

In the matter of the Commissions of Inquiry Act 1908

And

In the matter of the Canterbury Earthquakes Royal Commission

**Submissions of Holmes Consulting Group in relation to
Pyne Gould Corporation building hearing**

Date: 21 December 2011



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Submissions of Holmes Consulting Group in relation to Pyne Gould Corporation building hearing

Introduction

- 1 These submissions are intended as a very brief note outlining the key features of the evidence of the Holmes witnesses, Messrs Whiteside, Boys and Hare, and associated evidence of other witnesses. Holmes Consulting Group (**HCG**) has not undertaken a general analysis and response to all expert evidence and reports presented. It has considered the BECA report (BUI.CAM233.0051.1; 'Investigation into the collapse of the Pyne Gould Corporation building on 22 February 2011') (**Beca Report**) and accepts the conclusions in that report.

Building as originally designed

- 2 HCG agrees that the building appears to have complied generally with the design standards and practices of 1963, as supported by the Beca Report.
- 3 It appears to be common ground (among other evidence from both the Stage 1 Expert Panel report 30 September 2011 (BUI.VAR.0017.1) and from the observations of Mr WT Holmes in his 2 November 2011 report (ENG.RUT.003.1) that the PGC building was overwhelmed by the exceptional demands of the 22 February 2011 earthquake event, which far exceeded the capacity to which the building was originally designed, and indeed also overwhelmed many 'modern buildings' as evidenced by the large number of buildings of all decades of construction that are now being demolished.

The 1997 'Seismic Evaluation of Existing Building', and subsequent strengthening work

- 4 HCG correctly identified in its 'Seismic Evaluation' report (**the 1997 Report**) produced for the owner of the building (BUI.CAM.0026.1) that firstly the building was not earthquake prone relative to the code of the day and that secondly the gravity columns were unlikely to have sufficient capacity to resist the lateral drifts imposed as the wall capacity was

approached. It recommended that the owners install secondary supports to the columns as a minimum, even though this was not legally required as the PGC Building was not earthquake prone as defined at the time. Strengthening of the shear walls was discussed at the time with the architect. The owner elected to proceed with the column strengthening work only, to enhance the performance of the building to around 40-50% of the performance of a new building designed to the applicable version of NZS4203 in 1997 and to decrease the column vulnerability to a similar level to that which existed with the unstrengthened shear walls..

- 5 HCG also correctly identified that there could be shear wall cracking at relatively low loads when compared to NZS4203 at the time, but that while this would lead to permanent damage (again at the appropriate NZS4203 loading for the building), the consequences would not be as severe as column failure. Professor Priestley in his evidence accepted that HCG had correctly identified in the 1997 Report that shear wall damage in an event of the magnitude modelled in 1997 would be focussed at first floor level.
- 6 At TRANS.20111205.105 Professor Priestly commented on the HCG analysis and, in response to Mr Hare's evidence, noted that the 1997 Report had identified that inelastic action would occur at level 1. (Mr Hare's evidence is at TRANS.20111205.9.) Professor Priestley's evidence notes that methods for modelling have 'moved on a bit since that' and I submit that his evidence does not amount to any criticism of the HCG 1997 analysis but a consideration of how knowledge has moved on since.

2007 review and subsequent work

- 7 Design work was done by HCG for the building owner in 2007 relating to the expansion options for the PGC Building. It was not suggested by any evidence that that work was inappropriate or inadequate or that it can be regarded as having contributed in any way to the failure of the building.

Was the building earthquake prone after these works?

- 8 HCG's evidence on the 1997 analysis work was that the building was not earthquake prone at the time of the completion of the report, however there were 2 critical vulnerabilities that would need to be addressed if considering expansion – the columns and the shear walls at level 1, with the columns being the most vulnerable, if the gravity load were to be significantly increased. The owner was presented with options to address this along with the expansion of the building. However, as the expansion plans were shelved, there was no obligation to address these issues as the building was not earthquake prone.
- 9 The secondary columns had been installed to provide backup support in the event of failure of the original columns, but were not intended to provide additional strength, nor to provide support to the building as a whole in the event of the wall capacity being exceeded. The Beca report states that prior to September 2010 the building achieved approximately 30 - 40% of NBS. The sad reality is that the building was overwhelmed by the 22 February earthquake event, which was of a magnitude that the NBS percentage to which it had been strengthened had never been designed to withstand.

Inspections after 4 September 2010

Instructions for the inspections

- 10 HCG met with Harcourts (Mr Buchanan/Mr Seville) and concluded a 'Short Form Conditions of Engagement' (BUI.CAM233.0054.18 and .19) under which it agreed to carry out:

10.1 'initial earthquake inspection'

10.2 'securing measures as considered necessary'

for the buildings in Harcourts' portfolio.

- 11 Although at one point in the hearing it seemed there might be some disagreement between Harcourts' witnesses (notably Mr Buchanan) and

HCG on the scope of inspections that were envisaged, in the end there was agreement that the inspections were intended as 'initial' or 'Rapid Assessment - Level 2' assessments (once the 'Level 2' language came into use).

