound, its efficient and effective implementation during the response and recovery phases is paramount to achieving both objectives.

Question 3 – Who would be responsible for setting up and/or implementing any new framework? Should the roles and responsibilities in the building evaluation system be set at national or local level?

The Discussion Paper highlights issues relating to the implementation of the building evaluation process following the Canterbury earthquakes. During the state of emergency the national emergency process was mandated under the authority of the Civil Defence Emergency Act 2002 (CDEM Act) and managed by the Ministry of Civil Defence Emergency Management (MCDEM) working with affected local authorities. However, once the emergency declaration had been lifted, there was no legislative obligation for the process to continue or be fully completed according to the NZSEE Guidelines. Problems were also experienced with the building evaluation process being applied consistently. This was attributed to a variety of causes including lack of adequate training or briefings, unfamiliarity with the process and practitioners' varying competencies. Practical application of the process also identified further areas for improvement.

Responsibility for establishing and maintaining the national framework for assessing buildings after a major emergency should be defined in the CDEM legislation/regulation, and by default (unless specifically delegated to a territorial local authority) should sit with the central agency. As the agency responsible for emergency management the central agency should be MCDEM, but it should be made explicit that it delegates functions to the Ministry of Business Innovation and Employment (MBIE) in respect of building evaluation. It is during a declared state of emergency that the building evaluation activity initiates and progresses through the response and recovery phases. MCDEM as the lead agency should be allowed to direct this activity under the powers of the CDEM Act.

The alternative is for the statutory requirements being placed in the Building Act, but we are of the view that the purposes of the Acts are fundamentally different: the Building Act is performance-based, placing requirements on building owners to meet specific expectations over a period of time; the CDEM Act provides a command and control structure, co-ordinating a number of parties' activities. The CDEM Act is thus more suitable for directing a building evaluation programme that can occur in the absence of building owners. However once the state of emergency has been lifted, responsibility must pass very specifically to the Building Act, with a suitable transition arrangement, such as that shown in the table on page 4.

MBIE's involvement will be critical. MBIE, of which the former DBH is a part, has the mandate to regulate for the delivery of a number of key performance measures. These relate to the design, construction, modification and repair of buildings, including safety, well-being and sustainability. Therefore MBIE already has the technical mandate, relationships with key industry sector groups, and established processes to assist with the development of a national framework for building evaluations. MBIE, working closely with technical professional societies such as NZSEE and the SESOC, has already been instrumental in developing the current guidance to territorial authorities on building evaluation. This development process needs to continue to ensure training, resources and the system's

objectives are delivered. However overall responsibility for implementing the framework in the response phase should sit with and be managed by MCDEM.

The responsibility for implementing the building evaluation process should be determined by the level of risk presented and the capabilities available. In situations where a national state of emergency has been declared, MCDEM will be the lead agency in implementing the building evaluation process. For medium to small sized emergencies (such as the Gisborne earthquake), and where a state of emergency has not been declared, responsibility and authority for implementing the process should be delegated to the affected local authority. In small events the local authorities, with external engineering resources' assistance, will be capable of implementing an effective building assessment programme. However, with an event the scale of the Canterbury earthquakes the capacity of local authorities will be quickly overwhelmed. In these circumstances the responsibility for implementing the process might need to be delegated, based on the risks presented. The local building consent authority might manage the building evaluation process in relation to (non-complex) residential and commercial buildings, with a central agency (MCDEM or MBIE depending on whether a state of emergency is in place) managing buildings of a more complex nature. These could include multi-level buildings of greater than a specified number of storeys, for instance.

Critical to the process's success will be the transition from the response phase to the recovery phase after the state of emergency is lifted. Clear protocols are needed to ensure this transition is seamless, the process remains consistent and risks are controlled. It must be absolutely clear what is required of the building owner, and what is at their discretion.

Question 4 – What are the risks, costs, and benefits of using a building evaluation system that uses volunteer engineers who have a liability waiver? Are there any options that address the risks associated with using volunteer engineers that do not discourage them from volunteering?

