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**Project:** Bottle Lake Forest Old Woolshed Qualitative Engineering Evaluation

**Reference:** 228593
**Prepared for:** Christchurch City Council
**Revision:** 2
**Date:** 22 November 2012

Functional Location ID: PRK 0158 BLDG 006 EQ2

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| | | | | | | |
| | | | | | | |
| **Current Revision** | | **2** | | | | |

# Contents



# Appendices

# Executive Summary

This is a summary of the Qualitative Report for the Bottle Lake Forest Old Woolshed building structure and is based on the Detailed Engineering Evaluation Procedure document issued by the Structural Advisory Group on 19 July 2011, visual inspections, available structural documentation and summary calculations as appropriate.

| **Building Details** | **Name** | Bottle Lake Forest Old Woolshed | **BuildLoc ID:** | PRK 0158 BLDG 006 EQ2 | |
|---|---|---|---|---|---|
| **Building Address** | 70 Waitikiri Drive, Christchurch | | | | |
| **Foot Print (approx. m²)** | 120 | **Storeys above ground** | 1 | **Storeys below ground** | 0 |
| **Approximate Year Built** | 1960s | **Building Age Years** | Approx. 50 | **Number of res. units** | 0 |
| **Building Current Use** | Storage Shed | | | | |
| **Type of Construction** | Lightweight purlins and rafter, stud wall and floor, concrete apron | | | | |

## Qualitative L4 Report Results Summary

| | | |
|---|---|---|
| **Building Occupied** | Y | Currently used as an storage shed |
| **Suitable for Continued Occupancy** | Y | Suitable for continued use |
| **Critical Structural Weaknesses** | N | No critical structural weaknesses were found |
| **Building %NBS From Analysis** | Approx. 100% | Based on specific analysis using approximate material strengths |
| **Key Damage Summary** | Y | Refer to summary of building damage section 4.1 report body. |

## Qualitative L4 Report Recommendations

| | | |
|---|---|---|
| **Levels Survey Required** | N | Importance Level 1 Structure |
| **Geotechnical Survey Required** | N | Uncategorised, Technical Category 2 by extrapolation |
| **Multiple Structure Site** | Y | Bottle Lake Forest Park |
| **Proceed Directly To L5 Quantitative DEE** | N | No quantitative DEE is required for this structure. |

## Approval

| | | | |
|---|---|---|---|
| Author Signature | | Approver Signature | |
| Name | Christopher Bong | Name | Luis Castillo |
| Title | Structural Engineer | Title | Senior Structural Engineer |

# 1. Introduction

## 1.1 General

On 14 March 2012, Aurecon engineers visited the Bottle Lake Forest Old Woolshed to carry out a qualitative and quantitative building damage assessment on behalf of Christchurch City Council. Detailed visual inspections were carried out to assess the damage caused by the earthquakes on 4 September 2010, 22 February 2011, 13 June 2011, 23 December 2011 and their subsequent aftershocks.

The scope of work included:

- Assessment of the nature and extent of the building damage.
- Visual assessment of the building strength particularly with respect to safety of occupants if the building is currently occupied.

This report outlines the results of our qualitative and quantitative assessment of damage to the Bottle Lake Forest Old Woolshed and is based on the Detailed Engineering Evaluation Procedure document issued by the Structural Advisory Group on 19 July 2011, visual inspections, available structural documentation and summary calculations as appropriate.

# 2. Description of the Building

## 2.1 Building Age and Configuration

The Bottle Lake Forest Old Woolshed is a single storey, lightweight timber building possibly constructed in the 1960s. The approximate floor area of the building is 120 square metres, it is configured as a large gable ended shed with a lean to in one corner. The building can be classified as an importance level 1 according to NZS 1170 Part 0: 2002. The condition of the building could be described as fairly rough and commensurate with its use and level of finish. Being an unlined utility building it is a flexible structure unlikely to show minor deflection damage in the same way as a fully lined and finished building intended for full time occupancy.

## 2.2 Building Vertical and Horizontal Structural Systems

Corrugated iron roofing is supported by lightweight timber purlins and rafters. Rafters span from the ridge board to under purlins that provide intermediate support and then onto the external walls. The under purlins are supported by struts that radiate out from a beam supported on posts running through the centre of the shed. Loads are transferred to the ground via foundations to the internal posts and from the external walls into the floor and supporting foundation piles.

