



Submission by:
Steel Construction New Zealand Inc.

To:
Canterbury Earthquakes Royal Commission

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About Steel Construction New Zealand

Steel Construction New Zealand (SCNZ) aims to advance the interests of New Zealand's diverse steel construction industry by promoting the benefits of structural steel solutions in building and infrastructure projects. Members include manufacturers of structural steel and steel products, distributors, fabricators, designers, detailers, galvanisers, and paint and building supply companies.

SCNZ provides its members with technical advice on the latest in steel design trends and standards, networking opportunities and a representative voice with key industry and government decision-makers.

In recent years, the steel construction industry through the NZ Heavy Research Association (HERA) and the Government have together funded research into existing and new low-damage, seismic-resisting structural steel systems. This important and innovative work has resulted in the seismic design provisions in the Steel Structures Standard which, in testing, has produced excellent seismic performance.

SCNZ Manager Alistair Fussell represents the structural steel industry on the Steel Structures Standard.

For more information about SCNZ please visit our website www.scnz.org

Executive summary

SCNZ welcomes the recent publication of the Royal Commission's Interim Report and congratulates the Royal Commission on progress made to date. However, we are of the opinion that the Interim Report lacks balance, as evidenced by the conspicuous absence of structural steel building solutions.

This is despite representation on Royal Commission technical panels, and the obvious strong performance of steel-framed buildings in the Christchurch CBD during the Canterbury earthquakes – the prime example being the 12-storey HSBC Tower at 62 Worcester Boulevard. Tenants began returning to the building in May 2011 and it was fully re-tenanted in July. Notably, CERA has chosen to lease space in this building.

Without greater balance in its discussion and assessment of various building materials, it is SCNZ's view that there is considerable risk that the Royal Commission will not be able to adequately inform decision-makers of best-practice solutions for the rebuild and repair of Christchurch's (and Canterbury's) buildings and infrastructure.

There are three core issues addressed in this submission:

1. *Low-damage seismic-resisting structural steel technology*
2. *Strong performance of structural steel buildings during the Christchurch earthquakes*
3. *Royal Commission expert panel – proposed inclusion of Associate Professor of Civil Engineering Charles Clifton of the University of Auckland*

SCNZ requests that its concerns and recommendations be heard in person by the Royal Commission, and detailed in the Royal Commission's final report.

Introduction

We would like to thank the Hon. Justice Cooper for this opportunity to offer our comments on the Canterbury Earthquakes Royal Commission Interim Report.

SCNZ, representing New Zealand's structural steel industry, looks forward to playing its part in helping a new Christchurch emerge from the devastating earthquakes of the past year. Because of its seismic-resisting qualities in particular, we believe structural steel has a crucial role to play in the reconstruction of the inner city's built fabric. As such, we seek a level playing field where the technical and economic merits of structural steel can be compared to other materials, such as concrete and timber.

However, recent comments included in the Interim Report do not appear to be based on a level playing field. It is our opinion that, in its current state, the recommendations are heavily biased in favour of timber solutions, and structural steel technology has been largely overlooked.

To maintain the status quo in the final report would be to fail the Royal Commission's aim to inform decision-makers on best-practice rebuild and repair work.

We understand the Royal Commission is only part way through its inquiry process. As such, SCNZ anticipates that the issues we raise in this submission will receive full consideration for inclusion in the final report.

Comment on the Canterbury Earthquakes Royal Commission Interim Report

This section discusses the three core issues behind SCNZ's submission:

1. *Low-damage seismic-resisting structural steel technology*
2. *Strong performance of structural steel buildings during the Christchurch earthquakes*
3. *Royal Commission expert panel – proposed inclusion of Associate Professor of Civil Engineering Charles Clifton of the University of Auckland*

1. Low-damage seismic-resisting structural steel technology

Section 3.5 New Technologies in the Interim Report lacks material neutrality.

Section 3.5, no doubt, draws heavily upon the paper by various University of Canterbury academics, including Associate Professor Gregory MacRae. There is, however, no discussion of the latest low-damage seismic-resisting structural steel technology – other than a negative reference in the last paragraph of page 42 (“This appears to be less of a problem for timber than for structural concrete or structural steel.”)

The Interim Report presents PreSSS, a concrete and timber example of low-damage technology.

Page 42, in relation to timber PreSSS technology, states: “This technology has much to recommend it. It is technology developed in New Zealand, which uses a renewable New Zealand resource and is an environmentally friendly method of construction.”

