Christchurch City Council

BU 3569-005 EQ2
Governors Bay Pottery Shed
Main Road, Governors Bay

QUANTITATIVE ASSESSMENT REPORT

FINAL

- Rev B
- 04 March 2013

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Contents

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1. Executive Summary

1.1. Background

A Quantitative Assessment was carried out on the Governors Bay Pottery Shed located at Main Road, Governors Bay. The building is a masonry structure with a timber framed addition. An aerial photograph showing the location of the building is shown in figure 1. Detailed descriptions outlining the buildings age and construction type is given in Section 5 of this report.

Figure 1 Aerial Photograph of Governors Bay Pottery Shed

This Quantitative report for the building structure is based on the Engineering Advisory Group's "Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings" (draft) July 2011, visual inspections on 6th December 2012, 10th January 2013, and intrusive investigations 16th January 2013.

1.2. Key Damage Observed

Key damage observed includes: -

- 0.3mm - 1mm cracks through masonry at the joints and through the masonry block

Refer to the section 5 of this report for details of the damage discovered

1.3. Critical Structural Weaknesses

The following potential critical structural weaknesses have been identified.

- Unreinforced and unfilled masonry

1.4. Indicative Building Strength

As described in the Engineering Advisory Group's "Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings" (draft) July 2011, we have assessed the capacity of the building as a percentage new building standard seismic resistance using the quantitative method. Our assessment included consideration of geotechnical conditions, existing earthquake damage to the building and structural engineering calculations to assess both strength and ductility/resilience.

The assessments were based on the following:

- On-site investigation to assess the extent of existing earthquake damage including limited intrusive investigation.
- Qualitative assessment of critical structural weaknesses (CSWs) based on review of available structural drawings and inspection where drawings were not available.
- No intrusive geotechnical investigation has been undertaken. We have based this report on the desktop geotechnical investigation.
- Assessment of the strength of the existing structures taking account of the current condition.

Any building that is found to have a seismic capacity less than 33% of the New Building Standard (NBS) is required to be strengthened up to a capacity of at least 67%NBS in order to comply with Christchurch City Council (CCC) policy - Earthquake-prone dangerous & insanitary buildings policy 2010.

Based on the information available, and using the Quantitative Assessment Procedure, the buildings original capacity has been assessed to be in the order of 20%NBS and post earthquake capacity in the order of 17%NBS.

The building has been assessed to have a seismic capacity in the order of 17% NBS and is therefore potentially earthquake prone.

Please note that structural strengthening is required by law for buildings that are confirmed to have a seismic capacity of less than 33% NBS.

1.5. Recommendations

Based on the findings of this assessment indicating the building is in the order of 17%NBS, strengthening is required in order to comply with Christchurch City Council (CCC) policy – Earthquake-prone dangerous & insanitary buildings policy 2010.

It is recommended that:

a) The building is unsafe to occupy on the basis of the damage to the unreinforced and unfilled masonry walls. Controlled access for the purposes of damage assessment, making safe, and demolition is allowed.

b) The boarding restricting internal access inside the building is to remain and we consider that barriers around the building are not necessary.

c) Options to bring the building to a target of 67% are investigated.

2. Introduction

Sinclair Knight Merz was engaged by Christchurch City Council to carry out a Quantitative Assessment of the seismic performance of Governors Bay Pottery Shed located at Main Road, Governors Bay.

The scope of this quantitative analysis includes the following:

- Analysis of the seismic load carrying capacity of the building compared with current seismic loading requirements or New Buildings Standard (NBS). It should be noted that this analysis considers the building in its damaged state where appropriate.
- Identify any critical structural weaknesses which may exist in the building and include these in the assessed %NBS of the structure.
- Preparation of a summary report outlining the areas of concern in the building

The recommendations from the Engineering Advisory Group[1] were followed to assess the likely performance of the structures in a seismic event relative to the New Building Standard (NBS). 100% NBS is equivalent to the strength of a building that fully complies with current codes. This includes a recent increase of the Christchurch seismic hazard factor from 0.22 to 0.3[2].

At the time of this report, an intrusive site investigation had been carried out. Construction drawings were not made available; our evaluation of the building is based on visual observations and site measurements.

[1] EAG 2011, *Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury - Draft*, p 10
[2] http://www.dbh.govt.nz/seismicity-info

3. Compliance

This section contains a brief summary of the requirements of the various statutes and authorities that control activities in relation to buildings in Christchurch at present.

