Christchurch City Council

Greenhurst Courts Sockburn PRO 1563

Detailed Engineering Evaluation

Quantitative Assessment Report

Christchurch City Council

Greenhurst Courts

Quantitative Assessment Report

1-4 Takaro Avenue, Sockburn

Prepared By

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Date: March 2013
Reference: 6-QUCC2.21
Status: Final

Summary

Greenhurst Courts
PRO 1563

Detailed Engineering Evaluation
Quantitative Report - Summary
Final

Greenhurst Courts, 1-4 Takaro Avenue, Sockburn

Background
This is a summary of the quantitative report for the Greenhurst Courts Complex and it is based on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011, visual inspections on 19 January 2012, available drawings and calculations.

Key Damage Observed
Minor cracking to the external blockwork was observed as well as some minor cracking to a ceiling lining.

Critical Structural Weaknesses
No critical structural weaknesses have been identified for these buildings.

Indicative Building Strength
Based on available information and following a quantitative assessment, the buildings' original capacity has been assessed to be 44% NBS across the buildings, and therefore buildings are not considered earthquake prone in accordance with the Building Act 2004.

The buildings have a capacity of between 33%NBS and 67%NBS and are therefore defined as moderate earthquake risk under the NZSEE classification system and has a relative risk of failure of 5-10 times that of a building constructed to the New Building Standard. Based on the form of construction and the seismic load resisting systems present we do not believe that the buildings have a high risk of collapse. It is therefore considered that there is not a high risk imposed to building occupants.

Recommendations
It is recommended that:

a) Permanent strengthening options be developed for increasing the seismic capacity of the building to at least 67% NBS.
b) Ensure adequate fixings are provided between roof diaphragm and all timber and compartment walls.

Contents

1 Introduction

Opus International Consultants Limited has been engaged by Christchurch City Council (CCC) to undertake a detailed seismic assessment of the Greenhurst Courts buildings, located at 1-4 Takaro Avenue, Sockburn, Christchurch, following the Canterbury Earthquake Sequence since September 2010.

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

The seismic assessment and reporting have been undertaken based on the qualitative and quantitative procedures detailed in the Detailed Engineering Evaluation Procedure (DEEP) document (draft) issued by the Structural Engineering Society (SESOC) [2] [3] [4] [5].

2 Compliance

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

2.1 Canterbury Earthquake Recovery Authority (CERA)

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

Section 38 – Works

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

Section 51 – Requiring Structural Survey

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

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

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

1. The importance level and occupancy of the building.

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

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

2.2 Building Act

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

Section 112 - Alterations

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

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

Section 115 – Change of Use

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

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

Section 121 – Dangerous Buildings

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

1. In the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause injury or death or damage to other property; or
2. In the event of fire, injury or death to any persons in the building or on other property is likely because of fire hazard or the occupancy of the building; or
3. There is a risk that the building could collapse or otherwise cause injury or death as a result of earthquake shaking that is less than a 'moderate earthquake' (refer to Section 122 below); or
4. There is a risk that other property could collapse or otherwise cause injury or death; or

5. A territorial authority has not been able to undertake an inspection to determine whether the building is dangerous.

Section 122 – Earthquake Prone Buildings

This section defines a building as earthquake prone (EPB) if its ultimate capacity would be exceeded in a 'moderate earthquake' and it would be likely to collapse causing injury or death, or damage to other property.

A moderate earthquake is defined by the building regulations as one that would generate loads 33% of those used to design an equivalent new building.

Section 124 – Powers of Territorial Authorities

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

Section 131 – Earthquake Prone Building Policy

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

2.3 Christchurch City Council Policy

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

The 2010 amendment includes the following:

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

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

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

- The accessibility requirements of the Building Code.

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

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

2.4 Building Code

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

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

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

- Increased serviceability requirements.