Lateral loads from the roof are transferred via the roof diaphragm to the, mostly external, walls. The walls resist the lateral loads and transfer then into the supporting floor structure and from there into the foundation piles and into the ground.

## 2.3 Reference Building Type

The reference building type for the Bottle Lake Forest Old Woolshed is a typical rural old style farm shed. This is a fairly generic structure that is common throughout New Zealand and due to its natural flexibility and ductility is likely to perform well under seismic conditions as this one appears to have done.

## 2.4 Building Foundation System and Soil Conditions

The Bottle Lake Forest Old Woolshed's timber floor is founded on isolated timber pile foundations. The floor for this building has been constructed very close to the ground and although this is good for resisting lateral loads the timber may become vulnerable to decay.

CERA land zone maps indicate that Bottle Lake Forest Park currently sits on "Yet To be Classified Rural & Unmapped Land", however the land to the immediate south has classed as Technical Category 2 Land. By extrapolation, the land under the Bottle Lake Forest Old Woolshed is likely fit this category and accordingly be subject to minor or moderate land damage from liquefaction or settlement in future large earthquakes. The site inspection has shown no obvious ground disturbance or movement have been noted in the immediate vicinity of the shed.

## 2.5 Available Structural Documentation and Inspection Priorities

The building drawings were unavailable for review. And as such; this report is based solely on the exterior only visual inspection which was undertaken on 14 March 2012.

## 2.6 Available Survey Documentation

No levels or verticality survey information was available at the time of this report and, due to the age and low importance level of the structure, it is not expected that any will be required as part of the DEE process.

# 3. Structural Investigation

## 3.1 Summary of Building Damage

The Bottle Lake Forest Old Woolshed is as described above, an unlined utility building showing wear appropriate to its age and original level of finish. Being an unlined structure it is unlikely to show minor deflection damage in the way a fully lined and finished level 2 building would. This proved to be the case as there was no discernible damage found that could be attributed to seismic deformation.

## 3.2 Record of Intrusive Investigation

As the building is an unlined shed and all the structural elements fully exposed there was no need for an intrusive investigation.

## 3.3 Damage Discussion

It appears that the building has suffered little to no damage as a result of recent seismic activity. This is unsurprising as buildings of this nature are inherently flexible and ductile. The lack of linings and wear due to the building's age and function as a storage shed will have tended to obscure any seismic displacement damage.

# 4. Building Review Summary

As the building is an unlined woolshed, apart from the foundations, all the primary structural elements of were fully exposed.

# 5. Building Strength (Refer to Appendix E for background information)

Because the Bottle Lake Forest Old Woolshed is not an optimised engineered structure that was subject to specific engineering design the initial engineering procedure or IEP is not an appropriate method of assessment. The approach taken to determine the approximate seismic capacity of this structure was to calculate demand from first principles and then estimate capacity by assuming approximate strengths for existing materials. The size of existing load resisting elements, walls, in each direction was measured and from this an approximate capacity was calculated.

This analysis has resulted in an estimated capacity well in excess of calculated demand. Accordingly the Bottle Lake Forest Old Woolshed is considered to have an estimated percentage new building strength of approximately 100%NBS.

# 6. Conclusions and Recommendations

The absence of obvious visible damage to this structure tends to confirm the assessment that this structure has sufficient seismic capacity and does not require strengthening.

No levels or verticality survey information was available at the time of this report and, due to the age and low importance level of the structure; it is not recommended that this work be should be undertaken as part of the DEE process.

# 7. Explanatory Note

The inspections of the building discussed in this report have been undertaken to assess structural earthquake damage. No analysis has been undertaken to assess the strength of the building or to determine whether or not it complies with the relevant building codes, except to the extent that Aurecon expressly indicates otherwise in the report. Aurecon has not made any assessment of structural stability or building safety in connection with future aftershocks or earthquakes – which have the potential to damage the building and to jeopardise the safety of those either inside or adjacent to the building, except to the extent that Aurecon expressly indicates otherwise in the report.

This report is necessarily limited by the restricted ability to carry out inspections due to potential structural instabilities/safety considerations, and the time available to carry out such inspections. The report does not address defects that are not reasonably discoverable on visual inspection, including defects in inaccessible places and latent defects. Where site inspections were made, they were restricted to external inspections and, where practicable, limited internal visual inspections.

