Report

YWCA Units 1-4 BU 2311-001 EQ2 YWCA Units 5-9 BU 2311-002 EQ2 Detailed Engineering Evaluation Quantitative Report

Prepared for Christchurch City Council (Client)

By Beca Carter Hollings & Ferner Ltd (Beca)

4 July 2013

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Revision History

Revision Nº	Prepared By	Description	Date
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Action	Name	Signed	Date					
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Reviewed by	Jonathan Barnett	SBarrott	4 July 2013					
Approved by	David Whittaker	Deshittah	4 July 2013					
on behalf of	Beca Carter Hollings & Ferner Ltd							



YWCA Units 1-4 BU 2311-001 EQ2

YWCA Units 5-9 BU 2311-002 EQ2

Detailed Engineering Evaluation Quantitative Report – SUMMARY

Version 1

Address

285 Hereford Street Christchurch



Background

This is a summary of the Quantitative Assessment for the building structure, and is based on the document 'Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury – Part 2 Evaluation Procedure' (draft) issued by the Engineering Advisory Group (EAG) on 19 July 2011.

Two Qualitative Reports were issued to CCC on 4 October 2012; one each for Units 1-5 and Units 5-9.

The YWCA Units (Units 1-4, Units 5-9) are located at 285 Hereford Street, Christchurch. The housing consists of two separate buildings. Units 1-4 are situated on east side and consist of three residential units and one office, whereas Units 5-9 are on west side and consist of three residential units and two offices. Refer to Figure A1 in Appendix A for location of buildings.

It is assumed the units were built between 1965 & 1970 based on information from the tenants and type of construction. Unit 1 (east building) underwent some alterations in 1989 and was converted into an office. Unit 4 (east building) has been refurbished recently as a consequence of fire.

Units 1-4 and Units 5-9 have an approximate internal floor area of 550m² and 340m² respectively.

The East building (Units 1-4) is C shaped in plan, whereas the west building (Units 5-9) is rectangular in plan. Both buildings are single storey. Refer to building plans in Appendix A.

Construction typically comprises of metal-clad lightweight timber roof supported on timber-framed walls & 190 thick concrete hollow block masonry walls between units. Cladding consists of 90mm thick block wall. Brick veneer cladding is also present in some places.

The foundation structure consists of concrete perimeter foundation walls assumed to be founded on shallow strip foundation, and concrete piles internally.

The format and content of this report follows a template provided by CCC, which is based on the EAG document.



Key Damage Observed

Visual inspections on 7 August 2012 indicate that both buildings have suffered minor earthquake damage. Key damage observed includes:

Units 1-4

- Cracking to plasterboard wall linings, particularly at locations of joints and fixing.
- Separation of brick veneer cladding from the timber framed walls in some locations.
- Stepped cracking in the mortar joints of brick veneer walls. In some places the cracking is up to 5mm in width.
- Minor cracking to the raised concrete footpath.
- Stepped cracking in the mortar joints of the unfilled unreinforced concrete hollow block masonry wall between Units 2 and 3.

Units 5-9

- Cracking to the brick veneer mortar joints.
- Minor cracking to plasterboard wall linings.
- Separation between the timber-framed wall and ground slab at the entrance to Unit 6.

Critical Structural Weaknesses (CSW)

Units 1-4

- Plan irregularity identifying potential torsional behaviour.
- unfilled unreinforced concrete hollow block masonry walls

Units 5-9

- Few lateral load-resisting walls along the perimeter of the building.
- unfilled unreinforced concrete hollow block masonry walls.

Indicative Building Strength (from Detailed Assessment)

Units 1-4 and Units 5-9

The buildings have been assessed to have seismic capacity of approximately 40%NBS using the New Zealand Society for Earthquake Engineering (NZSEE) Detailed Assessment guideline 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes' (AISPBE), 2006, and is therefore not classified as Earthquake Prone, but is considered to be Earthquake Risk and Seismic Grade C.

The damage observed to the structure is not considered to have significantly reduced its ability to resist seismic loads. The structural damage is considered minor.

Our assessment has identified the following structural components that govern the building's seismic performance.

Out of plane capacity of 190 thick unfilled unreinforced concrete hollow block masonry walls.



Recommendations

In order that the owner can make an informed decision about the on-going use and occupancy of their building, the following information is presented in line with the Department of Building and Housing document 'Guidance for engineers assessing the seismic performance of non-residential and multi-unit residential buildings in greater Christchurch', June 2012.

For greater Christchurch the definition of a "dangerous" building in the Building Act has been extended (by the Canterbury Earthquake (Building Act) Order 2011) to include buildings at risk of collapsing in a moderate earthquake, that is earthquake prone buildings with a capacity at or below 33%NBS. Where council requires a dangerous building or an earthquake prone building to be upgraded, it may prohibit the use of the building until the works are carried out.

No significant damage or hazards were identified to the seismic or gravity load resisting system that would further reduce its ability to resist further loads.

Our recommendations are as follows:

- In accordance with CCC guidance/policy document 'Guidance for Engineers 2' dated 10 May 2012; no restrictions are required to the occupancy of the building.
- Foundations are exposed to confirm suitability of assumptions and damage as part of a subsequent Damage Assessment reporting.
- A verticality and level survey could be carried out to determine the extent of settlement of the building for insurance purposes.
- Repairs that would bring the building back to an "as new" condition are typically entitled under typical replacement insurance policies. We suggest you consult with your insurance advisor as to how you wish to proceed.



Table of Contents

Qua	antita	tive Report – SUMMARYii
1	Back	ground 3
2	Com	pliance 3
	2.1	Canterbury Earthquake Recovery Authority (CERA)
	2.2	Building Act
	2.3	Christchurch City Council Policy
	2.4	Building Code
3	Earth	nquake Resistance Standards 6
4	Build	ding Description7
	4.1	General
	4.2	Structural 'Hot-spots'
5	Site	Investigations10
	5.1	Previous Assessments
	5.2	Level 4 Damage Inspection
	5.3	Level 5 Intrusive Investigations
6	Dam	age Assessment10
	6.1	Damage Summary10
	6.2	Key Damage Observed
	6.3	Surrounding Buildings
	6.4	Residual Displacements and General Observations
	6.5	Implications of Damage
7	Gene	eric Issues13
8	Geot	echnical Consideration 13
9	Surv	ey14
10	Deta	iled Seismic Capacity Assessment14
	10.1	Assessment Methodology
	10.2	Assumptions
	10.3	Critical Structural Weaknesses
	10.4	Seismic Parameters
	10.5	Results of Seismic Assessment
11	Reco	ommendations16
	11.1	Occupancy
	11.2	Further Investigations, Survey or Geotechnical Work
	11.3	Damage Reinstatement
12	Desi	gn Features Report 17
13	Limit	tations 17



Appendices

Appendix A – Building Plans and Photographs

Appendix B - CERA DEE Summary Data

Appendix C - Previous Reports and Assessments



1 **Background**

Beca Carter Hollings & Ferner Ltd (Beca) has been engaged by the Christchurch City Council (CCC) to undertake a Quantitative Detailed Engineering Evaluation (DEE) of the YWCA Units 1-4 & Units 5-9 located 285 Hereford Street, Christchurch.

This report is a Quantitative Assessment of the building structure, and is based on the document 'Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury – Part 2 Evaluation Procedure' (draft) issued by the Engineering Advisory Group (EAG) on 19 July 2011.