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

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

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

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

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

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

3 Earthquake Resistance Standards

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

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

Description	Grade	Risk	%NBS	Existing Building Structural Performance
Low Risk Building	A or B	Low	Above 67	Acceptable (improvement may be desirable)
Moderate Risk Building	B or C	Moderate	34 to 66	Acceptable legally. Improvement recommended
High Risk Building	D or E	High	33 or lower	Unacceptable (Improvement required under Act)

Improvement of Structural Performance	
Legal Requirement	NZSEE Recommendation
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
	Not recommended. Acceptable only in exceptional circumstances
Unacceptable	Unacceptable

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

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

Table 1: %NBS compared to relative risk of failure

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

3.1 Minimum and Recommended Standards

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

3.1.1 Occupancy

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

3.1.2 Cordoning

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

3.1.3 Strengthening

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

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

3.1.4 Our Ethical Obligation

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

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

4 Building Description

4.1 General

The Greenhurst Courts development consists of three blocks which house 22 residential units as shown in Figure 2 below.

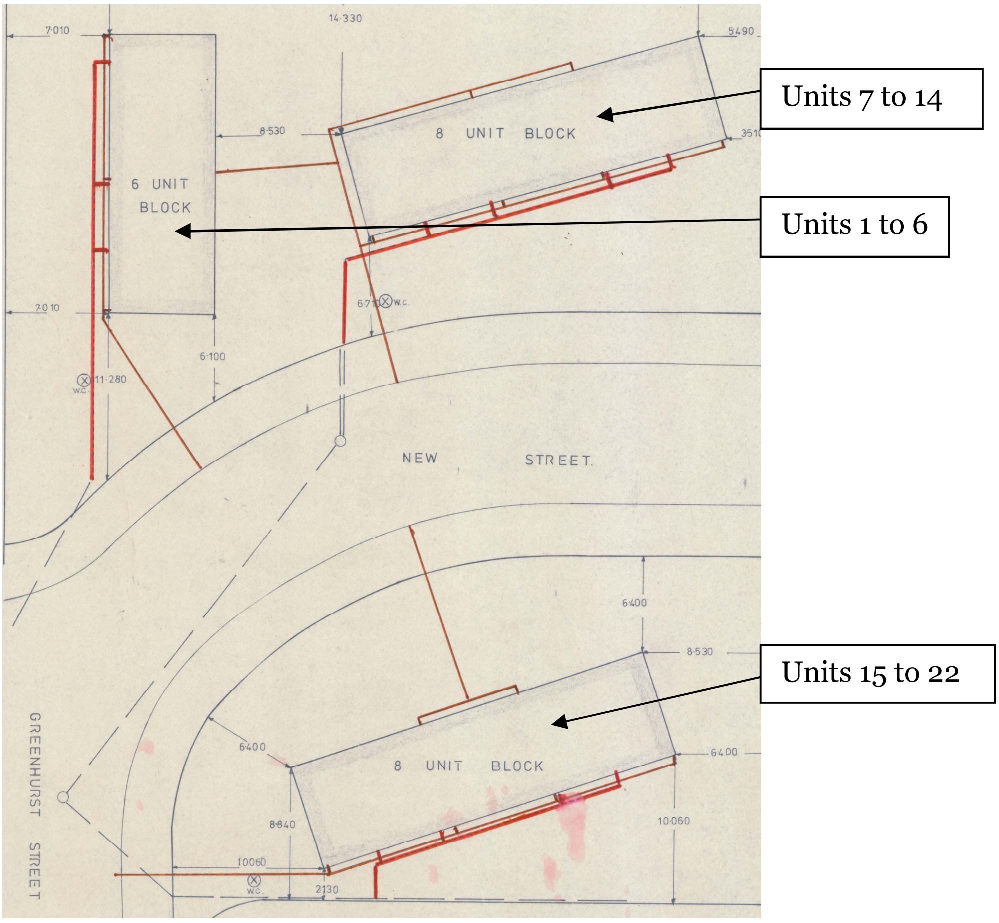


Figure 2: Greenhurst Courts Layout

Each block is a 2 storey structure with fully grouted masonry inter-tenancy walls extending to the underside of the roof line. Each unit has a timber trussed roof covered with concrete tiles and precast concrete first floor continuing throughout the whole building. Above the first floor level, each unit comprises a lightweight timber construction with timber framed walls and timber cladding. Below the first floor level, each unit comprises fully grouted masonry external walls and timber framed internal walls. All buildings have cantilever concrete walkways at the first floor level to provide access to upper units. Walkways are located along both the front and the rear of the building.

