# Little River Community Facilities
## Qualitative Engineering Evaluation

**Reference:** 228600
**Prepared for**:
Christchurch City Council

Functional Location ID: PRO 3659 003

Address: 40 Western Valley Road

**Revision:** 2
**Date:** 28 June 2013

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# Document Control Record


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| Approval | | | |
|---|---|---|---|
| Author Signature | | Approver Signature | |
| Name | Hugh Burnett | Name | Lee Howard |
| Title | Structural Engineer | Title | Senior Structural Engineer |

# Contents



# Appendices

# Executive Summary

This is a summary of the Qualitative Engineering Evaluation for the Little River Community Facilities 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** | Little River Community Facilities | | | |
|---|---|---|---|---|---|
| **Building Location ID** | PRO 3659 003 | | | **Multiple Building Site** | Y |
| **Building Address** | 40 Western Valley Road | | | **No. of residential units** | 0 |
| **Soil Technical Category** | NA | **Importance Level** | 2 | **Approximate Year Built** | 1978 |
| **Foot Print (m²)** | 360 | **Stories above ground** | 1 | **Stories below ground** | 0 |
| **Type of Construction** | Lightweight roof, steel portal frames, light timber framed walls, slab on grade floor. | | | | |

| **Qualitative L4 Report Results Summary** | | |
|---|---|---|
| **Building Occupied** | Y | The Little River Community Facilities are currently in use. |
| **Suitable for Continued Occupancy** | Y | The Little River Community Facilities are suitable for continued occupation. |
| **Key Damage Summary** | Y | Refer to summary of building damage Section 3.1 report body. |
| **Critical Structural Weaknesses (CSW)** | N | 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 IEP** | 67% | Based on an IEP assessment. |

| **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** | Hugh Burnett | **Name** | Lee Howard |
| **Title** | Structural Engineer | **Title** | Senior Structural Engineer |

# 1 Introduction

## 1.1 General

On 9 May 2012 Aurecon engineers visited the Little River Community Facilities 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 Little River Community Facilities 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. Assumptions

# 2 Description of the Building

## 2.1 Building Age and Configuration

Built in c. 1978 the Little River Community Facilities is a single storey building consisting of a large gymnasium with meeting and amenities rooms. The building is also attached to the Little River Fire Station. The gymnasium has a lightweight profiled steel roof, steel portal frames, timber framed walls, hardies sheet external cladding, plaster board internal cladding, a suspended timber floor (assumed to be) supported on isolated piles and a concrete perimeter foundation. The meeting and amenities rooms consist of lightweight timber framed walls, weatherboard external cladding, plaster board internal cladding, a suspended timber floor (assumed to be) supported on isolated piles and a concrete perimeter foundation. The approximate floor area of the building is 360 square metres. It is an importance level 2 structure in accordance with NZS 1170 Part 0:2002.

## 2.2 Building Structural Systems Vertical and Horizontal

The Little River Community Facilities is a simple structure. Its lightweight steel roof is supported on steel portal frames in the gymnasium and timber framed walls in the meeting and amenities rooms, these structures transfer loads to the foundations. Lateral loads for the gymnasium are resisted by the steel portal frames in the transverse (north-south) direction and by the lined timber framed walls in the longitudinal (east-west) direction. Lateral loads in the meeting and amenities areas of the building are resisted by timber framed walls in both directions.

## 2.3 Reference Building Type

The Little River Community Facilities is a basic portal framed structure typical of its age and style. The bolted and welded moment steel frames building type referenced in the “Guidance on Detailed Engineering Evaluations of Earthquake Affected Non-Residential Buildings in Canterbury” document issued by the Engineering Advisory Group applies to this building. The Little River Community Facilities has performed well with none of the known issues associated with this type of construction occurring.

## 2.4 Building Foundation System and Soil Conditions

The Little River Community Facilities has, as discussed above, a concrete perimeter foundation and isolated piles supporting the walls and floor. The land and surrounds of Little River Community Facilities are zoned Port Hills and Banks Peninsula and are unlikely to be susceptible to liquefaction or differential settlement. Additionally there are no signs in the vicinity of Little River Community Facilities of liquefaction bulges or boils and subsidence.

