Landsdowne Community Centre
Detailed Engineering Evaluation
BU 1771-001 EQ2
Quantitative Report

Prepared for Christchurch City Council (Client)

By Beca Carter Hollings & Ferner Ltd (Beca)

15 July 2013

Revision History

Revision N°	Prepared By	Description	Date
A	Andrew Sporn	Draft for CCC review	12 April 2013
B	Andrew Sporn	Update for further site investigations	12 July 2013
C	Andrew Sporn	Final	15 July 2013

Document Acceptance

Action	Name	Signed	Date
Prepared by	Andrew Sporn		15 July 2013
Reviewed by	Nicholas Charman		15 July 2013
Approved by	David Whittaker		15 July 2013
on behalf of	Beca Carter Hollings & Ferner Ltd		

Landsdown Community Centre BU1771-001 EQ2

Detailed Engineering Evaluation
Quantitative Report – SUMMARY
Version 1

Address
8 Landsdowne Terrace
Cashmere
Christchurch

Background

This is a summary of the Quantitative Assessment report 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.

A Qualitative Report was issued to CCC on 20 September 2012.

The Landsdowne Community Centre is located at 8 Landsdowne Terrace, Cashmere, Christchurch. The building is constructed from a combination of steel portal frames with reinforced concrete framing and masonry block infill. It was built in 1975, having an approximate internal plan area of 280m^2. The building is currently being used as a childcare centre and general purpose community hall.

A set of architectural and structural drawings produced by the Heathcote County Council, County Engineer was obtained. Calculations have been undertaken as part of the Quantitative Assessment.

Key Damage Observed

Visual inspections on 8 August 2012 indicate the building has suffered minor earthquake damage. The key damage observed includes:

- Minor stepped cracking was observed in the mortar at various locations in the external block walls.
- Minor cracking was observed to the concrete footpath at the rear of the main hall.

Critical Structural Weaknesses (CSW)

No Critical Structural Weaknesses were identified as a result of our Quantitative Assessment.

Indicative Building Strength (from Detailed Assessment)

The building has been assessed to have a seismic capacity of 66%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, is therefore considered potentially Earthquake Risk and classified as Seismic Grade C.

The structural damage observed is predominantly minor and the seismic capacity is not considered to have materially diminished from its pre-earthquake level.

Our assessment has identified the structural components that have governed/limited the building's seismic performance, and their potential failure mechanisms, are as follows:

- Portal frames, 66%NBS, governed by the flexural capacity of the portal frame rafter.
- Masonry infill walls, 68%NBS, governed by in plane capacity.

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.

The building is considered to be potentially earthquake risk, having an assessed capacity of between 33% and 67%NBS. The risk of collapse of an earthquake risk building is considered to be 5 to 10 times greater than that of an equivalent new building.

No significant damage or hazards were identified to the seismic or gravity load resisting system that would reduce its ability to resist further loads and therefore no restrictions on use or occupancy are recommended.

It is recommended that:

- A verticality and level survey could be carried out to determine the extent of the settlement of the building for insurance purposes.
- According to the recent CCC Instructions to Engineers document (16 October 2012), Council's insurance provides for repairing damaged elements to a condition substantially as new. We suggest you consult further with your insurance advisor.

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1 Background

Beca Carter Hollings & Ferner Ltd (Beca) has been engaged by Christchurch City Council (CCC) to undertake a Quantitative Detailed Engineering Evaluation (DEE) of the Landsdowne Community Centre located at 8 Landsdowne Terrace, Cashmere, 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 the assessment 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).

A full set of original architectural and structural drawings was made available and has been used in our assessment of the building. The building description below is based on a review of the drawings and our visual inspections.

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 Structural Performance	
					Legal Requirement	NZSEE Recommendation
Low Risk Building	A or B	Low	Above 67	Acceptable (improvement may be desirable)	The Building Act sets no required level of structural improvement (unless change in use) This is for each TA to decide. Improvement is not limited to 34%NBS.	100%NBS desirable. Improvement should achieve at least 67%NBS
Moderate Risk Building	B or C	Moderate	34 to 66	Acceptable legally. Improvement recommended		Not recommended. Acceptable only in exceptional circumstances
High Risk Building	D or E	High	33 or lower	Unacceptable (Improvement	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
A	80-100	1-2 times
B	67-80	2-5 times
C	33-67	5-10 times
D	20-33	10-25 times
E	<20	>25 times

4 Building Description

4.1 General

Summary information about the building is given in the following table.

