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Paeroa Reserve Pump Shed

Qualitative Engineering Evaluation

Reference: 231562

Prepared for:

Christchurch City Council

Functional Location ID: PRK_2936_BLDG_003

Address: 6 Paeroa Street, Riccarton

Revision: 2

Date: 14 October 2013

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Document Control Record

Document prepared by:

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

T +64 3 375 0761
F +64 3 379 6955
E christchurch@aurecongroup.com
W aurecongroup.com

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1	**16 July 2013**	Draft	O. Belov	O. Belov	C. Lillywhite	L. Castillo	
2	**14 October 2013**	Final	O. Belov	O. Belov	C. Lillywhite	L. Castillo	
Current Revision		2					

Approval			
Author Signature		Approver Signature	
Name	Oleg Belov	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 Paeroa Reserve Pump Shed 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**	Paeroa Reserve Pump Shed			
Building Location ID	PRK_2936_BLDG_003			**Multiple Building Site**	N
Building Address	6 Paeroa Street, Riccarton (access off Tara St)			**No. of residential units**	0
Soil Technical Category	NA	**Importance Level**	4	**Approximate Year Built**	NA
Foot Print (m²)	10	**Stories above ground**	1	**Stories below ground**	0
Type of Construction	Light-weight timber framed roof supported by concrete walls and a concrete slab.				
Qualitative L4 Report Results Summary					
Building Occupied	Y	The Paeroa Reserve Pump Shed is currently in use.			
Suitable for Continued Occupancy	Y	The Paeroa Reserve Pump Shed is suitable for continued occupancy.			
Key Damage Summary	Y	Refer to section 3.1.			
Critical Structural Weaknesses (CSW)	N	No critical structural weaknesses were identified.			
Levels Survey Results	N	Level survey not carried out. Floor appears to be within allowable tolerances.			
Building %NBS From Analysis	73%	Based on analysis of 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. It is recommended that this report is considered final.			
Approval					
Author Signature		Approver Signature			
Name	Oleg Belov	Name	Lee Howard		
Title	Structural Engineer	Title	Senior Structural Engineer		

1 Introduction

1.1 General

On 31 August 2012 an Aurecon engineer visited the Paeroa Reserve Pump Shed to undertake a qualitative building damage assessment on behalf of Christchurch City Council. A detailed visual inspection was 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; and
- A detailed engineering evaluation (DEE) including engineering calculations to determine extent of damage.

The scope of work excluded:

- Assessment of the nature and extent of the building damage to the concrete water tank under the pump shed.

This report outlines the results of our Qualitative Assessment of damage to the Paeroa Reserve Pump Shed and is based on the Detailed Engineering Evaluation Procedure document issued by the Structural Advisory Group on 19 July 2011, visual inspection, available structural documentation and summary calculations as appropriate.

2 Description of the Building

2.1 Building Configuration

The Paeroa Reserve Pump Shed is a single storey structure. It comprises of a light-weight timber framed roof, which is supported by perimeter concrete walls. The foundation consists of a concrete slab, which appears to be the top of a concrete water tank.

The building has an approximate floor area of 10 square metres. It is considered as an importance level 4 structure (post-disaster function) in accordance with AS/NZS 1170 Part 0:2002.

2.2 Building Structural Systems Vertical and Horizontal

The Paeroa Reserve Pump Shed is a very simple structure. Its timber framed roof is supported by concrete walls that transfer loads to the foundation. Lateral loads are resisted by the same walls mentioned before which are located around the perimeter of the structure.

2.3 Building Foundation System and Soil Conditions

The Paeroa Reserve Pump Shed is based on a concrete slab as its foundation system, which appears to be the top of a concrete water tank, used for non-residential purposes; the Department of Building and Housing (DBH) do not currently have a technical classification for the land in the immediate vicinity of the Paeroa Reserve Pump Shed. It is of note however, that the nearby surrounding area within the suburb of Riccarton consists of Technical Category 2 (TC2) land. According to CERA, TC2 land is defined as “minor to moderate land damage from liquefaction is possible in future significant earthquakes”.

2.4 Available Structural Documentation and Inspection Priorities

No drawings were available for this site. Inspection priorities for the building are related to a review of potential damage to the structural areas of the building caused by the Canterbury Earthquakes.

2.5 Available Survey Information

Due to the small floor area and a structurally sound foundation a floor level survey was not carried out. During the inspection it was observed that the building is well levelled. Approximate layout of reinforcement was measured at some locations, namely the walls, to determine the general arrangement of reinforcement within the building for assessment purposes.

