New Brighton Crèche Combined Report

Qualitative Engineering Evaluation

Functional Location ID: PRO 0001 B001, B002 & B003

Address: 109 Beresford Street

Reference: 227257

Prepared for:

Christchurch City Council

Revision: 3

Date: 17 October 2013

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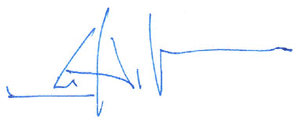
Author Signature		Approver Signature	
Name	Luis Castillo	Name	Forrest Lanning
Title	Senior Structural Engineer	Title	Senior Structural Engineer

Contents

Appendices

Executive Summary

This is a summary of the Qualitative Engineering Evaluation for the New Brighton Crèche 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**	New Brighton Crèche, Play/Staff Room & Storage Shed			
Building Location ID	PRO 0001 B001, B002 & B003			**Multiple Building Site**	Y
Building Address	109 Beresford Street			**No. of residential units**	0
Soil Technical Category	TC3	**Importance Level**	2	**Approximate Year Built**	1930's
Foot Print (m²)	180	**Storeys above ground**	1	**Storeys below ground**	0
Type of Construction	Light timber frame on suspended timber floor boards and perimeter concrete foundations.				
Qualitative L4 Report Results Summary					
Building Occupied	Y	The New Brighton Crèche is currently in service.			
Suitable for Continued Occupancy	Y	The New Brighton Crèche is suitable for continued use.			
Key Damage Summary	Y	Refer to summary of building damage Section 3.1 report body.			
Critical Structural Weaknesses (CSW)	N	No critical structural weaknesses were found			
Levels Survey Results	Y	TC3 – significant settlement			
Building %NBS From Analysis	100%	Sufficient lined timber framed walls to resist current code loads.			
Qualitative L4 Report Recommendations					
Geotechnical Survey Required	Y	TC3 – significant liquefaction			
Proceed to L5 Quantitative DEE	Y	Decision on building future will depend on results of geotechnical investigation and feasibility of re-levelling.			
Approval					
Author Signature			Approver Signature		
Name	Luis Castillo		Name	Forrest Lanning	
Title	Senior Structural Engineer		Title	Senior Structural Engineer	

1 Introduction

1.1 General

On 12 January 2010 Aurecon engineers visited the New Brighton Crèche to carry out 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 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 safety of occupants if the building is currently occupied.
- Assessment of requirements for additional investigation work including geotechnical investigation, level survey and any areas where linings and floor coverings need removal to expose structural damage.

In addition to the main Crèche building two associated secondary structures were reviewed. These were the play house and a light metal storage structure in the north east corner.

This report outlines the results of our qualitative assessment of damage to the New Brighton Crèche, 109 Beresford Street and associated secondary buildings.

2 Description of the Building

2.1 Building Age and Configuration

New Brighton Crèche is a single storey light timber framed residential structure with a light weight iron roof, timber weatherboard cladding, a suspended timber floor and concrete perimeter foundations. It is an importance level 2 building of approximately 180 square metres in plan area. The style and construction of the building indicates that the original house was constructed in the late 1930's.

Numerous additions and alterations have been carried out since then. Available building consent documents show that the house was converted into a crèche in 1991. The building is oriented approximately north-south. The entrance is off Beresford Street and leads into an asphalted car parking area. On the south side of the house is a large timber deck and an outdoor play area.

There are two out-buildings in the rear yard on the east side of the house. In the south-east corner of the yard is an unlined metal clad storage shed with a slab on grade foundation. Along the western boundary at the northern end of the yard is a small structure called the play house. The play house is of standard NZS3604 lightweight timber construction with a timber pile foundation. Its standard of finish is similar to a low cost house.

Additional structures include playground structures, landscaping and miscellaneous decks and walkways.

2.2 Building Structural Systems Vertical and Horizontal

The Crèche main building is of light timber framed construction. Because the building has had numerous alterations and additions carried out in different decades a range of wall and ceiling linings have been used. Parts of the original house still have lath and plaster on the walls and ceilings. Later additions and areas that have been altered are lined with plaster board. Other parts of the house have particle board on the walls.

