Brooklands Domain Toilets
Qualitative Engineering Evaluation

Reference: 229612
Prepared for:
Christchurch City Council

Functional Location ID: PRK 0140 BLDG 001 EQ2

Address: 28 Charon Street/45 Anfield Street

Revision: 2
Date: 11 January 2013

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Document Control Record

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

Contents

Appendices

Executive Summary

This is a summary of the Qualitative Engineering Evaluation for the Brooklands Domain Toilets 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**	Brooklands Domain Toilets			
Building Location ID	PRK 0140 BLDG 001 EQ2			**Multiple Building Site**	N
Building Address	28 Charon Street/45 Anfield Street, Brooklands			**No. of residential units**	0
Soil Technical Category	Red	**Importance Level**	1	**Approximate Year Built**	1990s
Foot Print (m²)	10	**Storeys above ground**	1	**Storeys below ground**	0
Type of Construction	Profiled sheet roof cladding, timber purlins, steel roof frames, stack bond concrete masonry walls, slab on grade foundations.				

Qualitative L4 Report Results Summary		
Building Occupied	Y	The Brooklands Domain Toilets is currently in service.
Suitable for Continued Occupancy	Y	The Brooklands Domain Toilets 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 identified.
Levels Survey Results	Y	The floor levels are acceptable for wet areas. The maximum gradient was 1.3%
Building %NBS From Analysis	>100%	Based on an analysis of bracing capacity and demand.

Qualitative L4 Report Recommendations		
Geotechnical Survey Required	N	Geotechnical survey not required due to lack of observed ground damage on site.
Proceed to L5 Quantitative DEE	N	A quantitative DEE is not required for this structure.

Approval			
Author Signature	[signature]	Approver Signature	[signature]
Name	Christopher Bong	Name	Luis Castillo
Title	Structural Engineer	Title	Senior Structural Engineer

1 Introduction

1.1 General

On 14 August 2012 Aurecon engineers visited the Brooklands Domain Toilets 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 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 Brooklands Domain Toilets 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

Located within the Brooklands Domain, the Brooklands Domain Toilets is a single storey toilet block constructed in the 1990s. The building is of concrete masonry construction. It has a lightweight roof constructed for profiled sheet roof cladding, timber purlins and steel roof frame. The stack bond concrete masonry walls are founded on a slab on grade foundation with thickenings for structural elements.

The building has an approximate floor area of 10 square metres. It is considered as an “importance level 1 structure” in accordance with AS/NZS 1170 Part 0:2002.

2.2 Building Structural Systems Vertical and Horizontal

The Brooklands Domain Toilets are of concrete masonry construction. The gravity loads from the roof are transferred into the ground via the concrete masonry walls and the concrete slab on grade foundations.

The lateral load resisting similar is identical to the gravity system in which the lateral loads in both principal directions are resisted by the concrete masonry walls.

2.3 Reference Building Type

The Brooklands Domain Toilets are of concrete masonry construction typical of the 1990s. Although there were no notes in the structural drawings indicating whether the walls are either fully or partially filled, it is assumed that given the stack bond brickwork and recent construction of the building, it is most likely that the walls are fully filled.

A general overview of the reference building type, construction era and likely earthquake risk is presented in the figure below. The Brooklands Domain Toilets is a fully filled concrete masonry building constructed in the 1990s and according to the figure below is “probably not earthquake prone”.