Table 4.1: Building Summary Information

Item	Details	Comment
Building name	Landsdowne Community Centre	
Street Address	8 Landsdowne Terrace Cashmere Christchurch	
Age	37 years (1975 design)	Toilet block added to the South of the building after the original construction (details unknown).
Description	The Landsdowne Community Centre is a single storey building. It is currently being used primarily as a childcare centre.	
Building Footprint / Floor Area	Approx. 11.6m x 19m and 9.1m x 6.2m. 280m^2 internally.	
No. of storeys / basements	1 storey / no basement	
Occupancy / use	Childcare centre, general use community centre.	Importance Level 2. Childcare capacity less than 150.
Construction	Steel portal frames and reinforced concrete frames with masonry infill walls. Internal partition walls are plasterboard lined, timber framed. The roofing consists of lightweight profiled metal sheeting supported by timber purlins on steel rafters. Purlins in the kitchen section of the building are supported by concrete beams spanning between the masonry walls.	Based on our limited visual observation the building appears to be generally constructed in accordance with the drawings obtained. Block infill is reinforced at 600mm centres horizontally and vertically. Only the reinforced cells are filled. Site scanning indicates that some masonry walls do not have starter bars connecting them to

Item	Details	Comment
		the foundations. Refer also Section 5.2.
Gravity load resisting system	Gravity loads from the roof are supported by timber purlins and transmitted to the steel rafters of the portal frames before being transmitted to the pad foundations by the steel portal columns.	
Seismic load resisting system	Lateral loads in the transverse direction are resisted by the steel portal frames. Loads in the longitudinal direction are resisted by the reinforced concrete frames with masonry block infill walls. Roof bracing transmits longitudinal lateral loads from the roof into the concreted frame masonry infill walls. The end walls are assumed to cantilever vertically under face loading.	Roof bracing was shown on drawings but not visible due to the presence of ceiling linings.
Foundation system	Shallow pad and strip foundations with 100mm thick slab on grade.	
Stair system	The building does not contain stairs.	
Other notable features		
External works	Car parking and playground facilities.	
Construction information	A set of 2 architectural and 3 structural drawings by R. J. Anderson, 1975.	See Appendix B.
Likely design standard	NZSS 1900, Chapter 8:1965	Inferred from age of building
Heritage status	Not heritage listed	
Other		

4.2 Structural 'Hot-spots'

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

- Connections between the portal frames and the walls.
- Masonry block infill under out-of-plane loading (particularly walls not connected to supporting structure).

5 Site Investigations

5.1 Previous Assessments

The building had Level 2 rapid assessments undertaken following the February 2011 and June 2011 earthquake events (refer to Appendix D).

Visual inspections as part of the Level 4 damage assessment were undertaken on 8 August 2012. A Qualitative Report was issued to CCC on 20 September 2012.

5.2 Level 5 Intrusive Investigations

The following intrusive investigations were carried out as part of the Level 5 quantitative assessment:

- Confirmation of the location of reinforcement in the masonry block walls and the location of starter bars through Ferroscan. The investigation indicated that for the north and south elevations there were no starter bars connecting the masonry infill to the concrete columns, roof bond beam or base slab/foundation. The drawings and schedule of reinforcing steel also did not indicate any starter bars.
- An intrusive investigation showed that in the east and west walls the vertical wall reinforcement extends into the foundation beam.
- Confirmation of the connection between the steel PFC header beam and the masonry block wall. The orientation of the PFC was also confirmed to be bending about its minor axis under wall face loading.

6 Damage Assessment

6.1 Damage Summary

The table below provides a summary of damage observed during our inspection. Refer to Appendix A for photographs.

Table 6.1: Damage Summary

Damage type	Unknown	Minor	Moderate	Major	Comment
settlement of foundations	ü				None observed during visual inspection. Level survey may be required to confirm.
tilt of building	ü				None observed during visual inspection. Verticality survey may be required to confirm.
liquefaction	ü				None observed during visual inspection.
settlement of external ground	ü				None observed during visual inspection.
lateral spread / ground cracks	ü				None observed during visual inspection.
frame					No damage observed during visual inspection.
masonry walls		ü			Minor cracking to the concrete masonry

Damage type	Unknown	Minor	Moderate	Major	Comment
					walls/mortar bed joints was observed (approximately up to 1mm wide)
cracking to concrete floors		ü			Cracking (up to 1mm wide) was observed in the external concrete ground slab.
bracing	ü				Roof bracing was unable to be viewed due to fixed ceiling.
cladding /envelope		ü			Cracking to block walls as above.
building services	ü				No inspection of services was carried out.