A quantitative assessment involves analytical calculations of the building's strength and may involve material testing, geotechnical testing and intrusive investigation. The qualitative assessment previously carried out involved inspections of the building, a desktop review of existing structural and geotechnical information, including existing drawings and calculations, if available and an assessment of the level of seismic capacity against current code using the Initial Evaluation Procedure (IEP).

The purpose of these assessments is to determine the likely building performance and damage patterns, to identify any potential Critical Structural Weaknesses (CSW) or collapse hazards, and to make an assessment of the likely building strength in terms of percentage of New Building Standard (%NBS).

The building description below is based only on our intrusive and visual inspections as only 1 No. drawing was made available.

The format and content of this report follows a template provided by CCC, which is based on the EAG document.

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 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 understood that CERA is adopting the Detailed Engineering Evaluation Procedure document (draft) issued by the Engineering Advisory Group on 19 July 2011, which sets out a methodology for both qualitative and quantitative assessments. We understand this report will be used in response to CERA Section 51.

The qualitative assessment includes a thorough visual inspection of the building coupled with a desktop review of available documentation such as drawings, specifications and IEP's. The quantitative assessment involves analytical calculation of the building's 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 that was assigned during the state of emergency following the 22 February 2011 earthquake.
- The age and structural type of the building.
- Consideration of any Critical Structural Weaknesses.
- The extent of any earthquake damage.

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 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.

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 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.

It is understood 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.

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:

- a. Hazard Factor increased from 0.22 to 0.3 (36% increase in the basic seismic design load)
- b. 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.

3 **Earthquake Resistance Standards**

For this assessment, the building's Ultimate Limit State 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).

No consideration has been given at this stage to checking the level of compliance against the increased Serviceability Limit State requirements.

The likely ultimate 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 building's 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 3.1 below.

Description	Grade	Risk	%NBS	Existing Building Structural Performance		Improvement of St	ructural 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)	100%NBS desirable. Improvement should achieve at least 67%NBS
Moderate Risk Building	B or C	Moderate	34 to 66	Acceptable legally. Improvement recommended		This is for each TA to decide. Improvement is not limited to 34%NBS.	Not recommended. Acceptable only in exceptional circumstances
High Risk Building	D or E	High	33 or lower	Unacceptable (Improvement	L	Unacceptable	Unacceptable

Figure 3.1: NZSEE Risk Classifications Extracted from Table 2.2 of the NZSEE 2006 AISPBE Guidelines

Table 3.1 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. on average 0.2% in any year). It is noted that the current seismic risk in Christchurch results in a 6% risk of exceedance in the next year.



Table 3.1: %NBS Compared to Relative Risk of Failure

Building Grade	Percentage of New Building Standard (%NBS)	Approx. Risk Relative to a New Building		
A+	>100	<1		
А	80-100	1-2 times		
В	67-80	2-5 times		
С	33-67	5-10 times		
D	20-33	10-25 times		
Е	<20	>25 times		

4 Building Description

4.1 General

Summary information about the building is given in the following table. No structural drawings have been made available, therefore the building information is assumed from our visual inspections and intrusive investigation only.

Table 4.1 and Table 4.2 contain building information for Units 1-4 and Units 5-9 respectively.

Table 4.1: Building Summary Information for Units 1-4

Item	Details	Comment
Building name	YWCA Units 1-4	Unit 1 is an office. Units 2-4 are residential
Street Address	285 Hereford Street, Christchurch	
Age	~45 years Construction between 1965 & 1970	No drawings available. Assumed based on method of construction and information obtained from tenants.
Description	The building is C shaped in plan and is single storey. The building is currently being used as residential apartments apart from Unit 1 which has been converted to office.	Unit 4 recently refurbished as a consequence of a fire
Building Footprint / Floor Area	Approx. 550m ²	
No. of storeys / basements	1 storey / no basement	
Occupancy / use	Multi-unit residential, Office	Importance Level 2
Construction	-timber framed walls with plasterboard linings -GIB-lined timber-framed walls (new refurbishment)	Based on intrusive site investigation



Item	Details	Comment		
	-unfilled unreinforced concrete hollow block masonry walls 190mm -lightweight timber roof -blockwork cladding 90mm -brick veneer cladding -subfloor supported on short piles			
Gravity load resisting system	Duo-pitched metal-clad light-weight timber roof supported on ridge and external walls. Ridge beam is supported on unreinforced masonry walls.	No structural drawings available		
Seismic load resisting system	Lateral loads are transferred through diaphragm made of ceiling plasterboard to;	No structural drawings available		
	 predominantly unreinforced blockwork masonry walls, and timber framed walls with plasterboard linings in transverse direction (E-W). 			
	 timber framed walls with plasterboard linings in the longitudinal direction (N- S). 			
Foundation system	Timber sub-floor supported on concrete piles. Strip footing assumed for unreinforced masonry wall.	No drawings available. Based on intrusive investigation.		
Stair system	None			
Other notable features	None			
External works	Brick veneer cladding			
Construction information	Visual inspection only, no drawings available.			
Likely design standard	NZS 1900, Part 8:1965	Inferred from age of building		
Heritage status	No heritage status			
Other	None			

Table 4.2: Building Summary Information for Units 5-9

Item	Details	Comment
Building name	YWCA Units 5-9	Units 8-9 are offices. Units 5-7 are residential.
Street Address	285 Hereford Street Christchurch	



Item	Details	Comment
Age	~45 years Construction between 1965 & 1970	No drawings available. Assumed based on method of construction and information obtained from tenants.
Description	Unit 8-9 are offices. Units 5-7 are residential.	Based on single available drawing
Building Footprint / Floor Area	Approx. 340 m ²	Building is rectangular.
No. of storeys / basements	1 storey / no basement	
Occupancy / use	Multi-unit residential, Office	Importance Level 2
Construction	-timber framed walls with plasterboard linings -unfilled unreinforced concrete hollow block masonry walls 190mm	Based on site inspection.
	-lightweight timber roof -blockwork cladding 90mm -brick veneer cladding -subfloor supported on short piles	
Gravity load resisting system	Duo-pitched metal-clad light-weight timber roof supported on ridge and external walls. Ridge beam is supported on unreinforced masonry walls.	No structural drawings available
Seismic load resisting system	Lateral loads are transferred through diaphragm made of ceiling plasterboard to; - predominantly unreinforced blockwork masonry walls, and timber framed walls with plasterboard linings in transverse direction (E-W) plasterboard linings in the longitudinal direction (N-S).	No structural drawings available
Foundation system	Timber subfloor supported on concrete piles. Strip footing assumed for unreinforced masonry wall.	No drawings available. Based on intrusive investigation.
Stair system	None	
Other notable features	None	
External works	Brick veneer cladding	
Construction information	None.	
Likely design standard	NZS 1900, Part 8:1965	
Heritage status	No heritage status	
Other	None.	



4.2 Structural 'Hot-spots'

Areas in which damage may be expected to occur from earthquake shaking are outlined below:

- Inadequate shear or flexural strength of concrete masonry walls.
- Out of plane restraint of unreinforced masonry walls due to lack of edge connection.
- Connections between the roof diaphragm and the walls.
- Connections between walls, timber floor and foundations/substructure.
- Adequacy of foundations.
- Restraint of brick veneer.

5 Site Investigations

5.1 **Previous Assessments**

The building had a Level 2 Rapid Assessment undertaken following the February 2011 earthquake (refer Appendix C). The level 2 report highlights cracking damage to the building's chimney and the collapse of the block walls forming a garage/shed at the rear of the site. At the time of a previous inspection on 7 August 2012 the damaged chimney and the collapsed garage had been removed from site.