- 12 In particular, there was confirmation both through HCG's witnesses and from Mr Buchanan and from Louise Sutherland (TRANS.20111129.129 and .131) that there would be initial inspections which were understood as 'Level 2 Assessments' and that if after those inspections HCG thought it was necessary HCG would call for more detailed and possibly invasive investigations. It also was envisaged that at a later stage (refer the email from Ms Sutherland to Mr West 30 September 2010: WIT.MAM.0001.28) there would be a further detailed investigation of what repairs were required and a consultant or a project manager would be appointed to do that at the appropriate time.
- 13 A notable piece of evidence as to the task which the inspecting engineers believed they were to carry out (based in part on briefings from Council - refer Mr Hare's evidence (TRANS.2011205.4 - .5)) was the required 'Statement by Chartered Professional Engineer in respect of the building at: ...' (BUI.CAM233.0198). Mr Hare gave evidence (TRANS.2011205.7) that this was issued by the Christchurch City Council and was a statement required by a Chartered Professional Engineer where red or yellow tags were being removed. The engineer was to certify that he/she was 'satisfied on reasonable grounds that ... where the structural integrity and/or structural performance of the building ... was materially affected by the Darfield earthquake or any aftershocks ... interim securing measures have been taken to restore the structural integrity and performance of the building to at least the condition that existed prior the earthquake of 4 September 2010'.
- 14 This accorded with what the inspecting engineers, based on their understanding of their professional responsibilities, conceived their task to be. This approach was supported by Mr Jury at TRANS.2011205.78 and .79 where he made observations about what the engineering profession believed they were doing noting that '... what was being done in those days following the main earthquake shock and also the

subsequent aftershocks was really to try and establish whether the building's condition had seriously changed to the point that in any further shaking that it might be detrimentally affected'.

Inspection 7 September 2010

- 15 Mr Whiteside inspected at a very early phase, 7 September 2010. He noted some damage including some cracks on the first floor shear wall but he concluded the building was not under immediate distress and did not have any significant impaired resistance to earthquake shaking.

Inspection 16 September 2010

- 16 Mr Boys subsequently inspected on 16 September 2010. This inspection was documented with a full 'Rapid Assessment Form - Level 2'. He inspected all accessible key structural elements on the ground and first floors, and also the central core walls and perimeter frames on levels 2 to 4. He took photographs. He recorded crack size using an appropriate gauge. He reached the same conclusions as Mr Whiteside.

Inspections 15 October 2010 and 20 January 2011

- 17 Mr Whiteside then inspected on two further occasions. The 15 October inspection was to look at specific items of damage reported by tenants (a gap around a ground floor window, and, while there, a crack on level 2). The 20 January inspection was due to tenants reporting new cracks. On that occasion he inspected the level 1 shear wall and the level 1 stair connection. Again he concluded that the building did not have any significant impaired resistance to earthquake shaking relative to that which it had prior to the 4 September 2010 earthquake.

Level 1 horizontal crack

- 18 Mr West gave evidence of reports by Perpetual staff that there was a hairline horizontal crack extending around portions of shear wall or 'toilet block' at level 1 approximately 1.5m from ground level (TRANS.2011129.61, 66 and 67). HCG's witnesses did not record a hairline crack of this extent and there does not appear to be evidence of this in the photographs. Mr Boys specifically said that he did not recall

seeing a crack that extended around the shear core in this manner (TRANS.20111130.68 and 71) though he did see a shorter crack that "seemed to dissipate very quickly".

Expectation of detailed assessment if required

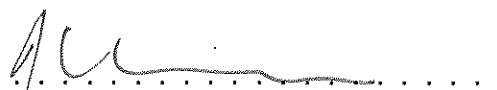
- 19 It is clear from the evidence of both the HCG and Harcourts' witnesses that three matters would have triggered a more detailed assessment of the building, including potentially more invasive inspections and review of structural plans and previous reports:
- 19.1 if HCG had concluded the damage observed was such that a more detailed investigation was required to determine whether the building continued to have adequate capacity relative to what it had the day before the 4 September 2010 earthquake,
- 19.2 if the structure of the building had not been able to be viewed and understood readily by the engineers completing the inspections. This would have prompted either backup review from another engineer, or would have triggered an escalation of the level of review;
- 19.3 if the owner or Harcourts on its behalf had specifically requested a detailed seismic evaluation.
- 20 A detailed assessment would in any case have been required before completing documentation of any repairs.

Generally

- 21 HCG's engineers diligently and responsibly carried out the tasks they understood they were required to undertake by the owner's/Harcourts' expectations as expressed to them, by the Council's expectations, and by their professional obligations as called for by the situation that presented to them. Evidence given by HCG witnesses will have demonstrated to the Commission that, where necessary, HCG engineers would change a green placarded building to a yellow placard and would call for more detailed inspections where they considered this was required.

22 HCG wishes and expects to contribute constructively to the rebuilding of Christchurch and the development and deployment of improvements to New Zealand's systems and practices for dealing with the earthquake resilience issues of older buildings.

Date: 21 December 2011

A handwritten signature in black ink, appearing to read 'JG Hannan', written over a horizontal dotted line.

JG Hannan

Counsel for Holmes Consulting Group