The buildings are founded on shallow strip foundations with an unreinforced ground bearing concrete slab.

Each unit is approximately 7.5m long by 6.3m wide. The apex of the roof is approximately 7m from ground level at the highest point. All internal walls are timber framed lined with gib-board on both sides.

The date of construction of the development is 1975.

4.2 Gravity Load Resisting System

The roof structure consists of timber trusses and is clad externally with concrete tiles. The roof trusses are supported by timber stud walls, which are 2.4m in height. These walls transfer roof loading to walls directly beneath them at the ground level. The compartment blockwork walls are load bearing and provide fire separation between adjacent units.

The first floor consists of precast concrete beams with hollow infill blocks and in-situ concrete structural topping and is primarily supported by the compartment masonry walls. However, a span reversal is used along the external perimeter to cantilever the slab to form balconies.

All load bearing and compartment walls are constructed on shallow foundation beams. The ground floor construction consists of unreinforced concrete slab-on-grade.

4.3 Seismic Load Resisting System

At the first storey level, seismic loads in both principal directions are resisted by timber stud walls lined with gib-board and blockwork compartment wall. The ceiling acts as a flexible diaphragm and distributes roof loadings to walls. No braces have been observed to the roof trusses.

At the ground storey level, seismic loads in both principal directions are resisted by perimeter and compartment blockwork walls. The concrete first floor with its in-situ concrete topping acts as a rigid diaphragm.

5 Survey

This report is based on structural drawings, site inspection records, and photographic evidence. The following site inspections were undertaken by Opus engineers:

- A rapid assessment was carried out by an Opus Structural Engineer on the 1st of April 2011 where a green placard was issued..
- A site visit by an Opus Structural Engineer on the 16th of November 2012.
- A site visit by an Opus Structural Engineer on the 18th of January 2013.

6 Damage Assessment

No evidence of ground liquefaction was observed during the rapid assessment survey and site visits.

No structural damage was observed to any of the units. A minor crack to external blockwork has been noted at one location (refer Appendix 1, photo 6).

Additionally, minor cracking to ceiling lining was recorded during the rapid assessment (refer Appendix 1, photo 7).

7 General Observations

The buildings have performed well under seismic conditions.

The main points of concern for the buildings on this site relate to cantilever balcony floors and “short column” effect on the walls, due to the numerous openings alongside the elevations.

Due to the non-intrusive nature of the original survey, many connection details could not be ascertained.

8 Detailed Seismic Assessment

The buildings capacities have been checked using a 2 stage analysis with seismic coefficients listed in Section 8.2. Additionally, a simplified modal analysis has been carried out for the buildings.

8.1 Critical Structural Weaknesses

As outlined in the Critical Structural Weakness and Collapse Hazards draft briefing document, issued by the Structural Engineering Society (SESOC) on 7 May 2011, 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 the building.

No CSW’s were identified for these buildings.

8.2 Seismic Coefficient Parameters

The seismic design parameters based on current design requirements from NZS1170.5:2004 and the NZBC clause B1 for this building are:

- 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 [1], for an Importance Level 2 structure with a 50 year design life
- μ = 1.25 for the blockwork walls below the first floor level
- μ = 2.0 for the timber frame with gib-board wall linings above the first floor level

8.3 Detailed Seismic Assessment Results

A summary of the structural performance of the buildings is shown in the following table. Note that the values given represent the worst performing elements in the building, as these effectively define the buildings’ capacities. Other elements within the building may have significantly greater capacity when compared with the governing element.

