



Engineers New Zealand

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**BRIEFING PAPER FOR MS LIANNE DALZIEL, MINISTER OF COMMERCE**

**From:** Dr Andrew Cleland  
Chief Executive

**Date:** 26 May 2003

**Subject:** Structural Engineering Practice Review – Interim Report

**Executive Summary**

The Structural Practice Review taskforce have completed consideration of submissions and the matters raised in the open letter from Mr Scarry, and are moving to formulate recommendations in a draft report for peer review amongst the profession. In their opinion, unacceptable variability in practice standards is more a function of systemic failures in the industry than any other reason. Nevertheless some work of an inadequate standard has been done by the profession, particularly when engaged for only a limited role within the total project. The consensus of professional opinion is that the types of failing alleged by Mr Scarry had been largely identified and corrected when the engineering profession was engaged for the whole project. Pre-cast hollow core floor slabs and pre-cast tilt slabs are examples of technologies that require immediate review to ascertain their suitability for ongoing future use. Recommended actions primarily relate to overcoming systemic failures in the regulatory environment for the Building Industry.

**Activities Undertaken**

The Taskforce comprising seven structural engineers with widely varying experiences and employment contexts has met five times and considered approximately 20 submissions received. At its most recent meeting it held discussions with Mr Scarry, and Professor John Mander who is conducting research on hollow core flooring. The task force's preliminary report is under preparation, and will be made available for peer review amongst the profession as soon as fully drafted.

The following sections outline progress within the five key areas of the Terms of reference (shown in italics in each case)

## Variability in Standards of Practice

*Identify any areas of Structural Engineering Practice in which there is variability in the standards of practice.*

The taskforce is of the view that unacceptable variations in standards of practice do exist, and that these correlate with the commercial arrangements in respect of structural engineering work being carried out. Structural engineering design, like most professional engineering activities, is an iterative process. As the detail of a design is filled out, and sometimes during the construction phase, aspects that were insufficiently considered, or not identified must be analysed and resolved. This often requires rework of concepts. Continuing professional involvement in a project is therefore required.

In practice, those purchasing structural engineering services and sometimes the regulators have too often seen structural design as a linear process - the initial design is done, and then the client may seek to sign off the structural engineer. Decisions on variations to overcome issues not apparent at early stages are often taken without proper advice. Further, there has been a tendency to engage the structural engineer for only a minimum level of service to obtain a consent and thus problems are not always uncovered. As a corollary, the likelihood of problems increases as the fee paid for structural engineering services decreases.

In some of the examples raised by Mr Scarry there has been feedback from members of the profession involved in similar projects. They reported that in cases where structural engineers have continued to be involved rather than discharged after an initial design has been performed, any problems have largely been found and fixed. Nevertheless some work of inadequate standard has been done by the profession, particularly when engaged for only a limited role within the total project. Overall, Mr Scarry has raised some valid concerns. The taskforce formed the view that the extent and severity of problems were less than may have been implied from the way in which his open letter had been worded.

The root causes of much but not all of the variability are systemic issues; where those engaging engineers and/or regulators have not recognised the iterative nature of design; the need for expert peer review of work in which the engineer must make judgements; where those engaging engineers and regulators have not identified that unsuitably qualified engineers have been engaged (e.g. recent migrants or visiting engineers doing work in NZ without knowledge of NZ's codes for seismic design); and where the client is only prepared to engage an expert professional engineer for limited service.

## Unacceptable Practices

*Identify those Structural Engineering practices that are placing life or property at potentially unacceptable risk.*

There are specific concerns over two practices. Recent research at the Universities of Canterbury and Auckland raises issues about the performance of pre-cast hollow core flooring. The research is incomplete, and evaluation of the results in the practising profession has not occurred. Indications are that performance of hollow floor pre-cast slabs may not be as good as was previously anticipated.

