Spencer Park Camping Ground Holiday Cabins

Qualitative Engineering Evaluation

Functional Location ID: PRO 0157 002

Address: 100 Heyders Road, Spencerville

Reference: 228605

Prepared for:

Christchurch City Council

Revision: 3

Date: 10 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 3 366 0821
F +64 3 379 6955
E christchurch@aurecongroup.com
W aurecongroup.com

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Approval			
Author Signature		Approver Signature	
Name	Christopher Bong	Name	Lee Howard
Title	Structural Engineer	Title	Senior Structural Engineer

Contents

Appendices

Executive Summary

This is a summary of the Qualitative Engineering Evaluation for the Spencer Park Camping Ground Holiday Cabins 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.

Building Details	**Name**	Spencer Park Camping Ground Holiday Cabins			
Building Location ID	PRO 0157 002			**Multiple Building Site**	Y
Building Address	100 Heyders Road, Spencerville			**No. of residential units**	1
Soil Technical Category	N/A	**Importance Level**	2	**Year Built**	1989
Foot Print (m²)	158	**Stories above ground**	1	**Stories below ground**	0
Type of Construction (Main Hall)	Light timber roof with purlins , pre-nailed lightweight timber trusses, corrugated steel roof, timber walls with vertical board cladding in the along direction, reinforced concrete masonry in the across direction, structure founded on pad				
Qualitative L4 Report Results Summary					
Building Occupied	Y	The Spencer Park Camping Ground Holiday Cabins are currently in use.			
Suitable for Continued Occupancy	Y	The Spencer Park Camping Ground Holiday Cabins are suitable for continued occupation.			
Key Damage Summary	Y	Refer to summary of building damage Section 3.1 report body.			
Critical Structural Weaknesses (CSW)	N	There were no critical structural weaknesses found.			
Levels Survey Results	Y	The floor was within the DBH's Guidelines with falls of less than 1:200 or 0.5%.			
Building %NBS From Analysis	Approx. 49%	Based on assumed approximate building material strength. "Moderate risk" category according to NZSEE guidelines refer Figure C1 in Appendix C.			
Qualitative L4 Report Recommendations					
Geotechnical Survey Required	N	A geotechnical survey not required.			
Proceed to L5 Quantitative DEE	N	A quantitative DEE is not required for this structure. It is recommended that this report is considered FINAL.			
Approval					
Author Signature	[signature]		**Approver Signature**	[signature]	
Name	Christopher Bong		**Name**	Lee Howard	
Title	Structural Engineer		**Title**	Senior Structural Engineer	

1 Introduction

1.1 General

On 14 March 2012 Aurecon engineers visited the Spencer Park Camping Ground Holiday Cabins 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:

1. Assessment of the nature and extent of the building damage.
2. Visual assessment of the building strength particularly with respect to safety of occupants if the building is currently occupied.
3. 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 Spencer Park Camping Ground Holiday Cabins and is based on the Detailed Engineering Evaluation Guidelines as issued by the Engineering Advisory Group on 19 July 2011, visual inspections, available structural documentation as appropriate are attached herein.

2 Description of the Building

2.1 Building Age and Configuration

The Spencer Park Camping Ground Holiday Cabins are a 1989 single storey, timber framed and concrete masonry building. It has a corrugated iron roof, lightweight timber purlins, pre-nailed lightweight timber trusses, load bearing timber framed walls clad with vertical cement sheets and inter-tenancy concrete masonry walls. The floor slab is a slab on grade with edge thickenings and strip footing at masonry wall locations.

The approximate floor area of the building is 158 square metres and is classified as an Importance Level 2 Structure in accordance with NZS 1170 Part 0: 2002.

2.2 Building Structural Systems Vertical and Horizontal

The load path for the Spencer Park Camping Ground Holiday Cabins to the concrete slab on grade foundation is simple; it comprises of three distinct systems in the vertical, along and across directions.

