



Parklands Community Centre
Qualitative Engineering Evaluation

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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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Author Signature		Approver Signature	
Name	Luis Castillo	Name	Lee Howard
Title	Structural Engineer	Title	Senior Structural Engineer

Contents

Executive Summary	1
1 Introduction	2
1.1 General	2
2 Description of the Building	2
2.1 Building Age and Configuration	2
2.2 Building Structural Systems Vertical and Horizontal	3
2.3 Reference Building Type	4
2.4 Building Foundation System and Soil Conditions	4
2.5 Available Structural Documentation and Inspection Priorities	4
2.6 Available Survey Information	5
3 Structural Investigation	5
3.1 Summary of Building Damage	5
3.2 Record of Intrusive Investigation	5
3.3 Damage Discussion	5
4 Building Review Summary	6
4.1 Building Review Statement	6
4.2 Critical Structural Weaknesses	6
5 Building Strength (Refer to Appendix C for background information)	6
5.1 General	6
5.2 Initial %NBS Assessment	6
5.3 Results Discussion	7
6 Conclusions and Recommendations	8
7 Explanatory Statement	8

Appendices

Appendix A Site Map, Photos and Levels Survey

Appendix B References



Appendix C Strength Assessment Explanation

Appendix D Background and Legal Framework

Appendix E Standard Reporting Spread Sheet

Executive Summary

This is a summary of the Qualitative Engineering Evaluation for the Parklands Community Centre 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	Parklands Community Centre			
Building Location ID		BU 0115 001 EQ2			Multiple Building Site	Y
Building Address		75 Queenspark Drive, Parklands			No. of residential units	0
Soil Technical Category		TC2	Importance Level	2	Approximate Year Built	1980 - 2000
Foot Print (m²)		1400	Storeys above ground	1	Storeys below ground	0
Type of Construction (Sports Hall)		Corrugated metal roof cladding, timber purlins, glulam timber portal frames, lined timber framed walls with a fibre cement sheet exterior lining and a concrete slab on grade foundation with local thickenings.				
Type of Construction (Church)		Corrugated metal roof cladding, timber framed roof, lined timber framed walls with a concrete masonry veneer exterior and a concrete slab on grade foundation with local thickenings.				
Type of Construction (Gymnasium)		Corrugated metal roof cladding, steel purlins, welded steel portal frames, lined timber framed walls and a concrete rib raft foundation with thickenings.				
Qualitative L4 Report Results Summary						
Building Occupied		Y	The Parklands Community Centre is currently in use.			
Suitable for Continued Occupancy		Y	The Parklands Community Centre is suitable for continued occupation.			
Key Damage Summary		Y	Refer to summary of building damage Section 3.1 report body.			
Critical Structural Weaknesses (CSW)		N	No critical structural weaknesses were identified.			
Levels Survey Results		Y	Variations in floor levels were within the DBH's Guidelines, with falls of less than 1:200 or 0.5%			
Building %NBS From Analysis		Approx. 58%	Based on Initial Evaluation Procedure (IEP) and bracing check - Sports Hall 58% (IEP), Church 95% (bracing check) and Gymnasium 66% (IEP).			
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		Luis Castillo		Name		Lee Howard
Title		Structural Engineer		Title		Senior Structural Engineer

1 Introduction

1.1 General

On 13 January 2012 Aurecon engineers visited the Parklands Community Centre 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 Parklands Community Centre 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

The Parklands Community Centre is a communal recreational complex consisting of 3 single storey buildings of various eras and construction summarised in Table 1 below. Also on location was a timber framed building currently occupied by Plunket and a concrete masonry toilet block. These buildings are not covered in this report.

Table 1: Buildings in the Parklands Community Centre complex

Building	Construction	Era
Sports Hall	The roof is of timber frame construction and is clad in colour steel. The structure consists of timber framed walls and glulam timber portal frames in the along and across directions respectively. The building is founded on a concrete slab on grade foundation with local thickenings for load bearing elements.	1980
Church	The roof is of timber frame construction and is clad in colour steel. The structure consists of lined timber framed walls with a concrete masonry veneer exterior. The building is founded on a concrete slab on grade foundation with local thickenings for load bearing elements.	1984
Gymnasium	The roof consists of steel purlins, diagonal bracing rods and is clad in colour steel. The structure consists of timber framed walls and welded steel portal frames in the along and across directions respectively. The building is founded on a concrete rib raft foundation with local thickenings for load bearing elements.	2000

NB. The across direction is parallel to the Queenspark Drive

The approximate floor area of the complex is 1400 square metres. The complex is classified as an Importance Level 2 in accordance with the loadings code AS/NZS 1170 Part 0:2002.

2.2 Building Structural Systems Vertical and Horizontal

The vertical and horizontal load paths for the 3 buildings that form the Parklands Community Centre are summarised in the table below.

Table 2: Load resisting systems of the Parklands Community Centre

Building	System	Load Path Description
Sports Hall	Vertical	The gravity loads from the metal roof cladding run through to the foundations via the timber purlins and the glulam timber portal frames.
Sports Hall	Along	The seismic loads in the along direction are transferred into the lined timber framed walls via the plywood roof diaphragm.
Sports Hall	Across	The seismic loads in the across direction are transferred into the lined timber framed gable walls and the glulam timber portal frames via the plywood roof diaphragm.
Church	Vertical	The gravity loads from the chapel's clerestory metal roof are carried by the timber frames and steel beams into the timber framed walls. The gravity loads from metal roof of the adjoining kitchen and meeting rooms are carried by the timber frames and the lined timber framed walls.
Church	Along	The seismic loads in the along direction are transferred into the lined timber framed walls via the particle board roof diaphragm.
Church	Across	The seismic loads in the across direction are transferred into the lined timber framed walls via the particle board roof diaphragm.
Gymnasium	Vertical	The gravity loads from the metal roof cladding run through to the foundations via the steel purlins and the welded steel portal frames.
Gymnasium	Along	The seismic loads in the along direction are resisted by the diagonal bracing rods.
Gymnasium	Across	The seismic loads in the across direction are resisted by the welded steel portal frames.

