Sockburn Civil Defence Training Centre

BU 1531-003 EQ2

Detailed Engineering Evaluation

Quantitative Assessment Report
149 Main South Road, Christchurch

Christchurch City Council

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Quantitative Assessment Report
149 Main South Road, Sockburn, Christchurch
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Prepared By

Toby Tscherry
Graduate Structural Engineer, GIPENZ

Reviewed By

Alistair Boyce
Senior Structural Engineer, CPEng 209860

Opus International Consultants Limited
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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Reference: 6-QUCCC.68
Status: Final

Training Centre, Sockburn Civil Defence Depot
BU 1531-003 EQ2

Detailed Engineering Evaluation
Quantitative Report - SUMMARY
Final

149 Main South Road, Christchurch

Background

This is a summary of the quantitative assessment report for the building structure at 149 Main South Road, Sockburn, and is based on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011, visual inspections on 22 March 2011 and 13 July 2012 and available drawings.

Key Damage Observed

The following damage has been noted:

- Cracking up to 4mm wide at intersecting walls throughout the building in the top courses of the concrete block.
- Minor internal step cracks in the block walls in along the north-east side of the building, and in the west corner in the toilet block.
- Minor cracking of the Pinex ceiling lining in the shower area.
- A new gap between the suspended tiled ceiling system and the walls in the lecture room indicating rotation of the ceiling system.

Critical Structural Weaknesses

No critical structural weaknesses have been identified in this building.

Indicative Building Strength (from quantitative assessment)

Based on the information available, and from undertaking a quantitative assessment, the building's original capacity has been assessed to be in the order of 42% NBS and post-earthquake capacity in the order of 42% NBS. The building is therefore not classed as an earthquake prone building.

Recommendations

a) A strengthening works scheme be developed to increase the seismic capacity of the building to at least 67% NBS - this will need to consider compliance with accessibility and fire requirements.

b) Access to the building should be prevented until such time that the cordon around the Sockburn Service Centre has been removed.

Contents

1 Introduction

Opus International Consultants Limited has been engaged by Christchurch City Council (CCC) to undertake a detailed seismic assessment of the Civil Defence Training Centre building at the Sockburn Civil Defence Depot, located at 149 Main South Road, Christchurch following the Canterbury earthquake events since 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 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 quantitative 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.

Any building with a capacity of less than 34% of new building standard (including consideration of critical structural weaknesses) will need to be strengthened to a target of 67% as required by 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).

Section 115 – Change of Use

This section requires that the territorial authority (in this case Christchurch City Council (CCC)) 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 CCC as being 67% of the strength of an equivalent new building. 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.

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:

- 36% increase in the basic seismic design load for Christchurch (Z factor increased from 0.22 to 0.3);
- 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	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). It is noted that the current seismic risk in Christchurch results in a 6% risk of exceedance 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[i] 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/Christchurch City Council 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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[i] 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 Civil Defence Training Centre building in the Sockburn Depot, located at 149 Main South Road, is a single storey concrete block structure. The date of construction of the building is unknown, but is expected to be in the 1980's.

For the purposes of this report, the north-west to south-east direction and the south-west to north-east direction are referred to as the longitudinal and transverse directions respectively. Refer to the site plan in Figure 2 below.

Figure 2: Civil Defence Sockburn Depot (taken from Google Maps)

The building has overall dimensions of approximately 18.5m long (longitudinal direction) and 11m wide (transverse direction), with an overall floor area of approximately 214 square metres. The roof consists of timber framed trusses spanning between the longitudinal concrete block walls. The high point of the roof is approximately 3.6m above ground level. Steel portal frames composed of 200UB25 beams and columns support trusses above the lecture room at the southern end of the building. These frames were introduced during alterations carried out in 1991.

The Training Centre has a reinforced slab on grade with variable thickness. Reinforcement was identified by cover meter survey in the foundation at the south-east end of the building, with the reinforcement consisting of two horizontal layers and vertical bars at 250mm centres. The interior portal frame columns are supported on base plates connected into the foundation slab. The slab level is approximately 300mm above ground level.

Vertical reinforcing bars were identified in the original building extending the full height of the wall on each side of wall openings such as doors and windows. Horizontal reinforcement bars were identified underneath windows, and at the top of the wall in the bond beam. A small portion of the building on the south-east end was observed to have additional starter bars at 900mm centres extending approximately 1.2m above the foundation.

4.2 Seismic Load Resisting System

In both directions, lateral loads are resisted by in plane shear action in the reinforced concrete block walls. A bond beam runs along the top of the block walls around the building providing a small amount of restraint to the walls. Several reinforced masonry internal walls are also located throughout the building and also provide contribution to resisting lateral loads.