3.1. Canterbury Earthquake Recovery Authority (CERA)

CERA was established on 28 March 2011 to take control of the recovery of Christchurch using powers established by the Canterbury Earthquake Recovery Act enacted on 18 April 2011. This act gives the Chief Executive Officer of CERA wide powers in relation to building safety, demolition and repair. Two relevant sections are:

Section 38 – Works

This section outlines a process in which the chief executive can give notice that a building is to be demolished and if the owner does not carry out the demolition, the chief executive can commission the demolition and recover the costs from the owner or by placing a charge on the owners' land.

Section 51 – Requiring Structural Survey

This section enables the chief executive to require a building owner, insurer or mortgagee carry out a full structural survey before the building is re-occupied.

We understand that CERA will require a detailed engineering evaluation to be carried out for all buildings (other than those exempt from the Earthquake Prone Building definition in the Building Act). It is anticipated that CERA will adopt the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011. This document sets out a methodology for both qualitative and quantitative assessments.

The qualitative assessment is a desk-top and site inspection assessment. It is based on a thorough visual inspection of the building coupled with a review of available documentation such as drawings and specifications. The quantitative assessment involves analytical calculation of the buildings strength and may require non-destructive or destructive material testing, geotechnical testing and intrusive investigation.

It is anticipated that factors determining the extent of evaluation and strengthening level required will include:

- The importance level and occupancy of the building
- The placard status and amount of damage
- The age and structural type of the building

- Consideration of any critical structural weaknesses
- The extent of any earthquake damage

3.2. Building Act

Several sections of the Building Act are relevant when considering structural requirements:

3.2.1. Section 112 – Alterations

This section requires that an existing building complies with the relevant sections of the Building Code to at least the extent that it did prior to any alteration. This effectively means that a building cannot be weakened as a result of an alteration (including partial demolition).

3.2.2. Section 115 – Change of Use

This section requires that the territorial authority (in this case Christchurch City Council (CCC)) be satisfied that the building with a new use complies with the relevant sections of the Building Code 'as near as is reasonably practicable'. Regarding seismic capacity 'as near as reasonably practicable' has previously been interpreted by CCC as achieving a minimum of 67%NBS however where practical achieving 100%NBS is desirable. The New Zealand Society for Earthquake Engineering (NZSEE) recommend a minimum of 67%NBS.

3.2.3. Section 121 – Dangerous Buildings

The definition of dangerous building in the Act was extended by the Canterbury Earthquake (Building Act) Order 2010, and it now defines a building as dangerous if:

- in the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause injury or death or damage to other property; or
- in the event of fire, injury or death to any persons in the building or on other property is likely because of fire hazard or the occupancy of the building; or
- there is a risk that the building could collapse or otherwise cause injury or death as a result of earthquake shaking that is less than a 'moderate earthquake' (refer to Section 122 below); or
- there is a risk that that other property could collapse or otherwise cause injury or death; or
- a territorial authority has not been able to undertake an inspection to determine whether the building is dangerous.

3.2.4. Section 122 – Earthquake Prone Buildings

This section defines a building as earthquake prone if its ultimate capacity would be exceeded in a 'moderate earthquake' and it would be likely to collapse causing injury or death, or damage to other property. A moderate earthquake is defined by the building regulations as one that would generate ground shaking 33% of the shaking used to design an equivalent new building.

3.2.5. Section 124 – Powers of Territorial Authorities

This section gives the territorial authority the power to require strengthening work within specified timeframes or to close and prevent occupancy to any building defined as dangerous or earthquake prone.

3.2.6. Section 131 – Earthquake Prone Building Policy

This section requires the territorial authority to adopt a specific policy for earthquake prone, dangerous and insanitary buildings.

3.3. Christchurch City Council Policy

Christchurch City Council adopted their Earthquake Prone, Dangerous and Insanitary Building Policy in 2006. This policy was amended immediately following the Darfield Earthquake of the 4^{th} September 2010.

The 2010 amendment includes the following:

- A process for identifying, categorising and prioritising Earthquake Prone Buildings, commencing on 1 July 2012;
- A strengthening target level of 67% of a new building for buildings that are Earthquake Prone. Council recognises that it may not be practicable for some repairs to meet that target. The council will work closely with building owners to achieve sensible, safe outcomes;
- A timeframe of 15-30 years for Earthquake Prone Buildings to be strengthened; and,
- Repair works for buildings damaged by earthquakes will be required to comply with the above.

The council has stated their willingness to consider retrofit proposals on a case by case basis, considering the economic impact of such a retrofit.

We anticipate that any building with a capacity of less than 33%NBS (including consideration of critical structural weaknesses) will need to be strengthened to a target of 67%NBS of new building standard as recommended by the Policy.