5.2 **Level 4 Damage Inspection**

Visual inspections as part of the Level 4 Damage Assessment were undertaken on 7 August 2012. Photographs were taken as a record of inspection.

5.3 Level 5 Intrusive Investigations

The following intrusive investigation was carried out as part of the Level 5 Quantitative Assessment.

- Testing using HILTI PS35 Ferrodetector indicated that there is no reinforcement in the masonry block walls.
- Confirmation of connection of brick veneer cladding to the main structure. The investigation involving making a hole in a timber-framed wall (Units 1-4 only) indicated the presence of ties connecting brick veneer cladding to the timber-framed walls.
- A part of the roof was stripped off to confirm the roofing structure. Also it was observed that masonry block walls are unfilled.

6 **Damage Assessment**

6.1 **Damage Summary**

The tables below provide a summary of the damage observed during our inspection. Refer to Appendix A for photographs of the observed damage.



Table 6.1: Damage Summary for Units 1-4

Damage type					Comment
Damage type	Unknown	Minor	Moderate	Major	Comment
settlement of foundations		✓			Cracking to perimeter foundations was observed during visual inspection. Level survey may be required to confirm.
tilt of building		✓			Movement of window on back wall and 2-5mm crack to brick veneer. Verticality survey might be required to confirm.
liquefaction	✓				None observed during visual inspection. From aerial photos taken on 24 February 2011 no liquefaction appears evident in the area.
settlement of external ground		✓			Cracking to external concrete pavement during visual inspection may indicate settlement.
lateral spread / ground cracks		✓			Cracking to pavement observed during visual inspection.
frame					No damage observed during visual inspection.
masonry walls		✓			Stepped cracking was observed in the mortar joints of the concrete masonry wall between units 2 and 3.
cracking to concrete floors		✓			Minor cracking was observed in the external concrete slab.
bracing		✓			Cracking of plasterboard lining along joints was observed.
precast flooring seating					Not applicable.
stairs					Not applicable (external concrete steps only).
cladding /envelope		✓			Minor cracking damage was observed in the brick veneer cladding mortar joints.
internal fit out		✓			Minor cracking damage was observed to the internal plasterboard wall linings and along the connection between the plasterboard ceiling and masonry walls.
building services	✓				The building services were not inspected.
other					The previous level 2 inspection noted damage to the building's chimney and the collapse of the garage at the rear of the site. However both have been removed since the level 2 inspection.



Table 6.2: Damage Summary for Units 5-9

	, U.Z.	Dam	uge	ou	imary for Units 5-9
Damage type	Unknown	Minor	Moderate	Major	Comment
settlement of foundations		✓			Cracking to perimeter foundations was observed during visual inspection. Level survey may be required to confirm.
tilt of building		✓			Evidence of building tilt (cracking to walls, warping of door frames) was observed during the inspection. Verticality survey may be required to confirm.
liquefaction	✓				None observed during visual inspection. From aerial photos taken on 24 February 2011 no liquefaction appears evident in the area.
settlement of external ground		✓			Cracking to external concrete pavement during visual inspection may indicate settlement.
lateral spread / ground cracks		✓			Cracking to pavement observed during visual inspection.
frame					No damage observed during visual inspection.
masonry walls	1				Not inspected due to linings in place.
cracking to concrete floors					Not Applicable.
bracing		✓			Cracking to plasterboard lining along joints was observed.
precast flooring seating					Not Applicable.
stairs					Not Applicable (external concrete steps only)
cladding /envelope		✓			Minor cracking was observed in the blockwork cladding mortar joints.
internal fit out		✓			Minor cracking damage was observed between internal plasterboard linings and their connection to the plasterboard ceiling.
building services	✓				Building services were not inspected.
other					The previous level 2 inspection noted damage to the building's chimney and the collapse of the garage at the rear of the site, however both have been removed since the level 2 inspection.

6.2 Key Damage Observed

Refer to Appendix A for photos showing following damage.



Units 1-4

- Cracking to plasterboard wall linings, particularly at locations of joints and fixing.
- Separation of brick veneer cladding from the timber framed walls in some locations.
- Stepped cracking in the mortar joints of brick veneer walls. In some places the cracking is up to 5mm in width.
- Minor cracking to the raised concrete footpath.
- Stepped cracking in the mortar joints of the concrete masonry wall between units 2 and 3.

Units 5-9

- Cracking to the brick veneer mortar joints.
- Minor cracking to plasterboard linings.
- Separation between the timber-framed wall and ground slab at the entrance to unit 6.

6.3 **Surrounding Buildings**

There are buildings in the general vicinity but neighbouring buildings are sufficiently separated such that they will not impact upon the YWCA Units during a seismic event.

6.4 **Residual Displacements and General Observations**

Evidence of minor permanent settlement or displacements was observed during our visual inspection. A global settlement survey may reveal movement to the building that may have resulted in a change to its original condition and may be considered a loss.

6.5 Implications of Damage

The structure has suffered minor visible structural damage only and therefore we believe the structural capacity has not been significantly affected.

7 **Generic Issues**

The following generic issues referred to in Appendix A of the EAG guideline document have been identified as applicable to all the YWCA Units:

Unfilled Unreinforced Concrete Hollow Block Masonry Walls

- Inadequate shear or flexural strength of unreinforced masonry walls.
- Inadequate out of plane strength of concrete masonry walls.
- Inadequate connections of roof diaphragms to the walls.
- Inadequate foundations.
- Plan irregularity (for Units 1-4 only).

Appendix A of the DEE guideline does not address generic issues of timber framed buildings.

8 **Geotechnical Consideration**

No Geotechnical information was available for this site.

During the inspection, no damage to the surrounding ground was noted.



9 Survey

There was some evidence of settlement and displacement observed during our inspection however no level or verticality surveys were carried out. CCC may wish to undertake a level survey as part of their damage assessment and reinstatement.

10 **Detailed Seismic Capacity Assessment**

10.1 Assessment Methodology

The seismic capacity of the buildings has been assessed using the Detailed Assessment Procedures in the NZSEE AISPBE guidelines, based on the site measurements and intrusive investigations undertaken. The structure has suffered minor damage.

Assumptions 10.2

The following assumptions were used in our quantitative assessment:

- 50% reduction in capacity assumed to account for potentially older style fibrous plaster gypsum wall board.
- Adequate diaphragm action is available.
- Building dimensions are scaled from available plan drawing.
- Strength parameters for mortar and bricks were assumed for "soft" material as per Table 10.2 of NZSEE AISPBE (April 2012) guidelines.

10.3 Critical Structural Weaknesses

Units 1-4

- Plan irregularity identifying potential torsional behaviour.
- unfilled unreinforced concrete hollow block masonry walls.

Units 5-9

- Fewer lateral load-resisting walls along the perimeter of the building.
- unfilled unreinforced concrete hollow block masonry walls.

Seismic Parameters

The seismic design parameters based on current design requirements from NZS 1170.5:2004 and the NZBC clause B1 for this building are:

- Site soil class: D NZS 1170.5:2004, Clause 3.1.3, Soft Soil.
- Site hazard factor, Z = 0.3 NZBC, Clause B1 Structure, Amendment 11 effective from 19 May
- Return period factor R_u = 1 NZS 1170.5:2004, Table 3.5, Importance Level 2 structure with a 50 year design life.
- Near fault factor N(T,D) = 1 NZS 1170.5:2004, Clause 3.1.6, Distance more than 20 km from fault line.



