



Seafield Park – Rabbit House  
Qualitative Engineering Evaluation

**Reference:** 230547

**Prepared for:**  
Christchurch City Council

**Functional Location ID:** PRK 0138 BLDG 006

**Address:** 105 Heyders Road, Christchurch

**Revision:** 2

**Date:** 2 July 2013

# Document Control Record

Document prepared by:


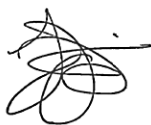
Aurecon New Zealand Limited  
Level 2, 518 Colombo Street  
Christchurch 8011  
PO Box 1061  
Christchurch 8140  
New Zealand

**T** +64 3 375 0761  
**F** +64 3 379 6955  
**E** christchurch@aurecongroup.com  
**W** aurecongroup.com

A person using Aurecon documents or data accepts the risk of:

- Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.
- Using the documents or data for any purpose not agreed to in writing by Aurecon.

Document control							aurecon
Report Title		Qualitative Engineering Evaluation					
Functional Location ID		PRK 0138 BLDG 006	Project Number		230547		
File Path		P:\ 230547 - Seafield Park – Rabbit House.docx					
Client		Christchurch City Council	Client Contact		Michael Sheffield		
Rev	Date	Revision Details/Status	Prepared	Author	Verifier	Approver	
1	11 January 2012	Draft	L. Castillo	L. Castillo	F.Lanning	F.Lanning	
2	2 July 2013	Final	L. Castillo	L. Castillo	F.Lanning	F.Lanning	
Current Revision		2					

Approval			
Author Signature		Approver Signature	
Name	Luis Castillo	Name	Forrest Lanning
Title	Senior Structural Engineer	Title	Senior Structural Engineer



# Contents

<b>Executive Summary</b>	<b>1</b>
<b>1 Introduction</b>	<b>2</b>
1.1 General	2
<b>2 Description of the Building</b>	<b>2</b>
2.1 Building Age and Configuration	2
2.2 Building Structural Systems Vertical and Horizontal	2
2.3 Reference Building Type	2
2.4 Building Foundation System and Soil Conditions	3
2.5 Available Structural Documentation and Inspection Priorities	3
2.6 Available Survey Information	3
<b>3 Structural Investigation</b>	<b>3</b>
3.1 Summary of Building Damage	3
3.2 Record of Intrusive Investigation	3
3.3 Damage Discussion	3
<b>4 Building Review Summary</b>	<b>4</b>
4.1 Building Review Statement	4
4.2 Critical Structural Weaknesses	4
<b>5 Building Strength (Refer to Appendix C for background information)</b>	<b>4</b>
5.1 General	4
5.2 Initial %NBS Assessment	4
5.3 Results Discussion	5
<b>6 Conclusions and Recommendations</b>	<b>5</b>
<b>7 Explanatory Statement</b>	<b>6</b>

# Appendices

**Appendix A Site Map and Photos**

**Appendix B References**



**Appendix C Strength Assessment Explanation**

**Appendix D Background and Legal Framework**

**Appendix E Standard Reporting Spread Sheet**

# Executive Summary

This is a summary of the Qualitative Engineering Evaluation for the Seafield Park – Rabbit House building and is based on the Detailed Engineering Evaluation Procedure document issued by the Engineering Advisory Group on 19 July 2011, visual inspections, available structural documentation and summary calculations as appropriate.