3 Structural Investigation

3.1 Summary of Building Damage

It was observed that the building has not suffered any structural damage. There is cracking in the concrete water tank supporting the pump shed, which appears to have been previously repaired. However the cracks have widened since the repairs were last carried out.

3.2 Record of Intrusive Investigation

Walls were scanned using a reinforcement scanner to confirm the reinforcement within the concrete walls. Due to the size and construction of the building we do not believe any further intrusive investigations are required.

3.3 Damage Discussion

The structure is comprised of three primary components; the light-weight timber framed roof, the concrete walls and the concrete foundation. Based on the geometry of the structure, refer to Appendix A, and the observed damage it can be concluded that the structure appears to have sufficient strength to resist earthquake loads.

Separate to the structure being assessed, the water tank supporting the pump shed contains cracking, which has previously being repaired, but has since opened up. The crack that was visible during the inspection is shown in the Appendix and is in the order ranging from 5mm to 15mm width.

4 Building Review Summary

4.1 Building Review Statement

Because of the generic nature of the building a significant amount of information can be inferred by a visual inspection. Refer to Appendix A for approximate geometry of the structure.

4.2 Critical Structural Weaknesses

The Paeroa Reserve Pump Shed does not have any obvious critical structural weaknesses. The strength of the shear connectors at the base of the walls was investigated and have been found to have a strength greater than 33%NBS. They are therefore not considered a critical structural weakness.

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

5.1 General

The Paeroa Reserve Pump Shed is primarily supported by concrete walls that resist earthquake loads. The existing condition of the structure indicates that there are no signs of structural damage.

5.2 Initial %NBS Assessment

The Paeroa Reserve Pump Shed has been subject to a detailed engineering evaluation (DEE). Table 1 below indicates the input parameters adopted during the DEE assessment.

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	1.8	NZS 1170.5:2004, Table 3.5, Importance Level 4 Structure (post-disaster function) with a Design Life of 50 years
Ductility Factor in the Along Direction (North-South), μ	1.25	Lightly reinforced concrete walls.
Ductility Factor in the Across Direction (East-West), μ	1.25	Lightly reinforced concrete walls.

The seismic demand for the Paeroa Reserve Pump Shed has been calculated based on the current code requirements. It is noted that the assessment was focused on the critical elements of the structure, namely the concrete walls. The roof and foundation have been assumed to be acceptable based on their geometry and lack of any notable damage.

The seismic demand imposed on the walls was then compared with their capacity. A summary of the strengths of the building elements is shown in Table 2.

Table 2: Building Strength

Building Element	Direction	% NBS
Concrete Walls – In plane shear	Along	100%
	Across	100%
Concrete Walls – Shear connection to slab	Along	100%
	Across	73%
Concrete Walls – Out-of-plane capacity	Along	95%
	Across	100%

5.3 Results Discussion

The results indicate that the structural integrity of the building is above the legal requirement of 33% NBS, which indicates that the building is not earthquake prone. The building has also satisfied the recommended minimum %NBS by the New Zealand Society for Earthquake Engineering (NZSEE) of 67%.

Minimal damage was observed during the inspection, which corresponds with the calculated %NBS. The importance level of 4 has been adopted due to the assumption that this building will be required to be functional in a post-disaster scenario.

6 Conclusions and Recommendations

The Paeroa Reserve Pump Shed has satisfied the minimum legal %NBS of 33% and has also satisfied the recommended minimum %NBS by the NZSEE of 67%. Thus, **the building is suitable to continue performing its designated function**.

The concrete foundation, which appears to be the top of a concrete water tank has cracks that have been previously repaired, but have since widened. It is our recommendation that the cracking in the concrete water tank should be investigated to determine its magnitude and extent and the concrete water tank should be assessed for any structural damage.

7 Explanatory Statement

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

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

To carry out the structural review, existing building drawings were obtained (where available) from the Christchurch City Council records. We have assumed that the building has been constructed in accordance with the drawings.

While this report may assist the client in assessing whether the building should be repaired, strengthened, or replaced that decision is the sole responsibility of the client.