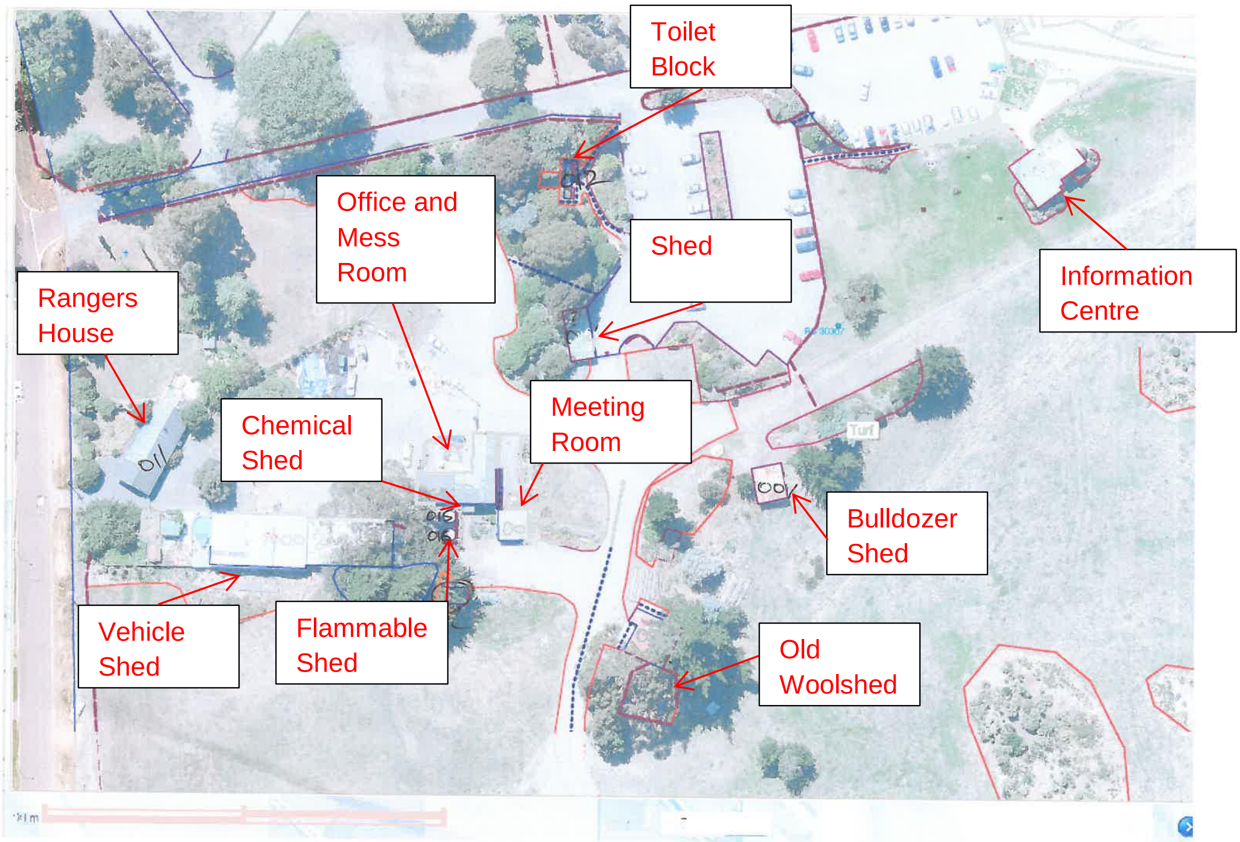
To carry out the structural review, existing building drawings were obtained from the Christchurch City Council records. We have assumed that the building has been constructed in accordance with the drawings.

While this report may assist the client in assessing whether the building should be strengthened, that decision is the sole responsibility of the client.

This review has been prepared by Aurecon at the request of its client and is exclusively for the client's use. It is not possible to make a proper assessment of this review 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 Aurecon. The report will 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, Aurecon's liability, whether under the law of contract, tort, statute, equity or otherwise, is limited as set out in the terms of the engagement with the client.