<b>Building Details</b>	<b>Name</b>	Seafield Park – Rabbit House			
<b>Building Location ID</b>	PRK 0138 BLDG 006			<b>Multiple Building Site</b>	N
<b>Building Address</b>	105 Heyders Road, Christchurch			<b>No. of residential units</b>	0
<b>Soil Technical Category</b>	NA	<b>Importance Level</b>	2	<b>Approximate Year Built</b>	1970
<b>Foot Print (m<sup>2</sup>)</b>	34	<b>Storeys above ground</b>	1	<b>Storeys below ground</b>	0
<b>Type of Construction</b>	Low pitched timber framed building, corrugated metal roof sheeting, Hardie plank on the back wall and wire chainlocked netting and Hardie plank on the front wall, concrete floor slab-on-grade				
<b>Qualitative L4 Report Results Summary</b>					
<b>Building Occupied</b>	Y	The Seafield Park – Rabbit House is currently in use.			
<b>Suitable for Continued Occupancy</b>	Y	The Seafield Park – Rabbit House is suitable for continued use.			
<b>Key Damage Summary</b>	Y	Refer to summary of building damage Section 3.1 report body.			
<b>Critical Structural Weaknesses (CSW)</b>	N	No critical structural weaknesses were identified.			
<b>Levels Survey Results</b>	N	Given the low levels of damage noted in the damage assessment, a levels survey is considered unnecessary.			
<b>Building %NBS From Analysis</b>	>100%	Based on seismic capacity and demand analysis.			
<b>Qualitative L4 Report Recommendations</b>					
<b>Geotechnical Survey Required</b>	N	Geotechnical survey not required due to lack of observed ground damage on site.			
<b>Proceed to L5 Quantitative DEE</b>	N	A quantitative DEE is not required for this structure.			
<b>Approval</b>					
<b>Author Signature</b>			<b>Approver Signature</b>		
<b>Name</b>	Luis Castillo		<b>Name</b>	Forrest Lanning	
<b>Title</b>	Senior Structural Engineer		<b>Title</b>	Senior Structural Engineer	

# 1 Introduction

## 1.1 General

On 22 August 2012, Aurecon engineers visited the Seafield Park – Rabbit House to undertake a qualitative 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 related 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 the safety of occupants if the building is currently occupied.
- Assessment of requirements for detailed engineering evaluation including geotechnical investigation, level survey and any areas where linings and floor coverings need removal to expose structural damage.

This report outlines the results of our Qualitative Assessment of damage to the Seafield Park – Rabbit House 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

Built in the late 1970's (as per Seafield Park Ranger), the Seafield Park – Rabbit House is a single storey low-pitched timber framed building with timber framed roof supporting corrugated metal roof sheeting. The southern wall is internally lined with plasterboard. The northern wall has wire chainlocked netting with Hardie plank on the lower end of the wall. The external walls have Hardie plank cladding and are supported by concrete floor slab-on-grade with, we assume, local thickening under load bearing walls.

The building has an approximate floor area of 34 square metres. It is considered as an importance level 2 structure in accordance with AS/NZS 1170 Part 0:2002.

### 2.2 Building Structural Systems Vertical and Horizontal

The Seafield Park – Rabbit House is of timber construction. The timber framed roof supports corrugated metal roof sheeting that transfer loads to the external load bearing walls. Load bearing walls are supported on concrete floor slab-on-grade. Lateral loads are resisted by the timber framed walls. No plans were available for this structure.

### 2.3 Reference Building Type

The Seafield Park – Rabbit House is a basic timber framed structure typical of its age and style. It was not subject to specific engineering design; rather it was constructed to a reliable formula known to achieve the performance and aesthetic objectives at the time it was built.



## 2.4 Building Foundation System and Soil Conditions

The Seafield Park – Rabbit House has concrete floor slab-on-grade with, we assume, local thickening under load bearing walls.

The building is currently used for non-residential recreational purposes. The Department of Housing and Building (DBH) do not currently have a technical classification for the land in the immediate vicinity of the Seafield Park – Rabbit House. The land and surrounds of Seafield Park – Rabbit House are zoned TC2 which, according to CERA, means that minor to moderate land damage from liquefaction is possible in future significant earthquakes. However, there are no signs in the vicinity of Seafield Park – Rabbit House of liquefaction bulges, boils or subsidence.

## 2.5 Available Structural Documentation and Inspection Priorities

A drawing detailing the relocation of the aviaries and shed at Seafield Park, dated 25 March 1998, has been provided by the Christchurch City Council. However the drawing does not include details for the Seafield Park – Rabbit House. Inspection priorities related to a review of potential damage to the foundations and bracing walls.

## 2.6 Available Survey Information

No floor level or verticality survey information was available at the time of this report and obtaining these is not required as part of the DEE process for this type of building.

# 3 Structural Investigation

## 3.1 Summary of Building Damage

The Seafield Park – Rabbit House was in use at the time the damage assessment was carried out. It has performed well with no structural damage noted from the recent seismic events.

## 3.2 Record of Intrusive Investigation

No damage was noted and therefore, an intrusive investigation was neither warranted nor undertaken for the Seafield Park – Rabbit House.

## 3.3 Damage Discussion

No seismic related damage was noted in the damage assessment. This is not surprising as buildings of this nature are flexible and have high inherent ductility.



