



**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
HIKINA WHAKATUTUKI

Structural and Fire Design Regulatory Control in New Zealand (changes resulting from the Canterbury Earthquakes)

Dr Larry Bellamy
Manager Engineering Design and Science
IRCC Workshop Malmo, 4 June 2014



Canterbury Earthquakes – Observations about Structural Performance

- Structural performance of modern buildings generally acceptable – damage but not collapse
- Geotechnical performance less acceptable – many building failures due to soil liquefaction
- Low number of fatalities (185) given level of seismic loading – notably no deaths in houses
- Catastrophic behaviour of the CTV (115 deaths) and Pyne Gould Corporation (18 deaths) buildings subject of a Royal Commission of Inquiry



Photos from K Berryman

Royal Commission of Inquiry into Building Failure into Building Failure Caused by the Canterbury Earthquakes



CTV building collapse



Royal Commission of Inquiry Recommendations

Recommendations include:

- *Geotechnical site reports and foundation design details should be kept on each property file by the territorial authority and made available for neighbouring site assessments by geotechnical engineers*
- *Building consent applications for:*
 - *buildings in importance levels 3, 4 and 5 in Table 3.2 of AS/NZS 1170.0:2002*
 - *commercial buildings comprising three or more storeys*
 - *residential buildings comprising three or more storeys with three or more household units**should be accompanied by a Structural Design Features Report, which describes the key elements of the design, including the foundations and gravity and lateral load resisting elements*
- *A structural Chartered Professional Engineer should be engaged at the same time as the architect for the design of a complex building*



Royal Commission of Inquiry Recommendations

Recommendations include:

- *After consideration of the Structural Design Features Report, the building consent authority should decide whether or not the structure should be regarded as complex*
- *On receipt of the building consent application, the building consent authority should decide:*
 - *whether it has the staff with the appropriate competency (qualifications and experience) to process the application in-house (including any decision as to whether the structure is complex and whether any additional peer review certified by a Recognised Structural Engineer should be required); or*
 - *whether it needs to refer the application to another building consent authority that has the staff with the appropriate competency (qualifications and experience) to process the application.*

	Fire	Structural
How are building code requirements verified?	<p>Prescriptive approach - Acceptable Solution C/AS1-7 for different risk classes of building</p> <p>Modelling approach – Verification Method C/VM2</p> <p>Alternative Solution – calculations, tests, simulations, performance history, etc</p>	<p>Prescriptive approach - Acceptable Solution B1/AS1-4 (Standards for various materials)</p> <p>Modelling approach – Verification Method B1/VM1-4 (Standards for various materials)</p> <p>Alternative Solution – calculations, tests, simulations, history of performance, etc</p>
Who verifies requirements are met?	<p>Local Building Control Authority (BCA) issues consents</p> <ul style="list-style-type: none"> - simple designs assessed by BCA - complex designs assessed by BCA and peer-reviewed by: (1) 2nd fire engineer (engaged by client) and in some cases; (2) the NZ Fire Service (e.g. public and complex commercial buildings) 	<p>Local Building Control Authority (BCA) issues consents</p> <ul style="list-style-type: none"> - simple designs assessed by BCA - complex designs assessed by BCA and peer-reviewed by second structural engineer (typically engaged by client)
What design documents are required by Building Control Authorities?	<p>Drawings, calculations, literature, producer statements (non-mandatory), Certificate of Design Work (for restricted building work), etc</p> <p>IPENZ Practice Note 22 <i>Guidelines for Documenting Fire Safety Designs</i> – a non-mandatory guideline that is under review</p>	<p>Drawings, calculations, literature, producer statements (non-mandatory), Certificate of Design Work (for restricted building work), Design Features Report (non-mandatory), etc</p> <p>Documents and records to be kept by the designer, project manager and BCA</p>



	Fire	Structural
When are documents presented to a Building Control Authority?	<p>Before construction commences</p> <p>When consent application is applied for Acceptable Solution designs</p> <p>Fire Engineering Brief documents at concept design stage for C/VM2 and Acceptable Solution designs</p>	<p>Before construction of the whole building commences, or before the next stage commences for staged construction.</p>
What qualifications do designers require?	<p>Acceptable Solutions used by anyone</p> <p>Verification Method may only be used by competent fire modellers</p> <p>BCA's typically require Chartered Professional Engineers (CPEng (Fire)) to undertake Verification Method and Alternative Solution designs</p> <p>CPEng (Fire) available to suitably-experienced holders of a Washington Accord accredited degree in fire engineering or equivalent standing</p>	<p>Acceptable Solutions used by anyone</p> <p>Verification Methods may only be used by competent structural designers</p> <p>BCA's typically require Chartered Professional Engineers (CPEng (Structural)) to undertake Verification Method and Alternative Solution designs</p> <p>CPEng (Structural) available to suitably-experienced holders of a Washington Accord accredited degree in fire engineering or equivalent standing</p>
Are there national or regional registers of approved designers?	<p>Some BCA's hold registers of approved designers for Verification Method and Alternative Solution designs</p>	<p>Some BCA's hold registers of approved designers for Verification Method and Alternative Solution designs</p>

