Christchurch City Council

Thurso Place Complex PRO 1321

Detailed Engineering Evaluation

Quantitative Assessment Report

Christchurch City Council

Thurso Place Complex

Quantitative Assessment Report

2 Thurso Place, Christchurch

Prepared By

Soon Ong
Structural Engineer

Reviewed & Approved By

Mary Ann Halliday
Senior Structural Engineer

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

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

Date: June 2013
Reference: 6-QUCC1.91
Status: Final

Summary

Thurso Place Complex
PRO 1321

Detailed Engineering Evaluation
Quantitative Report – SUMMARY
Final

2 Thurso Place, New Brighton, Christchurch

Background
This is a summary of the quantitative assessment report for the Thurso Place Complex located at 2 Thurso Place, New Brighton, Christchurch, and is based on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011, visual inspections on 22 and 29 August 2012 and available drawings.

Key Damage Observed
- Minor to moderate cracking to internal plasterboard lined walls and ceilings.
- Fallen block veneer to both ends of gable roof.
- Horizontal cracks to external block veneer.

Other Key Observations
An intrusive investigation to the bracing wall behind the wardrobe in Unit 1 revealed only nominal fixing between the plasterboard and the timber framing. The nail pattern was even less than the minimum required during the period of construction.

This has now been remediated in all the units by installing additional screw fixings.

Critical Structural Weakness
No critical structural weaknesses were identified for this building.

Indicative Building Strength (from quantitative assessment)
Based on the information available and remedial works undertaken, and from undertaking a quantitative assessment, the building's seismic capacity have been assessed to be 69% NBS and is considered to be low risk in accordance with the Building Act 2004.

Contents

1 Introduction

Opus International Consultants Limited (Opus) has been engaged by Christchurch City Council (CCC) to undertake a detailed seismic assessment of the Thurso Place Complex located at 2 Thurso Place, New Brighton, Christchurch following the M6.3 Christchurch earthquake on 22 February 2011.

This report is a Stage Two quantitative assessment of the building structure, and is based on the qualitative and quantitative procedures detailed in the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Engineering Society (SESOC) on 19 July 2011 [2]. In order to expedite the detailed evaluation procedure, the qualitative assessment was not undertaken. However this report incorporates the key aspects of a qualitative assessment.

2 Compliance

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

2.1 Canterbury Earthquake Recovery Authority (CERA)

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

Section 38 – Works

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

Section 51 – Requiring Structural Survey

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

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

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

1. The importance level and occupancy of the building.

2. The placard status and amount of damage.

3. The age and structural type of the building.
4. Consideration of any critical structural weaknesses.

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

2.2 Building Act

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

Section 112 - Alterations

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

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

Section 115 – Change of Use

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

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

Section 121 – Dangerous Buildings

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

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

Section 122 – Earthquake Prone Buildings

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

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

Section 124 – Powers of Territorial Authorities

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

Section 131 – Earthquake Prone Building Policy

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

2.3 Christchurch City Council Policy

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

The 2010 amendment includes the following:

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

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

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

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

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

2.4 Building Code

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

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

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

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

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

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

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

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

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

3 Earthquake Resistance Standards

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

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

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

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

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

Table 1: %NBS compared to relative risk of failure

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

3.1 Minimum and Recommended Standards

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

3.1.1 Occupancy

The Canterbury Earthquake Order[1] in Council 16 September 2010, modified the meaning of "dangerous building" to include buildings that were identified as being EPB's. As a result of this, we would expect such a building would be issued with a Section 124 notice, by the Territorial Authority, or CERA acting on their behalf, once they are made aware of our

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

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.

4 Background Information

4.1 Building Description

The Thurso Place Complex, located at 2 Thurso Place, Christchurch, is a residential complex built in 1975 and is currently managed by CCC.

The complex is a single storey timber structure consisting of a row of 4 single bedroom residential units, each separated by concrete block party wall. It has a concrete tiled gable roof supported on timber trusses. The external walls are cladded with Summerhill Stone and the internal ceiling and walls are lined with plasterboard. Each unit is approximately 7m long by 6m wide; and the overall building is approximately 28m long by 6m wide. The height of the roof apex is 3.2 m above ground level.

The Thurso Place Complex is north facing. For the purpose of this report, we refer to the direction parallel to Thurso Place as east-west (longitudinal) and the perpendicular direction as north-south (transverse).

Figure 2: Thurso Place Complex Site Location

4.2 Gravity Load Resisting System

The building roof gravity loads are resisted by transversely spanning gangnail timber trusses at 900mm centres supported on perimeter timber load bearing walls or lintels at door/window openings.