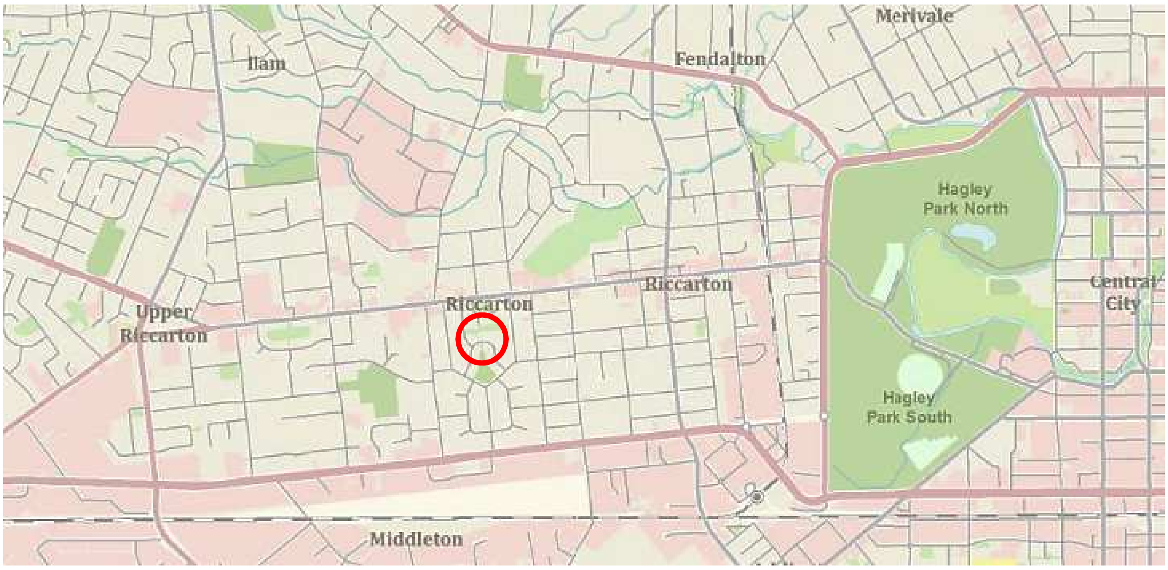
This review has been prepared by Aurecon at the request of its client and is exclusively for the client's use. It is not possible to make a proper assessment of this review without a clear understanding of the terms of engagement under which it has been prepared, including the scope of the instructions and directions given to and the assumptions made by Aurecon. The report will not address issues which would need to be considered for another party if that party's particular circumstances, requirements and experience were known and, further, may make assumptions about matters of which a third party is not aware. No responsibility or liability to any third party is accepted for any loss or damage whatsoever arising out of the use of or reliance on this report by any third party.

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

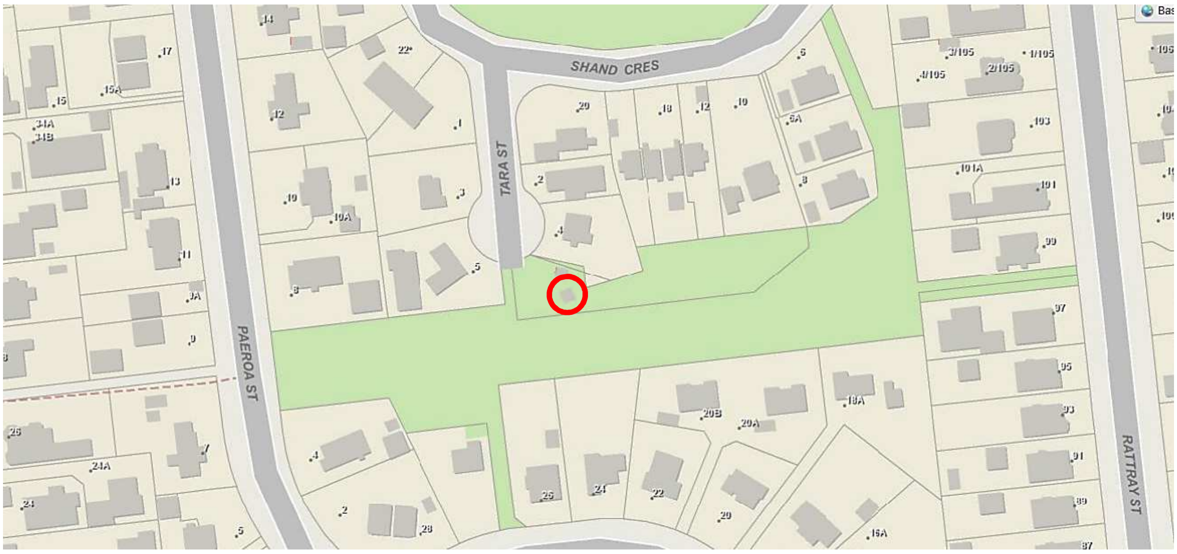
Appendices

Appendix A
Site Map, Photos and Geometry

31 August 2012 – Paeroa Reserve Pump Shed Site Map, Geometry, Levels Survey and Photographs



General Map (Retrieved on 17/10/2012 c/o Christchurch City Council, CERA maps)