The vertical loads that originate from the pre-nailed timber truss roof are distributed onto what is assumed to be the lightly reinforced, partially filled concrete masonry walls via the timber rafters and beams. The veranda roof is held up by timber beams and columns

The horizontal loads in the across direction are taken by the evenly distributed concrete masonry inter-tenancy walls. In a similar fashion, the horizontal loads in the along direction are resisted primarily by the rear timber framed walls on the Southern and Western side of the buildings. The torsional resistance is provided by the stiffer concrete masonry walls in the across direction.

2.3 Reference Building Type

The Spencer Park Camping Ground Holiday Cabins is a multi-residential building with concrete masonry and timber framed walls. The concrete masonry walls typically function as inter-tenancy walls and resist the vertical and lateral loads in the across direction. Additionally, timber framed walls resist the lateral loads in the less critical along direction and carry the vertical loads from the timber trusses.

Many buildings of this nature are intrinsically robust in construction and have suffered only minor damage. Furthermore, building stock constructed fairly recently (in 1989 in this instance) may be close to full compliance with current codes.

Seismic related damage for building of this nature and era can be:

- Inadequate shear or flexural strength of the masonry wall, evidenced by step cracking in the mortar joints
- Excessive displacement of the masonry wall due to rocking
- Cracking in brittle claddings such as gypsum plasterboard, due to deflections in the timber framed walls

These types of damage were specifically looked for during the damage assessment.

2.4 Building Foundation System and Soil Conditions

The Spencer Park Camping Ground Holiday Cabins are, as described above, founded on a concrete slab foundation. The land surrounding the Spencer Park Camping Ground Holiday Cabins is classified as “rural and unmapped” according to the DHB Technical Classes dated 23 March 2012.

It is of note that the residential property to the immediate east is classed as “Technical Category 3” or TC3 and according to CERA “may suffer moderate to significant liquefaction in future significant earthquakes”.

2.5 Available Structural Documentation and Inspection Priorities

The only documentation available at the time of writing of this report was a set of structural drawings and a building permit application lodged in June 1989 from the Christchurch City Council property files. The files indicate that the building was approved for construction by the Territorial Authority of the time, the Waimairi District Council. For the purpose of this report it is assumed that the building was constructed in accordance with these documents.

The inspection priorities for this report are the review of damage to the building and consideration of the bracing adequacy of the building.

2.6 Available Survey Information

A levels survey was undertaken on the floor coverings of the building to quantify the level of unevenness. The levels survey results were within the 1 in 200 or 0.5% slope threshold set by the Department of Building and Housing’s November 2011 Guidelines. Therefore no further action in the form of re-levelling is considered necessary.

3 Structural Investigation

3.1 Summary of Building Damage

The Spencer Park Camping Ground Holiday Cabins was in use and several units were occupied at the time of the damage assessment. A thorough visual damage assessment has shown:

- Several of the timber beams in the veranda have split parallel to the grain; and
- Foundation and pavement cracking; and
- Cracking in the plasterboard and ceiling linings.

The damage in general was evenly distributed and relatively minor.

3.2 Record of Intrusive Investigation

The extent of damage was relatively minor and therefore, an intrusive investigation was considered unnecessary. Due to the generic nature of the Spencer Park Camping Ground Holiday Cabins, a significant amount of structural information can be inferred from the building form and construction materials.

3.3 Damage Discussion

The damage observed in the Spencer Park Camping Ground Holiday Cabins was relatively minor. They were primarily splitting in the timber, cracking in the foundations/pavements and plasterboard linings. Of the various types of damage observed, only the plasterboard wall and ceiling lining cracks are likely to be exclusively earthquake related. Other damage, including the splitting in the timber beam and the cracking in the foundations/pavements may be due to historic in service conditions.

4 Building Review Summary

4.1 Building Review Statement

The high level of finish of the Spencer Park Camping Ground Holiday Cabins impeded the obstructed the viewing of most of the primary structural elements. Nevertheless, a non-intrusive damage assessment was undertaken assuming that the damage to the brittle claddings and finishes of the building would indicate a commensurate level of displacement damage on the building's structure.

