Christchurch City Council
PRK_3744_BLDG_002 EQ2
Okuti Valley School - Bowling Club Main Rooms
173 Okuti Valley Road

QUANTITATIVE REPORT
FINAL

- Rev C
- 02 May 2013

Christchurch City Council
PRK_3744_BLDG_002 EQ2
Okuti Valley School - Bowling Club Main Rooms
173 Okuti Valley Road

QUANTITATIVE ASSESSMENT REPORT

FINAL

- Rev C
- 02 May 2013

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Contents

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Approval

	Signature	Date	Name	Title
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1. Executive Summary

1.1. Background

A Quantitative Assessment was carried out on the building located at 173 Okuti Valley Road. The building is a community hall with kitchen, toilet and storeroom facilities and was previously used as a school. The building is a single storey timber framed building built prior to 1924. An aerial photograph illustrating these areas is shown below 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 173 Okuti Valley Road**

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 August 2012 and intrusive investigations 13th March 2013.

1.2. Key Damage Observed

Key damage observed includes:-

- Cracks in interior wall lining, deterioration of timber wall framing and water tank adjacent to the building is no longer level.

A more detailed account of the damage can be found in section 5.

1.3. Critical Structural Weaknesses

No potential critical structural weaknesses were identified in the quantitative assessment.

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 our desktop geotechnical investigation and the absence of liquefaction ejecta on the site.
- 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 target capacity of 67%NBS but at least 34% NBS.

Based on the information available, and using the Quantitative Assessment Procedure, the buildings original and post earthquake capacity has been assessed to be in the order of 39%NBS. The building is therefore not potentially earthquake prone.

1.5. Recommendations

Based on the findings of this assessment indicating the building is in the order of 39%, no 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) We consider that barriers around the building are not necessary.
b) The adjacent water tank should be checked, propped or demolished to ensure that it does not pose a risk to the Okuti Valley School Building. Until this is done we recommend that the building is not occupied.

2. Introduction

Sinclair Knight Merz were engaged by Christchurch City Council to carry out a Quantitative Assessment of the seismic performance of Okuti Valley School - Bowling Club Main Rooms located at 173 Okuti Valley Road.

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].

A qualitative assessment identified that the seismic capacity of the building was likely to be less than 33% of the new building standard (NBS). A quantitative assessment was recommended to confirm the initial assessment findings and to determine a more accurate seismic rating of the building.

At the time of this report no drawings were made available. An intrusive site investigation had been carried out. The building description is based on our visual and intrusive inspections.

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[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 4th 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: NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE Guidelines below.

Description	Grade	Risk	%NBS	Existing Building Structural Performance	Improvement of Structural Performance	
					Legal Requirement	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: %NBS compared to relative risk of failure 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 building PRK_3744_BLDG_002 EQ2 is located at 173 Okuti Valley Road. The building is a single storey timber framed building with timber board lining, clad with timber weather boards. The roof is timber framed clad with corrugated iron. The building has concrete foundations. The building has two main parts, the main hall and kitchen, and the toilets and storeroom area. These areas have different roof heights with their ceiling heights 3.5m and 2.2m respectively

Drawings of the structure were not made available. Our evaluation was based on the exterior and interior inspection on 6th August 2012, and intrusive investigations on 13th March 2013. Based on the documentation found posted on the interior wall the building was constructed before 1924. See Figure 3 below.

5.2. Gravity Load Resisting system

The east part of the building (main hall and kitchen) has a timber framed roof truss supporting the lightweight corrugated sheet cladding which is supported by the timber framed walls. The walls are supported by concrete strip footings and the floor area is supported by concrete piles.