Table 2: Summary of Seismic Performance

Structural Element/System	Failure mode and description of limiting criteria	% NBS based on μ as above
Compartment wall in plane	In plane shear capacity.	92%
Compartment wall out-of-plane[1]	Out of plane bending capacity.	100%
First Floor: External Timber Wall perpendicular to the compartment wall	In plane bracing capacity of the timber stud wall. Insufficient information to assess connections.	46%
First Floor: Internal Timber Wall perpendicular to the compartment wall	In plane bracing capacity of the timber stud wall.	100%
First Floor: Internal Timber Wall parallel to the compartment wall	In plane bracing capacity of the timber stud wall.	100%
Ground Floor: compartment wall	In plane shear capacity.	100%
Ground Floor: wall be at rear elevation	In plane shear capacity.	48%
Ground Floor: wall at rear elevation	In plane bending capacity.	44%
Ground Floor: front elevation wall	In plane shear capacity.	54%

Note 1: The compartment wall is checked as being simply supported by the concrete floors and timber roof/ceiling.

8.4 Discussion of Results

The buildings have a calculated capacity of 44% NBS, as limited by the concrete blockwalls at the short section of rear elevation wall.

In addition, the inter-tenancy wall pounding might cause structural damage to adjacent timber ceiling and wall elements, if fixings to roof/ceiling diaphragm are not adequate.

As the buildings have an overall capacity above 34% NBS, they are not considered earthquake prone in accordance with the Building Act 2004.

The buildings have a capacity of between 33%NBS and 67%NBS and are therefore defined as moderate earthquake risk under the NZSEE classification system and has a relative risk of failure of 5-10 times that of a building constructed to the New Building Standard. Based on the form of construction and the seismic load resisting systems present we do not believe that the buildings have a high risk of collapse. It is therefore considered that there is not a high risk imposed to building occupants.

8.5 Limitations and Assumptions in Results

The analysis and assessment of the buildings was based on them being in an undamaged state. There may have been damage to the buildings that was unable to be observed during assessments that could cause the capacity of the buildings to be reduced; therefore the current capacity of the buildings may 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;
- Assessments of material strengths based only on site inspections and engineering judgment;
- 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.
- Construction is consistent with normal practise of the era in which constructed.

9 Geotechnical Assessment

No signs of liquefaction were observed during the surveys and due to a lack of observed ground damage, no geotechnical assessment has been carried out.

The buildings have been constructed on shallow strip footings with ground supported floor slabs. No significant differential settlement of the floor slabs has been observed.

The site has been classified by Canterbury Earthquake Recovery Authority (CERA) as Technical Category 1 where future land damage due to liquefaction is unlikely. See Figure 3 below.

Figure 3: Technical Categories Map - CERA

10 Remedial Options

Any remedial options for increasing the seismic capacity above 67% NBS would need to address the capacity of the short section of rear elevation wall.

Additionally, roof diaphragms might require improvement to ensure adequate restraint to blockwork compartment walls.

11 Conclusions

(a) The buildings have a seismic capacity of 44% NBS and are not classed as earthquake prone in accordance with the Building Act 2004.

(b) The seismic capacity is limited by the concrete blockwalls at the short sections of rear elevation wall.

12 Recommendations

(a) Permanent strengthening options should be developed to increase the seismic capacity of the building to at least 67% NBS.

(b) Inspection be undertaken to determine if adequate fixings are provided to roof/ceiling diaphragm and timber and masonry walls.

13 Limitations

(a) This report is based on an inspection of the structure with a focus on the damage sustained from the Canterbury Earthquake sequence only. Non–structural damage is not included in this report.

(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 the time.

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

14 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.