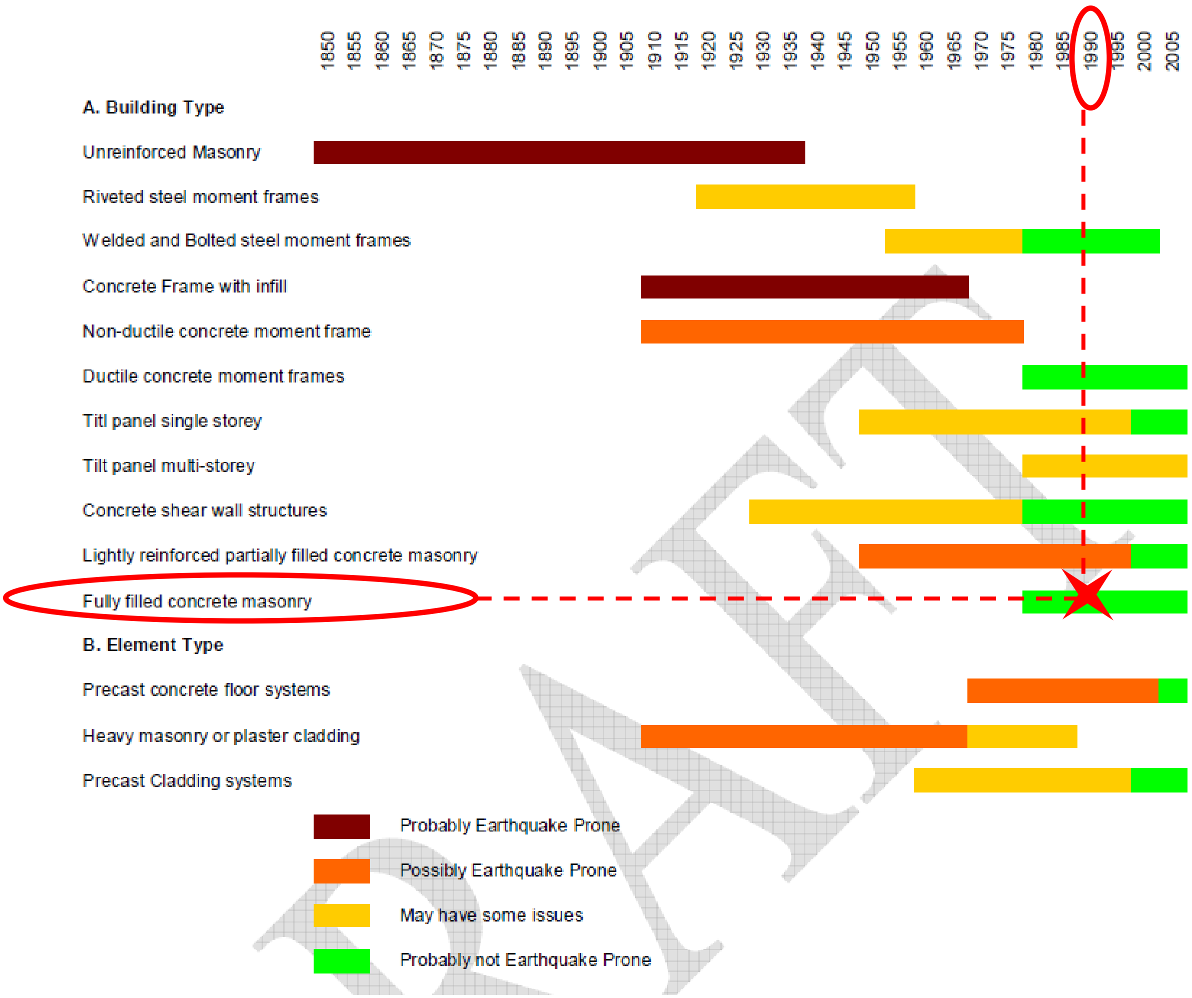


Figure 1: Timeline showing the building types, approximate time of construction and likely earthquake risk.

(From the Draft Guidance on DEEs of non-residential buildings by the Engineering Advisory Group)

2.4 Building Foundation System and Soil Conditions

The Brooklands Domain Toilets is founded on a concrete slab on grade foundation with thickenings for structural elements.

Most of the suburb of Brooklands is currently considered to be within the residential red zone with the exception of several Technical Category 3 properties to the south by Earlham Street. According to the Canterbury Earthquake Recovery Authority (CERA), “land repair (in the red zone) would be prolonged and uneconomic”.

2.5 Available Structural Documentation and Inspection Priorities

At the time of writing, there were no drawings specifically available for the Brooklands Domain Toilets, however the drawings corresponding to the same model of building built in the Bromley Cemetery were found and were taken as a reference allowing us to have a clear idea of the technical aspects needed for the detailed engineering evaluation.

The inspection priorities for our assessment were a review of the damage to the building in particular mortar joints as they are a key indicator of damage. Additionally, the damage assessment focused on the building geometry and other forms of potential damage such as cracking to the concrete blocks and the concrete floor or foundations.

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.

The Department of Building and Housing (DBH) published the “Revised Guidance on Repairing and Rebuilding Houses Affected by the Canterbury Earthquake Sequence” in November 2011, which recommends some form of re-levelling or rebuilding of the floor

1. If the slope is greater than 0.5% for any two points more than 2m apart, or
2. If the variation in level over the floor plan is greater than 50mm, or
3. If there is significant cracking of the floor.

It is important to note that these figures are recommendations and are only intended to be applied to residential buildings. However, they provide useful guidance in determining acceptable floor level variations.