Roof loads are supported by a corrugated iron roof on timber sarking on timber purlins and rafters. The roof is supported by the internal and external timber framed walls. Lateral loads are resisted by plaster lined timber framed walls in each principal direction.

Crèche floor loads are resisted by timber flooring on timber floor joists on bearers and individual piles. A concrete perimeter foundation wall exists around the outside of the building.

The playhouse has a similar structural system and is supported on timber piles. The storage shed has a slab on grade concrete pad foundation.

2.3 Reference type building

The New Brighton Crèche is constructed of different materials based on the era of construction of the part of the building under consideration. Generally damage observed in different parts of the building is consistent with the type of construction in that part of the building.

2.4 Building Foundation System and Soil Conditions

The land under these buildings is zoned technical category three (TC3) and is prone to settlement and liquefaction. Damage due to ground settlement has occurred and it is our recommendation that a geotechnical assessment is carried out to evaluate the ground conditions specific to this site in order to determine what measures may be required to provide a permanent solution to prevent future foundation settlement.

2.5 Available Structural Documentation and Inspection Priorities

Original plans were not available but documentation provided by Christchurch City Council included information relating to various additions and alterations carried out over time. This included plans with up to date wall layouts. Inspection priorities were signs of damage due to excessive in-plane deformation of walls and ceiling diaphragms and signs of significant differential settlement.

2.6 Available Survey Information

A floor level survey was undertaken to establish the level of unevenness across the floors. The results of the survey are presented on the attached sketch in Appendix A. All of the levels were taken on top of the existing floor coverings which may have introduced some margin of error.

The floor levels for the New Brighton Crèche are considered to be acceptable.

3 Structural Investigation

3.1 Summary of Building Damage

Damage to New Brighton Crèche as observed on 10 January 2012 is summarized as follows:

- Vertical cracks and spalling in the concrete perimeter wall were noticeable on the north elevation below the curved bay window to the general play area. A horizontal crack was observed on the north elevation in the foundation wall to the storage room and the sleep room. In some locations the foundation wall has pushed against the asphalt and a gap has opened up between the asphalt and the foundation wall.
- On the exterior wall along the east elevation vertical cracks in the cladding were observed. The most obvious crack was located at the junction between weather boards used for the original house and where fibre cement weather boards have been used for a later addition.
- Internally most of the plasterboard walls and ceilings were in fairly good condition. The lath and plaster ceiling to the general play area, which is in a part of the original house, had a significant amount of cracking at wall and ceiling junctions and at stress points adjacent to internal corners.
- Vertical cracks occur internally above door openings and between rooms where a significant amount of differential settlement has occurred. This type of damage was observed primarily in the north east corner of the house in the day-rooms and the sleep room.
- Significant differential settlement in many locations caused doors to become jammed. According to building personnel these have been eased by planing either the top or the bottom of the door.
- Significant differential settlement to the play house and the storage shed was also observed.

3.2 Record of Intrusive Investigation

Ceiling and floor cavities were inspected to confirm structural materials and layout but no intrusive investigations were carried out.

3.3 Damage Discussion

Being a single storey light timber framed structure the New Brighton Crèche is of a type of construction and configuration that is ductile and resilient and presents a low danger of harmful collapse. Apart from damage due to differential foundation settlement the damage is of a relatively minor nature. The observed damage is consistent with what might be expected for this type of structure. The major ceiling and wall damage was concentrated in the older part of the building where more brittle lath and plaster linings were used. The newer areas lined with modern plasterboard or particle board were less damaged. Although this building is damaged the damage is of a type and extent that is unlikely to have significantly reduced the lateral load capacity of the structure.

The major damage to the play house and storage shed consisted of differential settlement.

4 Building Review Summary

4.1 Building Review Statement

The building review covered all parts of the structure and all structural components. All parts of the building interior were visible however the condition of structural elements in roof space and subfloor was inferred from what was visible in the rooms. In general there was no evidence of excessive displacement or damage that would indicate significant damage or displacements to the hidden supporting elements.