## 2.5 Available Structural Documentation and Inspection Priorities

No structural drawings were available for the Little River Community Facilities however we were able to obtain Architectural drawings. Inspection priorities related to a review of potential damage to the portal frames, foundations and walls. Additionally there was potential for non-structural damage to linings. The generic building type for the Little River Community Facilities is a single story steel portal frame structure. This type of structure has performed well during the Canterbury Earthquakes.

## 2.6 Available Survey Information

A floor level survey was undertaken to establish the level of unevenness across the floors. The results of the survey are presented on the attached sketch in Appendix A. 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 for the Little River Community Facilities were found to be within the recommended tolerances once the various floor coverings are taken into account.

# 3 Structural Investigation

## 3.1 Summary of Building Damage

The Little River Community Facilities is currently in use and was occupied at the time the damage assessment was carried out.

The Little River Community Facilities has performed well and no damage from the recent earthquakes was noted.

## 3.2 Record of Intrusive Investigation

There was no damaged observed and therefore, an intrusive investigation was neither warranted nor undertaken for Little River Community Facilities.

## 3.3 Damage Discussion

There was no observed damage to the Little River Community Facilities as a result of seismic actions. This is not surprising as buildings of this nature are flexible and have high inherent ductility. Additionally being lightweight the building generates a relatively low seismic demand.

# 4 Building Review Summary

## 4.1 Building Review Statement

As noted above intrusive investigations were not carried out for the Little River Community Facilities. Because of the generic nature of the building a significant amount of information can be inferred from an external and internal inspection. The piles were unable to be directly inspected as access beneath the floor could not be gained however there were no signs of damage to the floor to indicate any damage to the piles.

## 4.2 Critical Structural Weaknesses

No specific critical structural weaknesses were identified as part of the building qualitative assessment.

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

## 5.1 General

The Little River Community Facilities is, as discussed above, a typical example of a steel portal frame building. It is of a type of building that, due to its light weight, flexibility and natural ductility, has typically performed well. The Little River Community Facilities is not an exception to this. It has performed well and no damage to the building related to the recent earthquakes was noted. Although the building consists of two different structural systems and is connected to the Little River Fire station this has not had an adverse effect on the performance of the building and the potential for damage due to the interaction of the two buildings is considered to be small.

## 5.2 Initial %NBS Assessment

The steel portal frame section of the Little River Community Facilities has been assessed using the initial evaluation procedure or IEP to obtain an estimate of the seismic performance of the building in relation to the performance of a new building.

The timber framed walls were assessed using assumed material strengths as the IEP is not an appropriate assessment method for this type of construction.

Selected assessment seismic parameters are tabulated in the Table 1 below.

**Table 1: Parameters used in the Seismic Assessment**

| Seismic Parameter | Quantity | Comment/Reference |
|---|---|---|
| Site Soil Class | D | NZS 1170.5:2004, Clause 3.1.3, Deep or Soft Soil |
| Site Hazard Factor, $Z$ | 0.30 | DBH Info Sheet on Seismicity Changes (Effective 19 May 2011) |
| Return period Factor, $R_u$ | 1.00 | NZS 1170.5:2004, Table 3.5 |
| Ductility Factor in Transverse Direction, $\mu$ | 3.00 | Steel portal frames |
| Ductility Factor in Longitudinal Direction, $\mu$ | 3.00 | Lined timber framed walls |

The seismic capacity for the Little River Community Facilities has been calculated using the IEP procedure and the strengths of existing materials. The capacity of the building was found to be 67% NBS limited by the steel portal frames.

## 5.3 Results Discussion

The analysis shows that the Little River Community Facilities achieves 67% NBS placing the building in the moderate risk category for building earthquake capacity. This is not surprising given that lightweight single story buildings like that of Little River Community Facilities produce a low seismic demand which when combined with a ductile structural system produces a structure with good seismic performance.

# 6 Conclusions and Recommendations

The land below the Little River Community Facilities is zoned as Port Hills and Banks Peninsula and as such is not expected to be prone to liquefaction and settlement. Additionally there is no local evidence of settlement and liquefaction in the surrounding land. Additionally **the levels survey carried out showed that the floor levels were within allowable tolerances.**

As there is no clear evidence of any liquefaction or ground movement in the vicinity of the Little River Community Facilities **a geotechnical investigation is currently not considered necessary**.