10.5 Results of Seismic Assessment

Units 1-4

The results of our quantitative assessment indicate the building has a seismic capacity of approximately 40%NBS and is governed by out of plane capacity of the unreinforced and unfilled concrete block masonry walls. This is lower than the value of 45%NBS stated in our previous Qualitative Report dated 4 Oct 2012. Table 10.1 presents the evaluated seismic capacity in terms of %NBS of the individual structural systems in each building direction.

Table 10.1: Summary of Seismic Assessment of Structural Systems for Units 1-4

Item	Loading Direction	Ductility μ	Seismic Performance	Notes
Overall %NBS adopted from DEE	Face Loading	1.0	42%NBS	Governed by rocking of URM wall
Unfilled URM Walls (in-plane)	Transverse (E-W)	1.0	48%NBS	Governed by shear capacity of wall
Unfilled URM Walls (out-of plane)	Face loading	1.0	42%NBS	Assessed as per Section 10.3 of NZSEE AISPBE guidelines April 2012
Timber framed walls with plasterboard linings (in-plane)	Longitudinal N-S	2.0	53%NBS	-

Note: Ductility factors are based on NZSEE recommendations.

Units 5-9

The results of our quantitative assessment indicate the building has a seismic capacity of approximately 40%NBS and is governed by out of plane capacity of the unreinforced and unfilled concrete block masonry walls. This is lower than the value of 45%NBS stated in our previous Qualitative Report dated 4 Oct 2012. Table 10.2 presents the evaluated seismic capacity in terms of %NBS of the individual structural systems in each building direction.



Table 20.2: Summary of Seismic Assessment of Structural Systems for Units 5-9

Item	Loading Direction	Ductility μ	Seismic Performance	Notes
Overall %NBS adopted from DEE	Face Loading	1.0	42%NBS	Governed by rocking of URM wall
URM Walls (in-plane)	Transverse (E-W)	1.0	54%NBS	Governed by shear capacity of wall
URM Walls (out-of plane)	Face loading	1.0	42%NBS	Assessed as per Section 10.3 of NZSEE AISPBE guidelines April 2012
Timber framed walls with plasterboard linings (in-plane)	Longitudinal N-S	2.0	48%NBS	-

Note: Ductility factors are based on NZSEE recommendations.

11 Recommendations

11.1 Occupancy

In order that the owner can make an informed decision about the on-going use and occupancy of their building the following information is presented in line with the Department of Building and Housing document 'Guidance for engineers assessing the seismic performance of non-residential and multi-unit residential buildings in greater Christchurch', June 2012.

Both buildings are not considered to be Earthquake Prone, but are considered to be Earthquake Risk, having an assessed capacity of approximately 40%NBS, and are classified as Seismic Grade C. The risk of collapse of an earthquake prone building of this grade is considered to be 5 to 10 times greater than that of an equivalent new building.

For greater Christchurch the definition of a "dangerous" building in the Building Act has been extended (by the Canterbury Earthquake (Building Act) Order 2011) to include buildings at risk of collapsing in a moderate earthquake, that is earthquake prone buildings with a capacity at or below 33% NBS. Where council requires a dangerous building or an earthquake prone building to be upgraded, it may prohibit the use of the building until the works are carried out.

No significant damage or hazards were identified to the seismic or gravity load resisting system that would further reduce its ability to resist further loads.

In accordance with CCC guidance/policy document 'Guidance for Engineers 2' dated 10 May 2012; no restrictions are required to the occupancy of the building.

11.2 Further Investigations, Survey or Geotechnical Work

Our recommendations are as follows:

 Foundations are exposed to confirm suitability of assumptions and damage as part of a subsequent Damage Assessment reporting.



 A verticality and level survey could be carried out to determine the extent of settlement of the building for insurance purposes.

11.3 Damage Reinstatement

Repairs that would bring the building back to an "as new" condition are typically entitled under typical replacement insurance policies. We suggest you consult with your insurance advisor as to how you wish to proceed.

12 Design Features Report

Repairs will be required to reinstate the existing structural system. A repair methodology has not been prepared at this stage. No new load paths are expected as a result of the repairs required.

13 Limitations

The following limitations apply to this engagement:

- Beca and its employees and agents are not able to give any warranty or guarantee that all defects, damage, conditions or qualities have been identified.
- Inspections are primarily limited to visible structural components. Appropriate locations for invasive inspection, if required, will be based on damage patterns observed in visible elements, and review of the construction drawings and structural system. As such, there will be concealed structural elements that will not be directly inspected.
- The inspections are limited to building structural components only.
- Inspection of building services, pipework, pavement, and fire safety systems is excluded from the scope of this report.
- Inspection of the glazing system, linings, carpets, claddings, finishes, suspended ceilings, partitions, tenant fit-out, or the general water tightness envelope is excluded from the scope of this report.
- The assessment of the lateral load capacity of the building is limited by the completeness and accuracy of the drawings provided. Assumptions have been made in respect of the geotechnical conditions at the site and any aspects or material properties not clear on the drawings. Where these assumptions are considered material to the outcome further investigations may be recommended. It is noted the assessment has not been exhaustive, our analysis and calculations have focused on representative areas only to determine the level of provision made. At this stage we have not undertaken any checks of the gravity system, wind load capacity, or foundations.
- The information in this report provides a snapshot of building damage at the time the detailed inspection was carried out. Additional inspections required as a result of significant aftershocks are outside the scope of this work.

This report is of defined scope and is for reliance by CCC only, and only for this commission. Beca should be consulted where any question regarding the interpretation or completeness of our inspection or reporting arises.

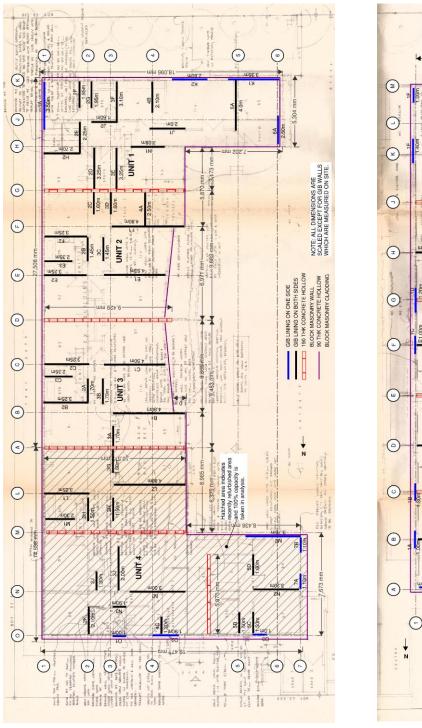


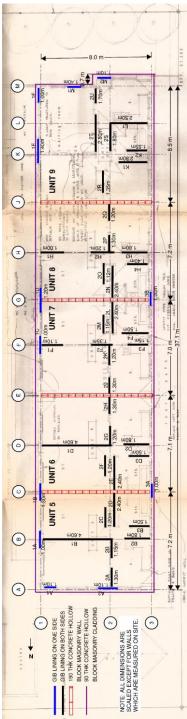
Appendix A

Building Plans and Photographs



Figure A1: Site plan for YWCA housing blocks





Plan of Units 1-4

Plan of Units 5-9

Figure A2: Building Plans

Units 1-4



Photo 1: External view of YWCA Units 1-4



Photo 2: Damage to 90 block wall cladding

Damage: Stepped cracking in block wall (crack width up to 5mm)



Photo 3: Damage to external raised slab.