If strengthening works are undertaken, a building consent will be required. A requirement of the consent will require upgrade of the building to comply ‘as near as is reasonably practicable’ with:

- The accessibility requirements of the Building Code.
- The fire requirements of the Building Code. This is likely to require a fire report to be submitted with the building consent application.

3.4. Building Code

The building code outlines performance standards for buildings and the Building Act requires that all new buildings comply with this code. Compliance Documents published by The Department of Building and Housing can be used to demonstrate compliance with the Building Code.

After the February Earthquake, on 19 May 2011, Compliance Document B1: Structure was amended to include increased seismic design requirements for Canterbury as follows:

a) Hazard Factor increased from 0.22 to 0.3 (36% increase in the basic seismic design load)
b) Serviceability Return Period Factor increased from 0.25 to 0.33 (80% increase in the serviceability design loads when combined with the Hazard Factor increase)

The increase in the above factors has resulted in a reduction in the level of compliance of an existing building relative to a new building despite the capacity of the existing building not changing.

4. Earthquake Resistance Standards

For this assessment, the building's earthquake resistance is compared with the current New Zealand Building Code requirements for a new building constructed on the site. This is expressed as a percentage of new building standard (%NBS). The new building standard load requirements have been determined in accordance with the current earthquake loading standard (NZS 1170.5:2004 Structural design actions - Earthquake actions - New Zealand).

The likely capacity of this building has been derived in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes' (AISPBE), 2006. These guidelines provide an Initial Evaluation Procedure that assesses a buildings capacity based on a comparison of loading codes from when the building was designed and currently. It is a quick high-level procedure that can be used when undertaking a Qualitative analysis of a building. The guidelines also provide guidance on calculating a modified Ultimate Limit State capacity of the building which is much more accurate and can be used when undertaking a Quantitative analysis.

The New Zealand Society for Earthquake Engineering has proposed a way for classifying earthquake risk for existing buildings in terms of %NBS and this is shown in Figure 2 below.

Description	Grade	Risk	%NBS	Existing Building Structural Performance	Improvement of Structural Performance: Legal Requirement	Improvement of Structural Performance: NZSEE Recommendation
Low Risk Building	A or B	Low	Above 67	Acceptable (improvement may be desirable)	The Building Act sets no required level of structural improvement (unless change in use) This is for each TA to decide. Improvement is not limited to 34%NBS.	100%NBS desirable. Improvement should achieve at least 67%NBS
Moderate Risk Building	B or C	Moderate	34 to 66	Acceptable legally. Improvement recommended		Not recommended. Acceptable only in exceptional circumstances
High Risk Building	D or E	High	33 or lower	Unacceptable (Improvement	Unacceptable	Unacceptable

- **Figure 2: NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE Guidelines**

Table 1 below compares the percentage NBS to the relative risk of the building failing in a seismic event with a 10% risk of exceedance in 50 years (i.e. 0.2% in the next year). It is noted that the current seismic risk in Christchurch results in a 6% risk of exceedance in the next year.

- **Table 1: %NBS compared to relative risk of failure**

Percentage of New Building Standard (%NBS)	Relative Risk (Approximate)
>100	<1 time
80-100	1-2 times
67-80	2-5 times
33-67	5-10 times
20-33	10-25 times
<20	>25 times

5. Building Details

5.1. Building description

The Governors Bay pottery shed is a single storey building located on Main Road, Governors Bay. The structure is made up of two parts, the main structure and the addition. The main structure is constructed from unfilled masonry walls with a concrete slab on grade foundation. The walls are mostly unreinforced except for a portion of the east and west walls, see Figure 3.

The addition is attached to the east of the main structure and is constructed from timber framed walls clad with corrugated metal. Driven timber half rounds make up the foundation for the addition.

For the purpose of this report the along direction is taken as the north-south direction, and the across direction is taken as the east-west direction. A sketch of the building is shown below in figure 3, based on site measurements.

5.2. Gravity Load Resisting system

Loads from the main structure's roof are carried by the timber framed roof structure which is then transferred to the masonry walls and then the concrete slab on grade foundation. Loads from the addition's roof are carried by the timber framed roof which is then supported by the driven timber half rounds.