The building is currently occupied and in use and in our opinion the Little River Community Facilities **is considered suitable for continued occupation**.

# 7 Explanatory Statement

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

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

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

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

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

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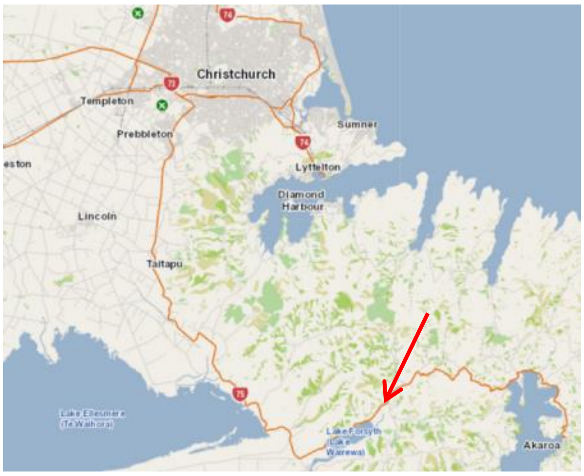
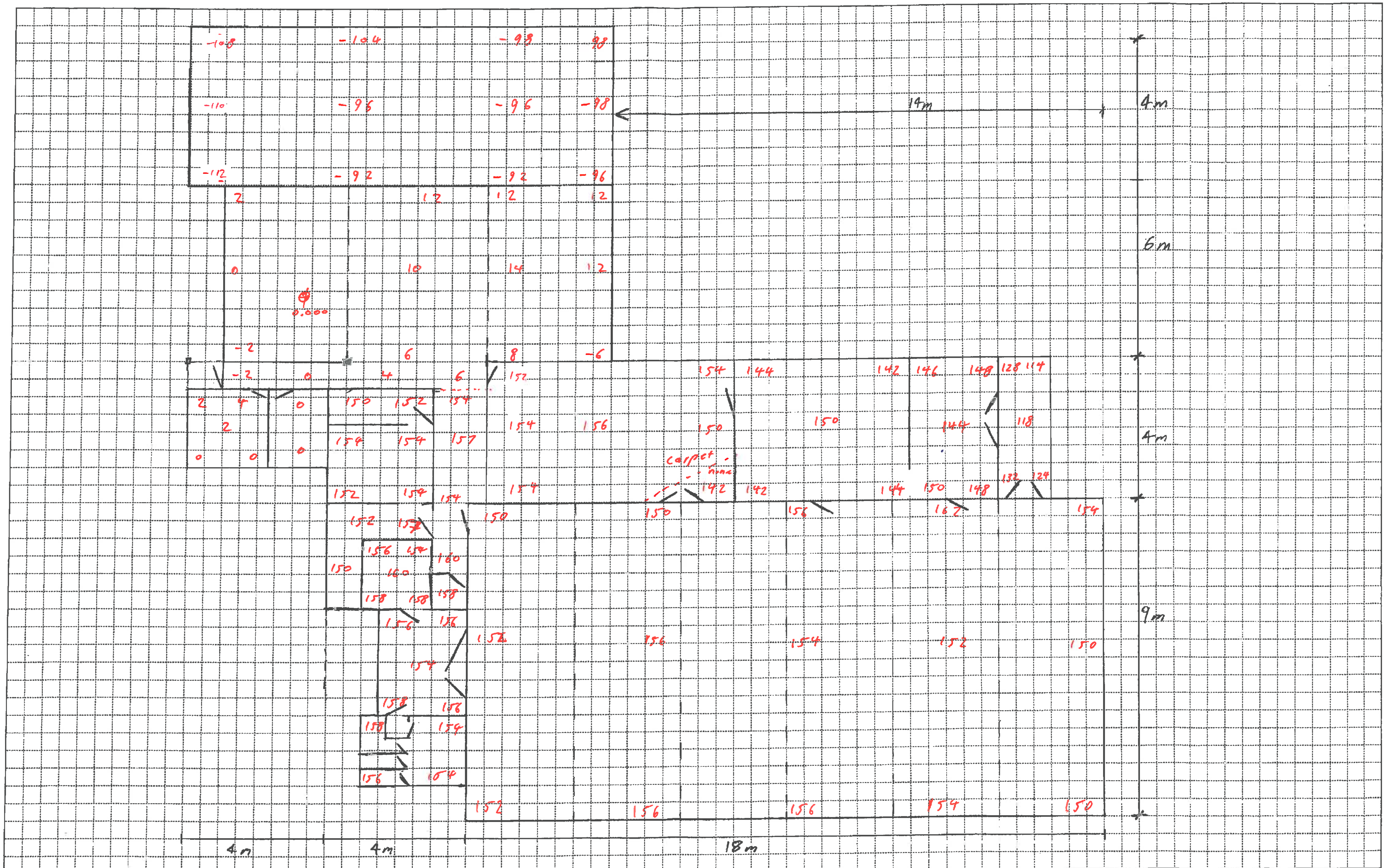
# Appendices