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

Although it has had numerous additions and alterations at various times over many years there are many internal and external walls that are well distributed internally and around the perimeter of the building. Being of standard timber construction with weatherboards a light roof with standard foundation piles the New Brighton Crèche is a naturally resilient structure. Lateral loads for this building are resisted primarily by interior and exterior wall linings. Loads are distributed to the walls by the ceiling diaphragm with the assistance of the roofing iron and sarking. The failure mechanism for this structure is via failure of the fixings (nails) that connect the structural components and secure the various linings to the walls. This is a ductile, non-brittle failure mode.

Although damaged in some locations the ceiling diaphragm, with the assistance of the sarking and the roofing iron, retains sufficient capacity to continue to distribute lateral loads to the walls of this structure. Vertical cracks observed in walls both internally and externally are likely to have been caused partly by differential settlement. This damage is unlikely to have significantly reduced the lateral load capacity of the walls.

No damage likely to compromise the vertical load capacity of the roof structure was observed.

No significant racking damage was observed in the playhouse or the storage shed and it is inferred from this that these structures are not vulnerable to this type of damage.

5.2 Initial %NBS Assessment

An approximate assessment of the building lateral load strength has been carried out by estimating the capacity of the existing walls and summing the capacity of the walls in each principal direction. The result of this excise gave a percentage new building strength (%NBS) in each principal direction of greater than or equal to 100%NBS. Given the relatively minor level of damage to the lateral load structure this is a reasonable estimate of the lateral load capacity of the structure.

5.3 Results Discussion

The lack of structural damage and the above %NBS analysis show that the building performed well during the earthquake sequence and that the building has sufficient strength to resist similar earthquake loads.

6 Conclusions and Recommendations

As noted above the land under New Brighton Crèche is zoned technical category three (TC3) and is prone to settlement and liquefaction. Damage due to ground settlement has occurred and it is our recommendation that a geotechnical assessment is carried out to evaluate the ground conditions specific to this site in order to determine what measures may be required to provide a permanent solution to prevent future foundation settlement.

The New Brighton Crèche has been subject to differential settlement. A geotechnical investigation will provide the additional information required to determine the correct pathway to a final decision on the future of the building be that to repair or to rebuild.

The Crèche buildings are currently occupied and in use and in our opinion they are considered 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