The maximum gradient in the floor was found to be 1.3%. However, the floor levels for the Brooklands Domain Toilets are considered acceptable despite not being within the recommended tolerances. This is because wet areas typically have an in-built fall for drainage and are often outside the DBH’s floor slope recommendations.

3 Structural Investigation

3.1 Summary of Building Damage

There was no seismic related damage noted in the damage assessment. However, it was noted that there were:-

- Missing bolts in two of the eaves beam to wall connections; and
- The damaged chipboard/particle board door on the right toilet cubical.

3.2 Record of Intrusive Investigation

There was no noted damage to the building and therefore, an intrusive investigation was neither warranted nor undertaken for Brooklands Domain Toilets.

3.3 Damage Discussion

There was no noted seismic related damage in the damage assessment. This is not surprising given that the building has well-distributed walls in both principal directions, which minimise the torsional effects on the structure.

4 Building Review Summary

4.1 Building Review Statement

As noted above no intrusive investigations were undertaken on the Brooklands Domain Toilets. 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 Brooklands Domain Toilets is of fully filled concrete masonry construction. The building has performed well in the Canterbury earthquake sequence as evidenced by the lack of noted damage in section 3 above.

5.2 Initial %NBS Assessment

The Brooklands Domain Toilets 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 with an in-plane bracing check and an out-of-plane bending check.

The 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	0.50	NZS 1170.5:2004, Table 3.5, Importance Level 1 Structure with a Design Life of 50 years
Ductility Factor in the Along Direction, μ	1.25	Fully filled concrete masonry walls
Ductility Factor in the Across Direction, μ	1.25	Fully filled concrete masonry walls

The methodology for the in-plane bracing check on the wall elements are outlined as follows:-

1. The seismic demands for the Brooklands Domain Toilets were calculated based on the current seismic code requirements (NZS 1170.5: 2004).
2. The wall elements were modelled using the structural analysis program, ETABS from CSI Berkeley.
3. The capacity of the wall elements were evaluated in accordance with the current material standards, NZS 4229:1999 and NZS 4230:2004.
4. To obtain the %NBS, the wall element’s seismic demand was compared with its seismic capacity in both principal directions.

The out-of-plane bending check was a comparison of the seismic moment demand against the wall’s cracked and un-cracked moment capacity.

Both the in-plane and out-of-plane checks on the wall elements in both the along and across directions were found to be in excess of 100%NBS.