2.3 Reference Building Type

The Parklands Community Centre complex consists of 3 buildings of different constructions, with generic construction types and expected performances described below.

Glulam timber portal framed buildings such as the sports hall are typically lightweight and ductile in nature. Buildings of this nature have typically performed well in the Canterbury earthquake sequence.

Timber framed wall buildings such as the church are relatively stiff and generally have ductile failure modes. However, the paper “Performance of Houses during the Christchurch Earthquake of 22 February 2011” by Buchanan et al. has shown that concrete masonry veneer walls may:

- a) Be prone to step cracking in the mortar joints due to excessively dry mortar and high seismic accelerations; and
- b) Detach from the timber framing due to missing or inadequate masonry ties.

Welded steel portal framed buildings such as the gymnasium generally have ductile failure modes. As a building type, welded steel portal framed buildings have generally performed well in the Canterbury earthquake sequence.

The agglomeration of buildings with varying stiffness and heights in close proximity introduces two potential critical structural weaknesses (CSWs) - a pounding potential between the buildings. The effects of the pounding potential are reduced by seismic separations and low rise construction.

The damages relating to the specific building construction and the critical structural weaknesses as described above were specifically sought after in the damage assessment that was undertaken.

2.4 Building Foundation System and Soil Conditions

The sports hall and the church are founded on concrete slab-on-grade foundations with local thickenings for load bearing elements, whilst the gymnasium is founded on a concrete rib raft foundation with local thickenings for load bearing elements.

The land beneath the building and surrounded properties of the complex was zoned as “Technical Category 2” land according to the Department of Building and Housing’s (DBH) Technical Classes dated 18 May 2012.

2.5 Available Structural Documentation and Inspection Priorities

Architectural drawings were available to some degree for all of the Parklands Community Centre buildings. The inspection priorities relate to a review of the potential damage to foundations and structure as well as the consideration of seismic bracing adequacy.



2.6 Available Survey Information

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

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

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

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

The floor levels were found to be within the recommended tolerances. This was consistent with the level of damage observed in the damage assessment.

3 Structural Investigation

3.1 Summary of Building Damage

The Parklands Community Centre was occupied at the time of the damage assessment. Access to all areas of the complex was provided by a gym staff member. The most critical structural elements of the buildings were exposed and visible for inspection. The damage noted is summarised below:-

- Step cracking in the mortar joints of the concrete masonry veneer of the church; and
- Minor cracks in the interior linings of the gym.

3.2 Record of Intrusive Investigation

The extent of damage noted was relatively minor and therefore, an intrusive investigation was neither warranted nor undertaken for Parklands Community Centre.

3.3 Damage Discussion

Only low levels of damage were noted to the Parklands Community Centre as a result of the recent seismic sequence. This is not surprising as buildings of this nature are flexible and have high levels of inherent ductility. Damage to the wall linings is a common occurrence in this type of construction as plasterboard linings are relatively brittle, with cracking appearing given a limited amount of movement.

4 Building Review Summary

4.1 Building Review Statement

As noted previously, no intrusive investigations were undertaken on the Parklands Community Centre. Furthermore, a significant amount of information was able to be inferred from a thorough damage assessment of the interior and exterior of the building.

4.2 Critical Structural Weaknesses

As discussed in Section 2.3, the potential critical structural weakness identified was a pounding potential.

It was noted on the architectural drawings that seismic gaps were present between the gymnasium and sports hall and as well as between the gymnasium and church. From the architectural drawings, the size of the seismic separations were

- c) 50 millimetres between the gymnasium and sports hall; and
- d) 40 millimetres between the gymnasium and church.

There were no noted signs of damage to any of the 3 buildings in the complex. This is despite the fact that the seismic separations do not meet the current code requirements for an allowance of 2.5% of inter-storey drift in an ultimate limit state earthquake (in real terms, this equates to a 150 millimetre clear gap between buildings).

In short, the low levels of the damage noted in the damage assessment of the Parklands Community Centre have shown that the real effects of the potential CSW identified have been insignificant.

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

5.1 General

The Parklands Community Centre is an agglomeration of 3 buildings of varying construction and eras. Due to the relative light weight, flexibility, natural ductility and good torsional resilience, the complex has fared well in the recent earthquake sequence. This is evidenced by the low levels of damaged described previously.

5.2 Initial %NBS Assessment

The sports hall and the gymnasium of Parklands Community Centre have been subject to specific engineering design and the initial evaluation procedure (IEP) is a suitable method of assessment for these buildings. However, the church has not been subject to a specific engineering design and thus a bracing check is a more appropriate method of assessment. The selected assessment seismic parameters are tabulated in the table below.

Table 3: 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	1.00	NZS 1170.5:2004, Table 3.5, Importance Level 2 Structure with a 50 year design life
Ductility Factor for the Sports Hall in the Along Direction, μ	2.00	Lined timber framed walls
Ductility Factor for the Sports Hall in the Across Direction, μ	1.25	Glulam timber portal frames
Ductility Factor for the Church in the Along Direction, μ	2.00	Lined timber framed walls
Ductility Factor for the Church in the Across Direction, μ	2.00	Lined timber framed walls
Ductility Factor for the Gymnasium in the Along Direction, μ	1.25	Steel cross bracing rods
Ductility Factor for the Gymnasium in the Across Direction, μ	2.00	Welded steel portal frames

The IEP in the along and across direction have shown that the complex is capable of achieving approximately 58%NBS. This has been taken as the minimum of the 3 buildings - Sports Hall 58%NBS (IEP), Church 95%NBS (bracing check) and Gymnasium 66%NBS (IEP). This corresponds to a “moderate risk” building in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines.

5.3 Results Discussion

The results of the Initial Evaluation Procedure (IEP) and bracing check correspond well with the low levels of damage observed in the visual damage assessment. This expected of the structure due to its lightweight construction, ductile nature and well distributed bracing elements. Overall the structure has demonstrated good seismic performance.

