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Halswell Quarry Farm Park - Toilet
PRK 1887 BLDG 007
Detailed Engineering Evaluation
Qualitative Report
Version FINAL

Kennedys Bush Road

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PRK 1887 BLDG 007**

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Qualitative Report
Version FINAL

Kennedys Bush Road

Christchurch City Council

Prepared By
Simon Barker

Reviewed By
Stephen Lee

Date
20 May 2013



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Qualitative Report Summary

Halswell Quarry Farm Park - Toilet

PRK 1887 BLDG 007

Detailed Engineering Evaluation

Qualitative Report - SUMMARY

Version FINAL

Kennedys Bush Road

Background

This is a summary of the Qualitative report for the building structure, and is based in part on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011 and visual inspections on 20th of September 2012.

Building Description

The single story toilet is located in Halswell Quarry Park and is likely constructed on a concrete slab supported by strip foundations. Lightweight timber framed perimeter walls extend from the slab forming a rectangular structure. There are two openings on the buildings north-eastern face and one on the buildings northern-western face. The rooms are split by timber framed partition walls, which extend to the roof.

The hipped roof is framed by timber rafters which extend from a timber top plate to a ridge beam. The rafters support timber boards running parallel to the adjacent wall. Corrugated metal sheeting clad these boards. There are skylights located throughout the roof structure.

Key Damage Observed

No damage was observed during the seismic assessment.

Critical Structural Weaknesses

No critical structural weaknesses have been identified in the structure.

Indicative Building Strength (from IEP and CSW assessment)

Based on the information available, and using the NZSEE Initial Evaluation Procedure, the original capacity of the building has been assessed to be in the order of 85% NBS and post-earthquake capacity also in the order of 85% NBS. As no critical structural weaknesses have been identified, the buildings post-earthquake capacity excluding critical structural weaknesses is also in the order of 85% NBS.

The building has been assessed to have a seismic capacity in the order of 85% NBS and is considered neither potentially Earthquake Risk nor potentially Earthquake Prone.



Recommendations

No further structural assessment is required.



1. Background

GHD has been engaged by the Christchurch City Council (CCC) to undertake a detailed engineering evaluation of the Halswell Quarry Farm Park Toilets.

This report is a Qualitative Assessment of the building structure, and is based in part 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.



2. 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.

2.1 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



2.2 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.

2.2.1 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.



2.3 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.

2.4 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.



3. Earthquake Resistance Standards

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 1 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 1 NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE

Table 1 compares the percentage NBS to the relative risk of the building failing in a seismic event with a 10% risk 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% risk of exceedance in the next year.



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

Table 1 %NBS compared to relative risk of failure

4. Building Description

4.1 General

The single storey structure is located in Halswell Quarry Park which can be accessed off Kennedys Bush Road. It is used as a public toilet for visitors to this Christchurch Park. The toilet is estimated to be constructed sometime within the late 1990's. No additions have been made to the building since its original construction.

The building appears to be constructed on a reinforced concrete slab with strip foundations.

Lightweight timber framed perimeter walls form a rectangular structure. All perimeter walls are clad externally with stone veneer to 1 meter above ground level and timber boards for their remaining height. There are two openings on the buildings north-eastern face and one on the buildings north-western face. The rooms are formed by timber framed partition walls which extend to roof level (see Figure 2)

The hipped roof is formed by timber rafters which extended from a timber top plate to the timber ridge and hip beams. The timber rafter's support timber boards running parallel to the adjacent wall. Corrugated metal sheeting clad these boards. There are skylights throughout the roof structure.