5.3. Seismic Load Resisting system

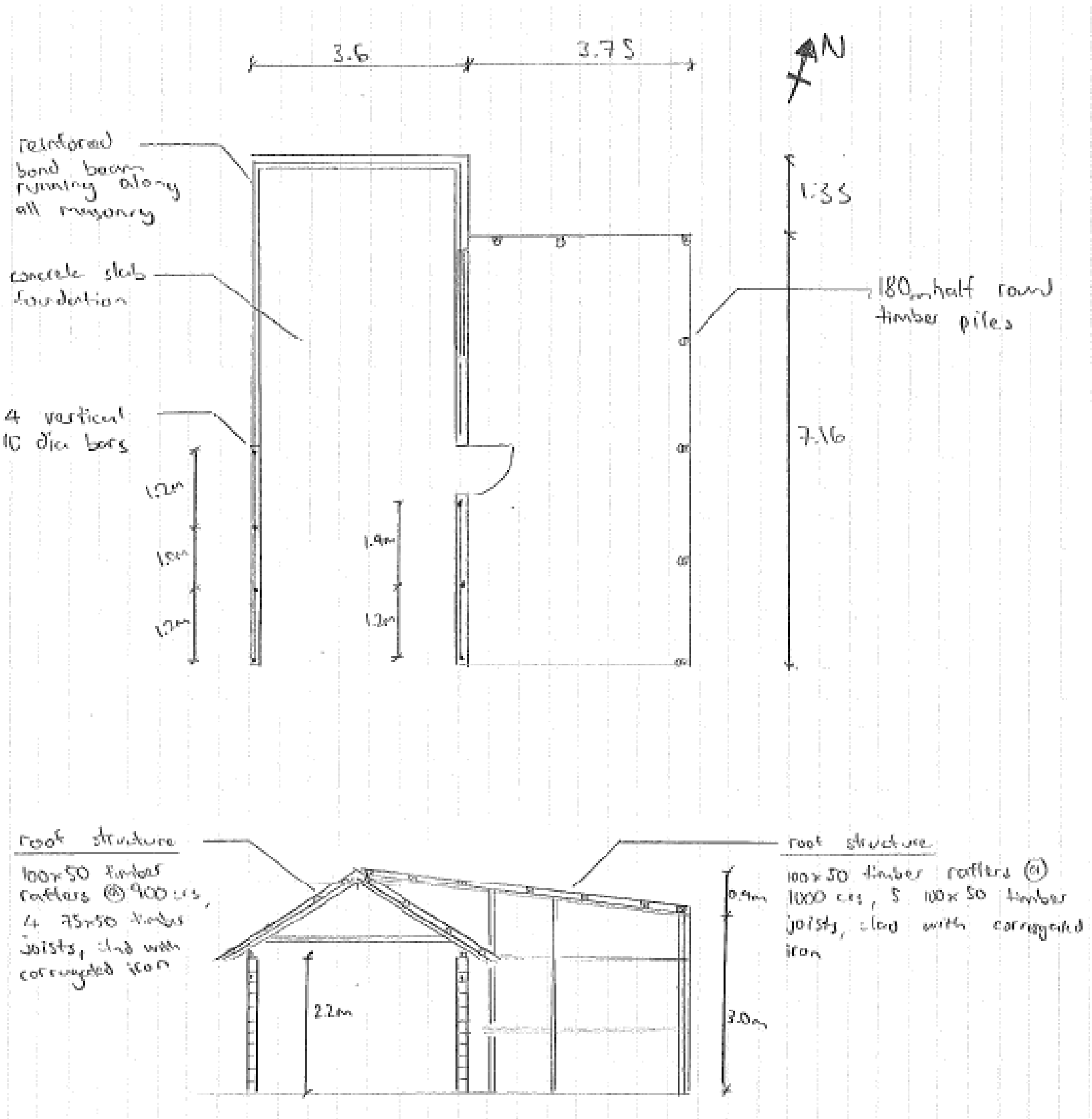
Lateral loads from the roof are carried by the masonry and timber framed walls acting in shear. The loads are then carried by the concrete slab on grade foundation and the driven timber half rounds acting in cantilever for the main structure and the addition respectively.

5.4. Building Damage

SKM undertook an exterior inspection on 6/12/12 and an interior inspection on 10/01/13. The following areas of damage were observed during the time of inspection.

- 1mm vertical crack in west wall running through masonry grout (photo 7 & 8)
- 0.3mm step cracks and displaced blocks in west wall (photo 9 - 12)
- 0.7mm crack through masonry in north wall (photo 14)
- 0.5mm vertical crack at masonry block joint (photo 15)

- 0.8mm and 0.6mm cracks around northwest corner of building (photo 17 & 18)
- 0.4mm crack around northeast corner of building (photo 19 & 20) can also be seen inside the building (photo 29 & 30)



- **Figure 3: Sketch of building**

6. Available Information and Assumptions

6.1. Available Information

Following our inspections on the 6th December 2012, 10th January 2013 and intrusive investigations 16th January 2013, SKM carried out a seismic review on the structure. This review was undertaken using the available information which was as follows:

- SKM site measurements and inspection findings.