# Appendix A
## Site Map, Photos and Levels Survey Results

**9 May 2012 – Little River Community Facilities Site Photographs**

| | |
|---|---|
| Location of Little River community Facilities. |  |
| Aerial photograph of Little River community Facilities. |  |
| Building western elevation. |  |

| | |
|---|---|
| Building north-eastern elevation. |  |
| Building internal view. |  |
| Building internal view. |  |




| No. | Date | Revision Details | By | Ver. | App. |
|---|---|---|---|---|---|

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| | |
|---|---|
| Client: | CCC |
| Project: | DEE Little River Fire Station |
| Drawn | Signed / Date |
| Designed | Signed / Date |
| Verified | Signed / Date |
| Approved | Signed / Date |
| Drawing Title: | Plan |
| Aurecon Group Project No. | 228601 228600 |
| Scale | 1:100 |
| Drawing No. | 1 |
| Rev. | |

20 10 0 10 20 30 40 50mm

# 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 22$^{nd}$ February 2011 earthquake the zone factor for Christchurch was 0.22. Following the earthquake the seismic zone factor (level of seismicity) in the Christchurch and surrounding areas has been increased to 0.3. This is a 36% increase.

For this assessment, the building's earthquake resistance is compared with the current New Zealand Building Code requirements for a new building constructed on the site. This is expressed as a percentage of new building standard (%NBS). The new building standard load requirements have been determined in accordance with the current earthquake loading standard (NZS 1170.5:2004 Structural design actions - Earthquake actions - New Zealand).

The likely capacity of this building has been derived in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes' (AISPBE), 2006. These guidelines provide an Initial Evaluation Procedure that assesses a buildings capacity based on a comparison of loading codes from when the building was designed and currently.  It is a quick high-level procedure that can be used when undertaking a Qualitative analysis of a building. The guidelines also provide guidance on calculating a modified Ultimate Limit State capacity of the building which is much more accurate and can be used when undertaking a Quantitative analysis.

The New Zealand Society for Earthquake Engineering has proposed a way for classifying earthquake risk for existing buildings in terms of %NBS and this is shown in Figure C1 below.

| Description | Grade | Risk | %NBS | Existing Building Structural Performance | Improvement of Structural Performance | |
|---|---|---|---|---|---|---|
| | | | | | Legal Requirement | NZSEE Recommendation |
| Low Risk Building | A or B | Low | Above 67 | Acceptable (improvement may be desirable) | The Building Act sets no required level of structural improvement (unless change in use) This is for each TA to decide. Improvement is not limited to 34%NBS. | 100%NBS desirable. Improvement should achieve at least 67%NBS |
| Moderate Risk Building | B or C | Moderate | 34 to 66 | Acceptable legally. Improvement recommended | | Not recommended. Acceptable only in exceptional circumstances |
| High Risk Building | D or E | High | 33 or lower | Unacceptable (Improvement | Unacceptable | Unacceptable |

**Figure C1: NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE Guidelines**

Table C1 below compares the percentage NBS to the relative risk of the building failing in a seismic event with a 10% probability of exceedance in 50 years (i.e. 0.2% in the next year). It is noted that the current seismic risk in Christchurch results in a 6% probability of exceedance in the next year.