## 4 Building Review Summary

### 4.1 Building Review Statement

As noted above no intrusive investigations were carried out for the Seafield Park – Rabbit House. Because of the generic nature of the building a significant amount of information can be inferred from an external and internal inspection.

### 4.2 Critical Structural Weaknesses

No specific critical structural weaknesses were identified as part of the building qualitative assessment.

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

### 5.1 General

The Seafield Park – Rabbit House is a typical single storey timber framed building. This type of building, due to its lightweight, flexibility and natural ductility, has typically performed well. Rabbit House is no exception to this.

### 5.2 Initial %NBS Assessment

The Seafield Park – Rabbit House has not been subject to specific engineering design and the initial evaluation procedure or IEP is not an appropriate method of assessment for this building. Nevertheless an estimate of lateral load capacity can be made by adopting assumed values for strengths of existing materials and calculating the capacity of existing walls.

Selected assessment seismic parameters are tabulated in the tables below.

Table 1: Parameters used in the Seismic Assessment

Seismic Parameter	Quantity	Comment/Reference
Site Soil Class	D	NZS 1170.5:2004, Clause 3.1.3, Deep or Soft Soil
Site Hazard Factor, Z	0.30	DBH Info Sheet on Seismicity Changes (Effective 19 May 2011)
Return period Factor, $R_u$	1.00	NZS 1170.5:2004, Table 3.5, Importance Level 2 Structure with a Design Life of 50 years
Ductility Factor in the Along Direction, $\mu$	3.00	Timber framed walls (AS1170.4:2007 Table 6.5A)
Ductility Factor in the Across Direction, $\mu$	3.00	Timber framed walls (AS1170.4:2007 Table 6.5A)

The seismic demand for the Seafield Park – Rabbit House has been calculated based on the current code requirements. The capacity of the existing walls in the building has been calculated from assumed strengths of existing materials and the number and length of walls present for both longitudinal and transverse directions. The seismic demand was then compared with the building capacity in both directions. The building was found to have a seismic capacity of **100%** of the New Building Standard (**NBS**) and is therefore classified as a 'low risk' building according to NZEE Guidelines. This is according to initial calculations using NZS3604:2011 and NZSEE:2006.



### 5.3 Results Discussion

Analysis shows that the Seafield Park – Rabbit House is capable of achieving a seismic performance of **100%NBS**. This is not surprising as lightweight construction like that of Seafield Park – Rabbit House produces a low seismic demand.

## 6 Conclusions and Recommendations

The land surrounding the Seafield Park – Rabbit House is zoned as TC2 and as such minor to moderate land damage from liquefaction is possible in future significant earthquakes. During our inspection, there is no local evidence of settlement and liquefaction sighted in the surrounding land. Given the good performance of the Seafield Park – Rabbit House in the Canterbury earthquake sequence and the lack of foundation damage, **a geotechnical investigation is currently not considered necessary.**

Additionally, the building has suffered no loss of functionality and in our opinion the Seafield Park – Rabbit House **is suitable for continued occupation.**



## 7 Explanatory Statement

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 (where available) 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 repaired, strengthened, or replaced 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.