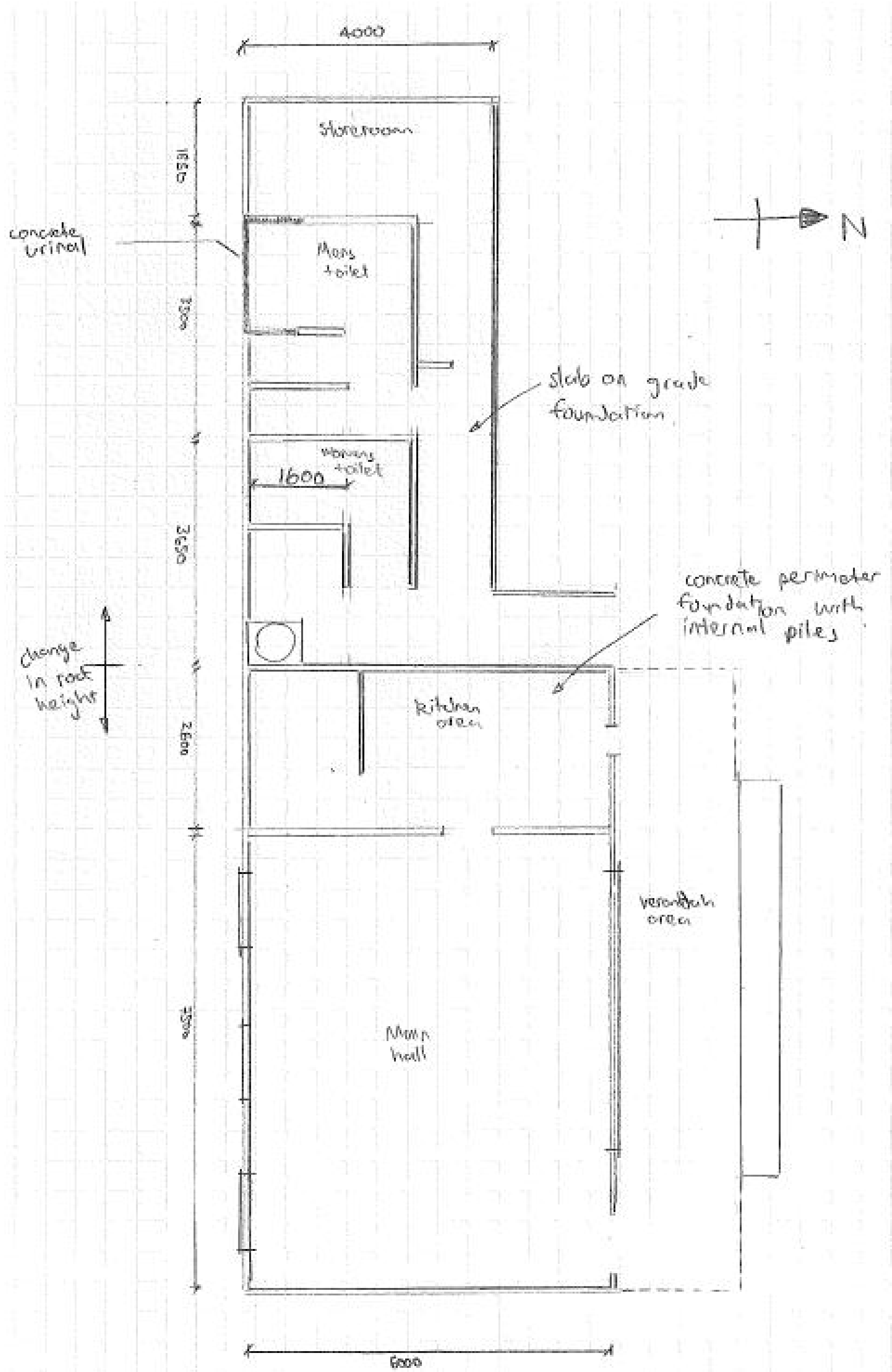
The west part of the building (toilet and storeroom) also has a timber framed roof, supporting the lightweight corrugated sheet cladding which is supported by the timber framed walls. The walls are supported by a concrete slab on grade foundation.

5.3. Seismic Load Resisting system

For the purposes of this report the along direction of the building is defined as being the east-west direction and the across direction is defined as being in the north-south direction.

Lateral loads acting on the east part of the building (main hall), will be resisted by the timber framed walls with the lathe and plaster ceiling acting as a diaphragm to distribute the loads. The loads will then be resisted by the concrete perimeter foundation only, as the internal concrete piles were not tied into the floor.

Lateral loads acting on the west part of the building (toilet area), will be resisted by the timber framed walls with the gypsum ceiling acting as a diaphragm to distribute the loads. The loads will then be resisted by the concrete slab on grade foundation



- **Figure 3: Sketch of building plan for 173 Okuti Valley School**

5.4. Building Damage

Key damage observed includes:-

- Crack in lining and cornice above window on the south wall (see photo 14 and 15).
- Timber in the window frame has deteriorated (see photo 16 and 17).
- Crack at wall lining joint on the west wall (see photo 18 and 19).
- Water tank on the west side of the building is leaning northwards (see photo 4) and there is a risk it may fall against the building in an earthquake event.