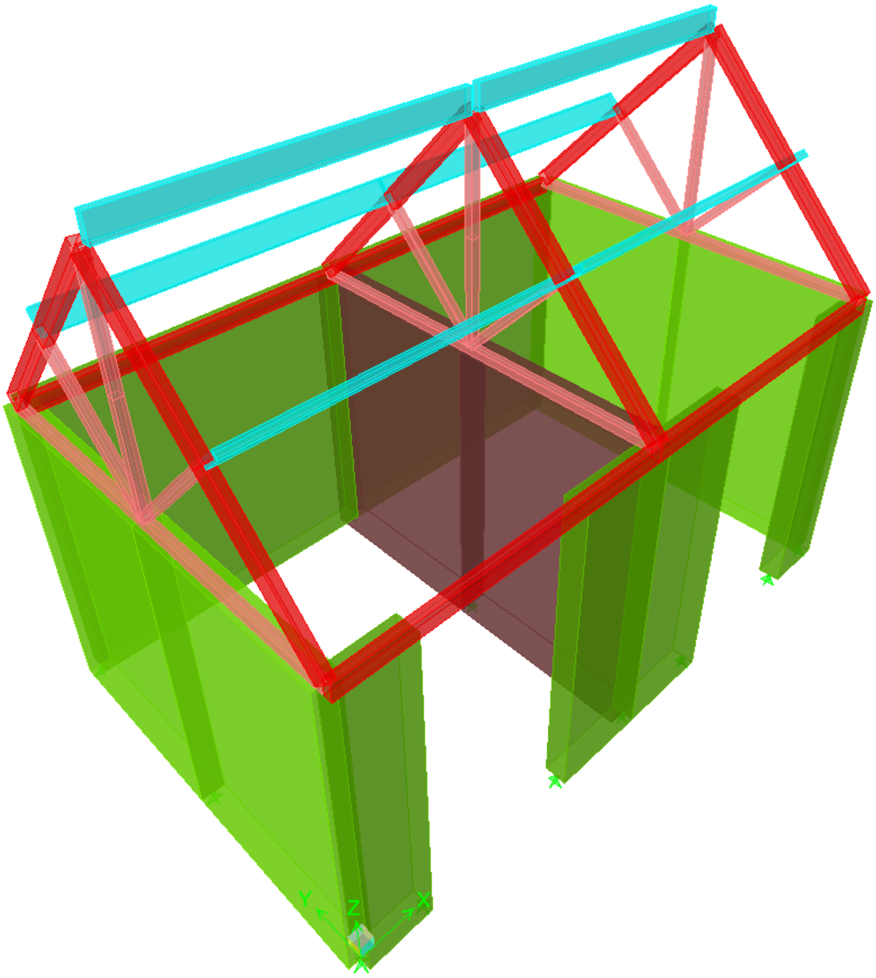


Figure 2: Rendered ETABS Model

5.3 Results Discussion

Both the in-plane and out-of-plane checks are in agreement with the observations of the damage assessment. This is not surprising given that the building has:-

- Evenly distribution of walls giving the building good in-plane strength and stability; and
- Fully filled walls which have high bending capacities (cracked and un-cracked) in the out-of-plan direction.

6 Conclusions and Recommendations

Given the good performance of the Brooklands Domain Toilets in the Canterbury earthquake sequence and the lack of foundation damage, a geotechnical investigation is currently not considered necessary. It should be noted however, that Brooklands is currently within the residential red zone and the potential for ground damage in future seismic events is high.

The building has suffered no loss of functionality and in our opinion the Brooklands Domain Toilets is considered suitable for continued use.

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.

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

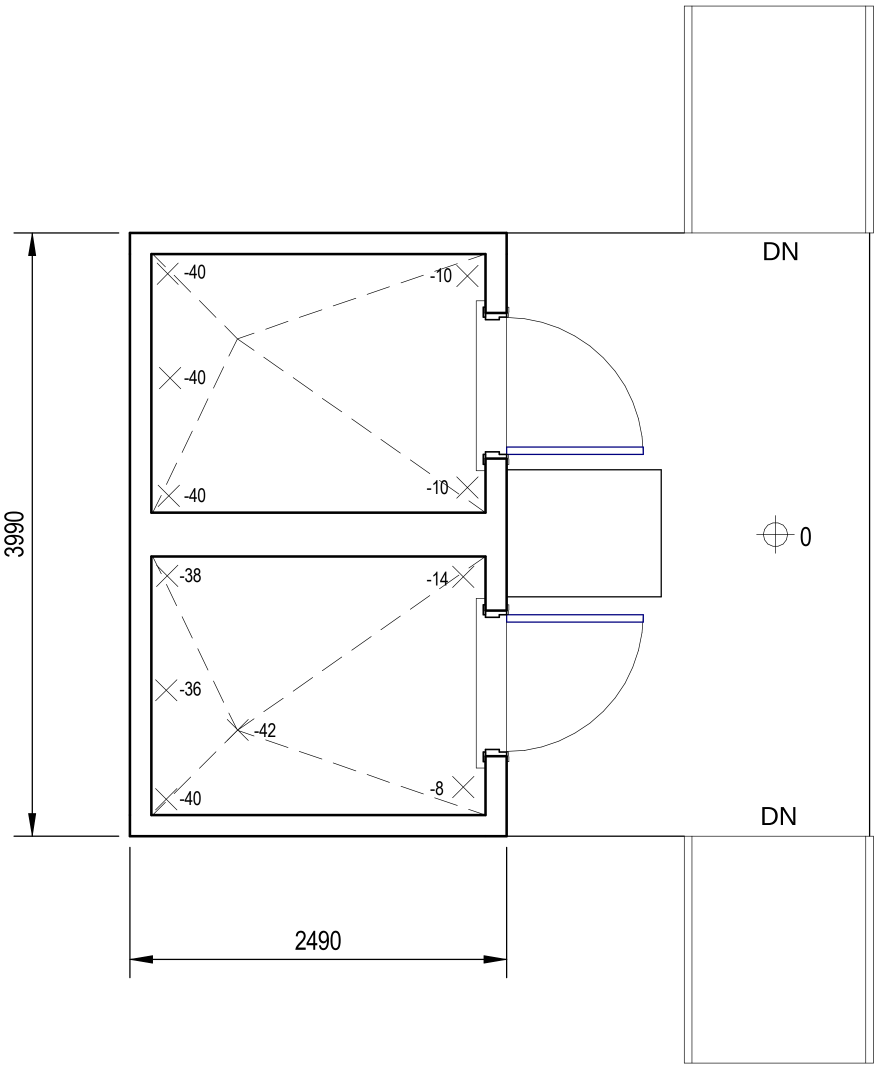
Appendix A

Site Location, Photos and Levels Survey

14 August 2012 – Brooklands Domain Toilets Site Photographs

Southern elevation of the Brooklands Domain Toilets.	
Northern elevation of the Brooklands Domain Toilets.	

