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Macfarlane Park Toilets

Qualitative Engineering Evaluation

Reference: 229185

Prepared for:

Christchurch City Council

Functional Location ID: PRK 0663 BLDG 003

Address: 19 Acheson Ave

Revision: 2

Date: 14 April 2014

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Approval			
Author Signature		Approver Signature	
Name	Hugh Burnett	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 Macfarlane Park 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**	Macfarlane Park Toilets			
Building Location ID	**PRK 0663 BLDG 003**			**Multiple Building Site**	N
Building Address	19 Acheson Ave			**No. of residential units**	0
Soil Technical Category	NA	**Importance Level**	2	**Approximate Year Built**	1995
Foot Print (m²)	9	**Storeys above ground**	1	**Storeys below ground**	0
Type of Construction	Light roof, concrete blockwork walls, concrete strip footings, slab on grade floor.				
Qualitative L4 Report Results Summary					
Building Occupied	Y	The Macfarlane Park Toilets are currently in use.			
Suitable for Continued Occupancy	Y	The Macfarlane Park Toilets 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	Floor levels are within tolerance.			
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			**Approver Signature**		
Name	Hugh Burnett		**Name**	Lee Howard	
Title	Structural Engineer		**Title**	Senior Structural Engineer	

1 Introduction

1.1 General

On 29 May 2012 Aurecon engineers visited the Macfarlane Park Toilets 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 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 Macfarlane Park 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

Built circa 1995 the Macfarlane Park Toilets are a single storey toilet block. The building has a lightweight profiled steel roof. The walls consist of 15 series concrete blockwork. Foundations consist of concrete strip footings and there is a concrete slab on grade floor slab. The approximate floor area of the building is 9 square metres. It is an importance level 2 structure in accordance with NZS 1170 Part 0:2002.

2.2 Building Structural Systems Vertical and Horizontal

The Macfarlane Park Toilets is a very simple structure. Its lightweight steel roof is supported on timber sarking on timber frames that transfer loads to load bearing blockwork walls. Load bearing walls are supported on concrete strip footings. Lateral loads are resisted by the concrete blockwork walls in each direction.

2.3 Reference Building Type

The Macfarlane Park Toilets is a basic toilet block typical of its age and style. This type of building has typically performed well under seismic loading.

2.4 Building Foundation System and Soil Conditions

The Macfarlane Park Toilets foundations, as discussed above consist of concrete strip footings. The land beneath the Macfarlane Park Toilets has not been zoned by CERA however the land adjacent to the building has been zoned as TC3 by and moderate to significant land damage from liquefaction is possible in future significant earthquakes. There were signs in the vicinity of Macfarlane Park Toilets of liquefaction bulges and boils additionally aerial photos taken soon after the 22 February earthquake shows liquefaction in the vicinity of the building.

2.5 Available Structural Documentation and Inspection Priorities

No architectural or structural drawings were available for the Macfarlane Park Toilets. Inspection priorities related to a review of potential damage to foundations and consideration of wall bracing adequacy. The generic building type for the Macfarlane Park Toilets is a small 1990s blockwork building and this type of structure has performed well during the Canterbury Earthquakes.

2.6 Available Survey Information

We undertook a floor levels survey to establish the amount of settlement that has occurred. The results of the survey are presented on the attached drawings in Appendix A. All of the levels were taken on top of the existing floor coverings which will have introduced some variation.

The floor levels for the Macfarlane Park Toilets were found to be within acceptable levels. The variations in floor level that were recorded related to slopes in the floor slab for drainage purposes.

3 Structural Investigation

3.1 Summary of Building Damage

The Macfarlane Park Toilets are currently in use and were occupied at the time the damage assessment was carried out.

The Macfarlane Park Toilets have performed well and no damage from the recent earthquakes was observed.

3.2 Record of Intrusive Investigation

No damage related to the recent earthquakes was observed and therefore, an intrusive investigation was not required for the Macfarlane Park Toilets.

3.3 Damage Discussion

There was no observed damage to the Macfarlane Park Toilets. This is expected as the small size of the building generates a low seismic demand.

4 Building Review Summary

4.1 Building Review Statement

As noted above no intrusive investigations were carried out for the Macfarlane Park Toilets. Because of the generic nature of the building and the lack of linings the primary structure was able to be observed with an external and internal visual 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 Macfarlane Park Toilets are, as discussed above, a typical example of a 1990's concrete blockwork amenities block. It is of a type of building that has typically performed well. The Macfarlane Park Toilets are not an exception to this and have performed well no damage observed.

5.2 Initial %NBS Assessment

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

Selected assessment seismic parameters are tabulated in the Table 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	1.0	NZS 1170.5:2004, Table 3.5
Ductility Factor in Transverse Direction, μ	1.25	Concrete blockwork walls
Ductility Factor in Longitudinal Direction, μ	1.25	Concrete blockwork walls

The seismic demand for the Macfarlane Park Toilets has been calculated based on the current code requirements. The capacity of the existing walls in the building was calculated from assumed strengths of existing materials and the number and length of walls present for both the north – south and east – west directions. The seismic demand was then compared with the building capacity in these directions. The building was found to have a sufficient strength in both the north – south and east – west directions to achieve 100% NBS.

5.3 Results Discussion

Analysis shows that the Macfarlane Park Toilets achieves 100% NBS placing the building in the low risk category for building earthquake capacity. This is expected as the building generates a low seismic demand due to its small size thus the walls are able provide adequate bracing to resist seismic loading. In addition the building has suffered very little if any earthquake related damage.