The other area in which there is concern, but a lesser concern is the performance of pre-cast tilt slabs. These are being made with dimension ratios regarded as too extreme by some (i.e. they are

too thin), and there are some concerns about means of attachment when the slabs are carrying significant loads.

In both cases, the evidence is incomplete and more research is needed urgently, with review of the results by the profession.

IPENZ has no jurisdiction which enables it to identify any specific buildings that may pose a significant and immediate risk. Problems in buildings may have arisen after professional engineering involvement was completed, (e.g. after consenting and prior to construction), or the engineers concerned may not have been IPENZ Members. IPENZ has sought to ensure that Members have acted responsibly in respect of existing buildings known to them. Newsletters have been sent to Members reminding them of their ethical responsibilities should they be aware of buildings that are a significant and immediate risk. It is their ethical duty to inform the building owner if the risk is judged to be sufficient. We expect that Members will have acted on this advice, but they are not obliged to inform us if they have acted. We note that under the existing Building Act there is no legal obligation to inform the TLA, and this is a concern. The taskforce is not aware of any specific buildings that they regard as posing a significant and immediate risk.

## **Recommendations**

*Develop recommendations to overcome shortcomings and identify if possible ways to implement these.*

The Group has developed seven recommendations as follows:

1. Development of Standards and Codes of Practice. There is an urgent need to develop more comprehensive standards (for practices that can be described in a prescriptive way, e.g. through Standards NZ processes) and codes of practice (for practices requiring substantial professional judgement e.g. through activities of the professional body).
2. Ongoing professional involvement. There is a need to ensure ongoing professional involvement so that the effective sign-off of structural work post-construction (including all the variations from the iterative process described above) is by a competent structural engineer
3. Systematic recognition of competent structural engineers. There is a need to ensure that those competent in simple structure design (normal loads), and those competent in design of complex structures (considering the varying loads that occur in seismic events) are identified, and that structural work be limited to those with the relevant competence for the nature of the design required. The competence assessments must be stringent, and this is a challenge for the profession.
4. Expanded technical leadership role for Government's central regulator. The central agency (presently the BIA) must take on a foresight and leadership role so that problems are anticipated and assertive actions taken. This will help lift the game of TLAs and certifiers.
5. Improved Consent and Audit Processes. The variability in standards between TLAs, and the unacceptably low standards in some cases, must be eliminated by ensuring that consent approvals and code compliance certification only occur after high quality evaluation processes, including peer review by expert structural engineers where the building has non-standard structural features. TLAs must establish a culture of complaining about the competence of engineers who present sub-standard work on an ongoing basis so that these people can be investigated by the registering authority.

6. Responsibility of Building Owners. Building owners must be required to employ or engage suitably qualified people.
7. Evaluation of New Materials. There needs to be a process that avoids new materials with uncertain properties and performance in the New Zealand context being allowed onto the market and into use without proper evaluation first. Series 500E reinforcing steel is an example of a product introduced to the New Zealand market without proper prior evaluation.

### **Feedback on Building Act**

*Provide feedback to the BIA and MED on the current review of the Building Act.*

IPENZ made a detailed submission on the discussion paper issued by MED, and this included the recommendations of the task force, amongst other suggestions. Any matters that are not considered to be fully addressed in the draft Bill will be submitted on at Select Committee.

### **Actions by IPENZ**

*If appropriate propose a programme that IPENZ could implement to address the recommendations in section 3 above.*

IPENZ can take actions at two levels – as the registering authority under the CPEng Act, where it is responsible for ensuring that structural engineers meet the CPEng standard (already underway), and as an agency (in conjunction with its collaborating technical society, SESOC, the NZ Structural Engineering Society) resourced by the building levy to develop codes of practice for structural engineering work requiring substantial professional judgement. Government might give IPENZ further capability to recognise those engineers capable of complex seismic design within its broader registration system.

IPENZ and the profession at large must also work to promote a culture of quality and self-regulation of acceptable standards rather than one of fee cost reduction amongst the profession.