6.2. Survey

The building was not surveyed.

6.3. Assumptions

The assumptions made in undertaking the assessment include:

- The building was built according to good practice at the time.
- The site has been assessed as NZS1170.5 Class C (Shallow Soil Site) from adjacent borehole logs. As described in NZS1170, the preferred site classification method is from site periods based on four times the shear wave travel time through material from the surface to the underlying rock. There is no risk of liquefaction at this site.
- Standard design assumptions for typical office and factory buildings as described in AS/NZS1170.0:2002:
  - 50 year design life, which is the default NZ Building Code design life.
  - Structure importance level 2. This level of importance is described as 'normal' with medium or considerable consequence for loss of human life, or considerable economic, social or environmental consequence of failure.
- The building has a short period less than 0.4 seconds.
- Site hazard factor, Z = 0.3, NZBC, Clause B1 Structure, Amendment 11 effective from 1 August 2011
- Ductility has been taken as μ=1 in both directions, based on the masonry walls being unfilled and unreinforced.

- The following material properties were used in the analyses:
- **Table 2: Material Properties**

Material	Material Property	Reference
Masonry, characteristic shear strength	f'_{ms}= 0.25 MPa	Clause 3.3.4 AS 3700
Masonry, flexural tensile strength	f'_{mt} = 0.2 MPa	Clause 3.3.3 AS 3700
Masonry, design characteristic lateral modulus of rupture	f'_{ut} = 0.8 MPa	Clause 3.2 AS 3700
Unit weight of timber	γ = 4.6 kN/m3	Table A1 NZS1170.1
Unit weight of masonry	γ = 20 kN/m3	

The detailed engineering analysis is a post construction evaluation. Since it is not a full design and construction monitoring, it has the following limitations:

- It is not likely to pick up on any concealed construction errors (if they exist)
- Other possible issues that could affect the performance of the building such as corrosion and modifications to the structure will not be identified unless they are visible and have been specifically mentioned in this report.
- The detailed engineering evaluation deals only with the structural aspects of the structure. Other aspects such as building services are not covered.
- It has been assumed that a building consent will be required to repair the damage to the building.

6.4. The Detailed Engineering Evaluation (DEE) process

The DEE is a procedure written by the Department of Building and Housing's Engineering Advisory Group and grades buildings according to their likely performance in a seismic event. The procedure is not yet recognised by the NZ Building Code but is widely used and recognised by the Christchurch City Council as the preferred method for preliminary seismic investigations of buildings[3].

The procedure of the DEE is as follows:

1) Qualitative assessment procedure

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[3] http://resources.ccc.govt.nz/files/EarthquakeProneDangerousAndInsanitaryBuildingsPolicy2010.pdf

   a. Determine the building's status following any rapid assessment that have been done
   b. Review any existing documentation that is available. This will give the engineer an understanding of how the building is expected to behave. If no documentation is available, site measurements may be required
   c. Review the foundations and any geotechnical information available. This will include determining the zoning of the land and the likely soil behaviour, a site investigation may be required
   d. Investigate possible Critical Structural Weaknesses (CSW) or collapse hazards
   e. Assess the original and post earthquake strength of the building (this assessment is subsequently superseded by the quantitative assessment)
2) Quantitative procedure
   a. Carry out a geotechnical investigation if required by the qualitative assessment
   b. Analyse the building according to current building codes and standards. Analysis accounts for damage to the building.

The DEE assessment ranks buildings according to how well they are likely to perform relative to a new building designed to current earthquake standards, as shown in Table 4. The building rank is indicated by the percent of the required New Building Standard (%NBS) strength that the building is considered to have. Earthquake prone buildings are defined as having less than 33 %NBS strength which correlates to an increased risk of approximately 20 times that of 100% NBS[4]. Buildings that are identified to be earthquake prone are required by law to be strengthened within 30 years of the owner being notified that the building is potentially earthquake prone[5].

[4] NZSEE 2006, *Assessment and Improvement of the Structural Performance of Buildings in Earthquakes,* p 2-2
[5] http://resources.ccc.govt.nz/files/EarthquakeProneDangerousAndInsanitaryBuildingsPolicy2010.pdf

- **Table 3: DEE Risk classifications**

Description	Grade	Risk	%NBS	Structural performance
Low risk building	A+	Low	> 100	Acceptable. Improvement may be desirable.
	A		100 to 80	
	B		80 to 67	
Moderate risk building	C	Moderate	67 to 33	Acceptable legally. Improvement recommended.
High risk building	D	High	33 to 20	Unacceptable. Improvement required.
	E		< 20	

The DEE method rates buildings based on the plans (if available) and other information known about the building and some more subjective parameters associated with how the building is detailed and so it is possible that %NBS derived from different engineers may differ.