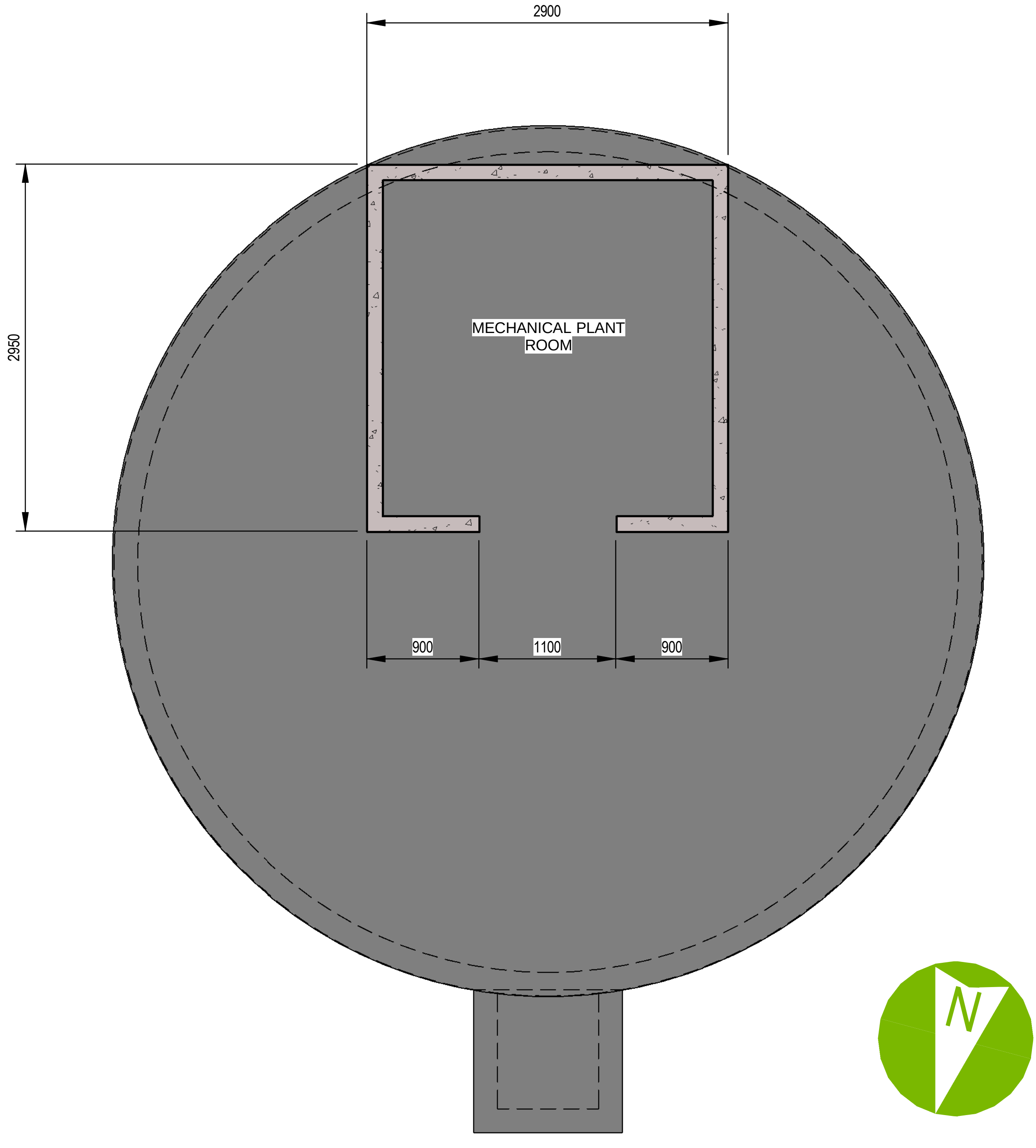
Local Map (Retrieved on 17/10/2012 c/o Christchurch City Council, CERA maps)

Image 1. General view of the Paeroa Reserve Pump Shed.	
Image 2. Side view.	