Appendix A – Photographs

Photo 1: Front Elevation Block 1

Photo 2: Front Elevation Block 2

Photo 3: Front Elevation Block 3

Photo 4: Rear Elevation Block 1

Photo 5: Rear Elevation Block 3

Photo 6: Cracking to Blockwork at Rear of Block 1

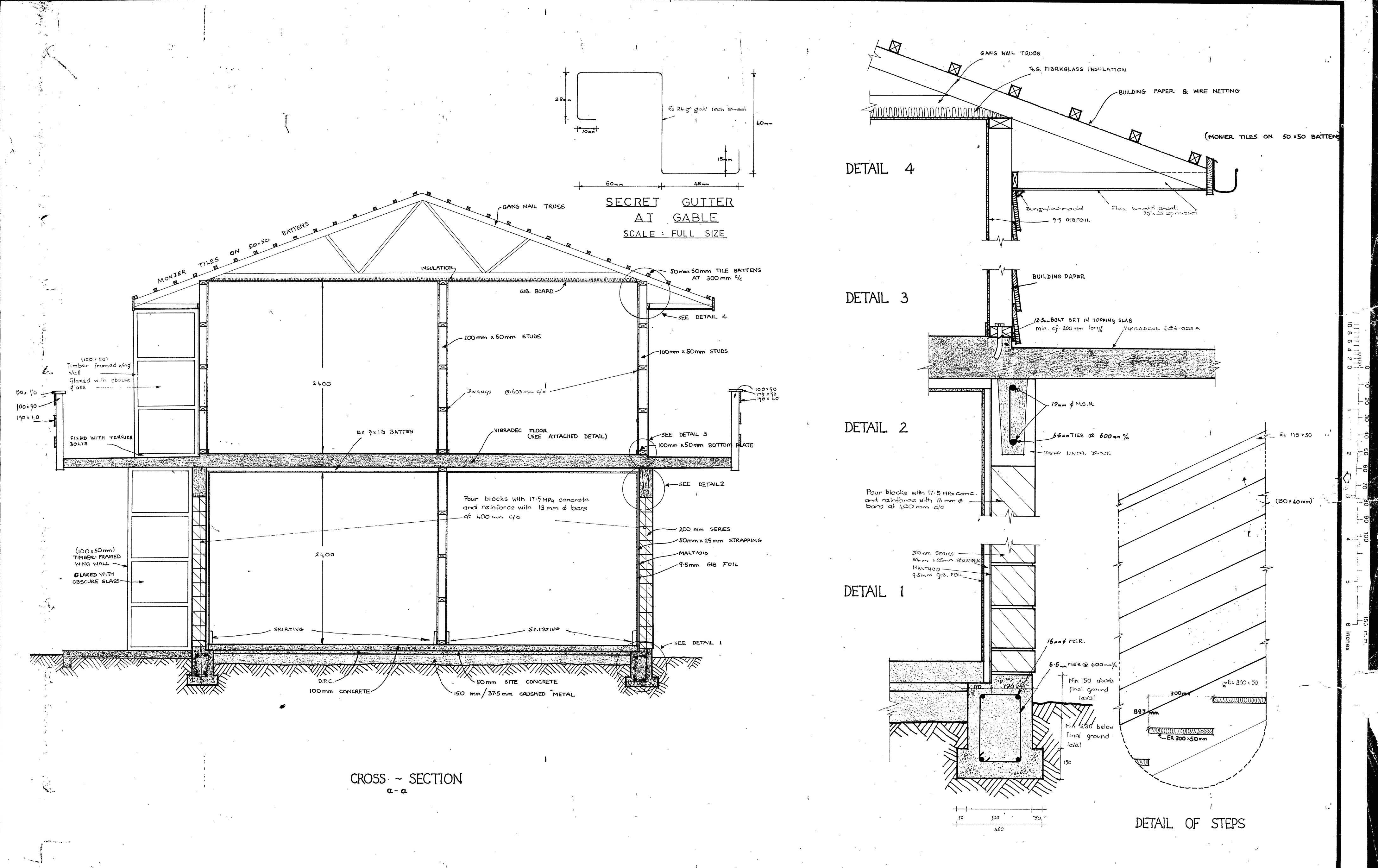
Photo 7: Minor Cracking to ceiling

Photo 8: Cracking to concrete pavement

Photo 9: Block 1, Unit 19 Roof Space

Photo 10: Block 1, Unit 20 Roof Space

Appendix B – Existing Drawings



Amendments	Initial	Date		Initial	Date
			Surveyed		
			Drawn		
			Designed		
			Traced	C.W. HADLEE	DEC: 74
			Checked		
			Filed		