# 8. Site Map



Toilet Block
Office and Mess Room
Shed
Information Centre
Rangers House
Chemical Shed
Meeting Room
Bulldozer Shed
Vehicle Shed
Flammable Shed
Old Woolshed

# Appendices

# Appendix A

## Photos

**Site photographs (14 March 2012)**

Elevations of the exterior of the old woolshed

Photos showing a timber floor founded upon timber piles and bearers

Photo showing a column, beam and struts holding up a timber roof made of timber rafters and purlins.

# Appendix B
References

## Reference Documents and Materials


- AS/NZS 1170  Parts 0,1 and 5 and commentaries;
- New Zealand Society for Earthquake Engineering (NZSEE) 2006 Study Group Recommendations "Assessment and Improvement of the Structural Performance of Buildings in Earthquakes" – June 2006
- Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-Residential Buildings in Canterbury. Part 2 Evaluation Procedure. Draft prepared by Engineering Advisory Group, Revision 5, 19 July 2011.

# Appendix C
## Strength Assessment Explanation

### New building standard (NBS)

New building standard (NBS) is the term used with reference to the earthquake standard that would apply to a new building of similar type and use if the building was designed to meet the latest design Codes of Practice. If the strength of a building is less than this level, then its strength is expressed as a percentage of NBS.

### Earthquake prone buildings

A building can be considered to be earthquake prone if its strength is less than one third of the strength to which an equivalent new building would be designed, that is, less than 33%NBS (as defined by the New Zealand Build Act). If the building strength exceeds 33%NBS but is less than 67%NBS the building is considered at risk.

### Christchurch City Council Earthquake Prone Building Policy 2010

The Christchurch City Council (CCC) already had in place an Earthquake Prone Building Policy (EPB Policy) requiring all earthquake-prone buildings to be strengthened within a timeframe varying from 15 to 30 years. The level to which the buildings were required to be strengthened was 33%NBS.

As a result of the 4 September 2010 Canterbury earthquake the CCC raised the level that a building was required to be strengthened to from 33% to 67% NBS but qualified this as a target level and noted that the actual strengthening level for each building will be determined in conjunction with the owners on a building-by-building basis. Factors that will be taken into account by the Council in determining the strengthening level include the cost of strengthening, the use to which the building is put, the level of danger posed by the building, and the extent of damage and repair involved.

Irrespective of strengthening level, the threshold level that triggers a requirement to strengthen is 33%NBS.

As part of any building consent application fire and disabled access provisions will need to be assessed.

### Christchurch Seismicity

The level of seismicity within the current New Zealand loading code (AS/NZS 1170) is related to the seismic zone factor. The zone factor varies depending on the location of the building within NZ. Prior to the 22nd February 2011 earthquake the zone factor for Christchurch was 0.22. Following the earthquake the seismic zone factor (level of seismicity) in the Christchurch and surrounding areas has been increased to 0.3. This is a 36% increase.

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 3.1 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 3.1: NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE Guidelines

Table 3.1 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 3.1: %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 |

# Appendix D

## Background and Legal Framework

### Background

Aurecon has been engaged by the Christchurch City Council (CCC) to undertake a detailed engineering evaluation of the building

This report is a Qualitative Assessment of the building structure, and is based on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011.

A qualitative assessment involves inspections of the building and a desktop review of existing structural and geotechnical information, including existing drawings and calculations, if available.

The purpose of the assessment is to determine the likely building performance and damage patterns, to identify any potential critical structural weaknesses or collapse hazards, and to make an initial assessment of the likely building strength in terms of percentage of new building standard (%NBS).

At the time of this report, no intrusive site investigation, detailed analysis, or modelling of the building structure had been carried out. Construction drawings were made available, and these have been considered in our evaluation of the building. The building description below is based on a review of the drawings and our visual inspections.

### 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.

### 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

## Building Act

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

**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).

**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.

**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.

**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.

**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.

**Section 131 – Earthquake Prone Building Policy**
This section requires the territorial authority to adopt a specific policy for earthquake prone, dangerous and insanitary buildings.