6.2 Surrounding Buildings

The Landsdowne Community Centre is located in a residential street. There are buildings in the general vicinity, but neighbouring buildings are sufficiently separated so that they will not impact upon the Community Centre during a seismic event.

6.3 Residual Displacements and General Observations

No evidence of permanent settlement or displacements was observed during our visual inspection; however a global settlement survey may reveal movement that could be described as damage under insurance entitlement.

6.4 Implication of Damage

Based on our visual inspection, the structure appears to have suffered minor damage only and therefore we believe the structural capacity has not materially diminished.

7 Generic Issues

The following generic issues referred to in Appendix A of the EAG guideline document have been identified as applicable to the Landsdowne Community Centre:

Concrete Frame with Infill

- Shear and flexural strength of masonry walls.
- Connections between the masonry walls and the roof and floor.
- Infills falling out of frames

However, only minor earthquake damage was observed.

8 Geotechnical Consideration

No Geotechnical information is currently available for this site.

During the inspection, any damage to the surrounding ground was noted and any effect to the structure was considered.

9 Survey

No level or verticality surveys were carried out as there was no evidence of settlement or displacement observed during the inspection. CCC may wish to undertake a level survey as part of insurance entitlement considerations.

10 Detailed Seismic Capacity Assessment

10.1 Assessment Methodology

The building has had its seismic capacity assessed using the Detailed Assessment Procedures in the NZSEE 2006 AISPBE guidelines, based on the drawings and intrusive investigations undertaken.

The structure has suffered minor damage. The post-damage capacity is considered to be the same as the original capacity.

10.2 Assumptions

The following assumptions were used in our quantitative assessment.

- Structural steel yield strength f_y=250 MPa.
- Reinforcing steel yield strength f_y=275MPa.
- Concrete compressive strength f'_c=20MPa as stated in the specification.
- 200 series masonry block compressive strength f'_c=4MPa (observation type C). Blockwork grout compressive strength f'_c=17.2 MPa (as stated in the specification).
- East and West walls have 12mm diameter starter and vertical reinforcement at 600mm centres. Only the reinforced cells are grout filled.
- Welds adopted were as noted on the drawings, assuming Category GP.
- Timber compressive strength f_c= 20.9 MPa (dry Radiata Pine).

10.3 Critical Structural Weaknesses

No Critical Structural Weaknesses have been identified during this assessment.

10.4 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 2011
- Return period factor Ru = 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

The results of our quantitative assessment indicate that the building has a seismic capacity of 66%NBS. This is higher than the IEP assessment of 41%NBS in the previous Qualitative Report.

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

Item	Loading Direction	Ductility, μ	Seismic Performance	Notes
Overall %NBS adopted from DEE			**66%NBS**	**Steel portal frames under transverse loading**
Portal frames	Transverse	1.25	66%NBS	Governed by flexural capacity of the rafter.
Masonry infill walls (in-plane)	Longitudinal	1.25	68%NBS	Assessed as per Section 9 of NZSEE 2006 AISPBE guidelines
Masonry infill walls (out-of-plane)	Transverse	1.0	>100%NBS	Assessed as per Section 9 of NZSEE 2006 AISPBE guidelines
Masonry block end walls (out-of-plane)	Longitudinal	1.0	80%NBS	Assessed to NZS4230:2004 Design of Reinforced Concrete Masonry Structures. Assessed as a part and assuming 12mm diameter starter bars at 600mm centres.
Concrete bond beam	Both	1.25	>100%NBS	
PFC header beam in end frame	Longitudinal (face loading)	2.0	71%NBS	Assessed as a part. Governed by flexural capacity
Connection between the portal frame and the concrete bond beam	Longitudinal	1.25	>100%NBS	
Roof bracing	Longitudinal	1.25	>100%NBS	

Note: Ductility factors are in accordance with values recommended in the NZSEE 2006 AISPBE guidelines.