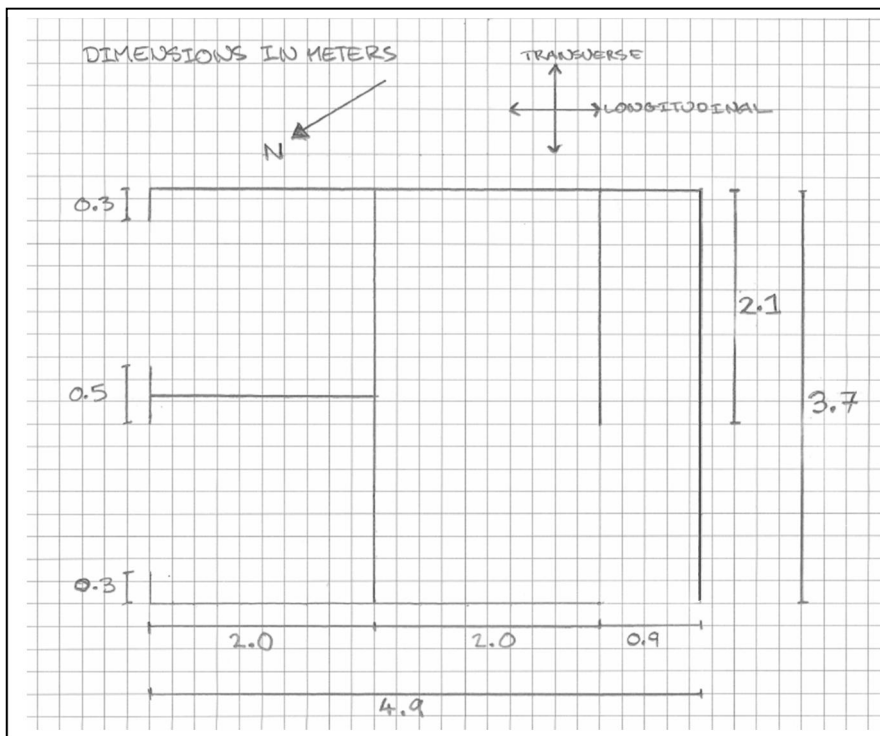


Figure 2 Plan Sketch Showing Key Structural Elements

The building is approximately 4.9m meters in length by 3.7m in width, it has a height of 3.4m and an approximate foot of 18m². The toilet is isolated from other buildings and is 500m to the east of a lake. The toilet has been built on a gentle slope.

No plans were available for this assessment.



4.2 Gravity Load Resisting System

Gravity loads are initially carried by the metal sheet cladding and timber boards. Loads are transferred into the timber rafter's and travel downward into the timber top beam. The loads are then resisted by the timber framed walls and transferred into the concrete slab and foundation.

Internal gravity floor loads are transferred through the concrete slab, into the ground.

4.3 Lateral Load Resisting System

The lateral load resisting systems in both the longitudinal and transverse directions are similar.

Lateral roof loads are transferred by the nominal diaphragm action of the timber framed roof and boards to walls in the plane of loading. The panel action of the in-plane walls transfers the lateral roof loads to the concrete strip foundations, and into the ground.

Walls subject to out of plane lateral loads span between the ground and roof diaphragm.



5. Assessment

An inspection of the building was undertaken on the 20th of September 2012. Both the interior and exterior of the building were inspected. The main structural components of the roof of the building were all able to be viewed. The piled foundations were not be viewed as these lay beneath the ground..

The inspection consisted of scrutinising the building to determine the structural systems and likely behaviour of the building during an earthquake. The site was assessed for damage, including examination of the ground conditions, checking for damage in areas where damage would be expected for the type of structure and noting general damage observed throughout the building in both structural and non-structural elements.

The %NBS score determined for this building has been based on the IEP procedure described by the NZSEE and based on the information obtained from visual observation of the building.

5.1 Damage Assessment

5.1.1 Surrounding Buildings

There are no buildings nearby.

5.1.2 Residual Displacements and General Observations

No residual displacements of the structure were noticed during our inspection of the building.

The building is in good condition and is well maintained except that the tiling on top of the stone veneer on the buildings western corner is missing. This is not related to the seismic event.

5.1.3 Floor Level Survey

No level or verticality surveys have been undertaken for this building at this stage as indicated by Christchurch City Council guidelines.

5.1.4 Ground Damage

There was no evidence of ground damage on the property or surrounding neighbours land.

5.2 Geotechnical Assessment

A desktop report was not undertaken because no evidence of liquefaction or lateral spreading was clearly visible in the aerial photography taken following the September 2010, February 2011, June 2011 or December 2011 earthquakes.

A soil class of D (in accordance with NZS 1170.5:2004) should be adopted for the site due to the following reasons:

- No evidence of liquefaction following earthquakes;
- Anticipated depth to bedrock in excess of 100m.



6. Critical Structural Weakness

6.1 Short Columns

No short columns are present in the structure.

6.2 Lift Shaft

The building does not contain a lift shaft.

6.3 Roof

Roof elements such as timber boards, and rafters were clearly visible and are expected to provide bracing to the roof structure.

6.4 Staircases

The building does not contain a staircase.

6.5 Site Characteristics

The site characteristics have been assessed as an 'insignificant' site characteristic in accordance with the NZSEE guidelines.



7. Initial Capacity Assessment

7.1 % NBS Assessment

The building has had its capacity assessed using the Initial Evaluation Procedure based on the information available. The buildings capacity excluding the capacity reduction of critical structural weaknesses is expressed as a percentage of new building standard (%NBS) and are in the order of that shown below in Table 2. These capacities are subject to confirmation by a more detailed quantitative analysis.