The suspended ceiling in the lecture room does not provide diaphragm action to transfer lateral loads to the wall elements. Diaphragm action is obtained in the café room plasterboard ceiling and also in the remainder of the building, which has an original Pinex ceiling lining. This ceiling type is expected to have a diagonal cut-between brace although this was not observed due to limited access to the roof space.

4.3 Original Documentation

Copies of the following construction drawings were provided by the CCC:

- Alterations to Amenities Building – Sockburn Service Centre Structural Drawings, dated 20 March 1991
- Amenities Building Alterations, Sockburn Service Centre Site Architectural Drawings, dated 10 October 2001.

The drawings have been used to confirm the structural systems, investigate potential critical structural weaknesses (CSWs) and identify details which required particular attention.

5 Survey

5.1 Post 22 February 2011 Rapid Assessment

A structural (Level 2) assessment of the above buildings/property was undertaken on 22 March 2011 by Opus International Consultants.

The site was posted with a Green (G2) placard on 22 March 2011, indicating that the building access is not restricted.

5.2 Further Inspections

Further inspections were undertaken by Opus International Consultants on 13 July 2012. These inspections included non-intrusive external and internal visual inspections of all structural elements above foundation level, and areas of damage to structural and non-structural elements. Measurements were obtained, and a cover meter was used to ascertain the presence of reinforcing steel in the walls.

5.3 Sockburn Service Centre

The Sockburn Service Centre building, located immediately adjacent to the north, has recently been identified as an earthquake prone building with a collapse hazard. The Service Centre building was subsequently cordoned off, and the Training Centre building is partly located within this cordon. Access is prevented to all areas within the cordon.

6 Structural Damage

The following damage has been noted:

a) Cracking up to 4mm wide at intersecting walls throughout the building in the top courses of the concrete block.

b) Minor internal step cracks in the block walls in along the north-east side of the building, and in the west corner in the toilet block.

c) Minor cracking of the Pinex ceiling lining in the shower area.

d) A new gap between the suspended tiled ceiling system and the walls in the lecture room indicating rotation of the ceiling system.

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 19 July 2011, 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. No CSW's have been identified for this building.

7.2 Seismic Coefficients

The seismic design parameters based on current design requirements from NZS1170.5:2004 are as follows:

- Site soil class D, clause 3.1.3 NZS 1170.5:2004
- Site hazard factor, $Z = 0.3$, B1/VM1 clause 2.2.14B
- Return period factor, $R_u = 1.0$ from table 3.5, NZS 1170.5:2004, for an Importance Level 2 structure with a 50 year design life.
- Ductility factor of $\mu = 1.25$ for the concrete block walls. The ductility factor chosen is based on the material and detailing of the walls.

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:

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

7.4 Quantitative Assessment Results

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, when redistributed can be relied on as these effectively define the building's capacity.

Table 2: Summary of Seismic Performance

Structural Element/System	Failure mode or description of limiting criteria based on capacity of critical element.	% NBS based on calculated capacity
Masonry walls (in-plane) Southern wall	In-plane flexural capacity of the reinforced masonry walls	69%
Masonry walls (out of plane) Side wall next to southern entrance to lecture room	Out of plane flexural failure of the reinforced masonry walls	79%
Bond beam (south-east end)	Flexural failure of the bond beam due to the lack of a ceiling diaphragm.	42%

7.5 Discussion of Results

Based on the building being assessed as an Importance Level 2 structure, the building has a calculated capacity of 42% NBS as governed by the out-of-plane capacity of the concrete block bond beam. This means the building is not classified as Earthquake Prone in accordance with the Building Act.

It is recommended that the building be strengthened to at least 67% NBS.

8 Summary of Geotechnical Appraisal

8.1 General

A geotechnical investigation was not conducted as part of this assessment. Due to the site location and lack of visible ground damage it was not considered essential to complete a geotechnical investigation in order to assess the seismic capacity of the building. The geotechnical information below has been taken from the quantitative seismic assessment report completed for the Sockburn Service Centre building directly adjacent to this building.

8.2 Liquefaction Potential

The site is indicated to have low potential for liquefaction in the ECAN study. The residential areas on the other side of Main South Road are indicated on the CERA map as being in Technical Category TC1 (grey), meaning they are unlikely to incur future land damage from liquefaction.

8.3 Further Work

If strengthening works are undertaken for the building, a geotechnical investigation will be required for the design of any foundation elements.