6 Conclusions and Recommendations

As noted within this report, only low levels of damage were observed and the level survey has shown that the floor levels were within acceptable limits. This is further supported by the strength assessments that were undertaken. It is therefore considered that the Parklands Community Centre **is suitable for continued occupation.**

As the floor levels of the Parklands Community Centre were within acceptable limits, **a geotechnical investigation is currently not considered necessary.**

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

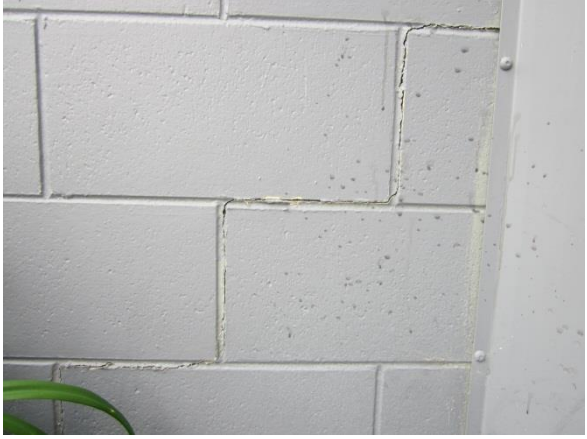






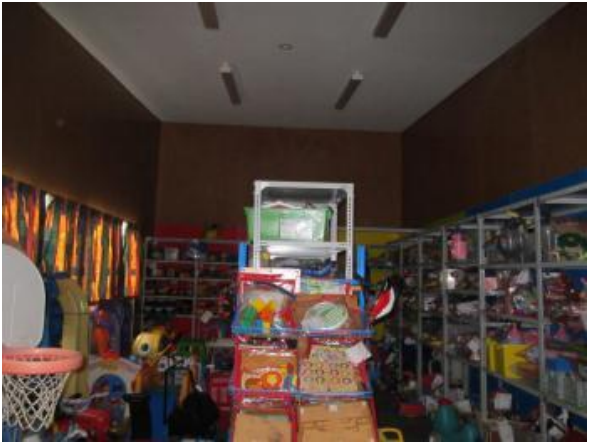
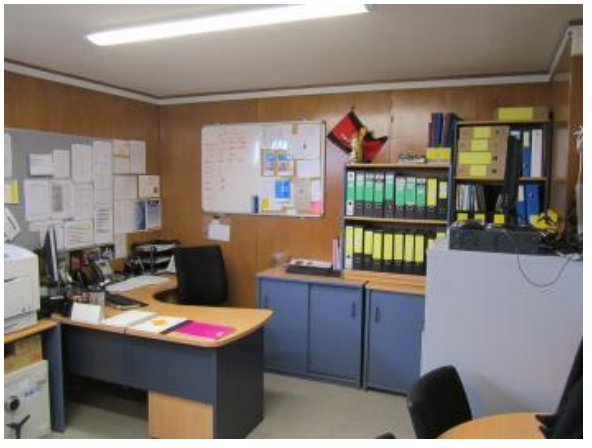