10.6 Discussion of results

The key findings of the assessment are as follows:

- Portal frames, 66%NBS, governed by the flexural capacity of the portal frame rafter.
- Masonry infill walls (North and South), 68%NBS, governed by in plane capacity.

Based on the results of our Quantitative Assessment, the Landsdowne Community Centre is considered potentially Earthquake Risk as the seismic capacity was assessed to be between 33%NBS and 67%NBS, and is classified as Seismic Grade C.

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.

The building is considered to be potentially earthquake risk, having an assessed capacity of between 33% and 67%NBS. The risk of collapse of an earthquake risk building is considered to be 5 to 10 times greater than that of an equivalent new building.

No significant damage or hazards were identified to the seismic or gravity load resisting system that would reduce its ability to resist further loads and therefore no restrictions on use or occupancy are recommended.

11.2 Further Investigations, Survey or Geotechnical Work

It is recommended that:

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

11.3 Damage Reinstatement

According to the recent CCC Instructions to Engineers document (16 October 2012), Council's insurance provides for repairing damaged elements to a condition substantially as new. We suggest you consult further with your insurance advisor.

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

Photographs

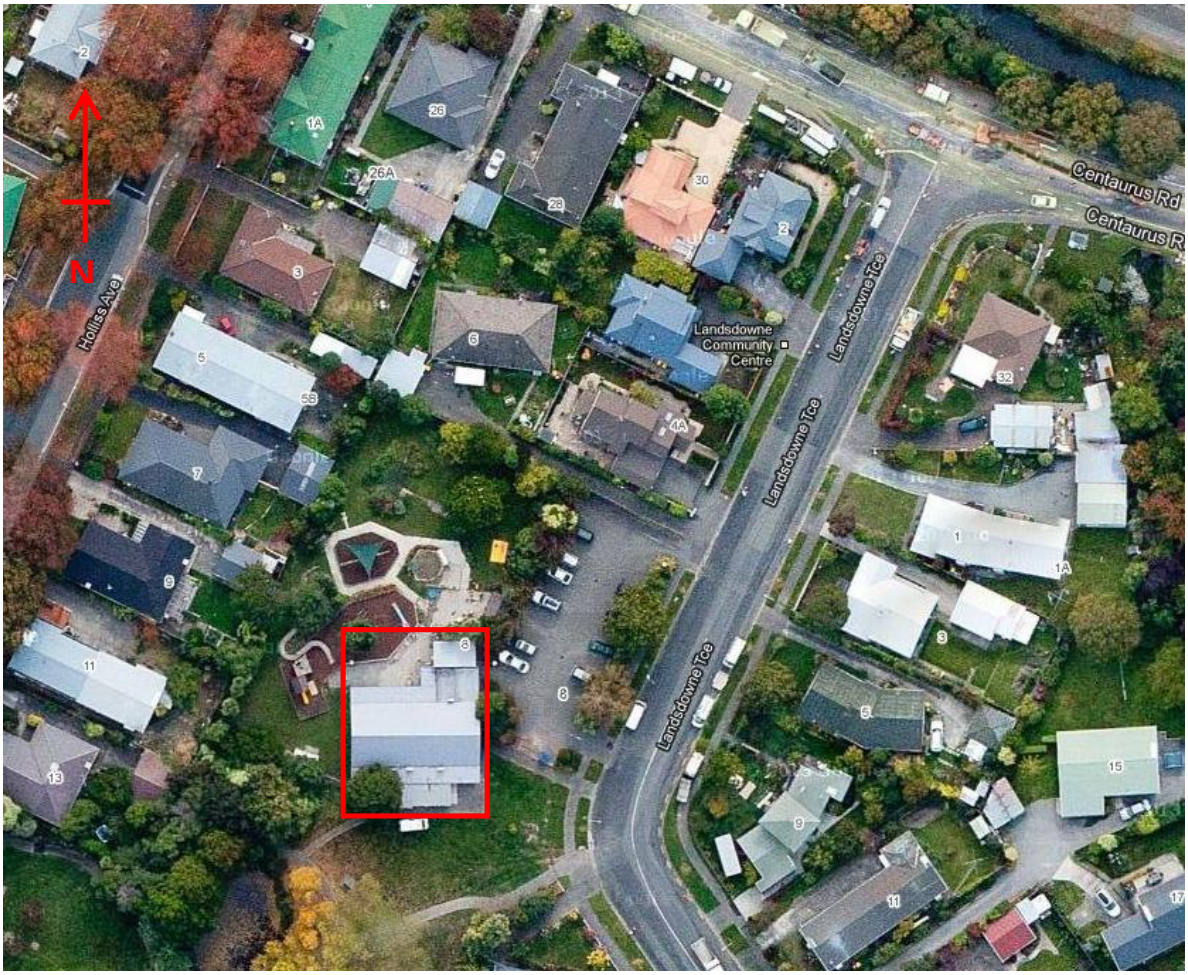


Figure 1: Site Layout

Photo 1: External view from the east.

Photo 2: External view from the north

Photo 3: External view from the north

Photo 4: Internal view of building showing structural system

Photo 5: Cracking to concrete ground slab (west of building).

Damage: Cracking to external concrete slab

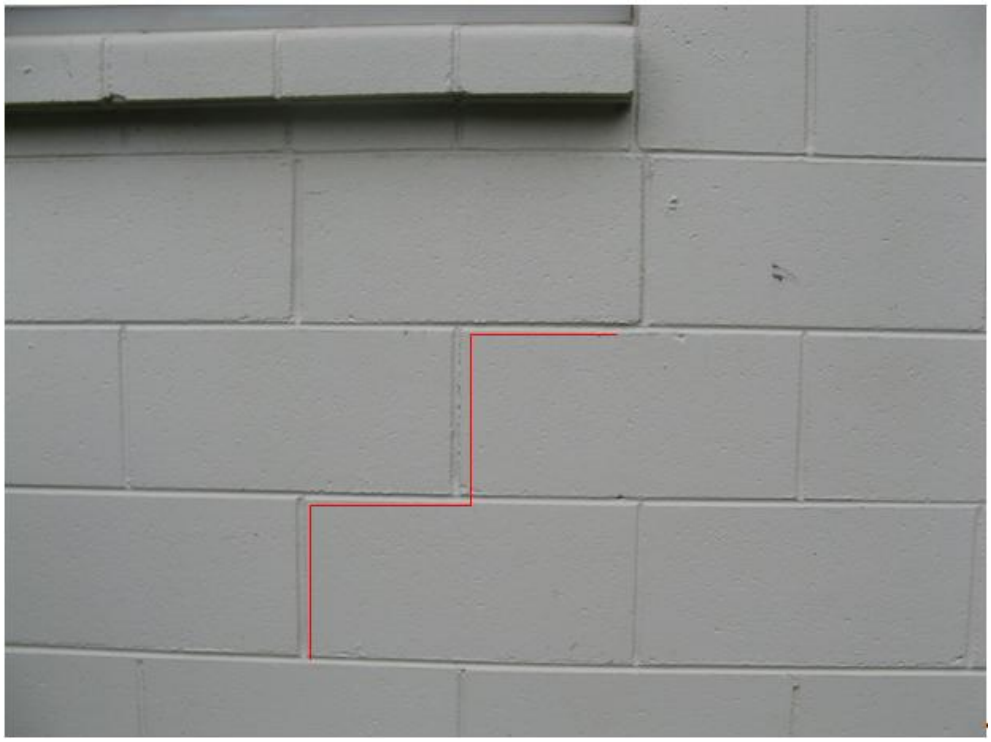


Photo 6: Cracking to masonry wall

Damage: Stepped cracking to masonry wall

Photo 7: Cracking to concrete masonry wall (close up)

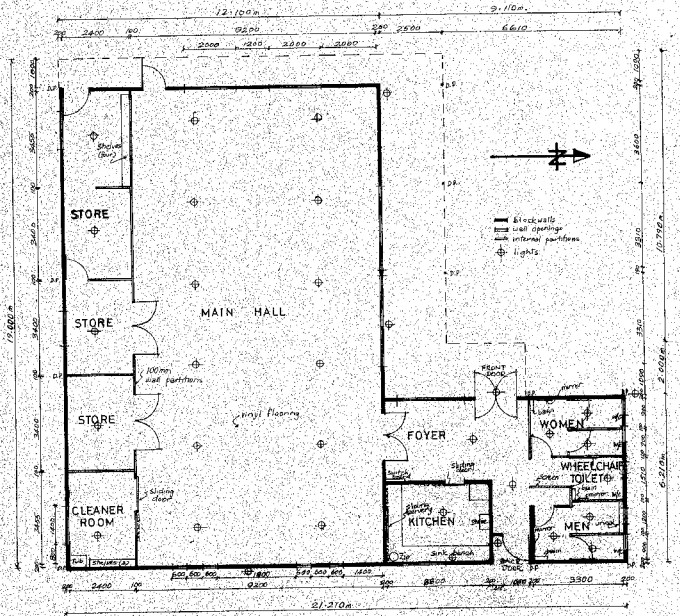
Damage: Cracking to concrete masonry mortar