**Table C1: Relative Risk of Building Failure In A**

| Percentage of New Building Standard (%NBS) | Relative Risk (Approximate) |
|---|---|
| >100 | <1 time |
| 80-100 | 1-2 times |
| 67-80 | 2-5 times |
| 33-67 | 5-10 times |
| 20-33 | 10-25 times |
| <20 | >25 times |

# Appendix D
## Background and Legal Framework

### Background

Aurecon has been engaged by the Christchurch City Council (CCC) to undertake a detailed engineering evaluation of the building

This report is a Qualitative Assessment of the building structure, and is based on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011.

A qualitative assessment involves inspections of the building and a desktop review of existing structural and geotechnical information, including existing drawings and calculations, if available.

The purpose of the assessment is to determine the likely building performance and damage patterns, to identify any potential critical structural weaknesses or collapse hazards, and to make an initial assessment of the likely building strength in terms of percentage of new building standard (%NBS).

At the time of this report, no intrusive site investigation, detailed analysis, or modelling of the building structure had been carried out. Construction drawings were made available, and these have been considered in our evaluation of the building. The building description below is based on a review of the drawings and our visual inspections.

### Compliance

This section contains a brief summary of the requirements of the various statutes and authorities that control activities in relation to buildings in Christchurch at present.

### Canterbury Earthquake Recovery Authority (CERA)

CERA was established on 28 March 2011 to take control of the recovery of Christchurch using powers established by the Canterbury Earthquake Recovery Act enacted on 18 April 2011. This act gives the Chief Executive Officer of CERA wide powers in relation to building safety, demolition and repair. Two relevant sections are:

#### Section 38 – Works

This section outlines a process in which the chief executive can give notice that a building is to be demolished and if the owner does not carry out the demolition, the chief executive can commission the demolition and recover the costs from the owner or by placing a charge on the owners' land.

#### Section 51 – Requiring Structural Survey

This section enables the chief executive to require a building owner, insurer or mortgagee carry out a full structural survey before the building is re-occupied.

We understand that CERA will require a detailed engineering evaluation to be carried out for all buildings (other than those exempt from the Earthquake Prone Building definition in the Building Act). It is anticipated that CERA will adopt the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011. This document sets out a methodology for both qualitative and quantitative assessments.

The qualitative assessment is a desk-top and site inspection assessment.  It is based on a thorough visual inspection of the building coupled with a review of available documentation such as drawings and specifications.  The quantitative assessment involves analytical calculation of the buildings strength and may require non-destructive or destructive material testing, geotechnical testing and intrusive investigation.

It is anticipated that factors determining the extent of evaluation and strengthening level required will include:

- The importance level and occupancy of the building
- The placard status and amount of damage
- The age and structural type of the building
- Consideration of any critical structural weaknesses
- The extent of any earthquake damage

## Building Act

Several sections of the Building Act are relevant when considering structural requirements:

**Section 112 – Alterations**

This section requires that an existing building complies with the relevant sections of the Building Code to at least the extent that it did prior to any alteration. This effectively means that a building cannot be weakened as a result of an alteration (including partial demolition).

**Section 115 – Change of Use**

This section requires that the territorial authority (in this case Christchurch City Council (CCC)) be satisfied that the building with a new use complies with the relevant sections of the Building Code 'as near as is reasonably practicable'. Regarding seismic capacity 'as near as reasonably practicable' has previously been interpreted by CCC as achieving a minimum of 67%NBS however where practical achieving 100%NBS is desirable. The New Zealand Society for Earthquake Engineering (NZSEE) recommend a minimum of 67%NBS.

**Section 121 – Dangerous Buildings**

The definition of dangerous building in the Act was extended by the Canterbury Earthquake (Building Act) Order 2010, and it now defines a building as dangerous if:

- in the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause injury or death or damage to other property; or
- in the event of fire, injury or death to any persons in the building or on other property is likely because of fire hazard or the occupancy of the building; or
- there is a risk that the building could collapse or otherwise cause injury or death as a result of earthquake shaking that is less than a 'moderate earthquake' (refer to Section 122 below); or
- there is a risk that that other property could collapse or otherwise cause injury or death; or
- a territorial authority has not been able to undertake an inspection to determine whether the building is dangerous.