4.2 Critical Structural Weaknesses

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

5 Building Strength (Refer Appendix C: for background information)

5.1 General

The Spencer Park Camping Ground Holiday Cabins, being of lightweight timber frame and concrete masonry construction, are intrinsically robust and have stood up well in the recent seismic events. This is evidenced by the low level of displacement damage described in section 3.1 above.

5.2 Initial %NBS Assessment

The Spencer Park Camping Ground Holiday Cabins, when constructed were most likely not subject to specific engineering design and the Initial Evaluation Procedure (IEP) will not give a useful estimate of building capacity in terms of percentage of new building strength. Nevertheless an estimate of lateral load capacity or bracing check 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 Table 1 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.
Ductility Factor in Transverse Direction, μ	1.25	Concrete masonry walls.
Ductility Factor in Longitudinal Direction, μ	2.00	Plasterboard lined lightweight timber framed walls.

The bracing check in both the longitudinal and transverse directions has shown that the building is capable of achieving approximately 49%NBS (i.e. a “moderate risk” building according to NZSEE guidelines).

5.3 Results Discussion

The findings of the bracing check were consistent with the observed damage in the visual damage assessment. The building’s sub-67%NBS score can be attributed to the lack of full height timber framed walls in the front (i.e. the northern and eastern elevations) of the building due to door and window openings.

This quantitative analysis was undertaken using the assumed approximate bracing capacity of the timber wall lined with gypsum wall board according to the New Zealand Society of Earthquake Engineering (NZSEE) guidelines for the Assessment and Improvement of The Structural Performance of Buildings in Earthquakes and the NZS 4229:1999, Concrete Masonry Buildings Not Requiring Specific Engineering Design.

6 Conclusions and Recommendations

As noted within the report, only low levels of visible damage was observed in the damage assessment and the levels survey has shown that the floor levels are within acceptable limits. This is further supported by the building strength analysis that was undertaken. It is therefore considered that the Spencer Park Camping Ground Holiday Cabins is **suitable for continued occupation**.

As there is no clear evidence of any liquefaction or ground movement in the vicinity of the Spencer Park Camping Ground Holiday Cabins **a geotechnical investigation is currently not considered necessary**.

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 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.