Photo 8: Joint between walls

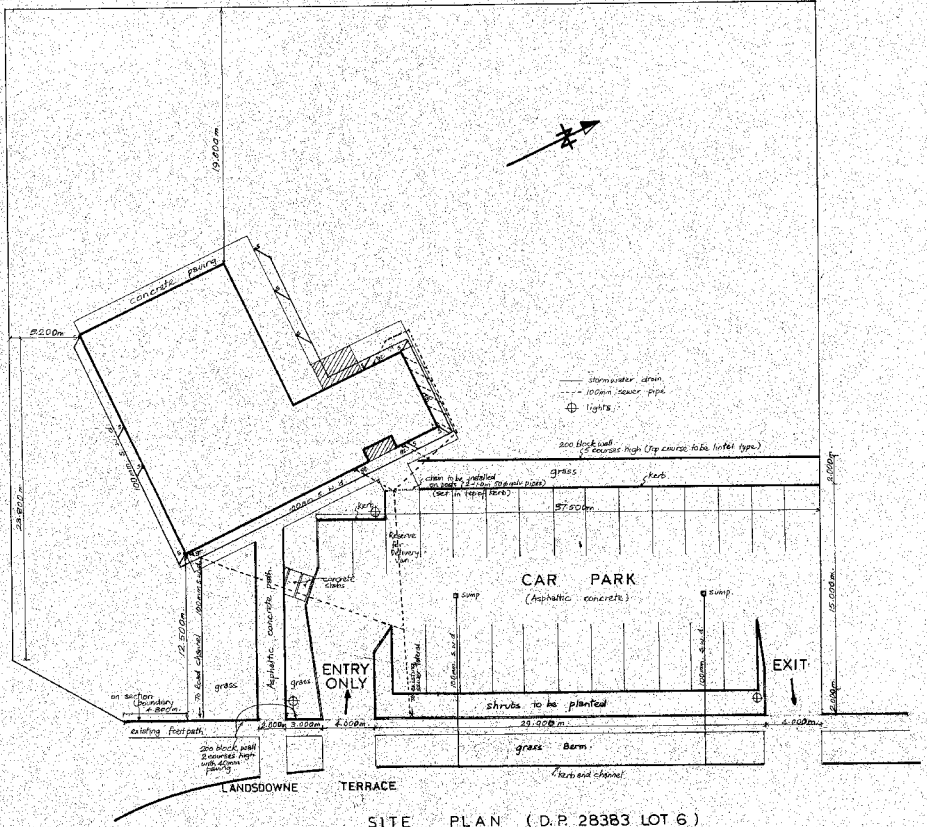
Damage: Minor non-structural cracking to wall at joint

Appendix B

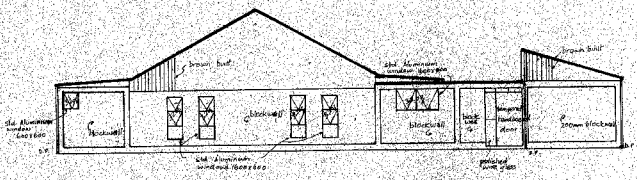
Existing Drawings



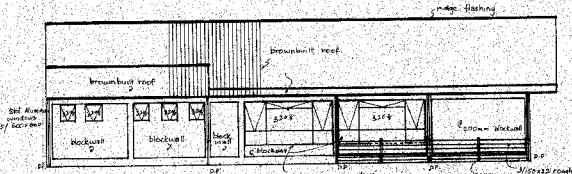
PLAN



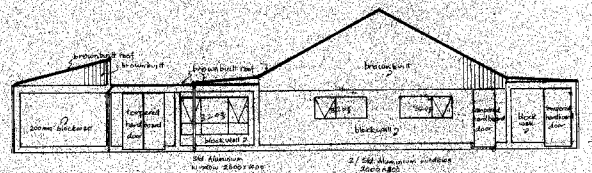
SITE PLAN (D.P. 28383 LOT 6)



