Christchurch City Council

Somerfield Community Centre BU 1129-001

Detailed Engineering Evaluation

Quantitative Assessment Report

OPUS

Christchurch City Council

Somerfield Community Centre

Quantitative Assessment Report

Reviewed By

Keith D. Palmer
Senior Structural Engineer
Ph.D., P.E. (MN)

Approved By

David Dekker
Principal Structural Engineer
CPEng 1003026

Opus International Consultants Ltd
Christchurch Office
20 Moorhouse Avenue
PO Box 1482, Christchurch Mail
Centre, Christchurch 8140
New Zealand

Telephone: +64 3 363 5400
Facsimile: +64 3 365 7858

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Executive Summary

Somerfield Community Centre
BU1129-001

Detailed Engineering Evaluation
Quantitative Report – Summary
Final

Background
Christchurch City Council appointed Opus International Consultants to carry out a detailed seismic assessment of their Somerfield Community Centre building located at 47 Studholme Street, Christchurch. The key outcome of this assessment was to ascertain the anticipated seismic performance of the structure and to compare this performance with current design standards.

Key Damage Observed
Key damaged observed to the building is as follows;

- Diagonal and horizontal cracking of some of the masonry veneer piers originating at the base of the windows.
- Vertical through brick cracking and horizontal dislocation of brickwork adjacent to the timber lintel over the entrance porch.
- Horizontal masonry veneer cracking and dislocation of the architrave adjacent to the top of some windows.
- Minor cracking to the perimeter foundation wall adjacent to the entry porch and vents.
- Minor separation (approximately 10mm) of the Supper Room extension structure from the original building, maximum at roof level and zero at the foundation.
- Collapse of ceiling plaster and cracking of ceiling and walls to the lath and plaster lined mezzanine rooms.
- Minor cracking to internal plaster lined partition walls and ceilings.

Critical Structural Weaknesses
The following Critical Structural Weaknesses (CSW) have been identified for this building:

- Plan irregularity – the large open Hall in the centre of the building is significantly longer than it is wide. This may lead to increased damage in this area, particularly if the ceiling diaphragm is under strength or non-existent. We have not been able to confirm the ability of the existing ceiling to act as a diaphragm.
- Length of wall – the significant length of windows down each side of the Hall and to the north wall, reduces the amount of available wall to transfer loads from the roof to the foundations. Bending will become significant for the narrow piers between the windows. Therefore, the Christchurch City Council appointed Opus to provide a temporary strengthening scheme which was delivered to the Council on August 28, 2013.

Indicative Building Strength

Brittle failure of interior wall plaster linings and an expected non-ductile behaviour of the gib plasterboard and hardboard wall linings due to inadequate nail size and spacing would give an approximate seismic capacity of 34%NBS in the longitudinal direction and 29%NBS in the transverse direction.

The roof over the Hall does not appear to be adequately braced or have a diaphragm present to distribute seismic lateral loads, particularly for loads in the transverse direction. Loads will be resisted by the east and west walls in out of plane bending (weak direction) rather than transferred to the adjacent north and south in plane shear walls. This would give an approximate seismic capacity of less than 33%NBS.

The temporary strengthening scheme developed by Opus partially mitigates the issues noted above for seismic loading in the transverse direction. Four braces installed on the exterior resists the seismic loading in the hall eliminating the need to transfer this entire load to the north and south shear walls. This strengthening increases the capacity in this direction to 50%NBS. This is an interim solution only to allow the building to remain operational while long term plans are developed.

Recommendations

In line with the NZSEE and Christchurch City Council, Opus recommends that this building be strengthened to at least 67% NBS.

Contents

1 Introduction

Opus International Consultants Limited has been engaged by Christchurch City Council to undertake a detailed seismic assessment of the Somerfield Community Centre building, located at 47 Studholme Street, Somerfield, Christchurch following the Canterbury Earthquake Sequence since September 2010.

The purpose of the assessment is to determine if the building is classed as being earthquake prone in accordance with the Building Act 2004.

The seismic assessment and reporting have been undertaken based on the qualitative and quantitative procedures detailed in the Detailed Engineering Evaluation Procedure (DEEP) document (draft) issued by the Structural Engineering Society (SESOC) [3] [4].