9 Remedial Options

Remedial repair works to the cracked walls are required.

10 Conclusions

a) The seismic capacity of the building is governed by the out-of-plane strength of the concrete block bond beam which is calculated in this quantitative assessment to be around 42% NBS. The building is therefore not considered to be earthquake prone in accordance with the Building Act 2004.

b) It is recommended that the building be strengthened to at least 67% NBS.

c) Cracks of up to 4mm wide have been identified at the intersection of concrete block walls.

d) The building is currently partly located within the cordon around the Sockburn Service Centre building, and it is therefore not recommended that this building is occupied.

11 Recommendations

c) A strengthening works scheme be developed to increase the seismic capacity of the building to at least 67% NBS - this will need to consider compliance with accessibility and fire requirements.

d) Access to the building should be prevented until such time that the cordon around the Sockburn Service Centre has been removed.

12 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 2011 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.

13 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 5, 19 July 2011.

[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, 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

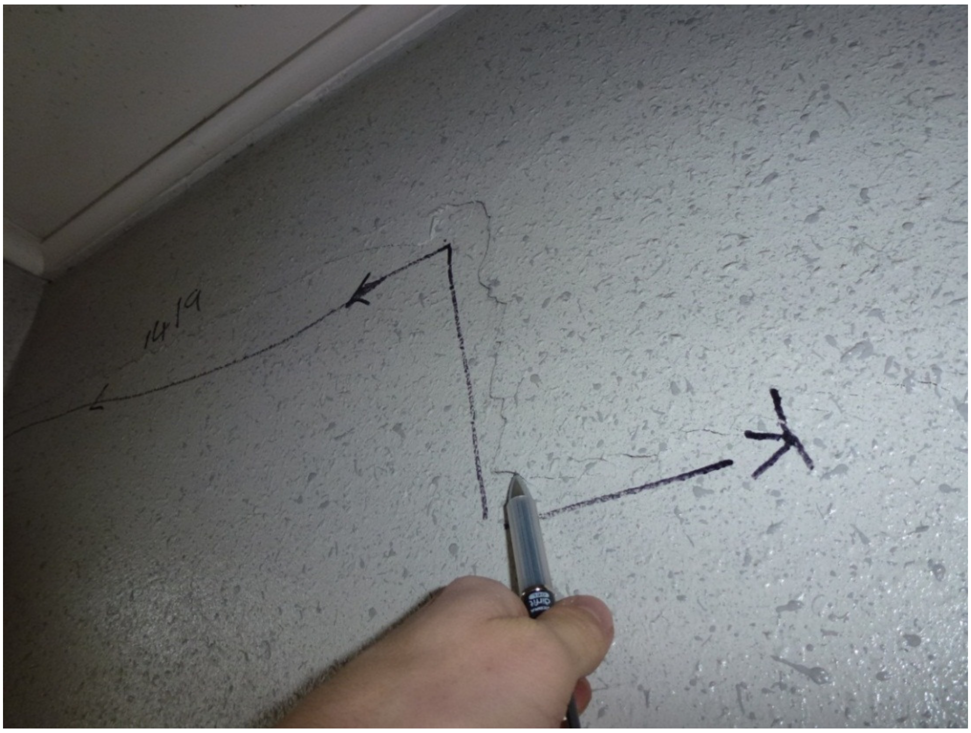
Appendix 1 – Photographs

Sockburn Civil Defence Training Centre		
No.	**Item description**	**Photo**
1.	Looking at north-east face of the building	
2.	Looking at south west face of the building	