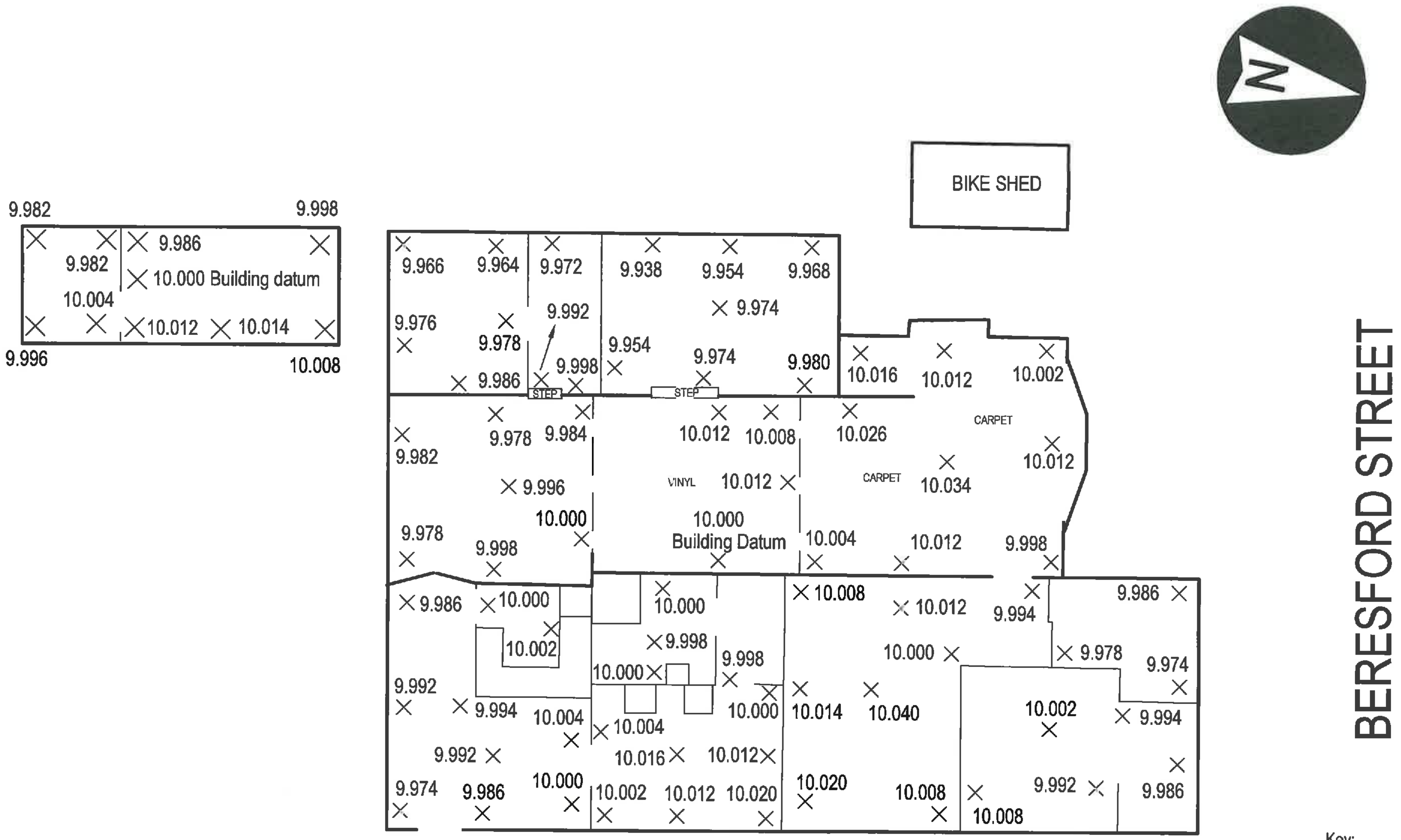
Appendix A
Photos and Level survey

12 January 2012 – New Brighton Crèche Site Photographs

Aerial photo	
North elevation of the New Brighton Crèche.	

Vertical crack in perimeter footing and asphalt deformation.	
Horizontal crack in perimeter footing	
Vertical crack at cladding junction between original structure and later addition.	

Cracks in ceiling at internal corner and at wall ceiling junction.	
Vertical crack in wall above door opening.	
Cracks in ceiling, ceiling wall intersection and at intersection of wall.	



Notes:
Levels are in terms of an arbitary site datum and are not related between seperate buildings.
All levels were taken on wood unless otherwise noted.

Key:
Internal Walls
External Walls
Flooring change
Level location

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CLIENT: CCC

PROJECT	NEW BRIGHTON CRECHE BERESFORD STREET
TITLE	FLOOR LEVELS
DRAWN	TMurray
SURVEYED	SManning
CHECKED	RHope
APPROVED	RHope
DATE	May 2012
PROJECT No	227257
SCALE	N.T.S.
SIZE	A4
DRAWING No	SU 01
REV	A

NOT FOR CONSTRUCTION

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 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		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

Location

Building Name:	New Brighton Creche	Reviewer:	Simon Manning
	Unit / No: / Street	CPEng No:	132053
Building Address:	109 Beresford Street	Company:	Aurecon
Legal Description:		Company project number:	227257
		Company phone number:	(03) 3660821
	Degrees / Min / Sec		
GPS south:	43 / 30 / 35.00	Date of submission:	17/10/2013
GPS east:	172 / 43 / 26.00	Inspection Date:	1/12/2011
		Revision:	3
Building Unique Identifier (CCC):	PRO 0001 B001, B002 & B003	Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:	silty sand	Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):	100	If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	3.00

Building

No. of storeys above ground:	1 (single storey = 1)	Ground floor elevation (Absolute) (m):	3.30
Ground floor split?	yes	Ground floor elevation above ground (m):	0.30
Storeys below ground			
Foundation type:	other (describe)	if Foundation type is other, describe:	Standard concrete piles
Building height (m):	3.00	height from ground to level of uppermost seismic mass (for IEP only) (m):	2
Floor footprint area (approx):	200		
Age of Building (years):	80	Date of design:	1935-1965
Strengthening present?	no	If so, when (year)?	
		And what load level (%g)?	
Use (ground floor):	educational	Brief strengthening description:	
Use (upper floors):			
Use notes (if required):			
Importance level (to NZS1170.5):	IL2		

Gravity Structure

Gravity System:	frame system		
Roof:	timber framed	rafter type, purlin type and cladding	sawn timber, sawn timber, iron
Floors:	timber	joist depth and spacing (mm)	100 x 50 - 450
Beams:	timber	type	timber bearers
Columns:	cast-insitu concrete	typical dimensions (mm x mm)	
Walls:			

Lateral load resisting structure

Note: Define along and across in detailed report!