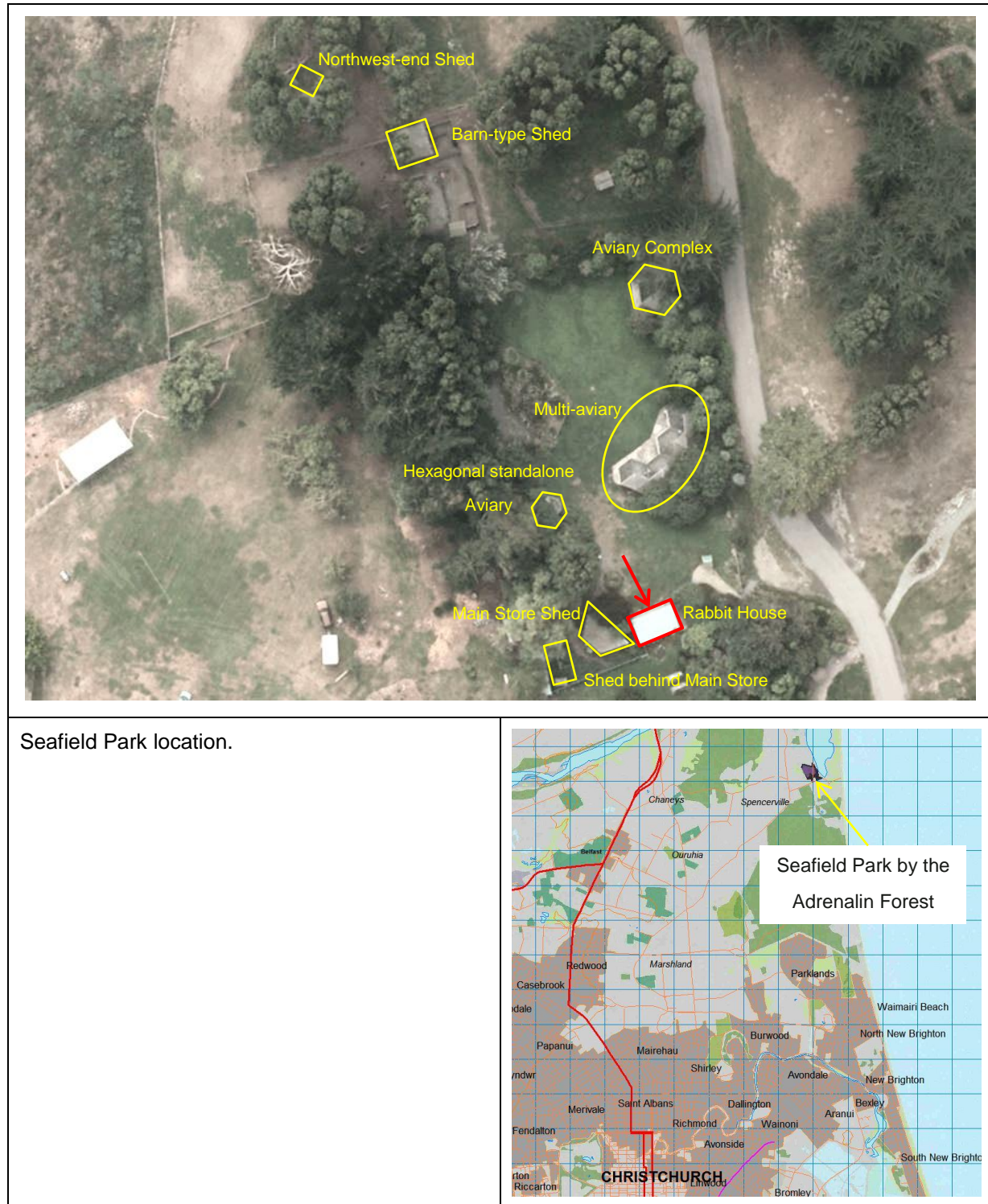
# Appendices







# Appendix A

## Site Map and Photos

22 August 2012 – Seafield Park – Rabbit House Site Photographs





<p>Northeast view of the building.</p>	 <p>A photograph showing the northeast view of a long, low building with a green-painted base and chain-link fencing on top. The building is surrounded by greenery and a lawn.</p>
<p>East end of the building.</p>	 <p>A photograph showing the east end of the building, featuring a chain-link fence and a dark-colored door. The date and time stamp '22/08/2012 11:20' are visible in the bottom right corner.</p>
<p>West end of the building.</p>	 <p>A photograph showing the west end of the building, featuring a chain-link fence and a dark-colored door. The date and time stamp '22/08/2012 11:22' are visible in the bottom right corner.</p>
<p>Internal view of the building.</p>	 <p>A photograph showing the interior of the building, which is a rabbit house. It features wooden walls, a chain-link fence, and a rabbit sitting on a wooden platform. The date and time stamp '22/08/2012 11:21' are visible in the bottom right corner.</p>