Image 3. Cracking of the concrete water tank under the pump shed. The crack appears to have been previously repaired, but has since opened up. Extend of cracking of the water tank should be investigated.	

NOTES:

1. CONTRACTOR TO CONFIRM EXACT MEASUREMENTS PRIOR TO COMMENCEMENT OF CONSTRUCTION.



PLAN SETOUT

1 : 50

Elevation

1
S-01-02

6/11/2012 12:04:50 p.m.

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CLIENT

REV	DATE	REVISION DETAILS	APPROVAL
A	02-11-2012	DEE REPORT	L.HOWARD

DRAWN	DESIGNED
D.LAKE	O.BELOV
CHECKED	
Checker	
APPROVED	
L.HOWARD	DATE

PROJECT
6 PAEROA STREET
RICCARTON

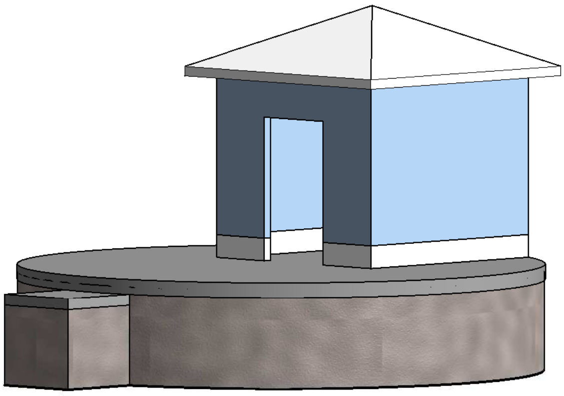
TITLE
PLAN VIEW

PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.	
231562	
SCALE	SIZE
1 : 50	A4
DRAWING No.	REV
S-01-01	A

NOTES:

1. CONTRACTOR TO CONFIRM EXACT MEASUREMENTS PRIOR TO COMMENCEMENT OF CONSTRUCTION.



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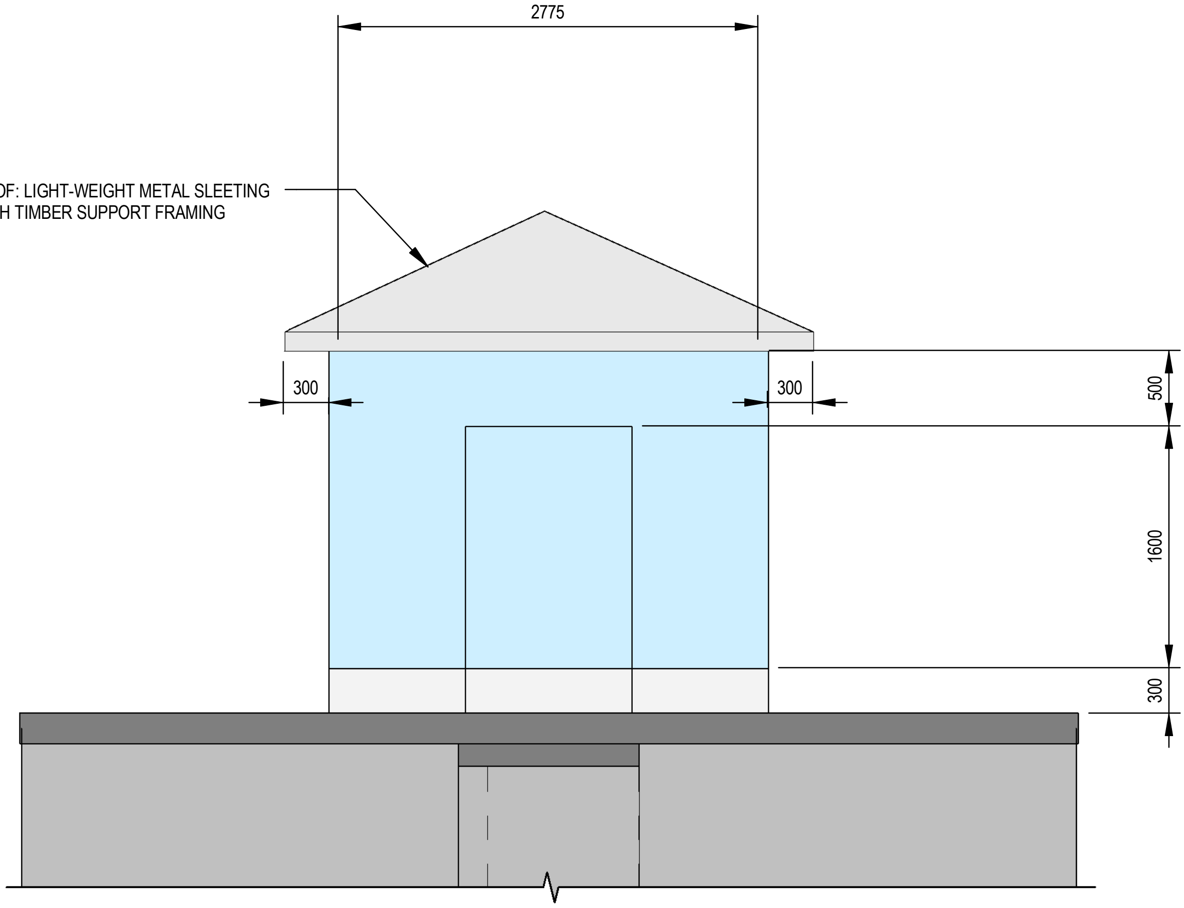