Damage: Cracking to concrete slab and minor spalling.



Photo 4: Damage to plasterboard wall lining.

Damage: Cracking to plasterboard due to seismic displacement.

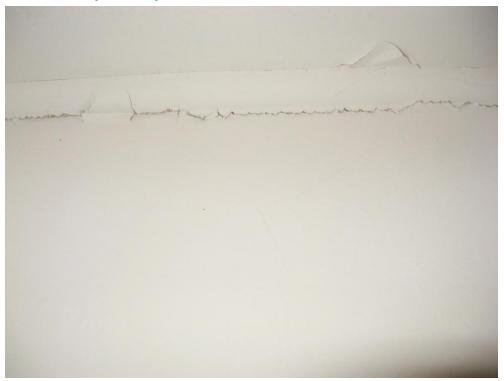


Photo 5: Typical damage at plasterboard ceiling connection to masonry walls.

Damage: Cracking to plasterboard due to relative movement between ceiling and concrete masonry wall.



Photo 6: Damage to plasterboard wall lining.

Damage: Cracking to plasterboard due to seismic displacement.



Photo 7: Separation of brick veneer cladding from timber framed wall.

Damage: Movement of brick veneer cladding due to damage to ties.



Photo 8: Damage to block wall and foundation wall.

Damage: Stepped cracking through mortar joints in block wall and cracking through foundation wall.



Photo 9: Damage to block wall cladding.

Damage: Stepped cracking in block wall (width of up to 5mm) and cracking to sill tiles.



Photo 10: Damage to raised concrete slab.

Damage: Cracking to concrete slab.



Photo 11: Damage to concrete masonry walls between units 2 and 3.

Damage: Stepped cracking through concrete masonry mortar joints.

Units 5-9



Photo 12: External view of YWCA Units 5-9 (front)



Photo13: External view of YWCA Units 5-9 (Side)

Units 5-9 (cont'd)



Photo 14: Separation of wall from ground slab at the entrance to unit 6. Shows differential settlement may have occurred.

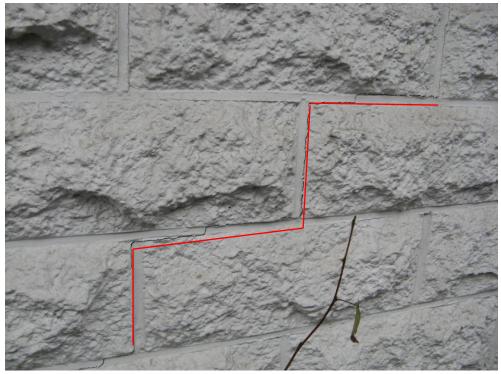


Photo 15: Damage to block wall

Damage: Stepped cracking in brick veneer.

Units 5-9 (cont'd)



Photo 16: Damage to perimeter foundation.

Damage: Cracking to concrete perimeter strip foundation.



Photo 17: Damage to internal fit out.

Damage: Cracking of plasterboard lining at joint due to movement.

Units 5-9 (cont'd)



Photo 18: Typical damage at plasterboard ceiling connection to masonry walls.

Damage: Opening of joint due to relative movement between ceiling and concrete masonry.

Appendix B

CERA DEE Summary Data

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Interim occupancy recommendations full occupancy Assessed %NBS before: Assessed %NBS after: 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): 1965-1976 he from above: 3m	Current Placard Status green Damage ratio 100% Describe (summary) Describe (summary) Describe (summary) Damage _ Ratio = (% NBS (before) - % NBS (after)) % NBS (before) Describe: Cracking in plasterboard linings CSWs: Damage? Ino Describe: Cracking in plasterboard linings and Describe: Cracking in plasterboard lining
Assessed %NBS after: methodology: Assessed %NBS before: 55% ##### %NBS from IEP below Assessed %NBS after: 55% ##### %NBS from IEP below With the second	Current Placard Status green Jamage ratio 100% Describe (summary) Describe (summary) Describe (summary) Describe (summary) Damage _ Ratio = (% NBS (before) - % NBS (after)) % NBS (before) Describe (Cracking in plasterboard linings SWs: Damage? Ino Describe: Des
Assessed %NBS after: methodology: Assessed %NBS before: 55% ##### %NBS from IEP below Assessed %NBS after: 55% ##### %NBS from IEP below With the second	Current Placard Status green Jamage ratio 100% Describe (summary) Describe (summary) Describe (summary) Describe (summary) Damage _ Ratio = (% NBS (before) - % NBS (after)) % NBS (before) Describe (Cracking in plasterboard linings SWs: Damage? Ino Describe: Des
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Assessed %NBS after: 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):1965-1976 he from above: 3m	Current Placard Status green Jong Damage ratio 100% Describe (summary): Loross Damage ratio Describe (summary): Japhragms Damage? [ves Describe: [Cracking in plasterboard linings and Describe: [Cracking
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): 3m	Current Placard Status green Nong Damage ratio 100% Describe (summary): 100% Describe (summary)
Period of design of building (from above):1965-1976 hn from above: 3m	Current Placard Status green Damage ratio
Period of design of building (from above):1965-1976 hn from above: 3m	Current Placard Status green Damage ratio
	Current Placard Status green Damage ratio
	Current Placard Status green Damage ratio
DOLLEGUIS AGE OF DISIGNAL	Current Placard Status green Damage ratio
not required for this age of building	Current Placard Status green Jong Damage ratio Describe (summary): Loross Damage ratio Describe: Lorostroe: Lor

Period (from above):