Appendix A

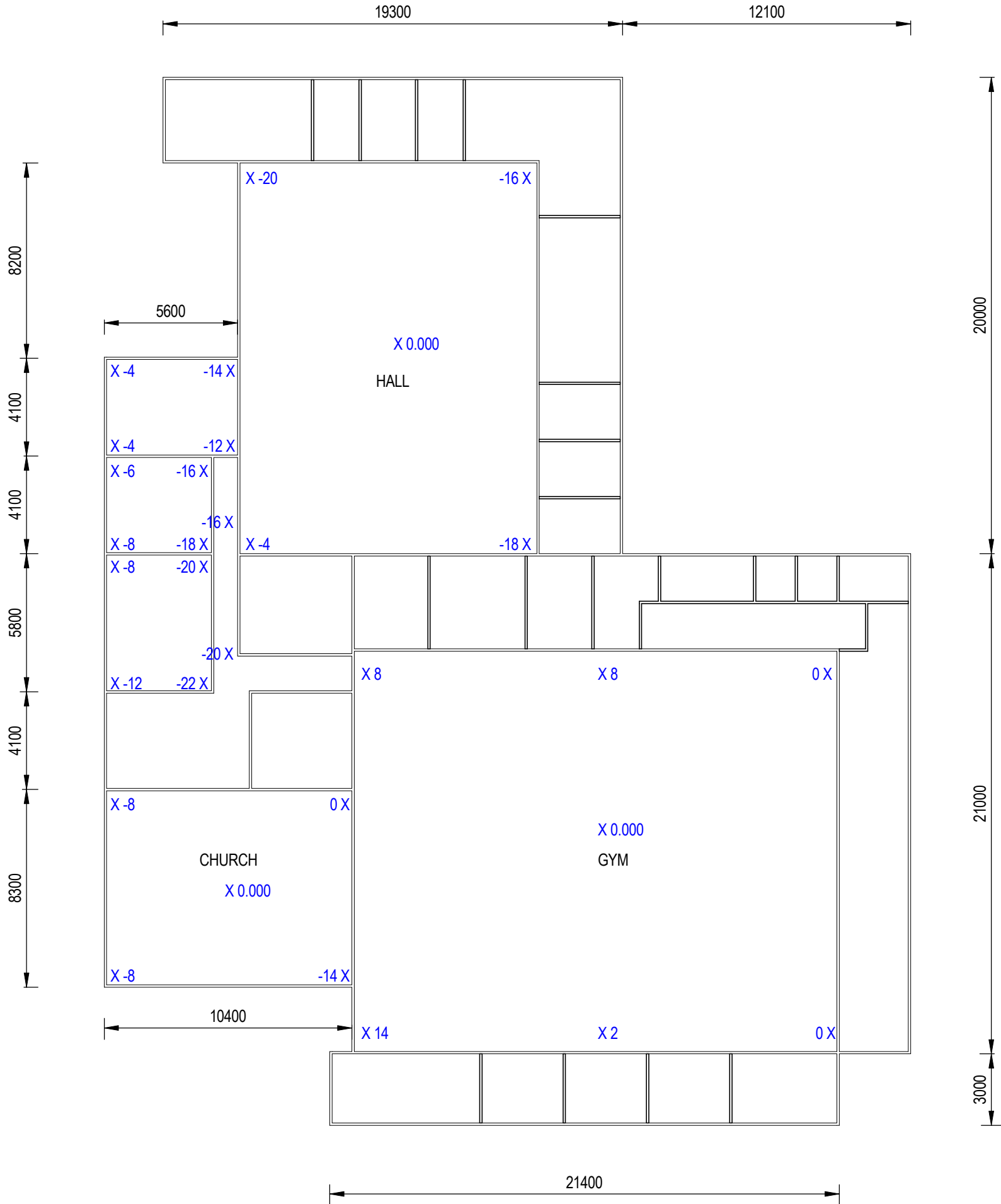
Site Map, Photos and Levels Survey

13 January 2012 – Parklands Community Centre Site Photographs

	
<p>Western Elevation of the Church showing the clerestory roof.</p>	
<p>Interior elevation of the chapel in the Church showing the clerestory roof construction.</p>	

<p>Step cracking in the exterior concrete masonry veneer wall of the Church adjacent to the gymnasium.</p>	
<p>Northern elevation of Sports Hall.</p>	
<p>Internal view of Sports Hall showing glulam timber portal frame.</p>	
<p>Southern Elevation of the Gymnasium.</p>	

<p>Interior view of the Gymnasium showing the welded steel portal frames.</p>	
<p>Interior view of the storage room of the Gymnasium.</p>	
<p>Interior view of the offices on the Southern elevation of the Gymnasium.</p>	
<p>Cracking in the wall linings above the door lintel in the Gymnasium.</p>	



CLIENT



REV	DATE	REVISION DETAILS	APPROVAL

PROJECT
PARKLANDS COMMUNITY CENTRE

TITLE
LEVEL SURVEY

DRAWN D.HUNIA	DESIGNED C.BONG	PRELIMINARY NOT FOR CONSTRUCTION
CHECKED L.CASTILLO	APPROVED	PROJECT No. 227675
DATE	SCALE 1 : 200	SIZE A3
L.CASTILLO	DRAWING No. S-01-00	REV

Appendix B

References

1. Department of Building and Housing (DBH), “Revised Guidance on Repairing and Rebuilding Houses Affected by the Canterbury Earthquake Sequence”, November 2011
2. New Zealand Society for Earthquake Engineering (NZSEE), “Assessment and Improvement of the Structural Performance of Buildings in Earthquakes”, April 2012
3. Standards New Zealand, “AS/NZS 1170 Part 0, Structural Design Actions: General Principles”, 2002
4. Standards New Zealand, “AS/NZS 1170 Part 1, Structural Design Actions: Permanent, imposed and other actions”, 2002
5. Standards New Zealand, “NZS 1170 Part 5, Structural Design Actions: Earthquake Actions – New Zealand”, 2004
6. Standards New Zealand, “NZS 3101 Part 1, The Design of Concrete Structures”, 2006
7. Standards New Zealand, “NZS 3404 Part 1, Steel Structures Standard”, 1997
8. Standards New Zealand, “NZS 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, 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 Sheets

- a) Church
- b) Gymnasium
- c) Sports Hall

Detailed Engineering Evaluation Summary Data

V1.11

Location

Building Name:	Parklands Community Centre Church			Reviewer:	Lee Howard
	Unit	No.	Street	CPEng No:	1008889
Building Address:	75 Queenpark Dr			Company:	Aurecon
Legal Description:	Lot 1 DP 51630			Company project number:	227675
				Company phone number:	(03) 3660821
	Degrees	Min	Sec	Date of submission:	29/06/2012
GPS south:	43	28	54.02	Inspection Date:	13/01/2012
GPS east:	172	42	15.94	Revision:	1
Building Unique Identifier (CCC):	BU 0115 001 EQ2			Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:	mixed	Soil Profile (if available):	
Site Class (to NZS1170.5):	D	If Ground improvement on site, describe:	
Proximity to waterway (m, if <100m):		Approx site elevation (m):	2.00
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m, if <100m):			

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):	2.10
Ground floor split?	yes		Ground floor elevation above ground (m):	0.10
Storeys below ground:			if Foundation type is other, describe:	
Foundation type:	mat slab	height from ground to level of uppermost seismic mass (for IEP only) (m):	4	
Building height (m):	4.00	Date of design:	1976-1992	
Floor footprint area (approx):	230			
Age of Building (years):	28			
Strengthening present?	no	If so, when (year)?		
Use (ground floor):	public	And what load level (%g)?		
Use (upper floors):		Brief strengthening description:		
Use notes (if required):				
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	load bearing walls	rafter type, purlin type and cladding	timber purlins, corrugated iron roof
Roof:	timber framed	slab thickness (mm)	
Floors:	concrete flat slab	beam and connector type	
Beams:	steel non-composite	typical dimensions (mm x mm)	
Columns:	timber		
Walls:			

Lateral load resisting structure

Lateral system along:	lightweight timber framed walls	Note: Define along and across in detailed report!	note typical wall length (m)	
Ductility assumed, μ :	2.00		estimate or calculation?	estimated
Period along:	0.40	0.00	estimate or calculation?	
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):				
Lateral system across:	lightweight timber framed walls		note typical wall length (m)	

