



CHRISTCHURCH CATHEDRAL

CURRENT STATUS

PREPARED FOR

CHURCH PROPERTY TRUSTEES
&
RESOURCE CO-ORDINATION PARTNERSHIP LTD

FEBRUARY 13TH, 2014

EXECUTIVE SUMMARY

Holmes Consulting Group has been engaged by Church Property Trustees to complete a further review of the Cathedral. The purpose of the review has been to update the current condition status of the building, to review our assessment of the building capacity and to review site and building security.

A rapid external visual survey has been completed on site, noting that there have been no significant earthquakes since the last survey in January 2013. No significant further shaking damage was noted, but there is continued degradation due to weather and infestation.

A formal quantitative evaluation of the residual building capacity cannot practically be completed for the building, as the aggregated damage over the Canterbury earthquake sequence has left many significant elements in an unstable condition. If further damaging earthquakes or partial deconstruction was to occur, there is not one section of the remaining original building that is undamaged and which could be considered a stable element in its own right. Shoring and stabilisation would be required for any practical configuration of partial retention that may be considered.

Our evaluation of the building capacity is therefore that it has significantly less than 33%NBS in its current form. For example, the building would now be unlikely to survive an earthquake of the strength and duration of the September 2010 Darfield earthquake, without partial or even full collapse, even though it caused relatively little damage at the time.

The site is currently secured with locked wire mesh fencing and a combination of shipping containers and purpose designed barriers at the east end to prevent debris scatter over the road. None of these is intended to be permanent and so future consenting of these may be considered at some stage. The fence may not offer satisfactory security in this event, so specialist security advice may be required.

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INTRODUCTION

Holmes Consulting Group LP has been engaged by Church Property Trustees to review and summarise the current status of the cathedral and surrounds. The purpose of this review is:

1. To re-evaluate the condition of the building, given the passage of time since the last review
2. To review our assessment of the residual capacity of the cathedral in its current condition
3. To assess the safety of the site in general

SCOPE OF WORK

The scope of work for this project included the following:

1. Visit the site to perform an external visual survey of the building
2. Review the damage observations against prior records to assess any change in condition.
3. Review past reports and evaluations to derive an estimate of capacity in its current condition.
4. Review current temporary stabilisation, support and protection in respect to current security and access.
5. Report on our findings and recommendations.

LIMITATIONS

Findings presented as a part of this project are for the sole use of Church Property Trustees in its evaluation of the subject properties. The findings are not intended for use by other parties, and may not contain sufficient information for the purposes of other parties or other uses. Our professional services are performed using a degree of care and skill normally exercised, under similar circumstances, by reputable consultants practicing in this field at this time. No other warranty, expressed or implied, is made as to the professional advice presented in this report.



CURRENT CONDITION

The site was revisited on the afternoon February 3rd 2014 by John Hare and Logan Taylor of Holmes Consulting Group. This was the first visit since January 14th, 2013, when a comprehensive update of the earlier damage reports was carried out.

This visit was not a complete damage evaluation. Instead, a general walk around and a review of key indicators was completed for comparison to the earlier records.

Since January 2013, there have been no significant aftershocks, with the last magnitude 5+ earthquake (regarded to be the level of local earthquake above which significant damage is likely) in the region having occurred on May 25, 2012. Therefore little significant new shaking damage was expected.

This review has confirmed that there is almost no new damage. Only two areas of minor change were observed:

1. Some more glass has fallen from a leadlight window to the east of the organ loft. This may have been the outcome of further shaking or may easily have resulted from wind.
2. A small amount of rubble has fallen from a cracked area on the south transept wall – see Figures 1 and 2 below



Figure 1: South transept wall, January 14, 2013



Figure 2: South transept wall, February 3, 2014

While there is no evidence of significant increased movement attributable to earthquake, there is increased general deterioration due to the effects of weathering and general infestation by both animals (particularly pigeons) and plant growth. Although no internal inspection was possible, it may be inferred that there will be significant quantities of pigeon droppings present. This will accelerate deterioration and is a health hazard.