2 Compliance

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

2.1 Canterbury Earthquake Recovery Authority (CERA)

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

Section 38 – Works

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

Section 51 – Requiring Structural Survey

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

We understand that CERA 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). CERA have adopted the Detailed Engineering Evaluation Procedure (DEEP) document (draft) issued by the Structural Engineering Society (SESOC) on 19 July 2011. This document sets out a methodology for both initial qualitative and detailed quantitative assessments.

It is anticipated that a number of factors, including the following, will determine the extent of evaluation and strengthening level required:

1. The importance level and occupancy of the building.

2. The placard status and amount of damage.
3. The age and structural type of the building.
4. Consideration of any critical structural weaknesses.

Christchurch City Council requires any building with a capacity of less than 34% of New Building Standard (including consideration of critical structural weaknesses) to be strengthened to a target of 67% as required under the CCC Earthquake Prone Building Policy.

2.2 Building Act

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

Section 112 - Alterations

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

The Earthquake Prone Building policy for the territorial authority shall apply as outlined in Section 2.3 of this report.

Section 115 – Change of Use

This section requires that the territorial authority is satisfied that the building with a new use complies with the relevant sections of the Building Code 'as near as is reasonably practicable'.

This is typically interpreted by territorial authorities as being 67% of the strength of an equivalent new building or as near as practicable. This is also the minimum level recommended by the New Zealand Society for Earthquake Engineering (NZSEE).

Section 121 – Dangerous Buildings

This section was extended by the Canterbury Earthquake (Building Act) Order 2010, and defines a building as dangerous if:

1. 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
2. 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
3. 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
4. There is a risk that other property could collapse or otherwise cause injury or death; or
5. 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 (EPB) 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 loads 33% of those used to design an equivalent new building.

Section 124 – Powers of Territorial Authorities

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

Section 131 – Earthquake Prone Building Policy

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

2.3 Christchurch City Council Policy

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

The 2010 amendment includes the following:

1. A process for identifying, categorising and prioritising Earthquake Prone Buildings, commencing on 1 July 2012;
2. A strengthening target level of 67% of a new building for buildings that are Earthquake Prone;
3. A timeframe of 15-30 years for Earthquake Prone Buildings to be strengthened; and,
4. 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.

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.

Where an application for a change of use of a building is made to Council, the building will be required to be strengthened to 67% of New Building Standard or as near as is reasonably practicable.

2.4 Building Code

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

On 19 May 2011, Compliance Document B1: Structure was amended to include increased seismic design requirements for Canterbury as follows:

- increase in the basic seismic design load for the Canterbury earthquake region (Z factor increased to 0.3 equating to an increase of 36 – 47% depending on location within the region);
- Increased serviceability requirements.

2.5 Institution of Professional Engineers New Zealand (IPENZ) Code of Ethics

One of the core ethical values of professional engineers in New Zealand is the protection of life and safeguarding of people. The IPENZ Code of Ethics requires that:

Members shall recognise the need to protect life and to safeguard people, and in their engineering activities shall act to address this need.

1.1 Giving Priority to the safety and well-being of the community and having regard to this principle in assessing obligations to clients, employers and colleagues.

1.2 Ensuring that responsible steps are taken to minimise the risk of loss of life, injury or suffering which may result from your engineering activities, either directly or indirectly.

All recommendations on building occupancy and access must be made with these fundamental obligations in mind.

3 Earthquake Resistance Standards

For this assessment, the building's earthquake resistance is compared with the current New Zealand Building Code requirements for a new building constructed on the site. This is expressed as a percentage of new building standard (%NBS). The loadings are in accordance with the current earthquake loading standard NZS1170.5 [1].

A generally accepted classification of earthquake risk for existing buildings in terms of %NBS that has been proposed by the NZSEE 2006 [2] is presented in Figure 1 below.

Description	Grade	Risk	%NBS	Existing Building Structural Performance	Improvement of Structural Performance: Legal Requirement	Improvement of Structural Performance: 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 required under Act)	Unacceptable	Unacceptable

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

Table 1 below compares the percentage NBS to the relative risk of the building failing in a seismic event with a 10% risk of exceedance in 50 years (i.e. 0.2% in the next year).