Ductility assumed, μ : <input style="width: 100%;" type="text" value="2.00"/> Period across: <input style="width: 100%;" type="text" value="0.40"/> Total deflection (ULS) (mm): <input style="width: 100%;" type="text"/> maximum interstorey deflection (ULS) (mm): <input style="width: 100%;" type="text"/>	0.00	estimate or calculation? <input style="width: 100%;" type="text" value="estimated"/> estimate or calculation? <input style="width: 100%;" type="text"/> estimate or calculation? <input style="width: 100%;" type="text"/>
Separations: <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> north (mm): <input style="width: 100%;" type="text"/> east (mm): <input style="width: 100%;" type="text"/> south (mm): <input style="width: 100%;" type="text"/> west (mm): <input style="width: 100%;" type="text"/> </div> <div style="width: 50%; text-align: center;"> leave blank if not relevant </div> </div>		
Non-structural elements <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Stairs: <input style="width: 100%;" type="text"/> Wall cladding: <input style="width: 100%;" type="text" value="plaster system"/> Roof Cladding: <input style="width: 100%;" type="text" value="Metal"/> Glazing: <input style="width: 100%;" type="text" value="aluminium frames"/> Ceilings: <input style="width: 100%;" type="text" value="plaster, fixed"/> Services(list): <input style="width: 100%;" type="text"/> </div> <div style="width: 50%;"> <div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> describe <input style="width: 100%;" type="text"/> describe <input style="width: 100%;" type="text"/> <input style="width: 100%;" type="text"/> <input style="width: 100%;" type="text"/> </div> </div> </div> </div>		
Available documentation <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Architectural <input style="width: 100%;" type="text" value="partial"/> Structural <input style="width: 100%;" type="text" value="partial"/> Mechanical <input style="width: 100%;" type="text"/> Electrical <input style="width: 100%;" type="text"/> Geotech report <input style="width: 100%;" type="text"/> </div> <div style="width: 50%;"> <div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> original designer name/date <input style="width: 100%;" type="text"/> original designer name/date <input style="width: 100%;" type="text"/> original designer name/date <input style="width: 100%;" type="text"/> original designer name/date <input style="width: 100%;" type="text"/> original designer name/date <input style="width: 100%;" type="text"/> </div> </div> </div> </div>		
Damage <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Site: (refer DEE Table 4-2) Site performance: <input style="width: 100%;" type="text" value="Good"/> Settlement: <input style="width: 100%;" type="text" value="none observed"/> Differential settlement: <input style="width: 100%;" type="text" value="none observed"/> Liquefaction: <input style="width: 100%;" type="text" value="none apparent"/> Lateral Spread: <input style="width: 100%;" type="text" value="none apparent"/> Differential lateral spread: <input style="width: 100%;" type="text" value="none apparent"/> Ground cracks: <input style="width: 100%;" type="text" value="none apparent"/> Damage to area: <input style="width: 100%;" type="text" value="none apparent"/> </div> <div style="width: 50%;"> Describe damage: <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> </div> </div>		
Building: <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Current Placard Status: <input style="width: 100%;" type="text" value="green"/> Along Damage ratio: <div style="display: flex; align-items: center;"> <div style="width: 100px; height: 10px; background: linear-gradient(to right, orange 0%, white 0%);"></div> <div style="margin-left: 5px;">0%</div> </div> Describe (summary): <input style="width: 100%;" type="text"/> Across Damage ratio: <div style="display: flex; align-items: center;"> <div style="width: 100px; height: 10px; background: linear-gradient(to right, orange 0%, white 0%);"></div> <div style="margin-left: 5px;">0%</div> </div> Describe (summary): <input style="width: 100%;" type="text"/> Diaphragms Damage?: <input style="width: 100%;" type="text" value="no"/> CSWs: Damage?: <input style="width: 100%;" type="text" value="no"/> Pounding: Damage?: <input style="width: 100%;" type="text" value="no"/> Non-structural: Damage?: <input style="width: 100%;" type="text" value="yes"/> </div> <div style="width: 50%;"> <div style="text-align: center; margin-bottom: 10px;"> $Damage_Ratio = \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$ </div> Describe how damage ratio arrived at: <input style="width: 100%;" type="text"/> Describe: <input style="width: 100%;" type="text"/> Describe: <input style="width: 100%;" type="text"/> Describe: <input style="width: 100%;" type="text"/> Describe: <input style="width: 100%;" type="text" value="cracking in plasterboard and CMU mortar joints"/> </div> </div>		
Recommendations		

	Level of repair/strengthening required:	minor non-structural	Describe:		
	Building Consent required:	no		Describe:	
	Interim occupancy recommendations:	full occupancy		Describe:	
Along	Assessed %NBS before:	95%	0% %NBS from IEP below	If IEP not used, please detail assessment methodology: bracing check to NZS 3604:2011	
	Assessed %NBS after:	95%			
Across	Assessed %NBS before:	100%	0% %NBS from IEP below		
	Assessed %NBS after:	100%			

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

Period of design of building (from above): 1976-1992 h_n from above: 4m

Seismic Zone, if designed between 1965 and 1992: B 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:	0.0%	0.0%
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		1.20
Note 2: for RC buildings designed between 1976-1984, use 1.2		1.0
Note 3: for buildings 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

Near Fault scaling factor, from NZS1170.5, cl 3.1.6: 1.00

	along	across
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: 0.30

Z₁₉₉₂, from NZS4203:1992

Hazard scaling factor, **Factor B:** 3.33333333

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

Assessed ductility (less than max in Table 3.2)

	along	across
Ductility scaling factor: =1 from 1976 onwards; or =k _μ , if pre-1976, from Table 3.3:	2.00	2.00
	1.57	1.57
Ductility Scaling Factor, Factor D:	1.00	1.00

2.6 Structural Performance Scaling Factor:

Sp: 0.700

Structural Performance Scaling Factor **Factor E:** 1.428571429

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

%NBS_b: 0% 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 1.0
Height Difference effect D2, from Table to right 1.0

Therefore, Factor D: 1

3.5. Site Characteristics 1

3.6. Other factors, Factor F For ≤ 3 storeys, max value =2.5, otherwise max valule =1.5, no minimum

Rationale for choice of F factor, if not 1

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

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

3.7. Overall Performance Achievement ratio (PAR)

Along

Across

1.0

1.00

4.3 PAR x (%NBS)b:

PAR x Baseline %NBS:

0%

0%

4.4 Percentage New Building Standard (%NBS), (before)

0%

Table for selection of D1

Separation	Severe	Significant	Insignificant/none
	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

Separation	Severe	Significant	Insignificant/none
	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

Detailed Engineering Evaluation Summary Data

V1.11

Location

Building Name:	Parklands Community Centre Gymnasium		Reviewer:	Lee Howard
	Unit	No:	Street	
Building Address:	75 Queenpark Dr			
Legal Description:	Lot 1 DP 51630			
	Degrees	Min	Sec	
GPS south:	43	28	54.41	
GPS east:	172	42	16.72	
Building Unique Identifier (CCC):	BU 0115 001 EQ2			
			Date of submission:	29/06/2012
			Inspection Date:	13/01/2012
			Revision:	
			Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
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):	2.00

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):	2.20
Ground floor split?	yes		Ground floor elevation above ground (m):	0.20
Storeys below ground:				
Foundation type:	pads with tie beams		if Foundation type is other, describe:	
Building height (m):	7.50	height from ground to level of uppermost seismic mass (for IEP only) (m):	7.5	
Floor footprint area (approx):	625			
Age of Building (years):	12		Date of design:	1992-2004
Strengthening present?	no		If so, when (year)?	
Use (ground floor):	commercial		And what load level (%g)?	
Use (upper floors):			Brief strengthening description:	
Use notes (if required):	gymnasium			
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	frame system	rafter type, purlin type and cladding	steel purlins, corrugated iron roof
Roof:	steel framed	slab thickness (mm)	
Floors:	concrete waffle slab	beam and connector type	
Beams:	steel non-composite	typical dimensions (mm x mm)	
Columns:	structural steel		
Walls:			

Lateral load resisting structure

Lateral system along:	other (note)	Note: Define along and across in detailed report!	describe system	steel cross bracing rods
Ductility assumed, μ :	1.25			
Period along:	0.40	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	welded and bolted steel moment frame		note typical bay length (m)	7.2

Ductility assumed, μ : <input type="text" value="2.00"/> Period across: <input type="text" value="0.40"/> Total deflection (ULS) (mm): <input type="text"/> maximum interstorey deflection (ULS) (mm): <input type="text"/>	0.00	<div style="display: flex; justify-content: space-between;"> <div> estimate or calculation? estimate or calculation? estimate or calculation? </div> <div> <input type="text" value="estimated"/> <input type="text"/> <input type="text"/> </div> </div>
Separations: <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> north (mm): <input type="text"/> east (mm): <input type="text"/> south (mm): <input type="text"/> west (mm): <input type="text"/> </div> <div>leave blank if not relevant</div> </div>		
Non-structural elements <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Stairs: <input type="text"/> Wall cladding: <input type="text" value="plaster system"/> Roof Cladding: <input type="text" value="Metal"/> Glazing: <input type="text" value="aluminium frames"/> Ceilings: <input type="text" value="plaster, fixed"/> Services(list): <input type="text"/> </div> <div> describe <input type="text"/> describe <input type="text"/> <input type="text"/> <input type="text"/> </div> </div>		
Available documentation <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Architectural: <input type="text" value="full"/> Structural: <input type="text" value="partial"/> Mechanical: <input type="text"/> Electrical: <input type="text"/> Geotech report: <input type="text"/> </div> <div> original designer name/date <input type="text"/> original designer name/date <input type="text"/> original designer name/date <input type="text"/> original designer name/date <input type="text"/> original designer name/date <input type="text"/> </div> </div>		
Damage Site: (refer DEE Table 4-2) <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Site performance: <input type="text" value="Good"/> Settlement: <input type="text" value="none observed"/> Differential settlement: <input type="text" value="none observed"/> Liquefaction: <input type="text" value="none apparent"/> Lateral Spread: <input type="text" value="none apparent"/> Differential lateral spread: <input type="text" value="none apparent"/> Ground cracks: <input type="text" value="none apparent"/> Damage to area: <input type="text" value="none apparent"/> </div> <div> Describe damage: <input type="text"/> notes (if applicable): <input type="text"/> notes (if applicable): <input type="text"/> notes (if applicable): <input type="text"/> notes (if applicable): <input type="text"/> notes (if applicable): <input type="text"/> notes (if applicable): <input type="text"/> </div> </div>		
Building: <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Current Placard Status: <input type="text" value="green"/> Along Damage ratio: <input type="text" value=""/> Describe (summary): <input type="text"/> Across Damage ratio: <input type="text" value=""/> Describe (summary): <input type="text"/> Diaphragms Damage?: <input type="text" value="no"/> CSWs: Damage?: <input type="text" value="no"/> Pounding: Damage?: <input type="text" value="no"/> Non-structural: Damage?: <input type="text" value="yes"/> </div> <div> <div style="text-align: center; margin-bottom: 20px;"> $Damage_Ratio = \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$ </div> Describe how damage ratio arrived at: <input type="text"/> Describe: <input type="text"/> Describe: <input type="text"/> Describe: <input type="text"/> Describe: <input type="text" value="cracking in plasterboard wall cladding"/> </div> </div>		
Recommendations		

	Level of repair/strengthening required:	minor non-structural	Describe:		
	Building Consent required:	no		Describe:	
	Interim occupancy recommendations:	full occupancy		Describe:	
Along	Assessed %NBS before:		63% %NBS from IEP below	If IEP not used, please detail assessment methodology:	
	Assessed %NBS after:				
Across	Assessed %NBS before:		84% %NBS from IEP below		
	Assessed %NBS after:				