Lateral system along:	lightweight timber framed walls	note typical wall length (m)	3000
Ductility assumed, μ:	3.00		
Period along:	0.01 (0.00)	estimate or calculation?	estimated
Total deflection (ULS) (mm):	30	estimate or calculation?	estimated
maximum interstorey deflection (ULS) (mm):	30	estimate or calculation?	estimated
Lateral system across:	lightweight timber framed walls	note typical wall length (m)	3000
Ductility assumed, μ:	3.00		
Period across:	0.01 (0.00)	estimate or calculation?	estimated
Total deflection (ULS) (mm):	30	estimate or calculation?	estimated
maximum interstorey deflection (ULS) (mm):	30	estimate or calculation?	estimated

Separations:

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

Non-structural elements

Stairs:			
Wall cladding:	other light	describe	Weather board
Roof Cladding:	Metal	describe	Corrugated iron
Glazing:	timber frames		
Ceilings:	plaster, fixed		
Services(list):			

Available documentation

Architectural	partial	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:	TC3	Describe damage:	noticable differential settlement
Settlement:	25-100m	notes (if applicable):	noticable differential settlement
Differential settlement:	1:150 or more	notes (if applicable):	noticable differential settlement
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:	slight	notes (if applicable):	

Building:

	Current Placard Status:	green		
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	Estimated
	Describe (summary):			
Across	Damage ratio:	0%		
	Describe (summary):			
Diaphragms	Damage?:	yes	Describe:	damge to ceiling and walls
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	yes	Describe:	Damage due to differential settlement

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

Recommendations

	Level of repair/strengthening required:	significant structural	Describe:	releveling required
	Building Consent required:	yes	Describe:	
	Interim occupancy recommendations:	full occupancy	Describe:	
Along	Assessed %NBS before:	100% ##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	Bracing calculations
	Assessed %NBS after:	100%		
Across	Assessed %NBS before:	100% ##### %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): 1935-1965

h_n from above: 2m

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):	0.01	0.01
(%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:		
	Z_{1992}, from NZS4203:1992		
	Hazard scaling factor, **Factor B:**		#DIV/0!
2.4 Return Period Scaling Factor	Building Importance level (from above):		2
	Return Period Scaling factor from Table 3.1, **Factor C**:		
		along	across
2.5 Ductility Scaling Factor	Assessed ductility (less than max in Table 3.2)		
	Ductility scaling factor: =1 from 1976 onwards; or =kμ, if pre-1976, fromTable 3.3:		
	Ductiity Scaling Factor, **Factor D**:	0.00	0.00
2.6 Structural Performance Scaling Factor:	Sp:		
	Structural Performance Scaling Factor **Factor E**:	#DIV/0!	#DIV/0!
2.7 Baseline %NBS, (NBS%)$_b$ = (%NBS)$_{nom}$ x A x B x C x D x E	**%NBS$_b$:**	**#DIV/0!**	**#DIV/0!**

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

3.1. Plan Irregularity, factor A:		1
3.2. Vertical irregularity, Factor B:		1
3.3. Short columns, Factor C:		1
3.4. Pounding potential	Pounding effect D1, from Table to right	
	Height Difference effect D2, from Table to right	
	Therefore, Factor D:	0
3.5. Site Characteristics		

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

		Along	Across
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		

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)		**0.00**	**0.00**
4.3 PAR x (%NBS)b:	PAR x Baselline %NBS:	**#DIV/0!**	**#DIV/0!**
4.4 Percentage New Building Standard (%NBS), (before)			**#DIV/0!**

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