Given the extremely low likelihood of an event of significant consequence occurring, there is little option but to utilise volunteer engineers during an emergency, and to a lesser extent in the early (transitional) parts of the recovery phase. The immediate need for significant engineering resources makes other options such as contracting in resources impractical. Experience shows that New Zealand engineers feel a strong obligation to assist in times of emergency. Following the Canterbury earthquakes IPENZ had little difficulty in mobilising the required engineering resources. However, we note that future mobilisation may be more difficult if processes become complex or adversarial. The mobilisation of volunteers therefore needs to be properly managed so efforts can be directed effectively and goodwill is maintained.

The concept of a volunteer engineer practicing outside the safeguard of his or her normal employment framework carries with it risks and costs that need to be considered during and following the state of emergency. Inherent in the understanding of this risk, particularly for structural engineers, is that they will be asked to make engineering judgements without the time to carry out standard practice investigation and analysis. In addition, engineers may be (and were in Canterbury) put in the position of assessing structural types of which they had little experience.

The Memorandum of Understanding for Volunteer Engineers (MoU), agreed between MCDEM, IPENZ, ACENZ and Local Government New Zealand, provides an agreed standard form agreement for volunteer engineers working under a declared state of emergency. The MoU addresses key issues such as:

- Liabilities – under section 110 of the Civil Defence Emergency Management Act 2002 a volunteer engineer is protected from liability in respect of services carried out under the direction of the CDEM Controller.

- Guarantees – the provisions of the Consumer Guarantees Act 1993 do not apply.

- Costs – provisions exist for the recovery of basic travel and accommodation.

Generally we believe that following the February 2011 earthquake the MoU worked well for both the local authorities and the engineers involved. The indemnity from liability, when working for the MCDEM was an essential safeguard for the individual engineers and for the employing firms and organisations that released their professional engineers to do the work (often while continuing to pay salaries).

The key issues are the means for training (in readiness) and the effective deployment of engineers. In our view, New Zealand must keep a trained pool of engineers, and training should be paid for by public good (government) funding. We have covered this matter in other submissions. This is a critical success factor.

In terms of deployment, because engineers are so central to emergency management, the means for deployment should be firmly embedded in the emergency management framework. The register is best kept with IPENZ, but the expertise to use it and to contact individuals needs to be available 24 hours a day, and in several geographic locations, not only at the IPENZ National Office. Thus, funding is needed for maintaining a pool of trained dispatchers.

Once the state of emergency is lifted, there remains no similar legislative basis under which volunteer engineers can assist and be assured of the MoU's protection. Thus, the only option is for engineers to transfer, through their employing company, to a contracted engagement covering the protections necessary to practice. This does not imply the engineer will perform any differently, simply that they are now subject to normal commercial liability and guarantee risks that must be mitigated.

However, an abrupt transition from a framework of legislative protection for volunteer engineers to one of individual engagements is impractical given the other priorities authorities are dealing with at the start of the recovery phase. This is particularly so if the event is significant as in the case of the Canterbury earthquakes. The legitimacy provisions provided to engineers through the CDEM Act need to flow through the transition period while alternative, perhaps more commercial arrangements, are put into place.

Question 5 – What framework should be used to evaluate buildings when a state of emergency is not declared but buildings are damaged (for example, after an aftershock)?

To ensure a seamless transition between the response and recovery phases, a common framework for evaluating buildings is needed. The current NZSEE Guidelines, which align with ATC-20, essentially cover only the response phase of an emergency. A means to continue through to the recovery phase and possibly beyond is needed. Our model considers this.

Whereas the CDEM Act provides the powers to ensure necessary building evaluation processes are carried out, and if necessary access to buildings controlled, similar levels of authority are not available once the state of emergency is lifted or not declared. Furthermore, once the state of emergency is lifted, responsibilities are transferred from the central agency controlling the emergency response to a number of organisations and parties, such as territorial authorities and building owners. Many of these organisations and parties have little understanding of their obligations, or sufficiently robust systems to ensure the building evaluation process is completed.

In an event where buildings have been damaged but a state of emergency has not been declared, the same safety risks have to be assessed and the same objectives (return to normality) met. We see no advantage in applying a system which is different from the

building evaluation framework. However, responsibilities and accountabilities need clarification as mentioned above.

Experience in Christchurch suggested the use of "indicator" buildings (a small set of examples of different building types) was helpful to decide the extent of re-evaluation required after an aftershock. We would recommend the procedures explicitly recognise the role of indicator buildings to decide the extent of re-evaluation.