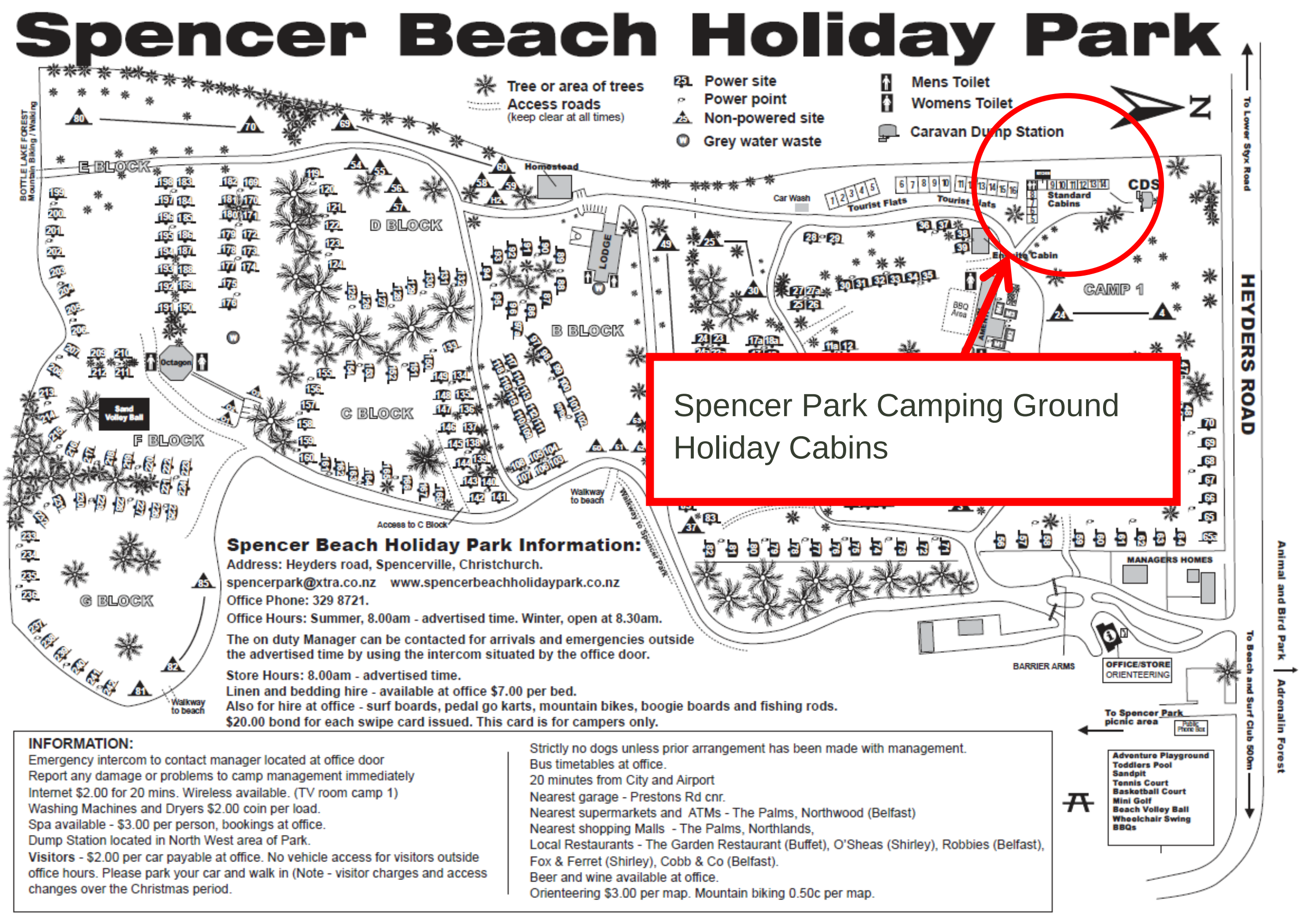
Without limiting any of the above, Aurecon's liability, whether under the law of contract, tort, statute, equity or otherwise, is limited as set out in the terms of the engagement with the client.