PAPARUA COUNTY COUNCIL

PENSIONER COTTAGES for GREENHURST STREET

APPROVED
M.N.Z.I.E.
County Engineer

Datum	Book	Page	Initial	Date
Survey Levels				

SCALE ½" to 1'-0"
1½" to 1'-0"

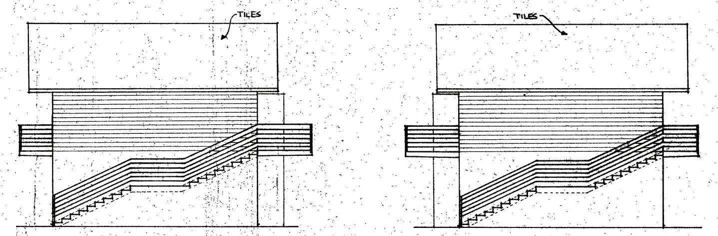
Issue

DWG No 643/2A

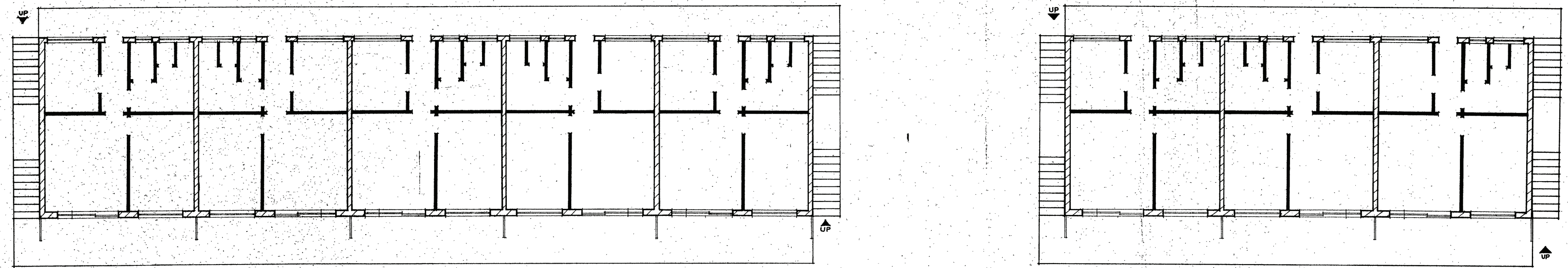
Sheet No TWO of sheets

A1

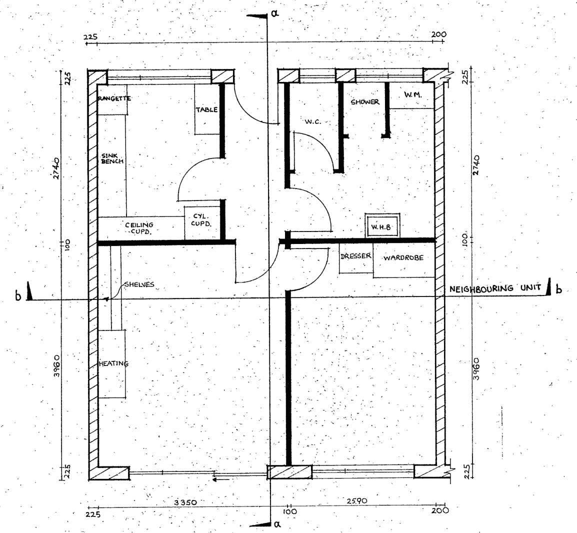
FRONT ELEVATION



END ELEVATIONS

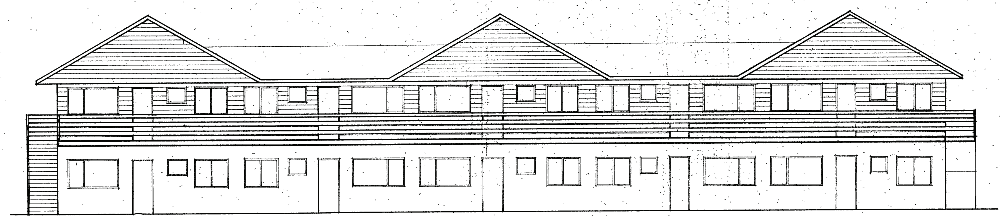


PLAN. SCALE 1:96



UNIT FLOOR PLAN

all dimensions in millimetres.