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PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.	
231562	
SCALE	SIZE
1 : 50	A4
DRAWING No.	REV
S-01-02	A

Appendix B
References

1. The Ministry of Business, Innovation and Employment (MBIE) "Repairing and rebuilding houses affected by the Canterbury earthquakes", 2012

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 3606, 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 or modelling of the building structure had been carried out.

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:	Paeroa Reserve - Pump Shed	Reviewer:	Lee Howard
	Unit / No: / Street	CPEng No:	1008889
Building Address:	6 Paeroa Street	Company:	Aurecon NZ Ltd
Legal Description:	Res 5128	Company project number:	231562
		Company phone number:	03 366 0821
	Degrees / Min / Sec		
GPS south:	43 / 31 / 55.19	Date of submission:	Oct-13
GPS east:	172 / 35 / 23.54	Inspection Date:	Aug-12
		Revision:	2
Building Unique Identifier (CCC):	PRK_2936_BLDG_003	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):	

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):
Ground floor split?	no		Ground floor elevation above ground (m):
Storeys below ground	0		
Foundation type:	other (describe)	if Foundation type is other, describe:	Concrete water tank
Building height (m):	3.00	height from ground to level of uppermost seismic mass (for IEP only) (m):	2.4
Floor footprint area (approx):	10		
Age of Building (years):		Date of design:	1976-1992
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):	Pump Shed		
Importance level (to NZS1170.5):	IL4		

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber framed	rafter type, purlin type and cladding	NA
Floors:	concrete flat slab	slab thickness (mm)	NA
Beams:			
Columns:			
Walls:	fully filled concrete masonry	#N/A	

Lateral load resisting structure

Lateral system along:	concrete shear wall	**Note: Define along and across in**	enter wall data in "IEP period calcs"	
Ductility assumed, μ:	1.25	**detailed report!**	worksheet for period calculation	
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:	concrete shear wall		enter wall data in "IEP period calcs"	
Ductility assumed, μ:	1.25		worksheet for period calculation	
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	Corrugated iron roof sheeting
Glazing:			
Ceilings:			
Services(list):	Pump shed utility services		

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:	95%	##### %NBS from IEP below	If IEP not used, please detail assessment methodology: Analysis of Capacity and Demand
	Assessed %NBS after e'quakes:	95%		
Across	Assessed %NBS before e'quakes:	73%	##### %NBS from IEP below	
	Assessed %NBS after e'quakes:	73%		

IEP

Use of this method is not mandatory - more detailed analysis may give a different answer, which would take precedence. Do not fill in fields if not using IEP.

Period of design of building (from above): 1976-1992 — h_n from above: 2.4m

Seismic Zone, if designed between 1965 and 1992: — not required for this age of building / not required for this age of building

	along	across
Period (from above):	0.4	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): 4
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 =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:		
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: 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
Height Difference effect D2, from Table to right

Therefore, Factor D: 0

3.5. Site Characteristics insignificant | 1

Table for selection of D1	Severe	Significant	Insignificant/none
Separation	0<sep<.005H	.005<sep<.01H	Sep>.01H
Alignment of floors within 20% of H	**0.7**	**0.8**	**1**
Alignment of floors not within 20% of H	**0.4**	**0.7**	**0.8**

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

3.6. Other factors, Factor F

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

Official Use only:

Accepted By
Date:

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

T +64 3 375 0761
F +64 3 379 6955
E christchurch@aurecongroup.com
W aurecongroup.com