This assessment describes only the likely seismic Ultimate Limit State (ULS) performance of the building. The ULS is the level of earthquake that can be resisted by the building without catastrophic failure. The DEE does also consider Serviceability Limit State (SLS) performance of the building and or the level of earthquake that would start to cause damage to the building but this result is secondary to the ULS performance.

The NZ Building Code describes that the relevant codes for NBS are primarily:

- AS/NZS 1170 parts 0, 1 and 5 Structural Design Actions
- NZS 3101:2006 Concrete Structures Standard
- NZS 3404:1997 Steel Structures Standard
- NZS 2606:1993 Timber Structures Standard
- NZS 4230:1990 Design of Reinforced Concrete Masonry Structures

7. Results and Discussions

7.1. Critical Structural Weaknesses

The building has the following critical structural weaknesses:

- Unreinforced and unfilled masonry

This critical structural weakness has been incorporated into the quantitative results below. The effect of this will be a lower quantitative assessment result when compared to a building containing no critical structural weaknesses.

7.2. Analysis Results

The equivalent static force method was used to analyse the seismic capacity of the building. The results of the analysis are reported in the following table as %NBS. The results below are calculated for the building in its damaged state. The building results have been broken down into their seismic resisting elements. As the building has elements that are less than 34%NBS any item with a capacity less than 67%NBS will need to be strengthened so that the overall building capacity is greater than 67%NBS.

(%NBS = the reliable strength / new building standards)

- **Table 4: DEE Results**

Seismic Resisting Element	Action	Seismic Rating %NBS
Along – east and west walls	Shear	100%
Along – out of plane for north wall	Horizontal bending	94% Pre EQ 80% Post EQ
Across – north wall (after installation of a diaphragm to take loads from the rest of the structure)	Shear	42% Pre EQ 36% Post EQ
Across – out of plane for east and west walls	Vertical cantilever bending	20% Pre EQ 17% Post EQ

The building has suffered structural damage in the masonry walls. The building has been found to be earthquake prone in its undamaged state due to the masonry walls being unfilled and unreinforced. It is difficult to calculate the damage ratio to the structure without more rigorous analysis. We have used judgement to determine a damage ratio of 30% based on the severity of the wall cracking.

7.3. Recommendations

The quantitative assessment carried out on the Governors Bay Pottery Shed indicates that the building has a seismic capacity below 34% of NBS and is therefore classed as being in the category of ‘High Risk’.

Strengthening is required in order to comply with Christchurch City Council (CCC) policy – Earthquake-prone dangerous & insanitary building policy 2010.

The building is to remain unoccupied until the building is strengthened or temporary propping is installed.

8. Conclusion

SKM carried out a quantitative assessment on Governors Bay Pottery Shed located at Main Road, Governors Bay. This assessment concluded that the building is classified as Earthquake Prone.

Table 5: Quantitative assessment summary

Description	Grade	Risk	%NBS	Structural performance
Governors Bay Pottery Shed	E	High	17	Unacceptable. Improvement required.

Strengthening is required on the building to bring the seismic capacity up to at a minimum of 67% of NBS. The strengthening options will need to be investigated to determine the feasibility of strengthening the building versus demolishing and rebuilding.

It is recommended that:

a) The building is unsafe to occupy on the basis of the damage to the unreinforced and unfilled masonry walls. Controlled access for the purposes of damage assessment, making safe, and demolition is allowed.

b) The boarding restricting internal access inside the building is to remain and we consider that barriers around the building are not necessary.

c) Options to bring the building to a target of 67% are investigated.

9. Limitation Statement

This report has been prepared on behalf of, and for the exclusive use of, SKM's client, and is subject to, and issued in accordance with, the provisions of the contract between SKM and the Client. It is not possible to make a proper assessment of this report without a clear understanding of the terms of engagement under which it has been prepared, including the scope of the instructions and directions given to, and the assumptions made by, SKM. The report may not address issues which would need to be considered for another party if that party's particular circumstances, requirements and experience were known and, further, may make assumptions about matters of which a third party is not aware. No responsibility or liability to any third party is accepted for any loss or damage whatsoever arising out of the use of or reliance on this report by any third party.

Without limiting any of the above, in the event of any liability, SKM's liability, whether under the law of contract, tort, statute, equity or otherwise, is limited in as set out in the terms of the engagement with the Client.

It is not within SKM's scope or responsibility to identify the presence of asbestos, nor the responsibility of SKM to identify possible sources of asbestos. Therefore for any property pre-dating 1989, the presence of asbestos materials should be considered when costing remedial measures or possible demolition.