along 0.4 across 0.4

Note:1 for specifical 2.2 Near Fault Scaling Factor 2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor 2.5 Ductility Scaling Factor	lly design public buildings, to the code of the	Note	Note 2: for RC building 3: for buildings designed prior Final (%NBS).com: Near Fauling factor (1/N(T,D),Factor A:	ngs designed between 197 to 1935 use 0.8, except in along 0% itt scaling factor, from NZS along #DIV/01 factor Z for site from AS11	8-1984, use 1.2 Wellington (1.0	across 0% across #DIV/0!
2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor	N		93: for buildings designed prior Final (%NBS) _{hom} : Near Fau ling factor (1/N(T,D),Factor A:	along 0% It scaling factor, from NZS: along #DIV/OI factor Z for site from ASI Z1092, from	1170.5, cl 3.1.6	0% across
2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor	N		Final (%NBS)nom: Near Fau ling factor (1/N(T,D),Factor A:	along 0% it scaling factor, from NZS: along #DIV/0! factor Z for site from AS11 Z1992, from	1170.5, cl 3.1.6	0% across
2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor	N	Near Fault scali	Near Fauling factor (1/N(T,D),Factor A:	0% It scaling factor, from NZS: along #DIV/0! factor Z for site from AS11 Z1992, from	70.5, Table 3.3	0% across
2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor	N	Near Fault scali	Near Fauling factor (1/N(T,D),Factor A:	alt scaling factor, from NZS: along #DIV/0! factor Z for site from AS11 Z1992, from	70.5, Table 3.3	across
2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor	N	Near Fault scali	ling factor (1/N(T,D),Factor A:	along #DIV/0! factor Z for site from AS11 Z1992, from	70.5, Table 3.3	
2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor	N	Near Fault scali	ling factor (1/N(T,D),Factor A:	along #DIV/0! factor Z for site from AS11 Z1992, from	70.5, Table 3.3	
2.4 Return Period Scaling Factor	N	Near Fault scali		#DIV/0! factor Z for site from AS11 Z ₁₉₉₂ , from		
2.4 Return Period Scaling Factor	N	Near Fauit Scaii		factor Z for site from AS11 Z ₁₉₉₂ , from		#DIV/0!
2.4 Return Period Scaling Factor			Hazard	Z1992, from		
					NZS4203:1992	
				riazard scalling is	ictor, Factor B:	#DIV/0!
2.5 Ductility Scaling Factor			Datum Dadi	Building Importance lev od Scaling factor from Table		2
2.5 Ductility Scaling Factor			Return Pend	od Scaling lactor from Table	e 3.1 Factor C.	
2.5 Ductility Scaling Factor				along		across
			lity (less than max in Table 3.2)		
	Ductility scaling factor: =1 from 1976	6 onwards; or =	= μ, if pre-1976, from Lable 3.3			
		Duc	ctiity Scaling Factor, Factor D:	0.00		0.00
2.6 Structural Performance Scaling	Easter		Sp:			
2.0 Su uctural Performance Scaling	ractor.		Sp:			
	Struc	uctural Performa	nance Scaling FactorFactor E:	#DIV/0!		#DIV/0!
2.7 Baseline %NBS, (NBS%) = (%NB	S)nom x A x B x C x D x E		%NBS:	#DIV/0!		#DIV/0!
Global Critical Structural Weaknesses	(refer to NZSEE IEP Table 3.4)					
3.1. Plan Irregularity, factor A:	insignificant	1				
3.2. Vertical irregularity, Factor B:	insignificant	1				
3.3. Short columns, Factor C:	insignificant	1	Table for selection of D1	Seve		
				Separation 0 <sep<.< td=""><td></td><td></td></sep<.<>		
3.4. Pounding potential	Pounding effect D1, from Table to right ght Difference effect D2, from Table to right	h+ 1.0	Alignment of floors with			1
110	gitt billerence ellect bz, nom rable to right		Alignment of floors not with	in 20% of H 0.4	0.7	0.8
	Therefore, Factor D:): 1	Table for Selection of D2	Seve	re Significar	nt Insignificant
3.5. Site Characteristics	insignificant			Separation 0 <sep<.< td=""><td></td><td></td></sep<.<>		
3.5. Site Characteristics	irisigniiicani		Height difference	> 4 storeys 0.4	0.7	1
			Height difference 2	to 4 storeys 0.7	0.9	1
			Height difference	< 2 storeys 1	1	1
				Along		Across
3.6. Other factors, Factor F	For ≤ 3 storeys, max value :		se max valule =1.5, no minimul			
		Rationale	le for choice of F factor, if not 1			
Detail Critical Structural Weaknesses	(refer to DEE Procedure section 6)	_				
List any:		Refer also sec	ection 6.3.1 of DEE for discussion	on of F factor modification f	or other critical structural	weaknesses
3.7. Overall Performance Achieveme	ent 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 Standa	rd (%NBS), (before)					#DIV/0!
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					