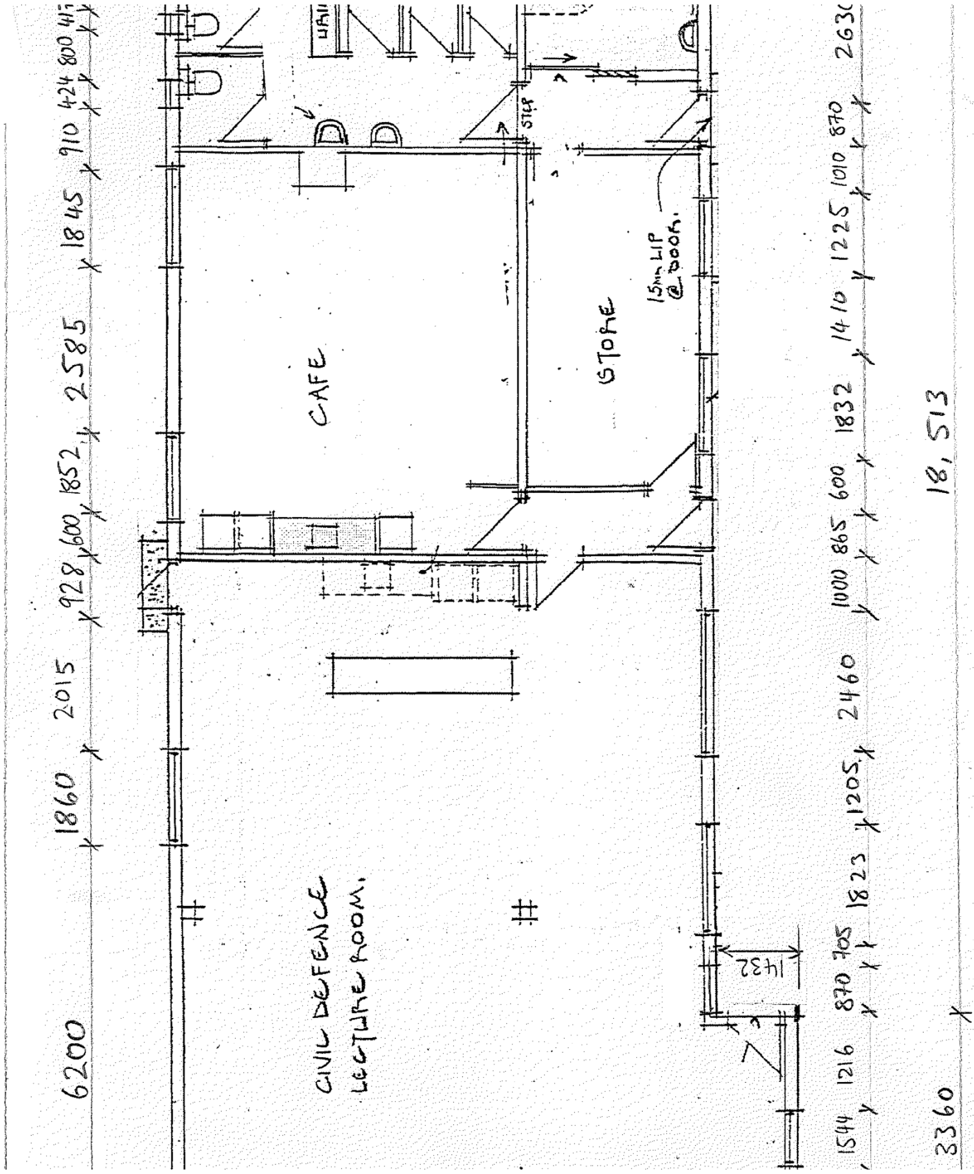
3.	Looking at the south-east end	
4.	Western corner of building	

5.	Roof space above lecture room tiled ceiling	
6.	Western face of southern corner showing different construction type of walls (notice vents at wall-foundation interface)	

7.	Gap opening up between ceiling tiles and portal frame in lecture room	
8.	Cracking above door way in hallway at entrance to lecture room and café	

9.	Step crack in toilet wall lining	

Appendix 2 – Floor Plan


CAFE
STORE
CIVIL DEFENCE
LECTURE ROOM.
15mm LIP
@ DOOR.
21,873
18,513
6200
3360

Appendix 3 – DEEP Spreadsheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Sockburn Civil Defence Training Centre	Reviewer:	Alistair Boyce
Building Address: (Unit / No: / Street)	149 Main South Road	CPEng No:	209860
Legal Description:		Company:	Opus International Consultants
		Company project number:	6-QUCCC.68
		Company phone number:	03 363 5400
GPS south: (Degrees / Min / Sec)	43 / 32 / 19.86	Date of submission:	Sep-12
GPS east: (Degrees / Min / Sec)	172 / 33 / 20.86	Inspection Date:	13-Jul-12
		Revision:	Final
Building Unique Identifier (CCC):	BU 1531-003 EQ2	Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:		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):	20.00

Building

No. of storeys above ground:	1 (single storey = 1)	Ground floor elevation (Absolute) (m):	20.30
Ground floor split?	no	Ground floor elevation above ground (m):	0.30
Storeys below ground	0		
Foundation type:	mat slab	if Foundation type is other, describe:	
Building height (m):	3.20	height from ground to level of uppermost seismic mass (for IEP only) (m):	
Floor footprint area (approx):	214		
Age of Building (years):		Date of design:	1976-1992
Strengthening present?		If so, when (year)?	
		And what load level (%g)?	
Use (ground floor):	institutional	Brief strengthening description:	
Use (upper floors):			
Use notes (if required):	Training centre for Civil Defence		
Importance level (to NZS1170.5):	IL2		

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber truss	truss depth, purlin type and cladding	1.7m depth, 140x45mm purlin, timber sarking & corrugated steel cladding
Floors:	concrete flat slab	slab thickness (mm)	Slab on grade
Beams:	steel non-composite	beam and connector type	Steel portal frame 203x135x25 UB sections
Columns:	structural steel	typical dimensions (mm x mm)	Steel portal frame 203x135x25 UB sections
Walls:	partially filled concrete masonry	thickness (mm)	190

Lateral load resisting structure

Note: Define along and across in detailed report!