4.3 Lateral Load Resisting System

In the transverse direction, the lateral load at the roof level is transferred to the internal timber bracing walls and the concrete blockwalls via the ceiling diaphragm and the transverse timber trusses. The longitudinal lateral loads are transferred to the external and internal walls via the ceiling diaphragm as well. An overview of the key lateral resisting elements is as shown in Figure 3 below.

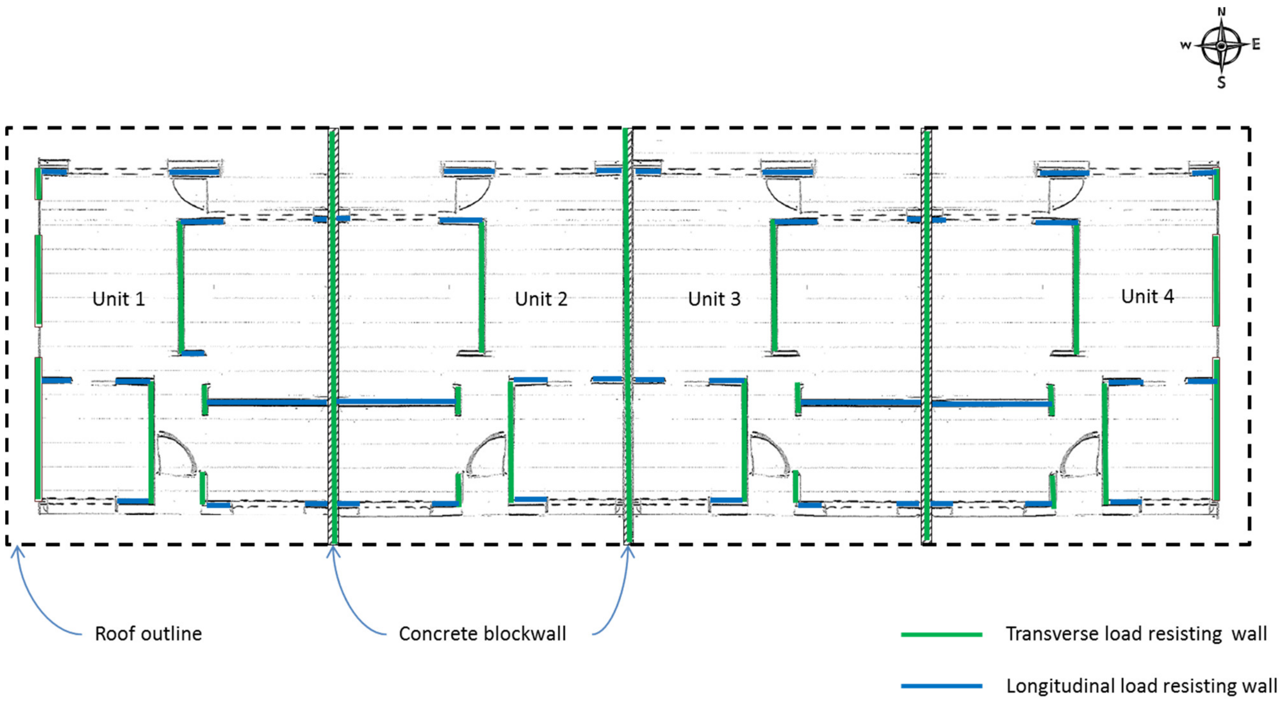


Figure 3: Building Layout and Location of Bracing Walls

4.4 Foundation

The building has a 100mm thick mesh reinforced ground bearing concrete slab with a 250 x 500mm deep perimeter reinforced concrete ground beam.

4.5 Original Documentation

Copies of the following drawings were provided:

- "Proposed Merritt-Beazley Cottages for the Elderly - Thurso Street – Christchurch" drawings reference no. A.60.8.6/1 to 5 (1975). See Appendix 2 - Drawing.

4.6 Post 22 February 2011 Rapid Assessment

An engineer from Opus undertook a Level 1 Rapid Assessment of the building on 2 March 2011. Units 1 and 4 were posted with a Yellow (Y2) placard indicating that the access to both units was restricted. This was due to the fall hazard posed by the significantly cracked block veneer at the gable ends which has since been removed. Units 2 and 3 posted with Green (G2) placard indicating that the access to these 2 units was not restricted.