REAR ELEVATION

Amendments	Initial	Date		Initial	Date
			Surveyed		
			Drawn		
			Designed		
			Traced	C.W.HADLEE	DEC.-74
			Checked		
			Filed		

PAPARUA COUNTY COUNCIL

PENSIONER COTTAGES for GREENHURST STREET

APPROVED				
M.N.Z.I.E. County Engineer				
Datum				
	Book	Page	Initial	Date
Survey				
Levels				

SCALE 1:96 (1/8" to 1'-0")
1:48 (1/4" to 1'-0")

Issue

DWG Nº

Sheet Nº ONE of sheets

Appendix C – CERA DEE Spreadsheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Greenhurst Courts	Reviewer:	Mary Ann Halliday
		CPEng No:	67073
Building Address:	1 to 4 (Unit No:) Takaro Ave, Sockburn (Street)	Company:	Opus International Consultants
Legal Description:		Company project number:	6-QUCC2.21
		Company phone number:	(09) 3559500
GPS south: (Degrees / Min / Sec)		Date of submission:	18-Mar-13
GPS east:		Inspection Date:	
		Revision:	Final
Building Unique Identifier (CCC):	PRO 1563	Is there a full report with this summary?	yes

Site

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

Building

No. of storeys above ground:	2	single storey = 1	Ground floor elevation (Absolute) (m):
Ground floor split?	no	Ground floor elevation above ground (m):	
Storeys below ground	0		
Foundation type:	strip footings	if Foundation type is other, describe:	
Building height (m):	7.00	height from ground to level of uppermost seismic mass (for IEP only) (m):	3.4
Floor footprint area (approx):	26		
Age of Building (years):	7	Date of design:	1965-1976
Strengthening present?	no	If so, when (year)?	
		And what load level (%g)?	
Use (ground floor):	multi-unit residential	Brief strengthening description:	
Use (upper floors):			
Use notes (if required):			
Importance level (to NZS1170.5):	IL2		

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber truss	truss depth, purlin type and cladding	1.8m at the appex, timber purlins,
Floors:	concrete flat slab	slab thickness (mm)	unknown
Beams:			
Columns:			
Walls:			

Lateral load resisting structure

Note: Define along and across in detailed report!

Lateral system along:	other (note)		describe system	timber and masonry walls
Ductility assumed, μ:	1.25			
Period along:	0.40	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	other (note)		describe system	timber and masonry walls
Ductility assumed, μ:	1.25			
Period across:	0.40	0.00	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:	steel	describe supports	lightweight, external
Wall cladding:	other light	describe	timber board
Roof Cladding:	Other (specify)	describe	concrete tiles
Glazing:			
Ceilings:	strapped or direct fixed		Gib board
Services(list):			

Available documentation

Architectural	partial	original designer name/date	n/a
Structural	partial	original designer name/date	n/a
Mechanical	none	original designer name/date	
Electrical	none	original designer name/date	
Geotech report	none	original designer name/date	

Damage

Site: (refer DEE Table 4-2)

Site performance:		Describe damage:	none observed
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:		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:	100%	Describe how damage ratio arrived at:	
	Describe (summary):			
Across	Damage ratio:			
	Describe (summary):			
Diaphragms	Damage?:	no	Describe:	
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	no	Describe:	

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

Recommendations

	Level of repair/strengthening required:	minor structural	Describe:	increase external masonry walls capacity
	Building Consent required:	yes	Describe:	
	Interim occupancy recommendations:	full occupancy	Describe:	
Along	Assessed %NBS before:	44%	0% %NBS from IEP below	If IEP not used, please detail assessment methodology: Quantitative
	Assessed %NBS after:			
Across	Assessed %NBS before:	92%	0% %NBS from IEP below	
	Assessed %NBS after:			

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