Table 1: %NBS compared to relative risk of failure

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

3.1 Minimum and Recommended Standards

Based on governing policy and recent observations, Opus makes the following general recommendations:

3.1.1 Occupancy

The Canterbury Earthquake Order[1] in Council 16 September 2010, modified the meaning of "dangerous building" to include buildings that were identified as being EPB's. As a result of this, we would expect such a building would be issued with a Section 124 notice, by the Territorial Authority, or CERA acting on their behalf, once they are made aware of our assessment. Based on information received from CERA to date and from the DBH guidance document dated 12 June 2012 [6], this notice is likely to prohibit occupancy of the building (or parts thereof), until its seismic capacity is improved to the point that it is no longer considered an EPB.

3.1.2 Cordoning

Where there is an overhead falling hazard, or potential collapse hazard of the building, the areas of concern should be cordoned off in accordance with current CERA/territorial authority guidelines.

3.1.3 Strengthening

Industry guidelines (NZSEE 2006 [2]) strongly recommend that every effort be made to achieve improvement to at least 67%NBS. A strengthening solution to anything less than 67%NBS would not provide an adequate reduction to the level of risk.

It should be noted that full compliance with the current building code requires building strength of 100%NBS.

3.1.4 Our Ethical Obligation

In accordance with the IPENZ code of ethics, we have a duty of care to the public. This obligation requires us to identify and inform CERA of potentially dangerous buildings; this would include earthquake prone buildings.

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[1] This Order only applies to buildings within the Christchurch City, Selwyn District and Waimakariri District Councils authority

4 Background Information

4.1 Building Description

The Somerfield Community Centre is a single level structure located at 47 Studholme Street, Somerfield, Christchurch. The original building is estimated to have been constructed around 1940. There is a small later extension to the north and the building was reroofed in 2010 when the original concrete tiles were replaced with longrun steel. The building is approximately 35m in length in the north-south direction and 10m in width in the east-west direction. An indicative floor plan is attached as Appendix A.

The building is located on the north side of Studholme Street and is oriented perpendicular to the street. For the purposes of this report we refer to the direction parallel to the street as the east-west or transverse direction and the direction perpendicular to the street as the north-south or longitudinal direction.

The building is of timber framed construction with a lightweight roof. Roof trusses typically span in the transverse direction with gables a the north and south ends, though there is a hip roof towards the east of the main ridge line, near the north end, over the main entrance to the building. The roof over the main entrance also contains a part upper floor consisting of 2 small rooms. The external walls are clad with a brick masonry veneer while the internal wall claddings are a mixture of new gib plaster board and original timber boarding, lath and plaster or hardboard. The floor appears to be a timber framed suspended floor of typical domestic type construction. The perimeter foundation consists of a concrete foundation wall.

The building is used as a Community Centre, with 2 meeting rooms at the south end, a large Hall in the centre extending the full width of the building, and a kitchen, large supper room, main entrance, toilets and stair access to the upper level located at the north end.

The site is generally flat, with a concrete driveway to the east providing access to the adjacent childcare centre building at the rear of the property. There is a small grass area adjacent to the street, and only a narrow path between the building and the boundary to the west.

4.2 Survey

4.2.1 Post 22 February 2011 Rapid Assessment

A structural (Level 2) assessment of the building was undertaken on 14 March 2011 by Opus International Consultants. The site was posted with a Yellow (Y1) placard indicating that the building access is restricted.

4.2.2 Further Inspections

Further inspection was undertaken by Opus International Consultants on 26 June 2011. Repairs to damage from the February earthquake were underway and the building was reposted with a Green (G2) placard.

These inspections included external and internal visual inspections of all structural elements above foundation level, and of areas of damage to structural and non-structural elements.

4.3 Original Documentation

Copies of the following construction drawings were provided by CCC:

- Proposed Reroof for City Care, Somerfield, Christchurch – Drawings by Peter Dunbar, undated but stamped received 25 March 2010 by Christchurch City Council.

The drawings relate to the reroof only and provide no details of the building other than a floor plan. The drawings contain insufficient information to confirm the structural systems, investigate potential critical structural weaknesses (CSW) and identify details which required particular attention.

No copies of the original drawings or design calculations have been obtained as part of the documentation set.

The assumptions made regarding the structural system have been inferred from our walk through inspections and inspection of damage only.

5 Structural Damage

The majority of damage found to this building occurred as a result of the February earthquake. Very little new damage was found during our inspection following the June earthquake.