4.7 Further Inspections

Detailed inspections were undertaken by Opus engineers on 22 and 29 August 2012 for the purpose of an extended rapid assessment report which was issued on 30 August 2012. No further site inspection was required for this detailed engineering evaluation.

5 Damage Assessment

The following damage has been noted:

5.1 Roofing

No observed earthquake related damage.

5.2 Load Bearing Wall

No observed earthquake related damage. However, a sample intrusive investigation to the bracing wall behind the Unit 1 wardrobe revealed only nominal fixing between the plasterboard and the timber framing. The nail pattern was even less than the minimum required during the period of construction. See Photo 2 in Appendix 1.

5.3 Flooring

No observed earthquake related damage.

5.4 Foundation

The foundation appears to have performed satisfactorily with no observed earthquake damage. Minor ground movement was observed during the initial rapid assessment on 2 March 2011. See Photo 3 in Appendix 1.

5.5 Non Structural

- Minor to moderate cracking to internal plasterboard lined walls and ceilings especially at corners of window and door frames. See Photo 4 in Appendix 1.
- Fallen block veneer to both ends of gable roof. See Photo 5 in Appendix 1. This damage has been repaired and replaced with lightweight wall cladding.
- Horizontal cracks to external block veneer typically at window sill level. See Photo 6 in Appendix 1.

6 Remedial Works

Following the identification of the inadequate wall fixings as highlighted in Section 5.2 above, remedial works have been undertaken to all the units. Primarily, the key bracing walls have been remediated by installing additional screw fixings in accordance to GIB Ezybrace fastener requirements. Refer to Appendix 3 for the details of the remedial works.

All the remedial works to all units have been completed. Refer photos 7 & 8 in Appendix 3. Further enhancement could be made by replacing the heavy concrete tiled roof with lightweight roof cladding.

7 Detailed Seismic Assessment

The detailed seismic assessment has been based on the NZSEE 2006 [2] guidelines for the "Assessment and Improvement of the Structural Performance of Buildings in Earthquakes" together with the "Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury, Part 2 Evaluation Procedure" [3] draft document prepared by the Engineering Advisory Group on 19 July 2011, and the SESOC guidelines "Practice Note – Design of Conventional Structural Systems Following Canterbury Earthquakes" [5] issued on 21 December 2011.

7.1 Critical Structural Weaknesses

The term Critical Structural Weakness (CSW) refers to a component of a building that could contribute to increased levels of damage or cause premature collapse of a building.

No CSW's were identified for this building.

7.2 Quantitative Assessment Methodology

The equivalent static load method was used to analyse the forces in the key components of the building's lateral load resisting system. The parameters used for the detailed analyses are as follows:

7.2.1 Seismic coefficient parameters

The seismic design parameters based on current design requirements from NZS1170.5:2004 [1] and the NZBC clause B1 for this building complex are:

- Site soil class D, clause 3.1.3 NZS 1170:2002
- 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] with a 50 year design life and based on an Importance Level 2).

7.2.2 Expected ductility factor

Based on our assessment of the building structure including the remedial works and using guidance from timber structures standard NZS 3603:1993, our estimate for the expected maximum structural ductility factor for the structure is 3.0 in both orthogonal directions.

7.3 Limitations and Assumptions in Results

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

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

7.4 Quantitative Analysis Methodology

The seismic force arising from the roof mass is assumed to be distributed to the perimeter and internal timber wall frames based on their respective tributary area. This is a reasonable assumption considering the flexible horizontal diaphragm created by the ceiling plasterboard and roof framing.

7.5 Quantitative Assessment Results

Based on the criteria as listed above, the estimated structural performance of the respective primary structural load resisting elements is as follows.

Structural Element / System	Description of limiting criteria based on elastic capacity of critical element	% NBS (based on calculated capacity)
North-South (Transverse) Direction		
All Units Internal and external bracing walls	Concrete blockwall and timber bracing wall resisting lateral load in the north-south direction	100%
East - West (Longitudinal) Direction		
All Units Internal and external bracing walls.	Timber bracing wall resisting lateral load in the east-west direction.	69%

8 Discussion of Results

Based on the analysis, the building has a minimum seismic capacity of approximately 69% NBS. This is limited by the seismic capacity of the longitudinal internal and external timber bracing walls resisting lateral loads in the east-west direction.

As the building has a seismic capacity of 69%, it is considered to be low risk in accordance with the Building Act 2004.

While there is some minor ground movement as noted in Section 5.4, the foundation has performed well overall.

9 Geotechnical Appraisal

Due to a lack of observed ground and foundation damage, no geotechnical appraisal has been undertaken for this site.