Exterior steel roof framing.	
Interior view of the Brooklands Domain Toilets.	
Interior view of the tiled floor.	
Missing bolt on one of the eaves beam to wall connection in the interior of the Brooklands Domain Toilets.	
Damaged chipboard/particle board door on right toilet cubical.	



21/08/2012 8:51:20 a.m.

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CLIENT
Christchurch City Council

REV	DATE	REVISION DETAILS	APPROVAL

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

PROJECT
TOILETS-BROOKLANDS DOMAIN
28 CHARON ST

TITLE
LEVEL SURVEY

PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.
229612

SCALE: 1 : 50
SIZE: A4

DRAWING No.: S-01-02
REV

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	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).

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:	Brooklands Domain Toilets			Reviewer:	Lee Howard
	Unit	No:	Street	CPEng No:	1008889
Building Address:		28	Charon Street	Company:	Aurecon NZ Ltd
Legal Description:	Pt Lot 1 DP 11734			Company project number:	229177
				Company phone number	03 366 0821
	Degrees	Min	Sec		
GPS south:	43	24	7.50	Date of submission:	Aug-12
GPS east:	172	41	55.69	Inspection Date:	Aug-12
				Revision:	1
Building Unique Identifier (CCC)	PRK 0140 BLDG 001 EQ2			Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	0
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):	1.15
Ground floor split?	no		Ground floor elevation above ground (m):	0.15
Storeys below ground	0			
Foundation type	raft slab		if Foundation type is other, describe:	
Building height (m):	3.00		height from ground to level of uppermost seismic mass (for IEP only) (m):	3
Floor footprint area (approx):	10			
Age of Building (years):	20		Date of design:	1992-2004
Strengthening present?	no		If so, when (year)?	
			And what load level (%g)?	
Use (ground floor):	public		Brief strengthening description:	
Use (upper floors):				
Use notes (if required):	toilets			
Importance level (to NZS1170.5):	IL1			

Gravity Structure

Gravity System:	load bearing walls		
Roof:	steel framed	rafter type, purlin type and cladding	timber purlins and steel rafters, profiled sheet roof cladding
Floors:	concrete flat slab	slab thickness (mm)	100
Beams:	steel non-composite	beam and connector type	hollow sections
Columns:			
Walls:	partially filled concrete masonry	thickness (mm)	140

Lateral load resisting structure

Lateral system along:	fully filled CMU	**Note: Define along and across in detailed report!**		
Ductility assumed, μ:	1.25		note total length of wall at ground (m):	
Period along:	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?	
Lateral system across:	fully 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:			
Roof Cladding:	Metal	describe	0.55mm color steel
Glazing:			
Ceilings:			
Services(list):			

Available documentation

Architectural	none	original designer name/date	
Structural	none	original designer name/date	
Mechanical	none	original designer name/date	
Electrical	none	original designer name/date	
Geotech report	none	original designer name/date	

Damage

Site:
(refer DEE Table 4-2)

Site performance:	good	Describe damage:	none noted
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: 100% ##### %NBS from IEP below

Assessed %NBS after e'quakes: 100%

If IEP not used, please detail assessment methodology: bracing check to NZS 4229:1999

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): 1992-2004

h_n from above: 3m

Seismic Zone, if designed between 1965 and 1992:

not required for this age of building

Design Soil type from NZS4203:1992, cl 4.6.2.2:

	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:

Z_{1992}, from NZS4203:1992

Hazard scaling factor, **Factor B:** #DIV/0!

2.4 Return Period Scaling Factor

Building Importance level (from above): 1

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)		
Ductility scaling factor: =1 from 1976 onwards; or $=k_\mu$, if pre-1976, fromTable 3.3:		
Ductiity Scaling Factor, **Factor D**:	1.00	1.00

2.6 Structural Performance Scaling Factor:

	along	across
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

	along	across
$\%NBS_b$:	**#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

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**

3.4. Pounding potential

Pounding effect D1, from Table to right

Height Difference effect D2, from Table to right

Therefore, Factor D: 0

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

3.5. Site Characteristics 1

3.6. Other factors, Factor F

	Along	Across
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

	Along	Across
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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