5.1 Perimeter Masonry Veneer Walls

- Diagonal and horizontal cracking of some of the masonry veneer piers originating at the base of the windows.

- Vertical through brick cracking and horizontal dislocation of brickwork adjacent to the timber lintel over the entrance porch.

- Horizontal masonry veneer cracking and dislocation of the architrave adjacent to the top of some windows.

5.2 Foundations

- Minor cracking to the perimeter foundation wall adjacent to the entry porch and vents.

5.3 Supper Room Extension

- Minor separation (approximately 10mm) of the Supper Room extension structure from the original building, maximum at roof level and zero at the foundation.

5.4 Non Structural Elements

- Collapse of ceiling plaster and cracking of ceiling and walls to the lath and plaster lined mezzanine rooms.

- Minor cracking to internal plaster lined partition walls and ceilings.

6 General Observations

This building has performed relatively well considering the large open spaces and significant length of windows in the north, east and west walls. The replacement of the heavy tile roof with a lightweight steel roof will have contributed significantly to the good performance.

The damage to the main structure is of a minor nature and it is expected to be cost effective to repair.

7 Detailed Seismic Assessment

The detailed seismic assessment has been based on the NZSEE 2006 [2] guidelines for the "Assessment and Improvement of the Structural Performance of Buildings in Earthquakes" together with the "Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury, Part 2 Evaluation Procedure" [3] draft document prepared by the Engineering Advisory Group on 16 May 2012, and the SESOC guidelines "Practice Note – Design of Conventional Structural Systems Following Canterbury Earthquakes" [5] issued on 21 December 2011.

7.1 Critical Structural Weaknesses

The term Critical Structural Weakness (CSW) refers to a component of a building that could contribute to increased levels of damage or cause premature collapse of a building. During the initial stage of the assessment the following potential CSW's were identified for the building and have been considered in the analysis.

- Plan irregularity – the large open Hall in the centre of the building is significantly longer than it is wide. This may lead to increased damage in this area, particularly if the ceiling diaphragm is under strength or non-existent. We have not been able to confirm the ability of the existing ceiling to act as a diaphragm.

- Length of bracing wall – the significant length of windows down each side of the Hall and to the north wall, reduce the amount of available wall to transfer loads from the roof to the foundations. Bending will become significant for the narrow piers between the windows. This was addressed through a temporary strengthening scheme issued by Opus to the Council on August 28, 2013.

Most of the critical structural weaknesses identified in the initial assessment will have an effect on the capacity of the building. These have been considered in the assessment tables.

7.2 Quantitative Assessment Methodology

The assessment assumptions and methodology are summarised as follows.

The force based design approach used is applicable to domestic type construction like the Somerfield Community Centre Building. The seismic design parameters based on current design requirements from NZS3604:2011 and the NZBC clause B1 for this building are:

- Site soil class D,

- Earthquake Zone 2, Fig 5.4 and Department of Building and Housing Information Sheet on Seismicity Changes effective from 19 May 2011
- Importance Level 2 structure with a 50 year design life. The importance level of the building should be increased to category 3 if any of the situations listed below were to apply:
    - If the building were to be used as an emergency centre not designated as a post-disaster structure; or
    - If more than 300 people can congregate in the Hall area.
- Floor loading of 3.0kPa in recognition of meeting spaces within the building.

Bracing ratings for walls in accordance with NZS3604 are based on an expected ductility of 3.5 at the ultimate limit state, governed by the nail fixings to the timber framing. Bracing ratings used in this assessment have been reduced to take account of non-compliant nailing and framing details.

7.3 Limitations and Assumptions in Results

Our analysis and assessment is based on an assessment of the building in its undamaged state. Therefore the current capacity of the building will be lower than that stated.

The results have been reported as a %NBS and the stated value is that obtained from our analysis and assessment. Despite the use of best national and international practice in this analysis and assessment, this value contains uncertainty due to the many assumptions and simplifications which are made during the assessment. These include:

a. Simplifications made in the analysis, including boundary conditions such as foundation fixity.
b. Assessments of material strengths based on limited drawings, specifications and site inspections
c. The normal variation in material properties which change from batch to batch.
d. Approximations made in the assessment of the capacity of each element, especially when considering the post-yield behaviour.