The site is located within Technical Category 3 zone which indicates that moderate to significant land damage from liquefaction is possible in future significant earthquakes.

10 Conclusions

The building has seismic capacity of 69% NBS and is therefore considered to be low risk in accordance to the Building Act 2004.

11 Limitations

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

b. Our inspections have been visual and non-intrusive, and no linings or finishes were removed to expose structural elements.

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

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

12 References

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

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

[3] Engineering Advisory Group, *Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury, Part 2 Evaluation Procedure*, Draft Prepared by the Engineering Advisory Group, Revision 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 (2011), *Practice Note – Design of Conventional Structural Systems Following Canterbury Earthquakes*, Structural Engineering Society of New Zealand, 21 December 2011.

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

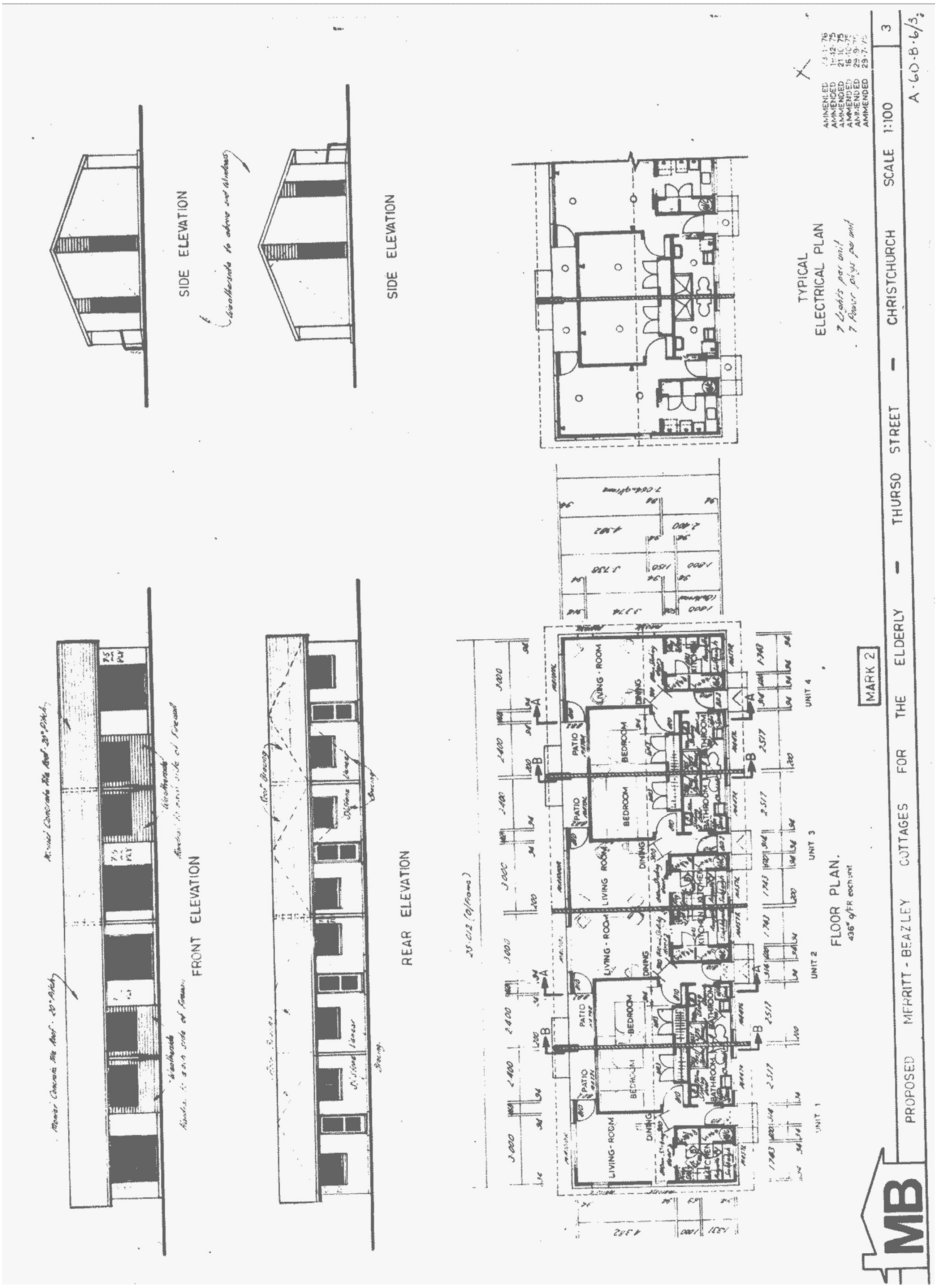
Appendix 1 - Photographs

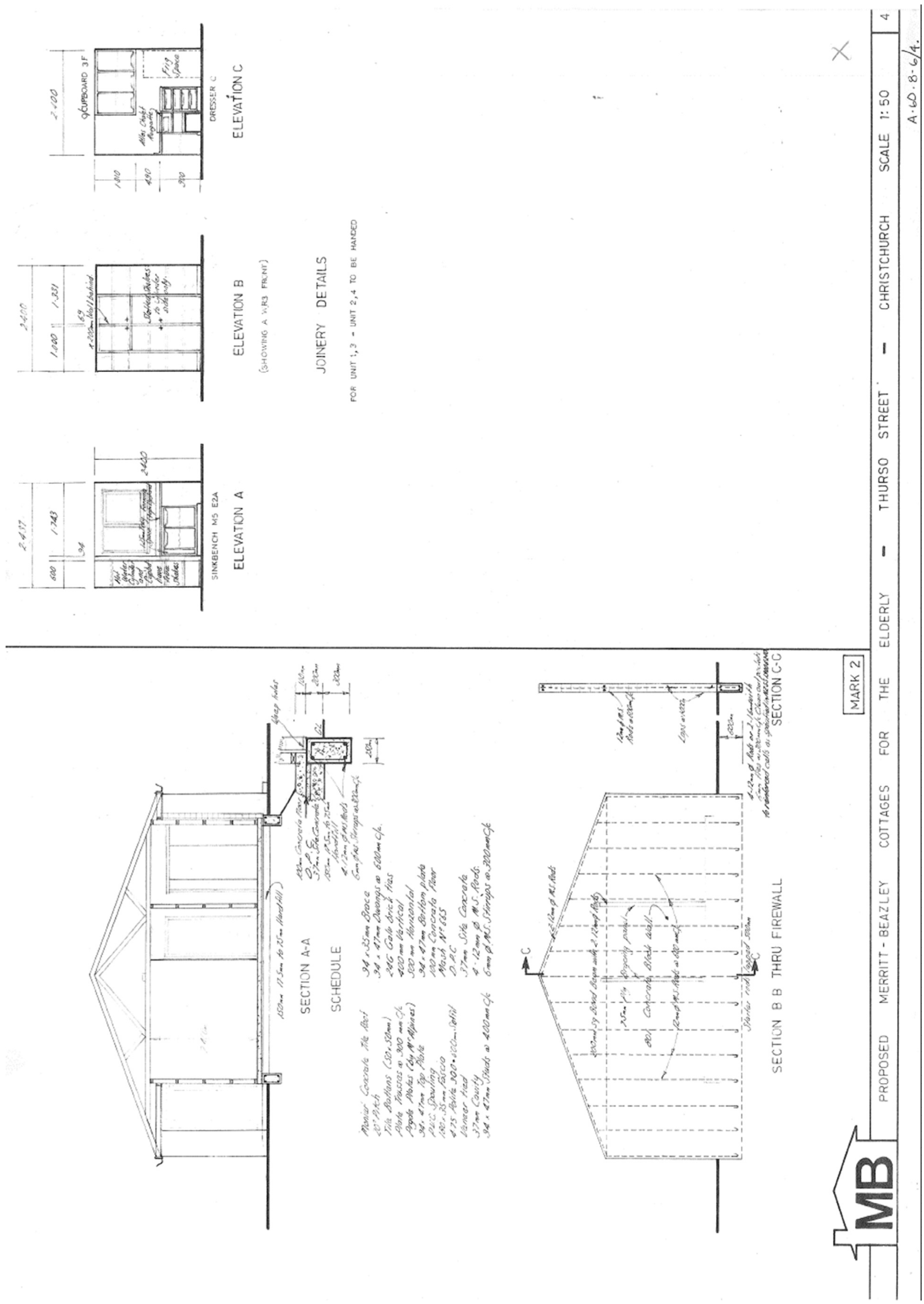
No.	Item description	Photo
1.	North elevation showing partial east elevation	
2.	Nominal nail fixings observed between plasterboard and timber framing behind Unit 1 wardrobe	

3.	Minor ground movement	
4.	Typical cracking to internal plasterboard lined walls and ceilings especially at corners of window and door frames	 