Location						
	Duilding Name	DOMO A LIGHT E O			Periousal	David Whiteless
	Building Name	YWCA Units 5-8 Unit	No:	Street	Reviewer: CPEng No:	David Whittaker 123089
	Building Address Legal Description	285 Hereford Street, Christchurch			Company: Company project number:	
	Legal Description		J		Company phone number	
	GPS south:	Degrees	Min	Sec	Date of submission:	27/06/2013
	GPS east				Inspection Date:	7/08/2012
	Building Unique Identifier (CCC)	Princes and			Revision:	
	Building Unique Identifier (CCC)	.BU2311-002			Is there a full report with this summary?	yes
iite						
	Site slope		1		Max retaining height (m)	0
	Soil type Site Class (to NZS1170.5)	D			Soil Profile (if available)	
	Proximity to waterway (m, if <100m)	D			If Ground improvement on site, describe	N/A
	Proximity to clifftop (m, if < 100m)					
	Proximity to cliff base (m,if <100m)		J		Approx site elevation (m)	
uilding	No. of storeys above ground		1	single storey = 1	Ground floor elevation (Absolute) (m)	
	Ground floor split	no		single storey = 1	Ground floor elevation above ground (m)	: 0.00
	Storeys below ground	0			75	
	Foundation type Building height (m)	other (describe) 3.50		height from ground to level of	if Foundation type is other, describe uppermost seismic mass (for IEP only) (m)	: 3.5
	Floor footprint area (approx)	340				
	Age of Building (years)	47	ļ		Date of design:	1965-1976
	Strengthening present	no			If so, when (year)?	
	Use (ground floor)	multi-unit residential	1		And what load level (%g)? Brief strengthening description	'
	Use (upper floors)				End of only in the state of the	
	Use notes (if required)					
	Importance level (to NZS1170.5)	ĮILZ	J			
Fravity Structure						
	Gravity System:	load bearing walls			rafter type purio because of all the	
	Floors				rafter type, purlin type and cladding joist depth and spacing (mm)	
	Beams	timber			type	
	Columns	load bearing walls partially filled concrete masonry			typical dimensions (mm x mm) thickness (mm)	
					ulicatiess (IIIII)	
ateral load resisting s	structure	lightweight timber from a decide		Note: Define plans and accomp	note to rively less 11 / 14	Approx 40m
	Lateral system along Ductility assumed, µ:	lightweight timber framed walls 2.00		Note: Define along and across in detailed report!	note typical wall length (m)	гърргод. 40111
	Period along				estimate or calculation?	estimated
	Total deflection (ULS) (mm)				estimate or calculation?	
maxii	timum interstorey deflection (ULS) (mm)		J		estimate or calculation?	
						Partially filled CMU and timber framed
	Lateral system across Ductility assumed, µ:	other (note)			describe system	walls
	Period across				estimate or calculation?	estimated
	Total deflection (ULS) (mm)				estimate or calculation?	
maxii	timum interstorey deflection (ULS) (mm)	t	J		estimate or calculation?	
Separations:						
	north (mm):			leave blank if not relevant		
	east (mm): south (mm):		-			
	west (mm):					
les steretural aleman	-1-					
Non-structural elemen	rius Stairs:		1			
	Wall cladding	brick or tile			describe (note cavity if exists)	Brick Veneer
	Roof Cladding				describe	Lightwight profiled metal sheeting
	Ceilings	timber frames plaster, fixed				
	Services(list):	Electrical, plumbing				
Available documenta						
	Architectura	none			original designer name/date	1
	Structural Mechanica	none			original designer name/date original designer name/date	
	Electrica	Hone			original designer name/date	
						<u> </u>
	Geotech repor				original designer name/date	
	Geotech repor					3
amage		none			oriğinal designer name/date	3
ite:	Site performance	none				
ite:	Site performance) Settlement	Good 0-25mm]		original designer name/date Describe damage [notes (if applicable)]	
ite:	Site performance) Settlement Differential settlement	Good 0-25mm 0-1:350]		original designer name/date Describe damage (notes (if applicable) notes (if applicable)	
ite:	Site performance) Settlement Differential settlement Liquefaction	Good 0-25mm 0-1:350 0-nose apparent]		original designer name/date Describe damage(notes (if applicable) notes (if applicable) notes (if applicable)	
ite:) Site performance Settlement Differential settlement Liquefaction Lateral Spread Differential alteral spread	Good 0-25mm 0-1:500 none apparent none apparent none apparent]		original designer name/date Describe damage[notes (if applicable)] notes (if applicable)	
ite:	Site performance) Settlement Differential settlement Luperfaction Lateral Spread Differential lateral spreac Ground cracks	Good 0-25mm 0-1350 none apparent none apparent none apparent none apparent			original designer name/date Describe damage notes (if applicable)	
ite: efer DEE Table 4-2)) Site performance Settlement Differential settlement Liquefaction Lateral Spread Differential alteral spread	Good 0-25mm 0-1350 none apparent none apparent none apparent none apparent			original designer name/date Describe damage[notes (if applicable)] notes (if applicable)	
te: efer DEE Table 4-2)	Site performance Settlement Differential settlement Liquefaction Lateral Spread Differential lateral spread Ground cracks Damage to area	Good 0-25mm 0-1.350 0-1.350 none apparent			original designer name/date Describe damage notes (if applicable)	
ite: efer DEE Table 4-2)	Site performance) Settlement Differential settlement Luperfaction Lateral Spread Differential lateral spreac Ground cracks	Good 0-25mm 0-1.350 0-1.350 none apparent]		original designer name/date Describe damage notes (if applicable)	
ite: efer DEE Table 4-2) uilding:	Site performance Settlement Differential settlement Luterlaction Lateral Spread Differential lateral spread Ground racks Damage to area Current Placard Status Damage ratio	Good 0-25mm 0-1350 none apparent			original designer name/date Describe damage[notes (if applicable)] notes (if applicable)	Minor damage not considered to reduce d
ite: refer DEE Table 4-2) uilding:	Site performance Settlement Differential settlement Liquefaction Lateral Spread Differential lateral spread Ground cracks Damage to area	Good 0-25mm 0-1350 none apparent			original designer name/date Describe damage notes (if applicable)	Minor damage not considered to reduce d
ite; efer DEE Table 4-2) <u>uilding:</u> long	Site performance Settlement Differential settlement Liquefaction Lateral Spread Differential lateral spreac Ground cracks Damage to area Current Placard Status Damage ratio Describe (summary)	Good 0-25mm 0-1:350 none apparent		mace Ratio = (%NBS (b	original designer name/date Describe damage notes (if applicable)	Minor damage not considered to reduce o
ite; efer DEE Table 4-2) <u>uilding:</u> long	Site performance Settlement Differential settlement Luterlaction Lateral Spread Differential lateral spread Ground racks Damage to area Current Placard Status Damage ratio	Good D-25mm 0-1:350 Inone apparent		$mage _Ratio = \frac{(\% NBS (b))}{9}$	original designer name/date Describe damage notes (if applicable)	Minor damage not considered to reduce d
tite: efter DEE Table 4-2) uilding: long cross	Site performance Settlement Differential settlement Liquefaction Lateral Spread Differential lateral spread Ground cracks: Damage to airea Current Placard Status Damage ratio Describe (summary) Damage ratio	Good 0-25mm 0-1:350 none apparent 100%		$mage _Ratio = \frac{(\% NBS)(b)}{9}$	Describe damage notes (if applicable) Notes	
uilding: long cross iaphragms	Site performance Settlement Differential settlement Liquefaction Lateral Spread Differential lateral sertlement Ground cracks: Damage to area Current Placard Status Damage ratio Describe (summary) Damage ratio Describe (summary)	Good 0-25mm 0-1350 none apparent 100%		$mage _Ratio = \frac{(\% NBS)(b)}{9}$	original designer name/date Describe damage[notes (if applicable) Describe how damage ratio arrived at the fore) - % NBS (after)) Describe (if applicable)	Minor damage not considered to reduce of Cracking in plasterboard linings
uilding: long cross iaphragms	Site performance Settlement Differential settlement Liquefaction Lateral Spread Differential lateral spread Ground cracks: Damage to airea Current Placard Status Damage ratio Describe (summary) Damage ratio	Good 0-25mm 0-1350 none apparent 100%		mage _Ratio = \frac{(\% NBS (b)}{9}	Describe damage notes (if applicable) Notes	
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itie: refer DEE Table 4-2) fullding: long cross biaphragms csWs: counding: lon-structural:	Site performance Settlement Differential settlement Liquefaction Lateral Spread Differential lateral spread Ground cracks Damage to area Current Placard Status Damage ratio Describe (summary) Damage ratio Describe (summary) Damage? Damage? Damage? Damage?	Good 0-25mm 0-1:350 none apparent none app		mage _Ratio = \frac{(\% NBS (b)}{9}	original designer name/date Describe damage[notes (if applicable)] Describe how damage ratio arrived at the properties of the properties	Cracking in plasterboard linings
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Period (from above):

along 0.2 across 0.4

Note:1 for specifical 2.2 Near Fault Scaling Factor 2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor 2.5 Ductility Scaling Factor	lly design public buildings, to the code of the	Note	Note 2: for RC building 3: for buildings designed prior Final (%NBS).com: Near Fauling factor (1/N(T,D),Factor A:	ngs designed between 197 to 1935 use 0.8, except in along 0% itt scaling factor, from NZS along #DIV/01 factor Z for site from AS11	8-1984, use 1.2 Wellington (1.0	across 0% across #DIV/0!
2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor	N		93: for buildings designed prior Final (%NBS) _{hom} : Near Fau ling factor (1/N(T,D),Factor A:	along 0% It scaling factor, from NZS: along #DIV/OI factor Z for site from ASI Z1092, from	1170.5, cl 3.1.6	0% across
2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor	N		Final (%NBS)nom: Near Fau ling factor (1/N(T,D),Factor A:	along 0% it scaling factor, from NZS: along #DIV/0! factor Z for site from AS11 Z1992, from	1170.5, cl 3.1.6	0% across
2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor	N	Near Fault scali	Near Fauling factor (1/N(T,D),Factor A:	0% It scaling factor, from NZS: along #DIV/0! factor Z for site from AS11 Z1992, from	70.5, Table 3.3	0% across
2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor	N	Near Fault scali	Near Fauling factor (1/N(T,D),Factor A:	alt scaling factor, from NZS: along #DIV/0! factor Z for site from AS11 Z1992, from	70.5, Table 3.3	across
2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor	N	Near Fault scali	ling factor (1/N(T,D),Factor A:	along #DIV/0! factor Z for site from AS11 Z1992, from	70.5, Table 3.3	
2.3 Hazard Scaling Factor 2.4 Return Period Scaling Factor	N	Near Fault scali	ling factor (1/N(T,D),Factor A:	along #DIV/0! factor Z for site from AS11 Z1992, from	70.5, Table 3.3	
2.4 Return Period Scaling Factor	N	Near Fault scali		#DIV/0! factor Z for site from AS11 Z ₁₉₉₂ , from		
2.4 Return Period Scaling Factor	N	Near Fauit Scaii		factor Z for site from AS11 Z ₁₉₉₂ , from		#DIV/0!
2.4 Return Period Scaling Factor			Hazard	Z1992, from		
					NZS4203:1992	
				riazard scalling is	ictor, Factor B:	#DIV/0!
2.5 Ductility Scaling Factor			Datum Dadi	Building Importance lev od Scaling factor from Table		2
2.5 Ductility Scaling Factor			Return Pend	od Scaling lactor from Table	e 3.1 Factor C.	
2.5 Ductility Scaling Factor				along		across
			lity (less than max in Table 3.2)		
	Ductility scaling factor: =1 from 1976	6 onwards; or =	= μ, if pre-1976, from Lable 3.3			
		Duc	ctiity Scaling Factor, Factor D:	0.00		0.00
2.6 Structural Performance Scaling	Easter		Sp:			
2.0 Su uctural Performance Scaling	ractor.		Sp:			
	Struc	uctural Performa	nance Scaling FactorFactor E:	#DIV/0!		#DIV/0!
2.7 Baseline %NBS, (NBS%) = (%NB	S)nom x A x B x C x D x E		%NBS:	#DIV/0!		#DIV/0!
Global Critical Structural Weaknesses	(refer to NZSEE IEP Table 3.4)					
3.1. Plan Irregularity, factor A:	insignificant	1				
3.2. Vertical irregularity, Factor B:	insignificant	1				
3.3. Short columns, Factor C:	insignificant	1	Table for selection of D1	Seve		
				Separation 0 <sep<.< td=""><td></td><td></td></sep<.<>		
3.4. Pounding potential	Pounding effect D1, from Table to right ght Difference effect D2, from Table to right	h+ 1.0	Alignment of floors with			1
110	gitt billerence ellect bz, nom rable to right		Alignment of floors not with	in 20% of H 0.4	0.7	0.8
	Therefore, Factor D:): 1	Table for Selection of D2	Seve	re Significar	nt Insignificant
3.5. Site Characteristics	insignificant			Separation 0 <sep<.< td=""><td></td><td></td></sep<.<>		
3.5. Site Characteristics	irisigniiicani		Height difference	> 4 storeys 0.4	0.7	1
			Height difference 2	to 4 storeys 0.7	0.9	1
			Height difference	< 2 storeys 1	1	1
				Along		Across
3.6. Other factors, Factor F	For ≤ 3 storeys, max value :		se max valule =1.5, no minimul			
		Rationale	le for choice of F factor, if not 1			
Detail Critical Structural Weaknesses	(refer to DEE Procedure section 6)	_				
List any:		Refer also sec	ection 6.3.1 of DEE for discussion	on of F factor modification f	or other critical structural	weaknesses
3.7. Overall Performance Achieveme	ent 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 Standa	ard (%NBS), (before)					#DIV/0!
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					