7.4 Assessment

A summary of the structural performance of the building is shown in the following tables. Note that the values given represent the worst performing elements in the building, as these effectively define the building's capacity. Other elements within the building may have significantly greater capacity when compared with the governing elements (for example the additional walls added to the original building in 1986). This will be considered further when developing the strengthening options.

Table 2: Summary of Seismic Performance

Structural Element/System	Failure Mode, or description of limiting criteria based on displacement capacity of critical element.	% NBS based on calculated capacity
Interior wall linings providing bracing in the longitudinal direction	Brittle failure of plaster linings. Expected non-ductile behaviour of the gib plasterboard and hardboard wall linings due to inadequate nail size and spacing.	34%
Interior wall linings providing bracing in the transverse direction	Brittle failure of plaster linings. Expected non-ductile behaviour of the gib plasterboard and hardboard wall linings due to inadequate nail size and spacing.	29% (This has been superseded by the temporary bracing discussed below)
Inadequate roof bracing in the Hall	The roof over the Hall does not appear to be adequately braced or have a diaphragm present to distribute seismic lateral loads, particularly for loads in the transverse direction. Loads will be resisted by the east and west walls in out of plane bending (weak direction) rather than transferred to the adjacent north and south in plane shear walls.	<33% (This has been superseded by the temporary bracing discussed below)
Temporary bracing constructed on the exterior of the Hall for resistance in the transverse direction	Four steel braces were attached to the exterior of four columns supporting the Hall roof. The braces were fixed to a new continuous concrete footing and the existing foundation wall. The weight of the concrete resisting uplift governed the capacity.	50%

Brittle failure of interior wall plaster linings and an expected non-ductile behaviour of the gib plasterboard and hardboard wall linings due to inadequate nail size and spacing would give an approximate seismic capacity of 34%NBS in the longitudinal direction and 29%NBS in the transverse direction.

The roof over the Hall does not appear to be adequately braced or have a diaphragm present to distribute seismic lateral loads, particularly for loads in the transverse direction. Loads will be resisted by the east and west walls in out of plane bending (weak direction) rather than transferred to the adjacent north and south in plane shear walls. This would give an approximate seismic capacity of less than 33%NBS.

The temporary strengthening scheme developed by Opus partially mitigates the issues noted above for seismic loading in the transverse direction. Four braces installed on the exterior resists the seismic loading in the hall eliminating the need to transfer this entire load to the north and south shear walls. This strengthening increases the capacity in this direction to 50%NBS. This is an interim solution only to allow the building to remain operational while long term plans are developed.

8 Summary of Geotechnical Appraisal

A preliminary geotechnical assessment [1] of the site was completed by Opus in September 2011 and this showed there was no significant evidence of ground damage despite being within an area of high liquefaction potential. No further geotechnical investigations were recommended.

9 Conclusions

a) The strengthened building will generally behave similarly to a new building except that the north and south walls do not meet the requirements of NZS3604 for minimum bracing capacity of external walls, leading to increased levels of damage under a design level earthquake.

b) The Somerfield Community Centre building should be strengthened to at least 67% NBS in order to reduce the seismic risk.

c) A detailed geotechnical investigation is not required.

d) Temporary bracing has been added as described in Table 2 above, increasing the seismic performance in the transverse direction to 50%NBS. This is an interim solution only to allow the building to remain operational while long term plans are developed.

10 Recommendations

In line with the NZSEE and Christchurch City Council, Opus recommends that this building be strengthened to at least 67% NBS.

11 Limitations

a. This report is based on an inspection of the structure of the buildings and focuses on the structural damage resulting from the 22 February Canterbury Earthquake and aftershocks only. Some non-structural damage is described but this is not intended to be a complete list of damage to non-structural items.

b. Our professional services are performed using a degree of care and skill normally exercised, under similar circumstances, by reputable consultants practicing in this field at this time.

c. This report is prepared for CCC to assist with assessing the remedial works required for council buildings and facilities. It is not intended for any other party or purpose.

12 References

[1] NZS 1170.5: 2004, *Structural design actions, Part 5 Earthquake actions,* Standards New Zealand.

[2] NZSEE (2006), *Assessment and improvement of the structural performance of buildings in earthquakes,* New Zealand Society for Earthquake Engineering.

[3] Engineering Advisory Group, *Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury, Part 2 Evaluation Procedure*, Draft Prepared by the Engineering Advisory Group, Revision 6, 16 May 2012.