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: 7.5m				
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:				
					<div> <div>along</div> <div>across</div> </div>				
					<div> <div>0.4</div> <div>0.4</div> </div>				
					<div> <div>Period (from above):</div> <div>(%NBS)_{nom} from Fig 3.3:</div> </div>				
					<div> <div>22.0%</div> <div>22.0%</div> </div>				
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 buildings designed prior to 1935 use 0.8, except in Wellington (1.0)					1.0				
					<div> <div>along</div> <div>across</div> </div>				
Final (%NBS) _{nom} :					<div> <div>22%</div> <div>22%</div> </div>				
2.2 Near Fault Scaling Factor					Near Fault scaling factor, from NZS1170.5, cl 3.1.6:				
					1.00				
					<div> <div>along</div> <div>across</div> </div>				
Near Fault scaling factor (1/N(T,D), Factor A:					<div> <div>1</div> <div>1</div> </div>				
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:				
					2.666666667				
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					Assessed ductility (less than max in Table 3.2)				
					<div> <div>along</div> <div>across</div> </div>				
					<div> <div>1.25</div> <div>2.00</div> </div>				
Ductility scaling factor: =1 from 1976 onwards; or =k _μ , if pre-1976, from Table 3.3:					<div> <div>1.14</div> <div>1.57</div> </div>				
					Ductility Scaling Factor, Factor D:				
					<div> <div>1.00</div> <div>1.00</div> </div>				
2.6 Structural Performance Scaling Factor:					Sp:				
					<div> <div>0.925</div> <div>0.700</div> </div>				
					Structural Performance Scaling Factor Factor E:				
					<div> <div>1.081081081</div> <div>1.428571429</div> </div>				
2.7 Baseline %NBS, (NBS%) _b = (%NBS) _{nom} x A x B x C x D x E					%NBS _b :				
					<div> <div>63%</div> <div>84%</div> </div>				
Global Critical Structural Weaknesses: (refer to NZSEE IEP Table 3.4)									

3.1. Plan Irregularity, factor A:

3.2. Vertical irregularity, Factor B:

3.3. Short columns, Factor C:

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

Therefore, Factor D:

3.5. Site Characteristics

3.6. Other factors, Factor F For ≤ 3 storeys, max value =2.5, otherwise max valule =1.5, no minimum

Rationale for choice of F factor, if not 1

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

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

3.7. Overall Performance Achievement ratio (PAR)

4.3 PAR x (%NBS)b:

PAR x Baseline %NBS:

4.4 Percentage New Building Standard (%NBS), (before)

Table for selection of D1	Severe	Significant	Insignificant/none
	0<sep<.005H	.005<sep<.01H	Sep>.01H
Separation			
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
	0<sep<.005H	.005<sep<.01H	Sep>.01H
Separation			
Height difference > 4 storeys	0.4	0.7	1
Height difference 2 to 4 storeys	0.7	0.9	1
Height difference < 2 storeys	1	1	1

Along

Across

1.0

1.0

Detailed Engineering Evaluation Summary Data

V1.11

Location

Building Name:	Parklands Community Centre Sports Hall			Reviewer:	Lee Howard
	Unit	No.	Street	CPEng No:	1008889
Building Address:	75 Queenpark Drive			Company:	Aurecon
Legal Description:	Lot 1 DP 51630			Company project number:	227675
				Company phone number:	(03) 3660821
	Degrees	Min	Sec	Date of submission:	29/06/2012
GPS south:	43	28	53.65	Inspection Date:	13/01/2012
GPS east:	172	42	16.66	Revision:	
Building Unique Identifier (CCC):	BU 0115 001 EQ2			Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:	mixed	Soil Profile (if available):	
Site Class (to NZS1170.5):	D	If Ground improvement on site, describe:	
Proximity to waterway (m, if <100m):		Approx site elevation (m):	2.00
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m, if <100m):			

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):	2.10
Ground floor split?	yes		Ground floor elevation above ground (m):	0.10
Storeys below ground:	0		if Foundation type is other, describe:	
Foundation type:	mat slab	height from ground to level of uppermost seismic mass (for IEP only) (m):	6	
Building height (m):	6.00	Date of design:	1976-1992	
Floor footprint area (approx):	310			
Age of Building (years):	32			
Strengthening present?	no	If so, when (year)?		
Use (ground floor):	public	And what load level (%g)?		
Use (upper floors):		Brief strengthening description:		
Use notes (if required):				
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	frame system	rafter type, purlin type and cladding	timber purlins, corrugated iron roof
Roof:	timber framed	slab thickness (mm)	
Floors:	concrete flat slab	type	
Beams:	timber	typical dimensions (mm x mm)	
Columns:	timber		
Walls:			

Lateral load resisting structure

Lateral system along:	lightweight timber framed walls	Note: Define along and across in detailed report!	note typical wall length (m)	N/A
Ductility assumed, μ :	2.00		estimate or calculation?	estimated
Period along:	0.40	0.00	estimate or calculation?	
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):				
Lateral system across:	timber moment frame		note typical bay length (m)	4