Item	%NBS
Building excluding CSW's	85

Table 2 Indicative Building and Critical Structural Weaknesses Capacities based on the NZSEE Initial Evaluation Procedure

Following an IEP assessment, the building has been assessed as achieving 85% New Building Standard (NBS). Under the New Zealand Society for Earthquake Engineering (NZSEE) guidelines the building is considered neither potentially Earthquake Risk nor potentially Earthquake Prone as it achieves greater than 67% NBS. This score has not been adjusted when considering damage to the structure as no damage, due to seismic activity, was observed.

7.2 Seismic Parameters

The seismic design parameters based on current design requirements from NZS 1170:2002 and the NZBC clause B1 for this building are:

- ▶ Site soil class: D, NZS 1170.5:2004, Clause 3.1.3, Soft Soil
- ▶ Site hazard factor, $Z = 0.3$, NZBC, Clause B1 Structure, Amendment 11 effective from 1 August 2011
- ▶ Return period factor $R_u = 1.0$, NZS 1170.5:2004, Table 3.5, Importance level 2 structure with a 50 year design life.

An increased Z factor of 0.3 for Christchurch has been used in line with requirements from the Department of Building and Housing resulting in a reduced % NBS score.

7.3 Expected Structural Ductility Factor

A structural ductility factor of 2.0 has been assumed based on the ductile behaviour expected from a timber framed structure built around the late 1990's.

7.4 Discussion of Results

The results obtained from the initial IEP assessment are consistent with those expected for a building of this age and construction type. Although the exact building's construction date is unknown the toilet was likely designed to the loading standard current around the late 1990's, NZS 4203:1992. The design loads used in accordance with this standard are likely to have been less than those required by the current loading standard. When combined with the increase in the hazard factor for Christchurch to 0.3,



it would be expected that the building would not achieve 100% NBS. However, due to the lack of any Critical Structural Weaknesses, it is reasonable to expect the Halswell Quarry Farm Park Toilets to be classified as neither potentially Earthquake Prone nor potentially Earthquake Risk.



8. Conclusions & Recommendations

The building has been assessed to have a seismic capacity in the order of 85% NBS and is therefore not potentially Earthquake Prone nor potentially Earthquake Risk.

The recent seismic activity in Christchurch has caused no damage to the building. As the building has achieved greater than 67% NBS following an initial IEP assessment of the building, no further assessment is required by Christchurch City Council to comply with the building act.



9. Limitations

9.1 General

This report has been prepared subject to the following limitations:

- ▶ No intrusive structural investigations have been undertaken.
- ▶ No intrusive geotechnical investigations have been undertaken.
- ▶ Visual inspections of the foundations were not undertaken.
- ▶ No level or verticality surveys have been undertaken.
- ▶ No material testing has been undertaken.
- ▶ No calculations, other than those included as part of the IEP in the CERA Building Evaluation Report, have been undertaken. No modelling of the building for structural analysis purposes has been performed.

It is noted that this report has been prepared at the request of Christchurch City Council and is intended to be used for their purposes only. GHD accepts no responsibility for any other party or person who relies on the information contained in this report. A specific limitations section.

9.2 Geotechnical Limitations

This report presents the results of a geotechnical appraisal prepared for the purpose of this commission, and solely for the use of Christchurch City Council and their advisors. The data and advice provided herein relate only to the project and structures described herein and must be reviewed by a competent geotechnical engineer before being used for any other purpose. GHD Limited (GHD) accepts no responsibility for other use of the data.

The advice tendered in this report is based on a visual geotechnical appraisal. No subsurface investigations have been conducted. An assessment of the topographical land features have been made based on this information. It is emphasised that Geotechnical conditions may vary substantially across the site from where observations have been made. Subsurface conditions, including groundwater levels can change in a limited distance or time. In evaluation of this report cognisance should be taken of the limitations of this type of investigation.

An understanding of the geotechnical site conditions depends on the integration of many pieces of information, some regional, some site specific, some structure specific and some experienced based. Hence this report should not be altered, amended or abbreviated, issued in part and issued incomplete in any way without prior checking and approval by GHD. GHD accepts no responsibility for any circumstances, which arise from the issue of the report, which have been modified in any way as outlined above.



Appendix A

Photographs



Photograph 1 Northwest elevation.



Photograph 2 View of toilet from the west.



Photograph 3 View of toilet from the south.



Photograph 4 Northeast elevation



Photograph 5 Missing tiling on stone veneer



Photograph 6 Roof interior



Photograph 7 Partition support to mid-point of rafter and hip beam.



Photograph 8 Sky light.