[4] Engineering Advisory Group, *Guidance on Detailed Engineering Evaluation of Non-residential buildings, Part 3 Technical Guidance*, Draft Prepared by the Engineering Advisory Group, 13 December 2011.

[5] SESOC (2011), *Practice Note – Design of Conventional Structural Systems Following Canterbury Earthquakes*, Structural Engineering Society of New Zealand, 21 December 2011.

[6] DBH (2012), *Guidance for engineers assessing the seismic performance of non-residential and multi-unit residential buildings in greater Christchurch*, Department of Building and Housing, June 2012

Appendix 1 – Photographs

Photo 1 – Site location

Photo 2 – General view of the building

Photo 3 – Interior of Hall showing ceiling line and steel rafter ties

Photo 4 – Typical masonry veneer damage

Appendix 2 – Building Plan

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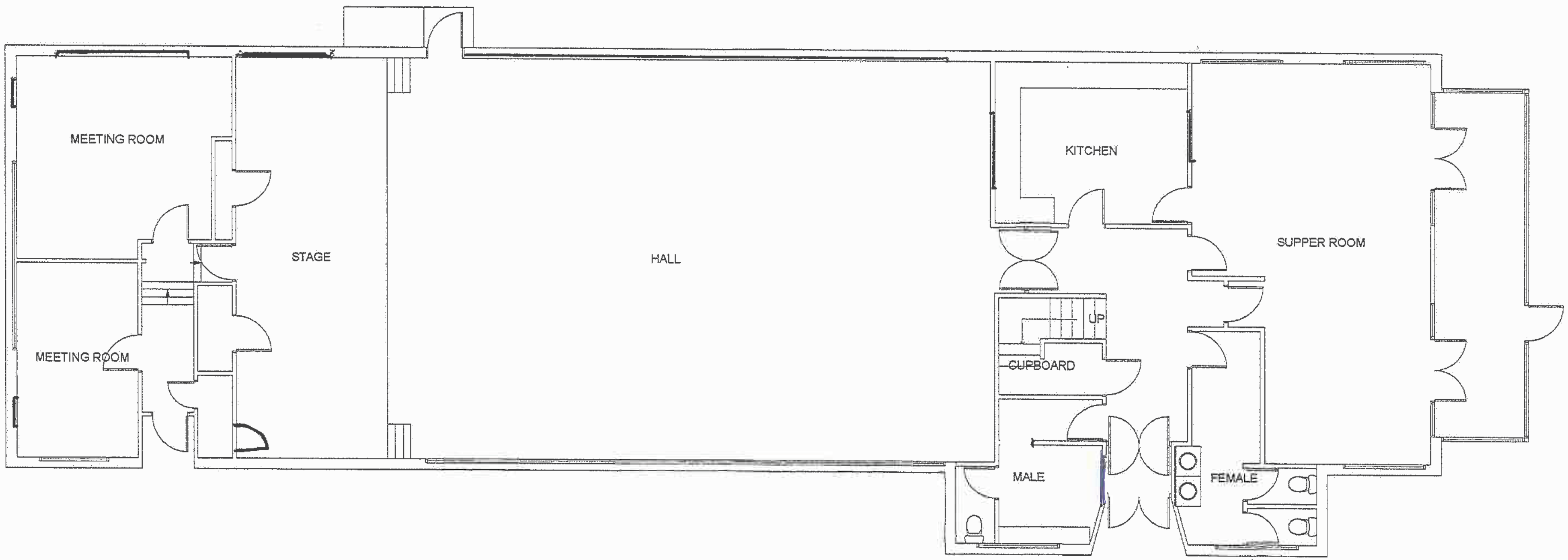

EXISTING FLOOR PLANS
Scale 1 : 100

peter dunbar
31 colombo street christchurch
ph 331 6026 fax 9606023
peter@peterdunbar.co.nz

PROPOSED REROOF
FOR CITY CARE

SOMERFIELD, CHRISTCHURCH

Floor Plans

Sheet #
2

Opus International Consultants Ltd
20 Moorhouse Avenue
PO Box 1482, Christchurch Mail Centre,
Christchurch 8140
New Zealand

t: +64 3 363 5400
f: +64 3 365 7858
w: www.opus.co.nz