SPECIFIC ISSUES WITH THE PLACARD SYSTEM USED IN CHRISTCHURCH

Question 3 – How well did individual, organisations, agencies and the wider public communicate and share information with each other after the Canterbury earthquakes; identify and gaps, failures and good performance. What could have improved how people communicated and shared information?

The guide to the National Civil Defence Emergency Plan notes IPENZ has the function of maintaining a register of professional engineers who can assist during a civil defence emergency. Following the events of 2010 and 2011, IPENZ mobilised and co-ordinated large numbers of engineers from around New Zealand to provide volunteer support. The deployment of engineering resources required the sharing of information between IPENZ, its technical societies, and Government agencies. This appears to have worked reasonably well. Since the events in Canterbury, IPENZ has refined its systems and can now more effectively identify engineers of the required skill base and competence to be deployed both nationally and internationally.

We believe there would be significant benefit in having an engineering spokesperson available during emergencies. Such an individual would be an experienced engineer embedded within the emergency response organisation and responsible for being the "mouth-piece" to the media and public on engineering matters.

We also believe the input of building occupants needs to be acknowledged as a potential source of information about buildings. A number of occupants reported the buildings they occupied had altered dynamic response after the earthquakes. Occupants of the Canterbury Television and Pyne Gould Corporation buildings had voiced disquiet about their building "feeling different" over time. While building occupants do not necessarily have the technical expertise to assess damage, their input should be viewed as valuable, and assessing and addressing occupants' concerns should be a key role for building owners. We recommend the management of occupants' concerns be reviewed.

Question 4 – What skill-sets do engineers need to accurately or adequately evaluate a building following an earthquake or aftershock? Are different skills needed to assess buildings of different ages and for different purposes? What are the advantages and disadvantages of requiring engineers to possess certain expertise / capability before they can become building safety evaluators?

More specific structures and arrangements are needed for professional engineers to be effectively integrated with civil defence and emergency management. We note however this will require engineers to be appropriately trained and engaged prior to an event so they can provide an effective contribution during the response and recovery phases of an emergency.

We endorse the various submissions from NZSEE in relation to the building assessment process following an emergency. In particular, we believe the submission "Integrating Professional Engineering within Emergency Management Planning and Response in New Zealand" by Dave Brunsdon captures all of the key issues on training engineers for use in emergency situations. We are aware that gaps in training and competency in relation to building evaluation did lead to inconsistency and in some case poor quality outcomes.

We see significant public benefit in establishing a pool of engineers trained and ready to respond to a civil emergency. This resource would fulfil two keys functions – building evaluation and co-ordination. Building evaluators would hold Chartered Professional Engineer (CPEng) status, and in addition be specifically trained and have passed an assessment of the competency to assess damaged buildings. Co-ordinators (dispatchers) would be engineers (not necessarily CPEng) capable of coordinating and dispatching the engineering resources in response to the priorities set by the controlling agency.

Building assessor engineers would differ from those assigned to Urban Search and Rescue (USAR) teams. Their competency would be more aligned with assessing intact or damaged buildings as opposed to extracting victims from collapsed structures.

To support the establishment of a national framework for training and certifying of engineers for the above roles, appropriate legislative drivers, leadership, and structures first need to be established. Furthermore, protocols for managing building related data need to be enhanced to ensure engineers volunteering to support an emergency response, or contracting to the recovery, have the necessary documentation essential to fulfil their duties. Critical structural data for all key buildings should be held in electronic form, both on-site and at a remote location for easy access following an emergency.

ACENZ and IPENZ are willing to contribute and support the development of this critical initiative.

BARRIERS TO ACTION, PARTICULARLY IN THE RECOVERY PHASE

Question 4 – What should central and local government, engineers, insurers and building owners be responsible for when changing and removing placards; following up on engineering recommendations for further evaluations or work; and making sure that building owners comply with their obligations? What roles does each of these groups play in making sure that damaged buildings are safe for long term occupation? How do we improve the system?

The responsibility for implementing the placard system, both during the response and recovery phases, needs to be clearly laid out in the building evaluation process. This should include who has authority to change a placard status and where that status information is recorded. Building owners and the public, in particular, need clear guidelines on the meaning of each placard, and where responsibilities sit.

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.