# Appendix B

## References

1. Department of Building and Housing (DBH), “Revised Guidance on Repairing and Rebuilding Houses Affected by the Canterbury Earthquake Sequence”, November 2011
2. New Zealand Society for Earthquake Engineering (NZSEE), “Assessment and Improvement of the Structural Performance of Buildings in Earthquakes”, April 2012
3. Standards New Zealand, “AS/NZS 1170 Part 0, Structural Design Actions: General Principles”, 2002
4. Standards New Zealand, “AS/NZS 1170 Part 1, Structural Design Actions: Permanent, imposed and other actions”, 2002
5. Standards New Zealand, “NZS 1170 Part 5, Structural Design Actions: Earthquake Actions – New Zealand”, 2004
6. Standards New Zealand, “NZS 3101 Part 1, The Design of Concrete Structures”, 2006
7. Standards New Zealand, “NZS 3404 Part 1, Steel Structures Standard”, 1997
8. Standards New Zealand, “NZS 3603, Timber Structures Standard”, 1993
9. Standards New Zealand, “NZS 3604, Timber Framed Structures”, 2011
10. Standards New Zealand, “NZS 4229, Concrete Masonry Buildings Not Requiring Specific Engineering Design”, 1999
11. Standards New Zealand, “NZS 4230, Design of Reinforced Concrete Masonry Structures”, 2004

# 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 Building 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 22<sup>nd</sup> 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 C1 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 C1: NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE Guidelines

Table C1 below compares the percentage NBS to the relative risk of the building failing in a seismic event with a 10% probability 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% probability of exceedance in the next year.

Table C1: Relative Risk of Building Failure In A

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).

### 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:

- Hazard Factor increased from 0.22 to 0.3 (36% increase in the basic seismic design load)
- 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

<b>Location</b>		Building Name: Seafield Park - Rabbit House	Reviewer: Lee Howard
	Unit No: Street	CPEng No: 1008889	
Building Address:	105 Heyders Road, Christchurch	Company: Aurecon NZ Ltd	
Legal Description: RES 40231		Company project number: 230547	
		Company phone number: 03 366 0821	
	Degrees Min Sec	Date of submission: Jul-13	
GPS south: 43 25 45.73		Inspection Date: Aug-12	
GPS east: 172 42 17.09		Revision: 2	
Building Unique Identifier (CCC): PRK 0138 BLDG 005		Is there a full report with this summary? yes	

<b>Site</b>	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): 0.00

<b>Building</b>	No. of storeys above ground: 1	single storey = 1	Ground floor elevation (Absolute) (m): 0.00
	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): 2.50	height from ground to level of uppermost seismic mass (for IEP only) (m): 2.5	
	Floor footprint area (approx): 34		
	Age of Building (years): 42	Date of design: 1976-1992	
	Strengthening present? no	If so, when (year)?	
	Use (ground floor): other (specify)	And what load level (%g)?	
	Use (upper floors):	Brief strengthening description:	
	Use notes (if required): rabbit house		
	Importance level (to NZS1170.5): IL2		

<b>Gravity Structure</b>	Gravity System: load bearing walls	
	Roof: timber framed	rafter type, purlin type and cladding: timber rafters and purlins supporting decramastic roofing
	Floors:	
	Beams:	
	Columns:	
	Walls:	

<b>Lateral load resisting structure</b>	Lateral system along: lightweight timber framed walls	Note: Define along and across in detailed report!	4.9
	Ductility assumed, $\mu$ : 3.00	note typical wall length (m)	
	Period along: 0.40	estimate or calculation? estimated	
	Total deflection (ULS) (mm):	estimate or calculation?	
	maximum interstorey deflection (ULS) (mm):	estimate or calculation?	

Lateral system across: lightweight timber framed walls  
Ductility assumed,  $\mu$ : 3.00  
Period across: 0.40  
Total deflection (ULS) (mm):  
maximum interstorey deflection (ULS) (mm):

0.00

note typical wall length (m)

estimate or calculation?

estimate or calculation?

estimate or calculation?

6.9

estimated

#### Separations:

north (mm):

east (mm):

south (mm):

west (mm):

leave blank if not relevant

#### Non-structural elements

Stairs:

Wall cladding:

Roof Cladding:

Glazing:

Ceilings:

Services(list):

other light

Other (specify)

timber frames

describe

describe

Hardie plank

decramastic roofing

#### Available documentation

Architectural:

Structural:

Mechanical:

Electrical:

Geotech report:

none

partial

none

none

none

original designer name/date

original designer name/date

original designer name/date

original designer name/date

original designer name/date

Christchurch City Council, 25/3/98

#### Damage

##### Site:

(refer DEE Table 4-2)

Site performance:

good

Describe damage:

none noted

Settlement:

Differential settlement:

Liquefaction:

Lateral Spread:

Differential lateral spread:

Ground cracks:

Damage to area:

none observed

none observed

none apparent

none apparent

none apparent

none apparent

none apparent

notes (if applicable):

notes (if applicable):

notes (if applicable):

notes (if applicable):

notes (if applicable):

notes (if applicable):

notes (if applicable):

#### Building:

Current Placard Status:

green

Along

Damage ratio:

0%

Describe (summary):

Describe how damage ratio arrived at:

Across

Damage ratio:

0%

Describe (summary):

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

Diaphragms

Damage?:

no

Describe:

CSWs:

Damage?:

no

Describe:

Pounding:

Damage?:

no

Describe:

Non-structural:

Damage?:

no

Describe:

**Recommendations**

Level of repair/strengthening required:   
Building Consent required:   
Interim occupancy recommendations:

Describe:   
Describe:   
Describe:

Along	Assessed %NBS before e'quakes:	<input type="text" value="100%"/>	0% %NBS from IEP below	If IEP not used, please detail assessment methodology:	<input type="text" value="based on bracing calculations"/>
	Assessed %NBS after e'quakes:	<input type="text" value="100%"/>			
Across	Assessed %NBS before e'quakes:	<input type="text" value="100%"/>	0% %NBS from IEP below		
	Assessed %NBS after e'quakes:	<input type="text" value="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): 1976-1992

$h_n$  from above: 2.5m

Seismic Zone, if designed between 1965 and 1992:

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

	along	across
Period (from above):	<input type="text" value="0.4"/>	<input type="text" value="0.4"/>
(%NBS) <sub>nom</sub> from Fig 3.3:	<input type="text" value="0.0%"/>	<input type="text" value="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	<input type="text" value="1.00"/>
Note 2: for RC buildings designed between 1976-1984, use 1.2	<input type="text" value="1.0"/>
Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0)	<input type="text" value="1.0"/>

	along	across
<b>Final (%NBS)<sub>nom</sub>:</b>	<input type="text" value="0%"/>	<input type="text" value="0%"/>

**2.2 Near Fault Scaling Factor**

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

	along	across
Near Fault scaling factor (1/N(T,D), <b>Factor A:</b>	<input type="text" value="1"/>	<input type="text" value="1"/>

**2.3 Hazard Scaling Factor**

Hazard factor Z for site from AS1170.5, Table 3.3:   
Z<sub>1992</sub>, from NZS4203:1992   
Hazard scaling factor, **Factor B:**

**2.4 Return Period Scaling Factor**

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

**2.5 Ductility Scaling Factor**

	along	across
Assessed ductility (less than max in Table 3.2)	<input type="text" value="1.25"/>	<input type="text" value="1.25"/>
Ductility scaling factor: =1 from 1976 onwards; or = $\kappa_u$ , if pre-1976, from Table 3.3:	<input type="text" value="1.14"/>	<input type="text" value="1.14"/>
Ductility Scaling Factor, <b>Factor D:</b>	<input type="text" value="1.00"/>	<input type="text" value="1.00"/>

**2.6 Structural Performance Scaling Factor:**

Sp:    
Structural Performance Scaling Factor **Factor E:**



2.7 Baseline %NBS,  $(NBS\%)_b = (NBS)_{nom} \times A \times B \times C \times D \times E$

%NBS<sub>b</sub>: 

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
---

3.5. Site Characteristics 

insignificant	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

3.6. Other factors, Factor F

For ≤ 3 storeys, max value =2.5, otherwise max valule =1.5, no minimum

Rationale for choice of F factor, if not 1

Along

Across

1.0

1.0

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)<sub>b</sub>:

PAR x Baseline %NBS:

0%

0%

4.4 Percentage New Building Standard (%NBS), (before)

0%



**Aurecon New Zealand Limited  
Level 2, 518 Colombo Street  
Christchurch 8011**

PO Box 1061  
Christchurch 8140  
New Zealand

**T** +64 3 375 0761  
**F** +64 3 379 6955  
**E** [christchurch@aurecongroup.com](mailto:christchurch@aurecongroup.com)  
**W** [aurecongroup.com](http://aurecongroup.com)

Aurecon offices are located in:  
Angola, Australia, Botswana, China,  
Ethiopia, Hong Kong, Indonesia,  
Lesotho, Libya, Malawi, Mozambique,  
Namibia, New Zealand, Nigeria,  
Philippines, Singapore, South Africa,  
Swaziland, Tanzania, Thailand, Uganda,  
United Arab Emirates, Vietnam.