Should there be any further significant earthquake event, of a magnitude 5 or greater, it will be necessary to conduct a follow-up investigation, as the observations, conclusions and recommendations of this report may no longer apply Earthquake of a lower magnitude may also cause damage, and SKM should be advised immediately if further damage is visible or suspected.

10. Appendix 1 – Photos

	
Photo 1: South elevation	Photo 2: East elevation (1)
	
Photo 3: East elevation (2)	Photo 4: North elevation

Photo 5: West elevation

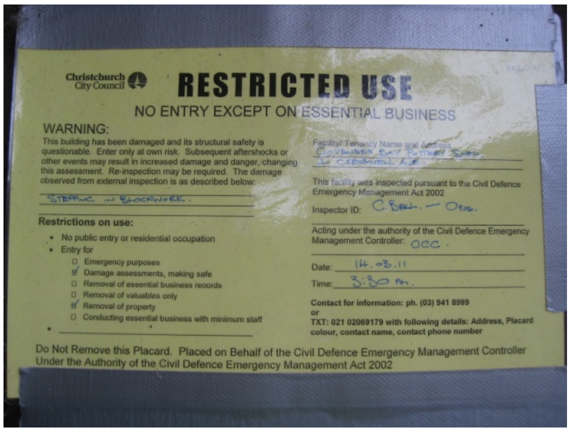

Photo 6: Yellow Placard posted on front opening

Photo 7: West wall, with junction between unreinforced wall and reinforced wall

Photo 8: Close up from photo 7 showing 1mm crack between junction

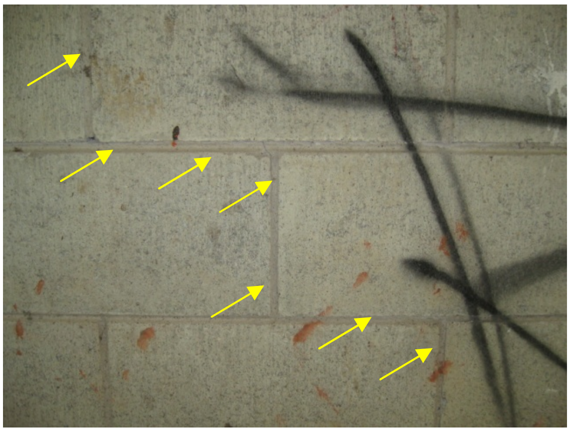	
Photo 9: Step cracking running diagonally on west wall	Photo 10: Close up view from photo 9 showing 0.3mm crack
	
Photo 11: View of west wall showing displaced blocks	Photo 12: Close up view from photo 11 showing 3mm displacement

Photo 13: North wall

Photo 14: Close up of north wall showing 0.7mm vertical crack

Photo 15: 0.5mm vertical crack at masonry block joint

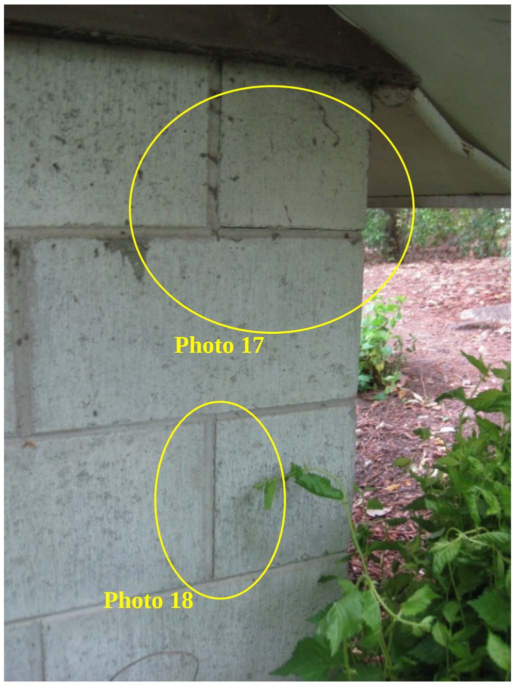

Photo 16: View of Northwest corner

	
Photo 17: Close up view from photo 16 showing 0.8mm crack at top block course	Photo 18: Close up view from photo 16 showing 0.6mm crack.
	