The damage noted above will not affect the structural performance of the building.

6. Available Information and Assumptions

6.1. Available Information

SKM carried out a seismic review on the structure. This review was undertaken using the available information which was as follows:

- SKM visual inspection findings from 6th August 2012.
- SKM site measurements and intrusive inspection findings from 13th March 2013.

6.2. Survey

The building does not appear to be out of level and has not been level surveyed.

6.3. Assumptions

The assumptions made in undertaking the assessment include:

- The building was built according to good practice at the time.
- The soil on site is class C as described in AS/NZS1170.5:2004, Clause 3.1.3, Shallow Soil Site. This is a conservative assumption based on our experience of soils around Christchurch. The ultimate bearing capacity on site is 220kPa, we believe that this assumption is reasonable. It is considered there is no risk of liquefaction at this site.
- Standard design assumptions for typical community 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 of 0.2 seconds.
- Site hazard factor, Z = 0.3, NZBC, Clause B1 Structure, Amendment 11 effective from 1 August 2011
- The ductility used in the analysis of this building is 2. This is typical for timber framed buildings.
- Bracing capacity in the 3.6m high walls in the main hall has no bracing capacity. This is due to the walls having vertically aligned tongue and groove wall linings. This is both difficult to quantify without engineering guidance and does not provide an efficient shear element for the timber stud walls.

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

Material	Material Property	Reference
1 sided Gypsum faced stud wall	2.1 kN/m	NZSEE, "Assessment and Improvement of the structural performance of buildings in Earthquakes", June 2006
2 sided Gypsum faced stud wall	3.0 kN/m	NZSEE, "Assessment and Improvement of the structural performance of buildings in Earthquakes", June 2006

The detailed engineering analysis is a post construction evaluation. Because SKM have not completed a full design or 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.

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
    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

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

   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 3. 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].

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

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

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

No potential critical structural weaknesses were identified in the quantitative assessment.

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.

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

- **Table 4: DEE Results**

Section	Seismic Resisting Element	Action	%NBS
East Part (housing the main hall and kitchen)	Wall lining – Along direction	Shear	39%
	Wall lining – Across direction	Shear	64%
West part (housing the toilet and storeroom)	Gypsum wall lining – Across direction	Shear	100%
	Gypsum wall lining – Along direction	Shear	100%

The building has been found to have a NBS of 39% governed by the walls linings in the eastern part of the building, resisting earthquake loads in the across direction.

The intrusive investigation could not confirm the connection detail between the floor and the perimeter foundation. Based on the age of the building it is expected that these connections will be inadequate to provide lateral resistance during an earthquake event, however the buildings foundations appear to have performed well during the Canterbury earthquakes. The consequences of this type of foundation failing will unlikely endanger human life, and therefore will not make the building earthquake prone.

7.3. Recommendations

Based on the findings of this assessment indicating the building is in the order of 39% NBS and is therefore classed as being in the category of 'Moderate Risk Buildings" and strengthening is not required although is recommended to strengthen the building to at least 67% NBS.

The adjacent external water tank appears to be out of level and at risk of collapse and as such it is recommended that it is removed or propped so that is no longer provides a risk to the building.

8. Conclusion

SKM carried out a quantitative assessment on PRK_3744_BLDG_002 EQ2 located at 173 Okuti Valley Road. This assessment concluded that the building is classified as not Earthquake Prone. Strengthening is not required but is recommended to achieve at least 67% NBS

- **Table 5: Quantitative assessment summary**

Description	Grade	Risk	%NBS	Structural performance
Okuti Valley School	C	Moderate	39	Acceptable legally. Improvement recommended.

It is recommended that:

a) We consider that barriers around the building are not necessary.

b) The adjacent water tank should be checked, propped or demolished to ensure that it does not pose a risk to the Okuti Valley School Building. Until this is done we recommend that the building is not occupied.

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: North Elevation (1)

Photo 2: North Elevation (2)

Photo 3: West Elevation (1)

Photo 4: West Elevation (2). Note the leaning watertank.