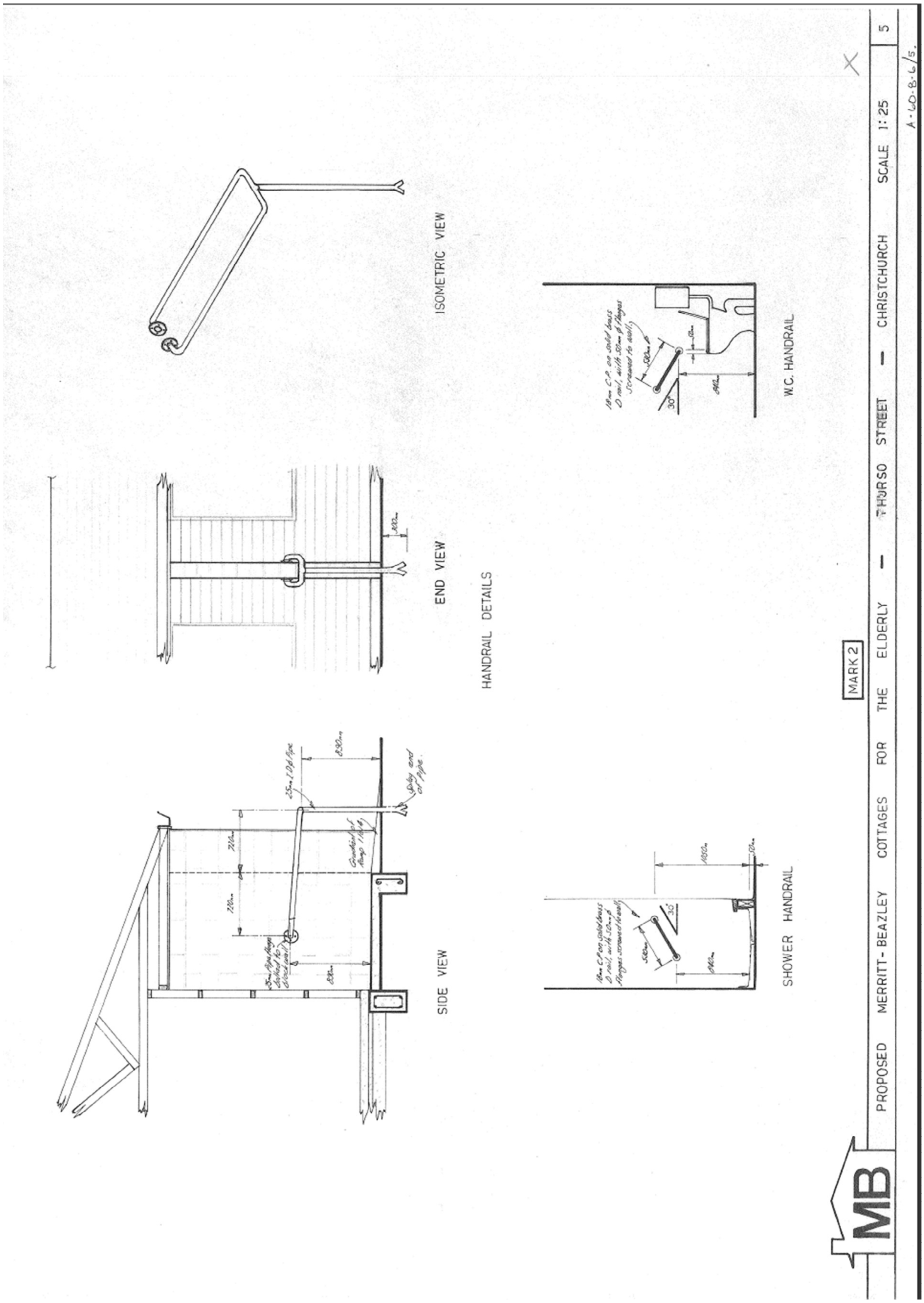
5.	Temporary weatherproofing to gable end where block veneer had fallen/removed	
6.	Typical horizontal cracking to external block veneer	

Appendix 2 - Drawings


SIDE ELEVATION
SIDE ELEVATION
FRONT ELEVATION
REAR ELEVATION
TYPICAL
ELECTRICAL PLAN
FLOOR PLAN.
MARK 2
UNIT 1
UNIT 2
UNIT 3
UNIT 4
LIVING-ROOM
BEDROOM
DINING
PATIO
KITCHEN
BATHROOM
PROPOSED MERRITT - BEAZLEY COTTAGES FOR THE ELDERLY — THURSO STREET — CHRISTCHURCH SCALE 1:100
A·60·8·6/3
MB