Photo 19: Northeast corner of masonry structure	Photo 20: Close up view of photo 19 showing 0.4mm crack

	
Photo 21: Interior view inside pottery shed looking along the west wall	Photo 22: Interior view inside pottery shed looking along east wall
	
Photo 23: Interior view of timber addition (1)	Photo 24: Interior view of timber addition (2)
	
Photo 25: Interior view of timber addition (3)	Photo 26: Interior view of timber addition (4)

	
Photo 27: Interior view of timber addition (5)	Photo 28: Interior view of main structure looking in the south direction
	
Photo 29: Northeast corner, with step cracks	Photo 30: close up view from photo 29 showing 0.4mm step cracks

	
Photo 31: Roof frame of main structure	Photo 32: Roof frame of timber framed addition

11. Appendix 2 – CERA Standardised Report Form

Location

Building Name:	Governors Bay Pottery Shed	Reviewer:	N Calvert
	Unit / No: / Street	CPEng No:	242062
Building Address:	Main Road, Governors Bay	Company:	Sinclair Knight Merz
Legal Description:		Company project number:	ZB01276.214
		Company phone number:	03 940 4900
	Degrees / Min / Sec		
GPS south:		Date of submission:	4-Mar
GPS east:		Inspection Date:	10/01/2013
		Revision:	B
Building Unique Identifier (CCC):		Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	0
Soil type:	mixed	Soil Profile (if available):	0-0.3m Topsoil, clay. 0.3-6m Clay, Silty Loess
Site Class (to NZS1170.5):	C		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	40.00

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):	40.00
Ground floor split?	no		Ground floor elevation above ground (m):	0.00
Storeys below ground	0			
Foundation type:	mat slab		if Foundation type is other, describe:	
Building height (m):	3.40		height from ground to level of uppermost seismic mass (for IEP only) (m):	3.4
Floor footprint area (approx):	58			
Age of Building (years):	40		Date of design:	1965-1976
Strengthening present?	no		If so, when (year)?	
			And what load level (%g)?	
Use (ground floor):	other (specify)		Brief strengthening description:	
Use (upper floors):				
Use notes (if required):				
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber framed	rafter type, purlin type and cladding	100x50 rafters @900crs, 75x50 purlins @750crs, corrugated metal
Floors:	concrete flat slab	slab thickness (mm)	
Beams:	none	overall depth x width (mm x mm)	
Columns:			
Walls:	partially filled concrete masonry	thickness (mm)	190

Lateral load resisting structure

Lateral system along:	partially filled CMU	**Note: Define along and across in detailed report!**	note total length of wall at ground (m):	17
Ductility assumed, μ:	1.00		wall thickness (m):	0.19
Period along:	0.40	0.40 from parameters in sheet	estimate or calculation?	estimated
Total deflection (ULS) (mm):	5		estimate or calculation?	estimated
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	estimated
Lateral system across:	partially filled CMU		note total length of wall at ground (m):	3.6
Ductility assumed, μ:	1.00		wall thickness (m):	0.19
Period across:	0.40	0.40 from parameters in sheet	estimate or calculation?	estimated
Total deflection (ULS) (mm):	5		estimate or calculation?	estimated
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	estimated

Separations:

north (mm):		leave blank if not relevant
east (mm):		
south (mm):		
west (mm):		

Non-structural elements

Stairs:			
Wall cladding:	profiled metal	describe	timber addition clad in corrugated metal
Roof Cladding:	Metal	describe	corrugated metal
Glazing:	timber frames		
Ceilings:			
Services(list):			

Available documentation

Architectural	none	original designer name/date	
Structural	none	original designer name/date	
Mechanical	none	original designer name/date	
Electrical	none	original designer name/date	
Geotech report	partial	original designer name/date	SKM desktop geotech investigation

Damage

Site: (refer DEE Table 4-2)

Site performance:		Describe damage:	
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	none apparent	notes (if applicable):	

Building:

	Current Placard Status:	yellow		
Along	Damage ratio:	15%	Describe how damage ratio arrived at:	Engineering judgement
	Describe (summary):	Step cracks in masonry		
Across	Damage ratio:	15%		
	Describe (summary):	step cracks in masonry		
Diaphragms	Damage?:	no	Describe:	No ceiling diaphragm
CSWs:	Damage?:	yes	Describe:	unfilled and unreinforced masonry
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	no	Describe:	

$$Damage\_Ratio = \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$$

Recommendations

Level of repair/strengthening required:	minor structural	Describe:	
Building Consent required:	yes	Describe:	
Interim occupancy recommendations:	do not occupy	Describe:	

Along	Assessed %NBS before:	94%	%NBS from IEP below	If IEP not used, please detail assessment methodology:	Qualitative Assessment carried out, this includes the NZSEE IEP - refer to SKM report
	Assessed %NBS after:	80%			
Across	Assessed %NBS before:	20%	%NBS from IEP below		
	Assessed %NBS after:	17%			