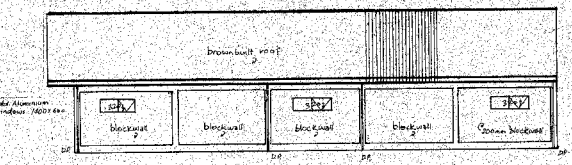
EAST ELEVATION



NORTH ELEVATION



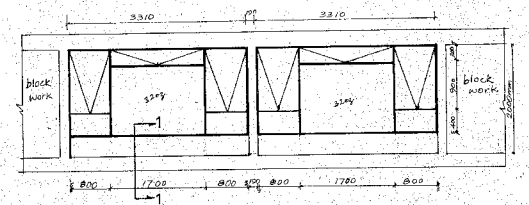
WEST ELEVATION



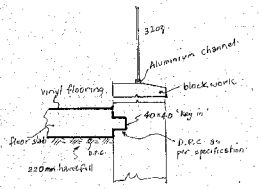
SOUTH ELEVATION

NOTE:
ROOFING IS OF BROWNBUILT 300 MARK III.
EXTERIOR WALLS ARE OF 200 BLOCKWORK.
WINDOWS ARE OF STD. ALUMINIUM TYPE
ELSE OTHERWISE STATED.
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK.

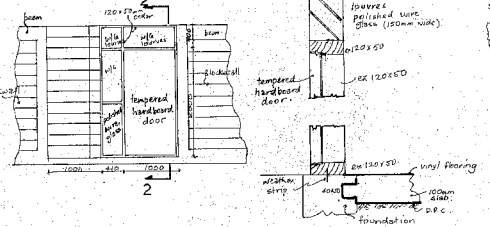
HEATHCOTE COUNTY COUNCIL	R. J. ANDERSON County Engineer JUNE 1975	LANDSDOWNE COMMUNITY CENTRE	PLAN, SITE PLAN AND ELEVATIONS	SCALES 1:100 1:200	M93/A1



ALUMINIUM FRAMES
(2 – 3300 X 1600)

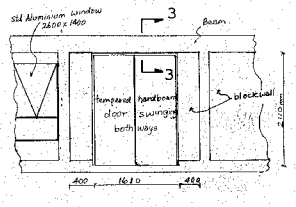


SECTION 1-1

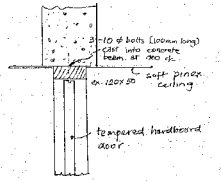


BACK DOOR

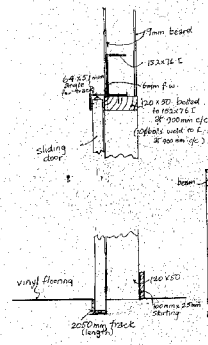
SECTION 2-2



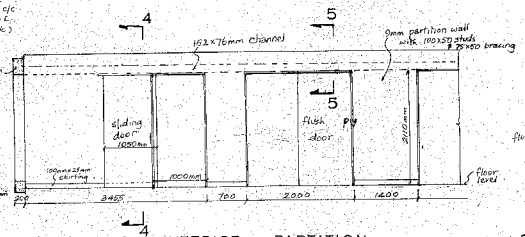
FRONT DOOR



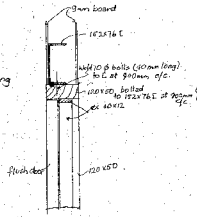
SECTION 3-3



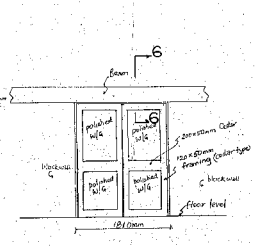
SECTION 4-4



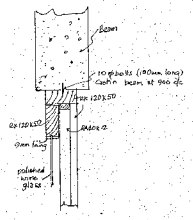
INTERIOR PARTITION



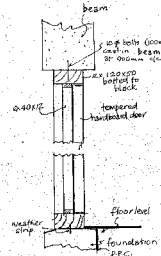
SECTION 5-5



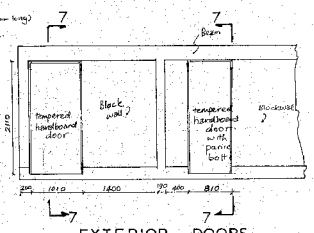
GLAZED DOOR
(between FOYER AND MAIN HALL)
from MAIN HALL