6 Conclusions and Recommendations

The Macfarlane Park Toilets are adjacent to land zoned as TC3 by CERA and moderate to significant land damage from liquefaction is possible in future significant earthquakes. Aerial photographs show that liquefaction occurred in the area of the Macfarlane Park Toilets after the 22 February 2011 earthquake. However the levels survey carried out showed that the floor levels were within allowable tolerances and no settlement has occurred therefore a **geotechnical investigation is currently not considered necessary**.

The building is currently occupied and in our opinion the Macfarlane Park Toilets **is suitable for continued occupation**.

7 Explanatory Statement

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

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

To carry out the structural review, existing building drawings were obtained 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.

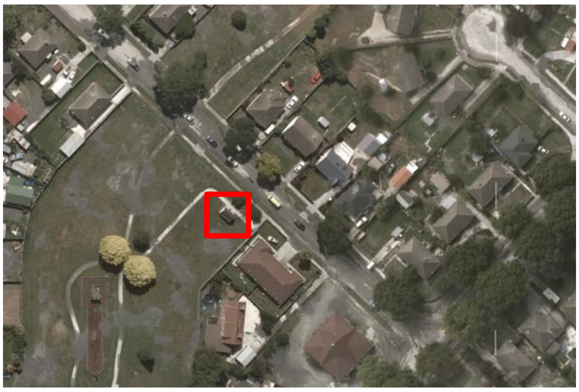
This review has been prepared by Aurecon at the request of its client and is exclusively for the client's use. It is not possible to make a proper assessment of this review without a clear understanding of the terms of engagement under which it has been prepared, including the scope of the instructions 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
Photos and Levels Survey Results

29 May 2012 – Macfarlane Park Toilets site photographs

Aerial photograph of the Macfarlane Park Toilets.	
Northern elevation of the Macfarlane Park Toilets.	
Eastern elevation of the Macfarlane Park Toilets.	

Southern elevation of the Macfarlane Park Toilets.	
Internal view of the Macfarlane Park Toilets.	
Typical roof to wall connection detail.	

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: Macfarlane Park Toilets
Building Address: Unit: Access off Jebson Street | No: Street: 17 Acheson Ave
Legal Description: RES 4743

	Degrees	Min	Sec
GPS south:	43	30	13.80
GPS east:	172	39	15.89

Building Unique Identifier (CCC): PRK 0663 BLDG 003

Reviewer: Lee Howard
CPEng No: 1008889
Company: Aurecon
Company project number: 229185
Company phone number: 03 375 0761
Date of submission: 14/04/2014
Inspection Date: 29/05/2012
Revision: 1
Is there a full report with this summary? yes

Site

Site slope: flat
Soil type: mixed
Site Class (to NZS1170.5): D
Proximity to waterway (m, if <100m):
Proximity to clifftop (m, if < 100m):
Proximity to cliff base (m,if <100m):

Max retaining height (m):
Soil Profile (if available):
If Ground improvement on site, describe:
Approx site elevation (m): 6.00

Building

No. of storeys above ground: 1 — single storey = 1
Ground floor split? no
Storeys below ground: 0
Foundation type: strip footings
Building height (m): 2.50
Floor footprint area (approx): 9
Age of Building (years): 17

Ground floor elevation (Absolute) (m): 6.15
Ground floor elevation above ground (m): 0.15
if Foundation type is other, describe:
height from ground to level of uppermost seismic mass (for IEP only) (m):
Date of design: 1992-2004

Strengthening present? no
If so, when (year)?
And what load level (%g)?
Brief strengthening description:

Use (ground floor): other (specify)
Use (upper floors):
Use notes (if required): Public Toilets
Importance level (to NZS1170.5): IL2

Gravity Structure

Gravity System: load bearing walls
Roof: timber framed — rafter type, purlin type and cladding:
Floors: concrete flat slab — slab thickness (mm):
Beams: none — overall depth x width (mm x mm):
Columns: load bearing walls — typical dimensions (mm x mm):
Walls: partially filled concrete masonry — thickness (mm): 140

Lateral load resisting structure

Note: Define along and across in detailed report!

Lateral system along: partially filled CMU
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: 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: exposed structure — describe
Roof Cladding: Metal — describe
Glazing: other (specify) — None
Ceilings: none
Services(list):

Available documentation

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

Damage

Site: (refer DEE Table 4-2)

Site performance: Average — Describe damage: Liquefaction Boils
Settlement: none observed — notes (if applicable):
Differential settlement: none observed — notes (if applicable):
Liquefaction: 5-10 m³/100m² — 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:
Describe (summary):

Across — Damage ratio: 0%
Describe (summary):

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

Diaphragms — Damage?: no — Describe:
CSWs: — Damage?: no — Describe:
Pounding: — Damage?: no — Describe:
Non-structural: — Damage?: no — Describe:

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: Code comparison / Calculation

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: m

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		1.00
Note 2: for RC buildings designed between 1976-1984, use 1.2		1.0
Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0)		1.0
Final $(\%NBS)_{nom}$:	**0%**	**0%**

2.2 Near Fault Scaling Factor

	along	across
Near Fault scaling factor, from NZS1170.5, cl 3.1.6:		1.00
Near Fault scaling factor (1/N(T,D), **Factor A**:	1	1

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3:
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**:

2.5 Ductility Scaling Factor

	along	across
Assessed ductility (less than max in Table 3.2)	1.00	1.00
Ductility scaling factor: =1 from 1976 onwards; or =kμ, if pre-1976, fromTable 3.3:		
Ductiity Scaling Factor, **Factor D**:	1.00	1.00

2.6 Structural Performance Scaling Factor:

	along	across
Sp:	1.000	1.000
Structural Performance Scaling Factor **Factor E**:	1	1

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: 1.0
Height Difference effect D2, from Table to right: 1.0
Therefore, Factor D: 1
3.5. Site Characteristics 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		
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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