## 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;
- 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.

## 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.

# Appendix E

Standard Reporting Spread Sheet

**Detailed Engineering Evaluation Summary Data** V1.11

**Location**

| | | | |
|---|---|---|---|
| Building Name: | Old Woolshed | Reviewer: | Simon Manning |
| | Unit / No: / Street | CPEng No: | 132053 |
| Building Address: | Bottle Lake Forest / / Waitikiri Drive | Company: | Aurecon |
| Legal Description: | RS 26529 | Company project number: | 228593 |
| | | Company phone number | 03 375 0761 |
| | Degrees / Min / Sec | | |
| GPS south: | 43 / 28 / 8.91 | Date of submission: | April |
| GPS east: | 172 / 40 / 53.39 | Inspection Date: | March |
| | | Revision: | 0 |
| Building Unique Identifier (CCC): | PRK 0158 BLDG 006 EQ2 | Is there a full report with this summary? | yes |

**Site**

| | | | |
|---|---|---|---|
| Site slope: | flat | Max retaining height (m): | |
| Soil type: | mixed | Soil Profile (if available): | |
| Site Class (to NZS1170.5): | D | | |
| 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): | 3.30 |

**Building**

| | | | | |
|---|---|---|---|---|
| No. of storeys above ground: | 1 | single storey = 1 | Ground floor elevation (Absolute) (m): | 3.55 |
| Ground floor split? | yes | | Ground floor elevation above ground (m) | 0.25 |
| Storeys below ground | | | | |
| Foundation type | timber piles | | if Foundation type is other, describe | |
| Building height (m): | 4.50 | | height from ground to level of uppermost seismic mass (for IEP only) (m): | 4.5 |
| Floor footprint area (approx): | 120 | | | |
| Age of Building (years): | 50 | | 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): | Storage Shed | | | |
| Importance level (to NZS1170.5): | IL1 | | | |

Gravity Structure

| | | | |
|---|---|---|---|
| Gravity System: | load bearing walls | | |
| Roof: | timber framed | rafter type, purlin type and cladding | |
| Floors: | timber | joist depth and spacing (mm) | |
| Beams: | timber | type | |
| Columns: | timber | typical dimensions (mm x mm) | |
| Walls: | non-load bearing | 0 | |

Lateral load resisting structure

| | | | | |
|---|---|---|---|---|
| Lateral system along: | lightweight timber framed walls | **Note: Define along and across in detailed report!** | note typical wall length (m) | 11.3 |
| Ductility assumed, μ: | 3.00 | | | |
| Period along: | 0.40 | 0.00 | estimate or calculation? | estimated |
| Total deflection (ULS) (mm): | | | estimate or calculation? | estimated |
| maximum interstorey deflection (ULS) (mm): | | | estimate or calculation? | estimated |
| Lateral system across: | lightweight timber framed walls | | note typical wall length (m) | 12.5 |
| Ductility assumed, μ: | 3.00 | | | |
| Period across: | 0.40 | 0.00 | estimate or calculation? | estimated |
| Total deflection (ULS) (mm): | | | 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: | | | none |
| Wall cladding: | other light | describe | board and batten |
| Roof Cladding: | Metal | describe | corrugated iron |
| Glazing: | | | none |
| Ceilings: | none | | |
| 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 | none | original designer name/date | |

**Damage**

Site:
(refer DEE Table 4-2)

| | | | |
|---|---|---|---|
| Site performance: | | Describe damage: | minor - none |
| 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): | | | |
| Across | Damage ratio: | 0% | | |
| | Describe (summary): | | | |
| 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 | none | Describe: | |
| Building Consent required | no | Describe: | |
| Interim occupancy recommendations: | full occupancy | Describe: | |

| | | | | | |
|---|---|---|---|---|---|
| Along | Assessed %NBS before: | 100% | 0% %NBS from IEP below | If IEP not used, please detail assessment methodology: | |
| | Assessed %NBS after: | 100% | | | |
| Across | Assessed %NBS before: | 100% | 0% %NBS from IEP below | | |
| | Assessed %NBS after: | 100% | | | |

**IEP** **Use of this method is not mandatory - more detailed analysis may give a different answer, which would take precedence. Do not fill in fields if not using IEP.**