BUILDING EVALUATION

No formal structural capacity evaluation of the building in its damaged state has been completed. This is principally because the building in its current substantially 'failed' condition cannot be considered to have reliable strength and stiffness properties which allow reliable analysis.

Areas of significant damage that potentially compromise the building's residual capacity include:

1. The tower – now demolished to a safe level.
2. The west wall and porch. The entire west wall above the level of the side aisles has collapsed, and the porch has been severely compromised, with parts of the northern end leaning against the adjacent containers.
3. The north side aisle from the west wall to the north entry porch has lost the roof (with the tower collapse) and seismic bracing.



4. The south side aisle has significant diagonal cracking to the piers with some partial collapse of the buttresses.
5. The south transept wall has sliding failures with displacements estimated to be in excess of 50mm.
6. The north wall of the apse has significant cracking to the piers with an offset in on pier in excess of 50mm in-plane and out-of-plane.
7. The interior columns supporting the nave (when last seen) exhibited significant fretting and damage at top and bottom, as do the four main columns at the crossing.

The partial strengthening systems that were inserted in the 2000's have been effective in preventing a more catastrophic collapse of the building. However, the remaining load paths tying the destabilised elements together and to these strengthening elements are severely compromised. Hence although there are isolated elements of the building with significant reliable capacity, the lack of remaining integration of the building means there is no significant area of the main building that can be considered stable in its own right. The exception to this may be the 1960 additions, which may have sufficient stability as a stand-alone structure, although they are currently vulnerable to damage from falling masonry in the event of failure of the structure above them.

Selective deconstruction of areas (such as the nave and side aisles, as far as the line of the transepts) will not result in a stable residual structure without the addition of substantial strengthening elements.

The building in its current condition may be considered to have a capacity which is likely to be significantly less than 33%NBS. More critically, in comparing records from in the days after the February 22nd 2011 earthquake to records from the June 2011 and December 2011 earthquakes, it is apparent that the building is progressively weakened with more shaking. This both reduces its overall capacity and decreases the threshold levels of shaking which will cause further damage, that is, it is deteriorating at an increasing rate.

A scenario that may be considered is an event of similar scale to the Darfield earthquake of September 4th 2010. This caused relatively little damage to the Cathedral at the time. We consider that another earthquake of that duration could possibly cause significant damage including collapse of parts of the building. Collapse of all or part of the nave in such an event is likely. It is further likely that significant damage or even partial collapse could occur in the transepts and parts of the apse. Full collapse of the building in such an event is possible.



SITE ACCESS AND SECURITY CONSIDERATIONS

The site is completely fenced although there is evidence that unauthorised access has occurred. Shipping containers (water filled) were erected around the east end of the site (from the transepts) to contain any falling scaffolding. This was subsequently replaced with a specifically designed steel and timber barrier wall in order to allow the trams to pass by.

As long as the shipping containers and the steel and timber barrier wall remain in place, there is reasonable protection offered to passing traffic. However, it should be noted that neither was intended to be a permanent installation. If they were to remain indefinitely, they could in theory all be required to have a Building Consent.

The security fencing is generally simple wire mesh interlocking barriers. Although locked, this may not be sufficient to provide long-term security, particularly with 24 hour public access to Cathedral Square. Specialist security advice may be required for a more permanent solution.



CONCLUSIONS & RECOMMENDATIONS

Our conclusions and recommendations are as follows:

1. There is no significant damage observed since the last review (in January 2013), but there is evidence of ongoing deterioration due to infestation and weather.
2. If the building is to remain in its current condition for an indefinite length of time, the security barriers and barrier systems may need to be formally consented. If so, consideration should be given to the required loading and durability requirements that must be complied with.
3. In addition, if even partial retention of the building is to be considered, significant consideration must be given firstly to the extent of temporary stabilisation that must be undertaken, and secondly, to the safe means of installation. Note that there is little value in attempting quantitative analysis of the residual capacity of the damaged structure, due to the spread and severity of the damage; and there is no area of the main part of the building that would be stable in its own right, ie partial deconstruction of the nave back to say, the transepts, will not reduce the collapse hazard to a satisfactory level without the addition of temporary significant shoring and bracing

Report Prepared by:

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