Appendix C

Previous Reports and Assessment

Inspector Initials Territorial Authority	Christchurch City	Date of Inspe Time	25/3/11 2:00	Exterior Only Exterior and Interior	V
Building Name Short Name Address	YWCA Well Housing.	1.00	ype of Construction		
GPS Co-ordinates Contact Name Contact Phone	So Eo		Timber frame J. Steel frame Tilt-up concrete Concrete frame RC frame with masonry infill	Concrete shear wall Unreinforced masonry Reinforced masonry Confined masonry Other:	i Vene
Storeys at and above ground level Total gross floor area (m²)	Below gro level Year built		imary Occupancy Dwelling Other residential	Commercial/Offices	
No of residential Units Photo Taken	10 approx.	19706	Public assembly School Religious	Industrial Government Heritage Listed Other	\$ 2
Investigate the building for Overall Hazards / Damag Collapse, partial collapse, off Building or storey leaning	e Minor/Non-		Severa	Comments	
Wall or other structural damage Dverhead falling hazard Ground movement, settlement Velghbouring building hazard Other	40000		☐ minar a ☐ GROS(a	cracks to Veneer	5
Choose a posting ba	ased on the evaluation and pealised Severe and overs all other placards at ever	d team judgement all Moderate condi y significant entra	Block Severe conditions affecting to tions may require a RESTRICT	he whole building are grounds for	collap or an card at
Record any restrict	INSPECTED GREEN ion on use or entry:		STRICTED USE YELLOW	UNSAFE RED.	
☐ Barricades are n	or <u>only</u> if further actions are received (state location); eeded (state location); ed engineering evaluation re tural		☐ Other:	60079.	,
None D-1 % D-10	Damage (Exclude Cont 31-60 % 61-99 % 100 %	ents)	Date & 7	Sign here on completion Sign here on completion Time 25/3/11	CPe :-

spector Initials			Date		Final	Postin (e.a.	g UNSAFE)
erritorial Authority	Christchurch Ch	ly	Time L				10000000000000000000000000000000000000
Bullding Name			Tyne	of Construction			
Short Name				Timber frame			Concrete shear wall
Address				Steel frame			Unreinforced masonry
		Eº		Till-up concrete			Reinforced masonry
GPS Co-ordinates	S ^o			Concrete frame			Confined masonry
Contact Name		<u> </u>		RC frame with masc	nry infill		Other:
Contact Phone		Below	Prim	ary Occupancy			
Storeys at and above ground level		ground	Sample Montage Control of Control	Dwelling			Commercial/ Offices
Total gross floor area (m²)		Year built	- Committee	Other residential			industrial Government
No of residential Units				Public assembly		П	Heritage Listed
				School		님	Other
Photo Taken	Yes	No		Religious		L please	Name of the state
vestigate the building fo	or the conditions lis	ited on page	1 and 2, and c	heck the appropriat	e column. <i>F</i>	i skelc	h may be added on page 3 Comments
verall Hazards / Dama	ige Mit	nor/None	Moderate	Severe			Collination
collapse, partial collapse, o	ff foundation .						
uilding or storey leaning							
Vall or other structural dam	iage		and the second				
Overhead falling hazard				Management .			
Ground movement, settlem	ent, slips	and the same of th		And a second sec			
Veighbouring building haza			- Constitution of the Cons	and the state of t			
Electrical, gas, sewerage, v				Employed			
		CONTRACTOR OF THE PROPERTY OF		par 2 4.5 m	r. [_	MS 00-100-100-100-100-100-100-100-100-100-
Record any	existing placard	on this buil	ding:	Existin Placard	e i Type	1	
				(e.g. Ul	VSAFE)		
	osting based on the JNSAFE posting. I	e new evalua .ocalised Sev ce. Post all o	tion and team ju ere and overall ther placards a	udgement. Severe c Moderate condition t every significant e	onditions at s may requi ntrance. Tra	ffecting re a Ri insfer f	n the whole building are ESTRICTED USE. Place the chosen posting to the top
Choose a new p grounds for an l INSPECTED plac of this page.	calu at mam circum						
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grounds for an INSPECTED plate of this page. INSI Record any res Further Action Tick the boxes Barricades Detailed er Other record Estimated Overall Bu	PECTED GREEN G1 striction on use of the commended: below only if further is are needed (state to be indineering evaluation of the commendations: idding Damage (E	G2 r entry: actions are recommended ixclude Control	RESTRICT commended ed Geotechnical	TED USE YELLOW Y1	Y2	F	RED R1 R2 R3

	g Damage				Cracks in Chimney. Front. Minu cracks to Veneer + Frant. Cracks to Slatos. Back Carage wells Collapsed.	
Usability Category Damage Intensity		Usa	bility Category	7	Remarks	
Light damage	Inspected (Green)	investiga	ole, no immediate eflon required ble, repairs requir			
Medium damage Medium risk	Restricted Use (Yellow)	Y1. Short ter Y2. No entry demolis	to parts until repa	aired or		
Heavy damage	Unsafe (Red)	strength	int damage; repai iening possible damage; demolitio			
High risk	,	R3. At risk fr	om adjacent pren ound failure	nises or		•

2 Inspection ID: _____ (Office Use Only)

Sketch (optional)
Provide a sketch of the entire
building or damage points. Indicate
damage points.

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ommendatio	ns for Repair and Reconstruction or Demolition (Optional)