Photo 5: South Elevation (1)

Photo 6: South Elevation (2)

Photo 7: East Elevation

Photo 8: View inside the toilet area with mens toilet doorway on the left and storeroom doorway to the right.

Photo 9: View of the main hall area, south west corner.

Photo 10: View of the main hall area, north east corner.

Photo 11: View of the main hall area, east wall

Photo 12: View of the main hall area, south east corner

Photo 13: View of the ceiling in main hall area.

Photo 14: View of the cornice on the south wall

Photo 15: Close up view of photo 14 showing crack in lining and cornice.

Photo 16: View of north wall and ceiling

Photo 17: Close up view of photo 16 showing deteriated timber window frame.

Photo 18: View of west wall and ceiling.

	
Photo 19: Close up view of photo 18 showing crack in joint lining.	Photo 20: View of entrace into kitchen area from the main hall.

Photo 21: View inside the kitchen.

Photo 22: View of north wall in the east corner of building showing location of intrusive investigation, confirming the lack of bracing element behind the tongue and groove lining.

Photo 22: View of foundation in the east part of the building

Photo 23: View of roof

11. Appendix 2 – CERA Standardised Report Form

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Okuti Valley School - Bowling Club Main Rooms	Reviewer:	Nick Calvert
	Unit / No: / Street	CPEng No:	242062
Building Address:	173 Okuti Valley Road	Company:	Sinclair Knight Merz
Legal Description:		Company project number:	ZB01276.135
		Company phone number:	03 940 4900
	Degrees / Min / Sec		
GPS south:		Date of submission:	2/05/2013
GPS east:		Inspection Date:	7/08/2012 and 13/3/2013
		Revision:	C
Building Unique Identifier (CCC):	PRK_3744_BLDG_002	Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:	silt	Soil Profile (if available):	
Site Class (to NZS1170.5):	C		
Proximity to waterway (m, if <100m):	30	If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	0.00

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):	0.00
Ground floor split?			Ground floor elevation above ground (m):	0.00
Storeys below ground				
Foundation type:	strip footings		if Foundation type is other, describe:	Assumed
Building height (m):	5.00		height from ground to level of uppermost seismic mass (for IEP only) (m):	5
Floor footprint area (approx):	100			
Age of Building (years):	90		Date of design:	Pre 1935
Strengthening present?	no		If so, when (year)?	
			And what load level (%g)?	
Use (ground floor):	public		Brief strengthening description:	
Use (upper floors):				
Use notes (if required):	recreational & sports club			
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber framed	rafter type, purlin type and cladding	corrugated metal clad roof
Floors:	concrete flat slab	slab thickness (mm)	
Beams:	timber	type	timber lintels above openings
Columns:	load bearing walls	typical dimensions (mm x mm)	timber framed walls
Walls:			

Lateral load resisting structure

Note: Define along and across in detailed report!

Lateral system along:	lightweight timber framed walls			
Ductility assumed, μ:	2.00		note typical wall length (m)	
Period along:	0.20	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):	5		estimate or calculation?	estimated
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	lightweight timber framed walls			
Ductility assumed, μ:	2.00		note typical wall length (m)	
Period across:	0.20	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):	5		estimate or calculation?	estimated
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

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

Non-structural elements

Stairs:			
Wall cladding:	other light	describe	tongue and groove timber boards
Roof Cladding:	Metal	describe	corrugated iron
Glazing:	timber frames		
Ceilings:	fibrous plaster, fixed		
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 report dated 18th August 2012

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:	green		
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	
	Describe (summary):	no damage observed		
Across	Damage ratio:	0%		
	Describe (summary):	no damage observed		
Diaphragms	Damage?:	no	Describe:	
CSWs:	Damage?:	no	Describe:	
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 non-structural	Describe:	
	Building Consent required:	no	Describe:	
	Interim occupancy recommendations:	full occupancy	Describe:	
Along	Assessed %NBS before e'quakes:	39%	#DIV/0! %NBS from IEP below	If IEP not used, please detail assessment methodology: SKM Calculations
	Assessed %NBS after e'quakes:	39%		
Across	Assessed %NBS before e'quakes:	64%	#DIV/0! %NBS from IEP below	
	Assessed %NBS after e'quakes:	64%		