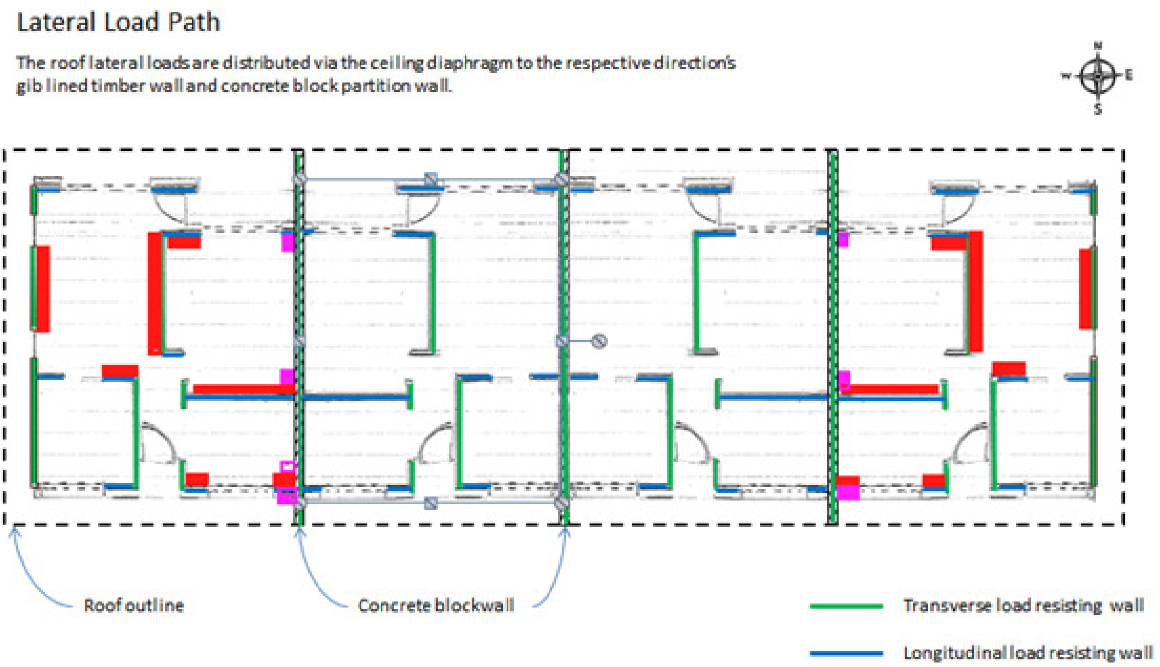


SINKBENCH MS E2A
ELEVATION A
ELEVATION B
(SHOWING A W.R3 FRONT)
DRESSER C
CUPBOARD 3F
ELEVATION C
JOINERY DETAILS
FOR UNIT 1,3 - UNIT 2,4 TO BE HANDED
SECTION A-A
SCHEDULE
SECTION B B THRU FIREWALL
SECTION C-C
MARK 2
MB
PROPOSED MERRITT - BEAZLEY COTTAGES FOR THE ELDERLY - THURSO STREET - CHRISTCHURCH
SCALE 1:50
4
A.60.8.6/4.


SIDE VIEW
END VIEW
ISOMETRIC VIEW
HANDRAIL DETAILS
SHOWER HANDRAIL
W.C. HANDRAIL
MARK 2
MB
PROPOSED MERRITT-BEAZLEY COTTAGES FOR THE ELDERLY — THURSO STREET — CHRISTCHURCH
SCALE 1:25
5

Appendix 3 –Remedial Works

Thurso Street Bracing and Firewall attachment Schedule.



Key

(red)	Walls screwed to Ezybrace Schedule.
(magenta)	Timber frames re-attached to firewalls. Methodology attached. Please note that where gib is taking of infill cavity with Pink Batts wall R2.6. Where there is a bathroom replace with Aqualine gibboard.

Please note that if the Gib board in the area indicated is damaged it will need to be replaced with a full sheet so that joins do not occur at corners of openings. All new Gib board fixing is to follow current best practise.

Subsequent to the issuance of the works instructions above, it was decided that the remedial works were to be undertaken for Units 2 & 3 as well.

(1) Methodology for Repairing timber frame walls to concrete block firewall.