Appendix B
CERA Building Evaluation Form

Detailed Engineering Evaluation Summary Data

V1.11

Location		Building Name: <input type="text" value="Halswell Quarry Farm Park - Toilet"/>	Reviewer: <input type="text" value="Stephen Lee"/>
	Unit No: <input type="text"/>	Street: <input type="text" value="Kennedys Bush"/>	CPEng No: <input type="text" value="1006840"/>
Building Address: <input type="text" value="Halswell Quarry Farm Park - Toilet"/>			Company: <input type="text" value="GHD"/>
Legal Description: <input type="text" value="Pt RS 14330"/>			Company project number: <input type="text" value="51/30902/68"/>
			Company phone number: <input type="text" value="04 472 0799"/>
	Degrees	Min	Sec
GPS south: <input type="text"/>	<input type="text" value="43"/>	<input type="text" value="35"/>	<input type="text" value="57.00"/>
GPS east: <input type="text"/>	<input type="text" value="172"/>	<input type="text" value="34"/>	<input type="text" value="52.00"/>
Building Unique Identifier (CCC): <input type="text" value="PRK_1887_BLDG_007"/>			Date of submission: <input type="text" value="5/20/2013"/>
			Inspection Date: <input type="text" value="9/20/2012"/>
			Revision: <input type="text" value="FINAL"/>
			Is there a full report with this summary? <input type="text" value="yes"/>

Site		Site slope: <input type="text" value="slope < 1 in 10"/>	Max retaining height (m): <input type="text"/>
	Soil type: <input type="text"/>		Soil Profile (if available): <input type="text"/>
Site Class (to NZS1170.5): <input type="text" value="D"/>			
Proximity to waterway (m, if <100m): <input type="text"/>			If Ground improvement on site, describe: <input type="text"/>
Proximity to clifftop (m, if < 100m): <input type="text"/>			
Proximity to cliff base (m,if <100m): <input type="text"/>			Approx site elevation (m): <input type="text"/>

Building		No. of storeys above ground: <input type="text" value="1"/>	single storey = 1	Ground floor elevation (Absolute) (m): <input type="text"/>
	Ground floor split?: <input type="text" value="no"/>			Ground floor elevation above ground (m): <input type="text"/>
	Storeys below ground: <input type="text"/>			
	Foundation type: <input type="text" value="strip footings"/>			if Foundation type is other, describe: <input type="text"/>
	Building height (m): <input type="text" value="3.40"/>		height from ground to level of uppermost seismic mass (for IEP only) (m): <input type="text" value="3.4"/>	
	Floor footprint area (approx): <input type="text" value="18"/>			
	Age of Building (years): <input type="text" value="12"/>			Date of design: <input type="text" value="1992-2004"/>
	Strengthening present?: <input type="text" value="no"/>			If so, when (year)? <input type="text"/>
	Use (ground floor): <input type="text" value="public"/>			And what load level (%g)? <input type="text"/>
	Use (upper floors): <input type="text"/>			Brief strengthening description: <input type="text"/>
	Use notes (if required): <input type="text" value="Public Toilet"/>			
	Importance level (to NZS1170.5): <input type="text" value="IL2"/>			

Gravity Structure		Gravity System: <input type="text" value="load bearing walls"/>	rafter type, purlin type and cladding: <input type="text"/>
	Roof: <input type="text" value="timber framed"/>		describe sytem: <input type="text" value="Slab on grade"/>
	Floors: <input type="text" value="other (note)"/>		
	Beams: <input type="text" value="none"/>		overall depth x width (mm x mm): <input type="text"/>
	Columns: <input type="text"/>		
	Walls: <input type="text"/>		

Lateral load resisting structure

Lateral system along:
Ductility assumed, μ :
Period along:
Total deflection (ULS) (mm):
maximum interstorey deflection (ULS) (mm):

0.00

Note: Define along and across in detailed report!

note typical wall length (m)
estimate or calculation?
estimate or calculation?
estimate or calculation?

Lateral system across:
Ductility assumed, μ :
Period across:
Total deflection (ULS) (mm):
maximum interstorey deflection (ULS) (mm):

0.00

note typical wall length (m)
estimate or calculation?
estimate or calculation?
estimate or calculation?