This statement makes the absence of structural steel technology even more surprising: it, too, is home-grown technology, developed using government and industry funding by the Heavy Engineering Research Association (HERA). An established local supply chain designs, manufactures and delivers steel components to exact specifications.

The first low-damage seismic-resisting building in New Zealand was a steel-framed building and, since 2005, approximately \$3 billion of new buildings have been constructed utilising this technology. The technical innovation involved was recognised with a prestigious international award for the Te Puni village project, providing student accommodation at Victoria University of Wellington.

Section 3.5 New Technologies quite simply does not reflect the full contents of the key reference paper *Base Isolation and Damage-Resistant Technologies for Improved Seismic performance of Buildings: Technical Report* by Professors Des Bull, Rajesh P Dharkal, Gregory MacRae and Stefano Pampanin, (particularly *Section 8: Damage Resistant Design of Steel Structures*, which represents 22 pages of a 93 page report). Please refer to Appendix 2.

The apparent endorsement of one particular system, particularly its environmental credentials, in SCNZ's view is inappropriate for a Royal Commission whose Terms of Reference relate primarily to seismic performance.

2. Strong performance of structural steel buildings during the Christchurch earthquakes

The Terms of Reference for the Royal Commission state that it is desirable to inquire into the building failures in the Christchurch City CBD to establish "why certain buildings failed severely while others failed less severely or there was no readily perceptible failure".

In our opinion the Interim Report does not properly reflect these Terms of Reference: it does not discuss why certain buildings suffered "no readily perceivable failure"; as part of this, there is no recognition of the seismic performance of structural steel buildings which, overall, performed very well.

In our view, this issue should be addressed in *Section 3.5* of the Report, *New Building Technologies*.

Notably, buildings with eccentrically braced steel frames (EBFs), cast integrally with composite metal deck slabs, performed very well. This is covered in the technical

paper *Steel Building Damage from the Christchurch Earthquake Series of 2010 and 2011*, by Charles Clifton, Michel Bruneau, Alistair Fussell, Roberto Leon and Greg MacRae (currently published on the Royal Commission website's Document Library under 'All Documents'). Please refer to Appendix 1.

The HSBC Tower, a 12-storey steel-framed building with composite floors and EBFs, is a case in point. It was the first multi-storey building in Christchurch to be fully reoccupied. Built in 2009, it required no structural repair following the earthquake and was fully re-tenanted in July of this year. We suspect that it is no coincidence that CERA has chosen to lease space in this building.

The 22-storey Pacific Tower performed almost as well, with just one active link requiring replacement, work which was successfully undertaken in October 2011. This demonstrates both the resilience and economic value of steel-framed buildings – damaged components can be quickly and simply removed and replaced, meaning tenants can be back in their buildings paying rent faster than might otherwise be possible with buildings of alternative construction materials and methods.

3. Royal Commission expert panel – proposed inclusion of Associate Professor of Civil Engineering Charles Clifton of the University of Auckland

We would like to take this opportunity to propose that Associate Professor of Civil Engineering Charles Clifton be included on the Royal Commission's panel of expert advisers, as per Appendix 2 of the Interim Report. He is a leading authority in the field of structural steel in New Zealand. His experience includes:

- Leading the development of new structural steel design solutions for earthquake, fire and general performance since 1983, including being the principal contributor to *HERA Report R4-76*, which sets out the procedure for seismic design of steel structures, since 1994
- Chairman of the Steel Structures Standard committee from 1989-2007, including writing the first draft of *Section 12: Seismic Design*, and also a significant contributor to the Loadings Standard
- Developer of two new seismic resisting systems for structural steel, which are in increasing use in New Zealand, as described above

- Co-author of *Review of New Zealand Building Codes of Practice* and has peer-reviewed the steel section of the report "*Structural Design for Earthquake Resistance*"
- Provided expert advice to the Engineering Advisory Group and to individual consulting engineers on steel-framed building and reinforced concrete building performance (the latter relating to rebar performance)
- Currently providing formal advice to Clark Hyland of Hyland Consultants on the CTV building collapse

Ends

Appendix 1

[provide technical paper *Steel Building Damage from the Christchurch Earthquake Series of 2010 and 2011*]

Appendix 2

[provide *Section 8: Damage Resistant Design of Steel Structures*, of key reference paper]