Ductility assumed, μ : <input style="width: 100%;" type="text" value="1.25"/> Period across: <input style="width: 100%;" type="text" value="0.40"/> Total deflection (ULS) (mm): <input style="width: 100%;" type="text"/> maximum interstorey deflection (ULS) (mm): <input style="width: 100%;" type="text"/>	0.00	estimate or calculation? <input style="width: 100%;" type="text" value="estimated"/> estimate or calculation? <input style="width: 100%;" type="text"/> estimate or calculation? <input style="width: 100%;" type="text"/>
Separations: <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> north (mm): <input style="width: 100%;" type="text"/> east (mm): <input style="width: 100%;" type="text"/> south (mm): <input style="width: 100%;" type="text"/> west (mm): <input style="width: 100%;" type="text"/> </div> <div style="width: 50%; text-align: center;"> leave blank if not relevant </div> </div>		
Non-structural elements <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> Stairs: <input style="width: 100%;" type="text"/> Wall cladding: <input style="width: 100%;" type="text" value="plaster system"/> Roof Cladding: <input style="width: 100%;" type="text" value="Metal"/> Glazing: <input style="width: 100%;" type="text" value="aluminium frames"/> Ceilings: <input style="width: 100%;" type="text" value="plaster, fixed"/> Services(list): <input style="width: 100%;" type="text"/> </div> <div style="width: 35%;"> describe <input style="width: 100%;" type="text"/> describe <input style="width: 100%;" type="text"/> <input style="width: 100%;" type="text"/> <input style="width: 100%;" type="text"/> </div> </div>		
Available documentation <div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> Architectural <input style="width: 100%;" type="text" value="partial"/> Structural <input style="width: 100%;" type="text" value="partial"/> Mechanical <input style="width: 100%;" type="text"/> Electrical <input style="width: 100%;" type="text"/> Geotech report <input style="width: 100%;" type="text"/> </div> <div style="width: 60%;"> original designer name/date <input style="width: 100%;" type="text"/> original designer name/date <input style="width: 100%;" type="text"/> original designer name/date <input style="width: 100%;" type="text"/> original designer name/date <input style="width: 100%;" type="text"/> original designer name/date <input style="width: 100%;" type="text"/> </div> </div>		
Damage <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> Site: (refer DEE Table 4-2) Site performance: <input style="width: 100%;" type="text" value="Good"/> Settlement: <input style="width: 100%;" type="text" value="none observed"/> Differential settlement: <input style="width: 100%;" type="text" value="none observed"/> Liquefaction: <input style="width: 100%;" type="text" value="none apparent"/> Lateral Spread: <input style="width: 100%;" type="text" value="none apparent"/> Differential lateral spread: <input style="width: 100%;" type="text" value="none apparent"/> Ground cracks: <input style="width: 100%;" type="text" value="none apparent"/> Damage to area: <input style="width: 100%;" type="text" value="none apparent"/> </div> <div style="width: 35%;"> Describe damage: <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> notes (if applicable): <input style="width: 100%;" type="text"/> </div> </div>		
Building: <div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> Current Placard Status: <input style="width: 100%;" type="text" value="green"/> Along Damage ratio: <div style="display: flex; align-items: center;"><div style="width: 100px; height: 10px; background: linear-gradient(to right, orange 0%, white 0%);"></div><div style="margin-left: 5px;">0%</div></div> Describe (summary): <input style="width: 100%;" type="text"/> Across Damage ratio: <div style="display: flex; align-items: center;"><div style="width: 100px; height: 10px; background: linear-gradient(to right, orange 0%, white 0%);"></div><div style="margin-left: 5px;">0%</div></div> Describe (summary): <input style="width: 100%;" type="text"/> Diaphragms Damage?: <input style="width: 100%;" type="text" value="no"/> CSWs: Damage?: <input style="width: 100%;" type="text" value="no"/> Pounding: Damage?: <input style="width: 100%;" type="text" value="no"/> Non-structural: Damage?: <input style="width: 100%;" type="text" value="yes"/> </div> <div style="width: 60%;"> <div style="text-align: center; margin-bottom: 10px;"> $Damage_Ratio = \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$ </div> Describe how damage ratio arrived at: <input style="width: 100%;" type="text"/> Describe: <input style="width: 100%;" type="text"/> Describe: <input style="width: 100%;" type="text"/> Describe: <input style="width: 100%;" type="text"/> Describe: <input style="width: 100%;" type="text" value="cracking in plasterboard wall cladding"/> </div> </div>		
Recommendations		

	Level of repair/strengthening required:	minor non-structural	Describe:		
	Building Consent required:	no		Describe:	
	Interim occupancy recommendations:	full occupancy		Describe:	
Along	Assessed %NBS before:	76%	76% %NBS from IEP below	If IEP not used, please detail assessment methodology:	
	Assessed %NBS after:	76%			
Across	Assessed %NBS before:	58%	58% %NBS from IEP below		
	Assessed %NBS after:	58%			

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: 6m	
Seismic Zone, if designed between 1965 and 1992: B			not required for this age of building not required for this age of building	
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 buildings designed prior to 1935 use 0.8, except in Wellington (1.0)				
			along	across
Period (from above):			0.4	0.4
(%NBS) _{nom} from Fig 3.3:			16.0%	16.0%
			1.00	
			1.0	
			1.0	
			along	across
Final (%NBS) _{nom} :			16%	16%
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:			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:	
			0.30	
			0.8	
			3.333333333	
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	1.25
Ductility scaling factor: =1 from 1976 onwards; or =k _μ , if pre-1976, fromTable 3.3:			1.57	1.14
			Ductility Scaling Factor, Factor D:	
			1.00	
2.6 Structural Performance Scaling Factor:			Sp:	
			0.700	
			0.925	
			Structural Performance Scaling Factor Factor E:	
			1.428571429	
			1.081081081	
2.7 Baseline %NBS, (NBS%) _b = (%NBS) _{nom} x A x B x C x D x E			%NBS _b :	
			76%	
			58%	
Global Critical Structural Weaknesses: (refer to NZSEE IEP Table 3.4)				

3.1. Plan Irregularity, factor A:

3.2. Vertical irregularity, Factor B:

3.3. Short columns, Factor C:

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

Therefore, Factor D:

3.5. Site Characteristics

3.6. Other factors, Factor F For ≤ 3 storeys, max value =2.5, otherwise max valule =1.5, no minimum

Rationale for choice of F factor, if not 1

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

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

3.7. Overall Performance Achievement ratio (PAR)

Along

Across

1.0

1.0

4.3 PAR x (%NBS)b:

PAR x Baseline %NBS:

76%

58%

4.4 Percentage New Building Standard (%NBS), (before)

58%

Table for selection of D1

Separation	Severe	Significant	Insignificant/none
	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

Separation	Severe	Significant	Insignificant/none
	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



**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

Aurecon offices are located in:
Angola, Australia, Botswana, China,
Ethiopia, Hong Kong, Indonesia,
Lesotho, Libya, Malawi, Mozambique,
Namibia, New Zealand, Nigeria,
Philippines, Singapore, South Africa,
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