Appendices

Appendix A

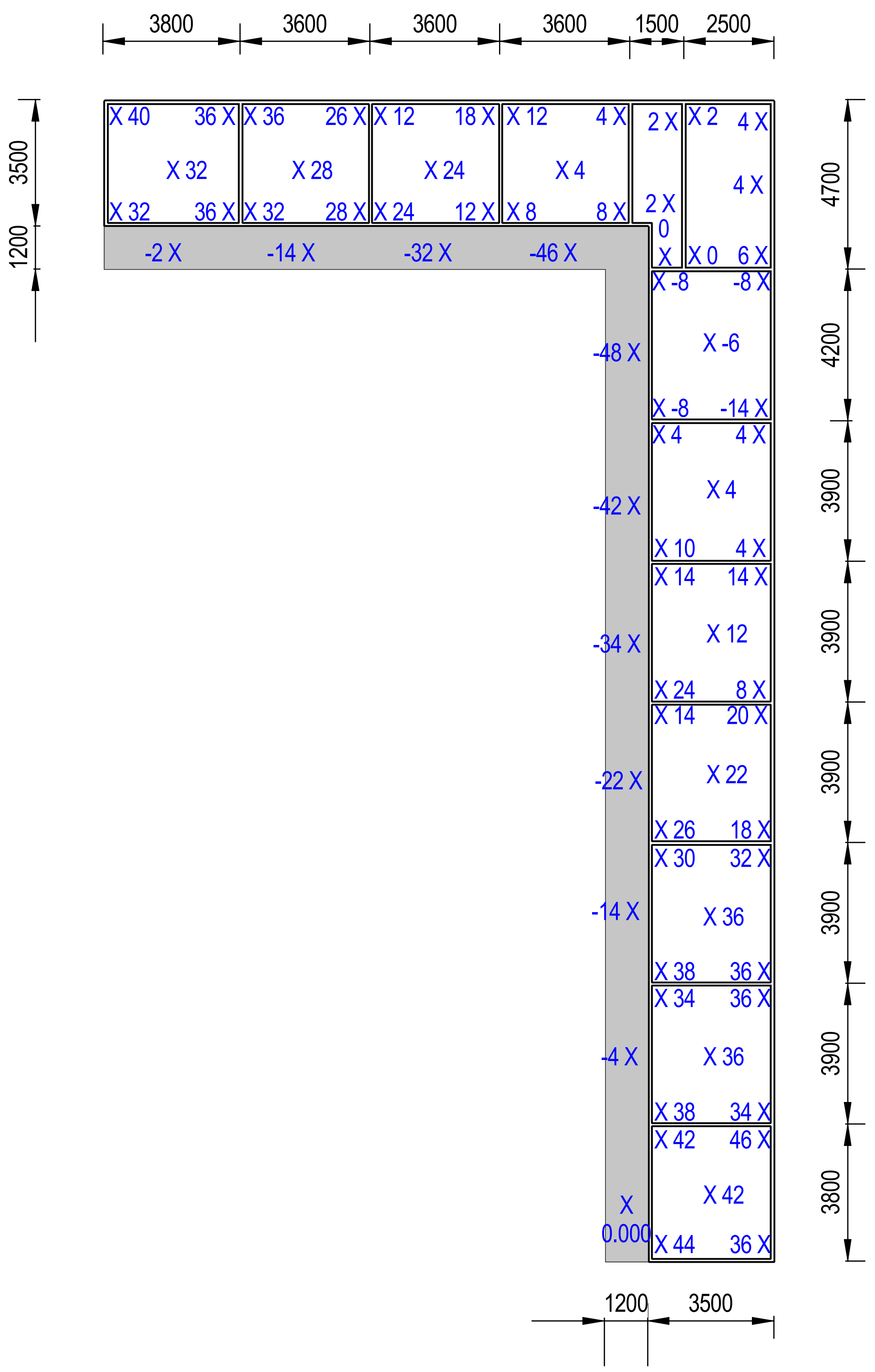
Site Map, Photos and Levels Survey Results

Site photographs (14 March 2012)



Building North Eastern elevation.

Building Northern end elevation.	
Vertical cement sheet boards and concrete slab below.	
Timber veranda beams and post.	
Splitting in the veranda timber beam.	



C BLOCK

1 : 200

28/11/2012 10:22:22 a.m.

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CLIENT
Christchurch City Council

REV	DATE	REVISION DETAILS	APPROVAL

DRAWN: D.HUNIA
DESIGNED: C.BONG
CHECKED: L.HOWARD
APPROVED: L.HOWARD
DATE

PROJECT
SPENCER PARK CAMPING GROUND
HOLIDAY CABINS

TITLE
LEVEL SURVEY
C BLOCK

PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.
228605

SCALE: 1 : 200
SIZE: A4
DRAWING No.: S-01-02
REV

Appendix B
References

- Standards New Zealand, "AS/NZS 1170 Parts 0,1 and 5 and commentaries"
- Standards New Zealand, "NZS 3604:2011: Timber Framed Structures"
- Standards New Zealand, "NZS 4229:1999, Concrete Masonry Buildings Not Requiring Specific Design"
- Standards New Zealand, "NZS 3404:1997, Steel Structures Standard"
- Standards New Zealand, "NZS 3101:2006, Concrete Structures Standard"
- New Zealand Society for Earthquake Engineering (NZSEE), "Assessment and Improvement of the Structural Performance of Buildings in Earthquakes June 2006"
- Engineering Advisory Group, "Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-Residential Buildings in Canterbury. Part 2 Evaluation Procedure. 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 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 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 C1 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	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.	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).