The points below form the strategy of which the timber stud walls need to be reconnected to the concrete block firewall.

a) Remove skirting from gib board.
b) Take off gib linings to expose the timber frame-concrete block connections.
c) Redrill and fix 3 M12 Trubolts, bottom middle and top with 50x50 washers.
d) Where there is a new timber firewall 3 type 17 purlin screws will be required evenly spaced.
e) Where there is serotone shower lining remove, install bolts and re-fix serotone.
f) Where there is a cupboard remove cupboard, Re-fix timber to fire wall and re-install cupboard.
g) Attach new gib board to area of gib linings that were removed.
h) Plaster area that has been worked on.
i) Replace skirting board
j) Paint affected walls and ceiling

Note if the timber wall has separated more than 15mm from the fire wall 5 tonne strops will need to be used to tension the walls back plumb and vertical.

Photos of Typical Remedial Works Undertaken

No.	Item description	Photo
7.	Typical additional screw fixings to bracing wall behind wardrobe	
8.	Typical additional screw fixings to bracing wall in living room	

Appendix 4 – CERA DEE Data Sheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Thurso Place Complex	Reviewer:	Mary Ann Halliday
	Unit / No: 2 / Street: Thurso Place	CPEng No:	67073
Building Address:	2 Thurso Place	Company:	Opus
Legal Description:		Company project number:	6-QUCC1.91
		Company phone number:	03 363 5400
GPS south: (Degrees / Min / Sec)		Date of submission:	Jun-13
GPS east:		Inspection Date:	29-Aug-12
		Revision:	Final
Building Unique Identifier (CCC):	PRO 1321 EQ2	Is there a full report with this summary?	yes

Site

Site slope:	slope < 1in 5	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:	1	single storey = 1	Ground floor elevation (Absolute) (m):	
Ground floor split?	no		Ground floor elevation above ground (m):	0.20
Storeys below ground				
Foundation type:	raft slab		if Foundation type is other, describe:	
Building height (m):	3.20		height from ground to level of uppermost seismic mass (for IEP only) (m):	
Floor footprint area (approx):	170			
Age of Building (years):	37		Date of design:	1965-1976
Strengthening present?	no		If so, when (year)?	
			And what load level (%g)?	
Use (ground floor):			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	1.2, timber framing, concrete tiles
Floors:			
Beams:			
Columns:			
Walls:			

Lateral load resisting structure

Lateral system along:	lightweight timber framed walls	**Note: Define along and across in detailed report!**		33
Ductility assumed, μ:	1.50		note typical wall length (m)	
Period along:		0.00	estimate or calculation?	
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	partially filled CMU			3x4m lengths, plus timber framed walls
Ductility assumed, μ:	1.50		note total length of wall at ground (m):	
Period across:		##### enter height above at H31	estimate or calculation?	
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

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

Non-structural elements

Stairs:			
Wall cladding:	brick or tile	describe (note cavity if exists)	37mm cavity, summerhill stone cladding
Roof Cladding:	Heavy tiles	describe	concrete tiles
Glazing:	aluminium frames		
Ceilings:	plaster, fixed		
Services(list):			

Available documentation

Architectural	full	original designer name/date	Merritt Beazley 1975
Structural		original designer name/date	
Mechanical		original designer name/date	
Electrical		original designer name/date	
Geotech report		original designer name/date	

Damage

Site:
(refer DEE Table 4-2)

Site performance:	minor ground movement identified	Describe damage:	
Settlement:		notes (if applicable):	
Differential settlement:		notes (if applicable):	
Liquefaction:		notes (if applicable):	
Lateral Spread:		notes (if applicable):	
Differential lateral spread:		notes (if applicable):	
Ground cracks:		notes (if applicable):	
Damage to area:		notes (if applicable):	

Building:

	Current Placard Status:	green		
Along	Damage ratio:	-200%	Describe how damage ratio arrived at:	based on %NBS before and after remedial works
	Describe (summary):			
Across	Damage ratio:	-104%		
	Describe (summary):			
Diaphragms	Damage?:	yes	Describe:	minor to moderate cracking of lining
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	yes	Describe:	fallen block in gable veneers

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

Recommendations

	Level of repair/strengthening required:	minor structural	Describe:	improve internal wall lining fixings
	Building Consent required:	yes	Describe:	Consent obtained for remedial works
	Interim occupancy recommendations:	full occupancy	Describe:	Remedial works completed
Along	Assessed %NBS before e'quakes:	23% ##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	equivalent static load method
	Assessed %NBS after e'quakes:	69%		
Across	Assessed %NBS before e'quakes:	49% ##### %NBS from IEP below		
	Assessed %NBS after e'quakes:	100%		