Period of design of building (from above): 1965-1976

$h_n$ from above: 4.5m

Seismic Zone, if designed between 1965 and 1992: B

not required for this age of building
not required for this age of building

| | along | across |
|---|---|---|
| Period (from above): | 0.4 | 0.4 |
| (%NBS)nom from Fig 3.3: | 0.0% | 0.0% |

| | |
|---|---|
| Note:1 for specifically design public buildings, to the code of the day: pre-1965 = 1.25; 1965-1976, Zone A =1.33; 1965-1976, Zone B = 1.2; all else 1.0 | 1.00 |
| Note 2: for RC buildings designed between 1976-1984, use 1.2 | 1.0 |
| Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0) | 1.0 |

| | along | across |
|---|---|---|
| **Final $(\%NBS)_{nom}$:** | **0%** | **0%** |

**2.2 Near Fault Scaling Factor**

Near Fault scaling factor, from NZS1170.5, cl 3.1.6: 1.00

| | along | across |
|---|---|---|
| Near Fault scaling factor (1/N(T,D), **Factor A**: | 1 | 1 |

**2.3 Hazard Scaling Factor**

| | |
|---|---|
| Hazard factor Z for site from AS1170.5, Table 3.3: | 0.30 |
| $Z_{1992}$, from NZS4203:1992 | |
| Hazard scaling factor, **Factor B:** | 3.333333333 |

**2.4 Return Period Scaling Factor**

| | |
|---|---|
| Building Importance level (from above): | 1 |
| Return Period Scaling factor from Table 3.1, **Factor C**: | 1.00 |

**2.5 Ductility Scaling Factor**

| | along | across |
|---|---|---|
| Assessed ductility (less than max in Table 3.2 | 2.00 | 2.00 |
| Ductility scaling factor: =1 from 1976 onwards; or =$k_\mu$, if pre-1976, fromTable 3.3: | 1.25 | 1.25 |
| Ductiity Scaling Factor, **Factor D**: | 1.25 | 1.25 |

**2.6 Structural Performance Scaling Factor:**

| | along | across |
|---|---|---|
| Sp: | 0.925 | 0.925 |
| Structural Performance Scaling Factor **Factor E**: | 1.081081081 | 1.081081081 |

| **2.7 Baseline %NBS, $(NBS\%)_b = (\%NBS)_{nom} \times A \times B \times C \times D \times E$** | along | across |
|---|---|---|
| **$\%NBS_b$:** | **0%** | **0%** |

Global Critical Structural Weaknesses: (refer to NZSEE IEP Table 3.4)

| | | |
|---|---|---|
| **3.1. Plan Irregularity, factor A:** | insignificant | 1 |
| **3.2. Vertical irregularity, Factor B:** | insignificant | 1 |
| **3.3. Short columns, Factor C:** | insignificant | 1 |

**3.4. Pounding potential**

| | |
|---|---|
| Pounding effect D1, from Table to right | 1.0 |
| Height Difference effect D2, from Table to right | 1.0 |
| Therefore, Factor D: | 1 |

| **Table for selection of D1** | Severe | Significant | Insignificant/none |
|---|---|---|---|
| Separation | 0<sep<.005H | .005<sep<.01H | Sep>.01H |
| Alignment of floors within 20% of H | **0.7** | **0.8** | **1** |
| Alignment of floors not within 20% of H | **0.4** | **0.7** | **0.8** |

| **Table for Selection of D2** | Severe | Significant | Insignificant/none |
|---|---|---|---|
| Separation | 0<sep<.005H | .005<sep<.01H | Sep>.01H |
| Height difference > 4 storeys | 0.4 | 0.7 | 1 |
| Height difference 2 to 4 storeys | 0.7 | 0.9 | 1 |
| Height difference < 2 storeys | 1 | 1 | 1 |

| | | |
|---|---|---|
| **3.5. Site Characteristics** | insignificant | 1 |

**3.6. Other factors, Factor F**

| | Along | Across |
|---|---|---|
| For ≤ 3 storeys, max value =2.5, otherwise max valule =1.5, no minimum | 1.0 | 1.0 |
| Rationale for choice of F factor, if not 1 | | |

Detail Critical Structural Weaknesses: (refer to DEE Procedure section 6)

List any: | Refer also section 6.3.1 of DEE for discussion of F factor modification for other critical structural weaknesses

| | | | |
|---|---|---|---|
| **3.7. Overall Performance Achievement ratio (PAR)** | | **1.00** | **1.00** |
| **4.3 PAR x (%NBS)b:** | PAR x Baselline %NBS: | **0%** | **0%** |
| **4.4 Percentage New Building Standard (%NBS), (before)** | | | **0%** |

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