Separations:

north (mm):
east (mm):
south (mm):
west (mm):

leave blank if not relevant

Non-structural elements

Stairs:
Wall cladding:
Roof Cladding:
Glazing:
Ceilings:
Services(list):

describe
describe

Available documentation

Architectural
Structural
Mechanical
Electrical
Geotech report

original designer name/date
original designer name/date
original designer name/date
original designer name/date
original designer name/date

Damage

Site:
(refer DEE Table 4-2)

Site performance:
Settlement:
Differential settlement:
Liquefaction:
Lateral Spread:
Differential lateral spread:
Ground cracks:
Damage to area:

Describe damage:
notes (if applicable):
notes (if applicable):
notes (if applicable):
notes (if applicable):
notes (if applicable):
notes (if applicable):

Building:

Current Placard Status:

Along	Damage ratio: <input type="text" value="0%"/>	Describe how damage ratio arrived at: <input type="text"/>
	Describe (summary): <input type="text"/>	
Across	Damage ratio: <input type="text" value="0%"/>	$\text{Damage_Ratio} = \frac{(\% \text{NBS (before)} - \% \text{NBS (after)})}{\% \text{NBS (before)}}$
	Describe (summary): <input type="text"/>	
Diaphragms	Damage?: <input type="text" value="no"/>	Describe: <input type="text"/>
CSWs:	Damage?: <input type="text" value="no"/>	Describe: <input type="text"/>
Pounding:	Damage?: <input type="text" value="no"/>	Describe: <input type="text"/>
Non-structural:	Damage?: <input type="text" value="no"/>	Describe: <input type="text"/>

Recommendations

Level of repair/strengthening required:	<input type="text" value="none"/>	Describe: <input type="text"/>	
Building Consent required:	<input type="text" value="no"/>	Describe: <input type="text"/>	
Interim occupancy recommendations:	<input type="text" value="full occupancy"/>	Describe: <input type="text"/>	
Along	Assessed %NBS before e'quakes: <input type="text" value="85%"/>	85% %NBS from IEP below	If IEP not used, please detail assessment methodology: <input type="text"/>
	Assessed %NBS after e'quakes: <input type="text" value="85%"/>		
Across	Assessed %NBS before e'quakes: <input type="text" value="85%"/>	85% %NBS from IEP below	
	Assessed %NBS after e'quakes: <input type="text" value="85%"/>		

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: 3.4m

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:	<input type="text" value="22.3%"/>	<input type="text" value="22.3%"/>
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	<input type="text" value="1.00"/>	<input type="text" value="1.00"/>
Note 2: for RC buildings designed between 1976-1984, use 1.2	<input type="text" value="1.0"/>	<input type="text" value="1.0"/>
Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0)	<input type="text" value="1.0"/>	<input type="text" value="1.0"/>
Final (%NBS)_{nom}:	<input type="text" value="22%"/>	<input type="text" value="22%"/>

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:	<input type="text" value="1"/>	<input type="text" value="1"/>

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3:	0.30
Z ₁₉₉₂ , from NZS4203:1992	0.8
Hazard scaling factor, Factor B:	2.66666667

2.4 Return Period Scaling Factor

Building Importance level (from above):	2
Return Period Scaling factor from Table 3.1, Factor C:	1.00

2.5 Ductility Scaling Factor

	along	across
Assessed ductility (less than max in Table 3.2)	2.00	2.00
Ductility scaling factor: =1 from 1976 onwards; or =k _μ , if pre-1976, from Table 3.3:	1.00	1.00
Ductility Scaling Factor, Factor D:	1.00	1.00

2.6 Structural Performance Scaling Factor:

Sp:	0.700	0.700
Structural Performance Scaling Factor Factor E:	1.428571429	1.428571429

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

%NBS _b :	85%	85%
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Global Critical Structural Weaknesses: (refer to NZSEE IEP Table 3.4)

3.1. Plan Irregularity, factor A: insignificant 1

3.2. Vertical irregularity, Factor B: insignificant 1

3.3. Short columns, Factor C: insignificant 1

3.4. Pounding potential
 Pounding effect D1, from Table to right 1.0
 Height Difference effect D2, from Table to right 1.0

Therefore, Factor D: 1

3.5. Site Characteristics insignificant 1

	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

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

3.6. Other factors, Factor F

For ≤ 3 storeys, max value =2.5, otherwise max value =1.5, no minimum	Along	Across
Rationale for choice of F factor, if not 1	1.0	1.0

Detail Critical Structural Weaknesses: (refer to DEE Procedure section 6)

List any: Refer also section 6.3.1 of DEE for discussion of F factor modification for other critical structural weaknesses

3.7. Overall Performance Achievement ratio (PAR)

1.00	1.00
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4.3 PAR x (%NBS)_b:

PAR x Baseline %NBS:	85%	85%
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4.4 Percentage New Building Standard (%NBS), (before)

85%





GHD

Level 11, Guardian Trust House
15 Willeston street, Wellington 6011
T: 64 4 472 0799 F: 64 4 472 0833 E: wgtnmail@ghd.com

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Document Status

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