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:

- 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

Location

Building Name:	Holiday Cabins	Reviewer:	Lee Howard
	Unit / No: / Street	CPEng No:	1008889
Building Address:	Spencer Park Camping Ground / 100 / Heyders Road	Company:	Aurecon
Legal Description:	Lot 1 DP 44484	Company project number:	228605
		Company phone number:	03-366 0821
	Degrees / Min / Sec		
GPS south:	43 / 25 / 48.84	Date of submission:	10/07/2013
GPS east:	172 / 42 / 15.91	Inspection Date:	14/03/2012
		Revision:	3
Building Unique Identifier (CCC):	PRO 0157 002	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):	1.00

Building

No. of storeys above ground:	1	single storey = 1 / Ground floor elevation (Absolute) (m):	1.00
Ground floor split?	no	Ground floor elevation above ground (m):	0.00
Storeys below ground	0		
Foundation type:	raft slab	if Foundation type is other, describe:	
Building height (m):	4.00	height from ground to level of uppermost seismic mass (for IEP only) (m):	4
Floor footprint area (approx):	230		
Age of Building (years):	24	Date of design:	1976-1992
Strengthening present?	no	If so, when (year)?	
		And what load level (%g)?	
Use (ground floor):	multi-unit residential	Brief strengthening description:	
Use (upper floors):			
Use notes (if required):			
Importance level (to NZS1170.5):	IL2		

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber framed	rafter type, purlin type and cladding	lightweight timber purlins and re-nailed roof trusses
Floors:	concrete flat slab	slab thickness (mm)	100
Beams:	timber	type	lightweight timber for lintels
Columns:	timber	typical dimensions (mm x mm)	150mm square
Walls:	partially filled concrete masonry	thickness (mm)	190

Lateral load resisting structure

Lateral system along:	lightweight timber framed walls	**Note: Define along and across in detailed report!**		Partially filled masonry walls
Ductility assumed, μ:	2.00		note typical wall length (m)	
Period along:	0.40	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	partially filled CMU			
Ductility assumed, μ:	1.25		note total length of wall at ground (m):	
Period across:	0.40	#### enter height above at H31	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
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:	plaster system	describe	painted CMU, plasterboard walls
Roof Cladding:	Metal	describe	corrugated steel
Glazing:	aluminium frames		
Ceilings:	plaster, fixed		
Services(list):			

Available documentation

Architectural	none	original designer name/date	
Structural	partial	original designer name/date	Waimairi District Council/1989
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:	Good	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 e'quakes:	56%	#### %NBS from IEP below	If IEP not used, please detail assessment methodology:	detailed calculations
	Assessed %NBS after e'quakes:	56%			
Across	Assessed %NBS before e'quakes:	100%	#### %NBS from IEP below		
	Assessed %NBS after e'quakes:	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:	4m
Seismic Zone, if designed between 1965 and 1992:		not required for this age of building	D soft soil
		not required for this age of building	

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

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

Note 2: for RC buildings designed between 1976-1984, use 1.2
Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (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:

	along	across
Near Fault scaling factor (1/N(T,D), **Factor A**:	#DIV/0!	#DIV/0!

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3:	0.30
Z_{1992}, from NZS4203:1992	0.8
Hazard scaling factor, **Factor B:**	3.333333333

2.4 Return Period Scaling Factor

Building Importance level (from above):	2
Return Period Scaling factor from Table 3.1, **Factor C**:	0.80

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 =kμ, if pre-1976, fromTable 3.3:	1.57	1.57
Ductiity Scaling Factor, **Factor D**:	1.00	1.00

2.6 Structural Performance Scaling Factor:

	along	across
Sp:	0.700	0.700
Structural Performance Scaling Factor **Factor E**:	1.428571429	1.428571429

2.7 Baseline %NBS, (NBS%)b = (%NBS)nom x A x B x C x D x E — **%NBSb:** **#DIV/0!** | **#DIV/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:	significant	0.7
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

	Along	Across
For ≤ 3 storeys, max value =2.5, otherwise max valule =1.5, no minimum	2.0	2.0
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

	along	across
3.7. Overall Performance Achievement ratio (PAR)	**1.40**	**1.40**
4.3 PAR x (%NBS)b: — PAR x Baselline %NBS:	**#DIV/0!**	**#DIV/0!**
4.4 Percentage New Building Standard (%NBS), (before)		**#DIV/0!**

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

T +64 3 366 0821
F +64 3 379 6955
E christchurch@aurecongroup.com
W aurecongroup.com