**Section 122 – Earthquake Prone Buildings**

This section defines a building as earthquake prone if its ultimate capacity would be exceeded in a 'moderate earthquake' and it would be likely to collapse causing injury or death, or damage to other property.  A moderate earthquake is defined by the building regulations as one that would generate ground shaking 33% of the shaking used to design an equivalent new building.

#### Section 124 – Powers of Territorial Authorities

This section gives the territorial authority the power to require strengthening work within specified timeframes or to close and prevent occupancy to any building defined as dangerous or earthquake prone.

#### Section 131 – Earthquake Prone Building Policy

This section requires the territorial authority to adopt a specific policy for earthquake prone, dangerous and insanitary buildings.

## Christchurch City Council Policy

Christchurch City Council adopted their Earthquake Prone, Dangerous and Insanitary Building Policy in 2006. This policy was amended immediately following the Darfield Earthquake of the 4th September 2010.

The 2010 amendment includes the following:

- A process for identifying, categorising and prioritising Earthquake Prone Buildings, commencing on 1 July 2012;
- A strengthening target level of 67% of a new building for buildings that are Earthquake Prone;
- A timeframe of 15-30 years for Earthquake Prone Buildings to be strengthened; and,
- Repair works for buildings damaged by earthquakes will be required to comply with the above.

The council has stated their willingness to consider retrofit proposals on a case by case basis, considering the economic impact of such a retrofit.

We anticipate that any building with a capacity of less than 33%NBS (including consideration of critical structural weaknesses) will need to be strengthened to a target of 67%NBS of new building standard as recommended by the Policy.

If strengthening works are undertaken, a building consent will be required. A requirement of the consent will require upgrade of the building to comply 'as near as is reasonably practicable' with:

- The accessibility requirements of the Building Code.
- The fire requirements of the Building Code. This is likely to require a fire report to be submitted with the building consent application.

## Building Code

The building code outlines performance standards for buildings and the Building Act requires that all new buildings comply with this code. Compliance Documents published by The Department of Building and Housing can be used to demonstrate compliance with the Building Code.

After the February Earthquake, on 19 May 2011, Compliance Document B1: Structure was amended to include increased seismic design requirements for Canterbury as follows:

- Hazard Factor increased from 0.22 to 0.3 (36% increase in the basic seismic design load)
- Serviceability Return Period Factor increased from 0.25 to 0.33 (80% increase in the serviceability design loads when combined with the Hazard Factor increase)

The increase in the above factors has resulted in a reduction in the level of compliance of an existing building relative to a new building despite the capacity of the existing building not changing.

# Appendix E
## Standard Reporting Spread Sheet

## Detailed Engineering Evaluation Summary Data

V1.11

### Location

| | | | |
|---|---|---|---|
| Building Name: | Little River Community Centre | Reviewer: | Lee Howard |
| | | CPEng No: | 1008889 |
| Building Address: (Unit / No: / Street) | 40 Western Vally Road | Company: | Aurecon |
| Legal Description: | RS 41527 | Company project number: | 228600 |
| | | Company phone number: | 03 3660821 |
| GPS south: (Degrees / Min / Sec) | 43 / 45 / 50.42 | Date of submission: | 28/06/2013 |
| GPS east: (Degrees / Min / Sec) | 172 / 47 / 42.01 | Inspection Date: | 9/05/2012 |
| | | Revision: | 2 |
| Building Unique Identifier (CCC): | PRO 3659 003 | 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): | 1.00 |

### Building

| | | | |
|---|---|---|---|
| No. of storeys above ground: | 1 (single storey = 1) | Ground floor elevation (Absolute) (m): | 1.10 |
| Ground floor split? | no | Ground floor elevation above ground (m): | 0.10 |
| Storeys below ground | 0 | | |
| Foundation type: | timber piles | if Foundation type is other, describe: | |
| Building height (m): | 6.60 | height from ground to level of uppermost seismic mass (for IEP only) (m): | 6.6 |
| Floor footprint area (approx): | 360 | | |
| Age of Building (years): | 34 | 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): | | | |
| Importance level (to NZS1170.5): | IL2 | | |