Lateral system along:	partially filled CMU		note total length of wall at ground (m):	20.2
Ductility assumed, μ:	1.25			
Period along:	0.40	##### enter height above at H31	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	partially filled CMU		note total length of wall at ground (m):	19.8
Ductility assumed, μ:	1.25			
Period across:	0.40	##### enter height above at H31	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

north (mm): — leave blank if not relevant
east (mm):
south (mm):
west (mm):

Non-structural elements

Stairs:			
Wall cladding:	plaster system	describe	
Roof Cladding:	Metal	describe	Corrugated iron, supported by sarking
Glazing:			
Ceilings:	fibrous plaster, fixed		various: Pinex board, light tile system, & plasterboard
Services(list):	Mains water, Electricity		

Available documentation

Architectural	partial	original designer name/date	Christchurch City Council Design Services - Architects 20 March 1991; City Design - Christchurch, The Garden City 10 April 2001
Structural	partial	original designer name/date	Christchurch City Council Design Services - Architects 20 March 1991
Mechanical		original designer name/date	
Electrical	partial	original designer name/date	Christchurch City Council Design Services - Architects 20 March 1991
Geotech report		original designer name/date	

Damage

Site: (refer DEE Table 4-2)

Site performance:		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: green

Along	Damage ratio:	0%	Describe how damage ratio arrived at:	
	Describe (summary):			
Across	Damage ratio:	0%		
	Describe (summary):			
Diaphragms	Damage?:	yes	Describe:	Minor cracking in Pinex board
CSWs:	Damage?:	yes	Describe:	Cracking to masonry walls (not CSW)
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	no	Describe:	

$$Damage\_Ratio = \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$$

Recommendations

	Level of repair/strengthening required:	minor structural	Describe:	Minor-moderate cracking in CMU walls
	Building Consent required:	no	Describe:	
	Interim occupancy recommendations:	full occupancy	Describe:	Adjacent building (Service Centre) is a falling hazard
Along	Assessed %NBS before e'quakes:	42% ##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	Quantitative assessment
	Assessed %NBS after e'quakes:	42%		
Across	Assessed %NBS before e'quakes:	42% ##### %NBS from IEP below		
	Assessed %NBS after e'quakes:	42%		

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: m

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

	along	across
Period (from above):	0.4	0.4
(%NBS)nom from Fig 3.3:		

Note:1 for specifically design public buildings, to the code of the day: pre-1965 = 1.25; 1965-1976, Zone A =1.33; 1965-1976, Zone B = 1.2; all else 1.0	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

	along	across
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:
Z_{1992}, from NZS4203:1992
Hazard scaling factor, **Factor B:** #DIV/0!

2.4 Return Period Scaling Factor

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

2.5 Ductility Scaling Factor

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

2.6 Structural Performance Scaling Factor:

	along	across
Sp:		
Structural Performance Scaling Factor **Factor E**:	#DIV/0!	#DIV/0!

	along	across
2.7 Baseline %NBS, $(NBS\%)_b = (\%NBS)_{nom}$ x A x B x C x D x E — **$\%NBS_b$:**	**#DIV/0!**	**#DIV/0!**

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

3.1. Plan Irregularity, factor A: 1

3.2. Vertical irregularity, Factor B: 1

3.3. Short columns, Factor C: 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

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

3.5. Site Characteristics 1

3.6. Other factors, Factor F

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

Detail Critical Structural Weaknesses: (refer to DEE Procedure section 6)
List any: — Refer also section 6.3.1 of DEE for discussion of F factor modification for other critical structural weaknesses

	Along	Across
3.7. Overall Performance Achievement ratio (PAR)	**0.00**	**0.00**
4.3 PAR x (%NBS)b: — PAR x Baselline %NBS:	**#DIV/0!**	**#DIV/0!**
4.4 Percentage New Building Standard (%NBS), (before)		**#DIV/0!**

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