Gravity Structure

| | | | |
|---|---|---|---|
| Gravity System: | frame system | | |
| Roof: | steel framed | rafter type, purlin type and cladding | |
| Floors: | timber | joist depth and spacing (mm) | |
| Beams: | steel non-composite | beam and connector type | |
| Columns: | structural steel | typical dimensions (mm x mm) | |
| Walls: | non-load bearing | 0 | |

Lateral load resisting structure

**Note: Define along and across in detailed report!**

| | | | | |
|---|---|---|---|---|
| Lateral system along: | lightweight timber framed walls | | | |
| Ductility assumed, μ: | 3.00 | | note typical wall length (m) | |
| 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 | | | |
| Ductility assumed, μ: | 3.00 | | note typical bay length (m) | |
| Period across: | 0.52 | 0.00 | estimate or calculation? | estimated |
| Total deflection (ULS) (mm): | | | estimate or calculation? | |
| maximum interstorey deflection (ULS) (mm): | | | estimate or calculation? | |

Separations:

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

leave blank if not relevant

Non-structural elements

| | | | |
|---|---|---|---|
| Stairs: | | | |
| Wall cladding: | plaster system | describe | |
| Roof Cladding: | Metal | describe | |
| Glazing: | aluminium frames | | |
| Ceilings: | | | |
| Services(list): | | | |

### Available documentation

| | | | |
|---|---|---|---|
| Architectural | partial | original designer name/date | peter dunbar architectural designer |
| 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: | |
| 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: | | | |
| 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: | 67% | 67% %NBS from IEP below | If IEP not used, please detail assessment methodology: | |
| | Assessed %NBS after e'quakes: | 67% | | | |
| Across | Assessed %NBS before e'quakes: | 67% | 67% %NBS from IEP below | | |
| | Assessed %NBS after e'quakes: | 67% | | | |

### 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: 6.6m

Seismic Zone, if designed between 1965 and 1992: C

not required for this age of building
not required for this age of building

| | along | across |
|---|---|---|
| Period (from above): | 0.4 | 0.52 |
| (%NBS)nom from Fig 3.3: | 14.0% | 14.0% |
| 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 | | 1.00 |
| Note 2: for RC buildings designed between 1976-1984, use 1.2 | | 1.0 |
| Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0) | | 1.0 |
| **Final (%NBS)nom:** | **14%** | **14%** |

**2.2 Near Fault Scaling Factor**

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

**2.3 Hazard Scaling Factor**

| | |
|---|---|
| Hazard factor Z for site from AS1170.5, Table 3.3: | 0.30 |
| $Z_{1992}$, from NZS4203:1992 | |
| Hazard scaling factor, **Factor B:** | 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) | 3.00 | 3.00 |
| Ductility scaling factor: =1 from 1976 onwards; or =kμ, if pre-1976, fromTable 3.3: | | |
| Ductiity Scaling Factor, **Factor D**: | 1.00 | 1.00 |

**2.6 Structural Performance Scaling Factor:**

| | along | across |
|---|---|---|
| Sp: | 0.700 | 0.700 |
| Structural Performance Scaling Factor **Factor E**: | 1.428571429 | 1.428571429 |

**2.7 Baseline %NBS, $(NBS\%)_b = (\%NBS)_{nom} \times A \times B \times C \times D \times E$**

| | along | across |
|---|---|---|
| **$\%NBS_b$:** | **67%** | **67%** |

Global Critical Structural Weaknesses: (refer to NZSEE IEP Table 3.4)

| | | |
|---|---|---|
| **3.1. Plan Irregularity, factor A:** | insignificant | 1 |
| **3.2. Vertical irregularity, Factor B:** | insignificant | 1 |
| **3.3. Short columns, Factor C:** | insignificant | 1 |
| **3.4. Pounding potential** – Pounding effect D1, from Table to right | | 1.0 |
| Height Difference effect D2, from Table to right | | 1.0 |
| Therefore, Factor D: | | 1 |
| **3.5. Site Characteristics** | insignificant | 1 |

| **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 | 1.0 | 1.0 |
| 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)** | **1.00** | **1.00** |
| **4.3 PAR x (%NBS)b:** PAR x Baselline %NBS: | **67%** | **67%** |
| **4.4 Percentage New Building Standard (%NBS), (before)** | | **67%** |

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