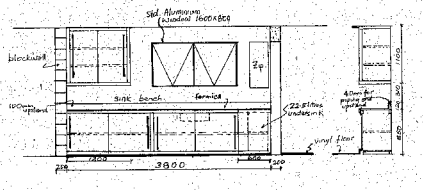
SECTION 6-6

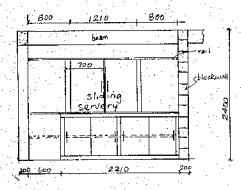


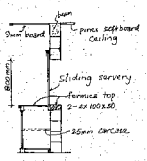
SECTION 7-7



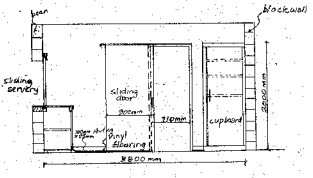
EXTERIOR DOORS

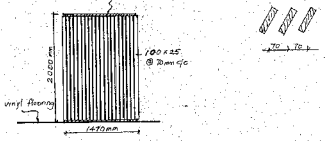






KITCHEN ELEVATIONS

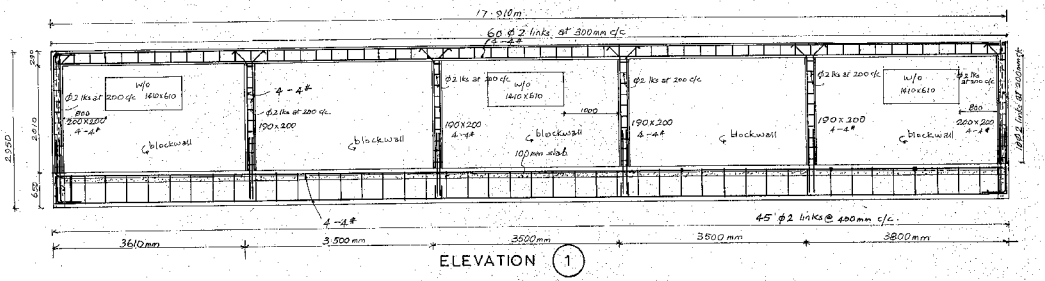




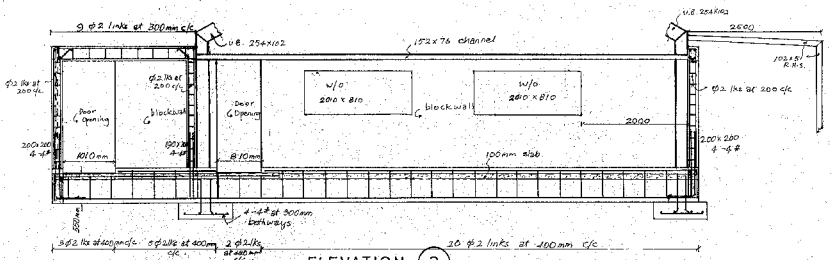
SCREEN

NOTE
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

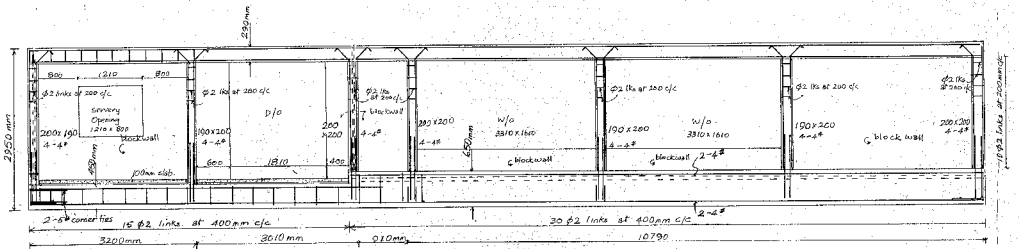
HEATHCOTE COUNTY COUNCIL	R.J. ANDERSON County Engineer JUNE 1975	LANDSDOWNE COMMUNITY CENTRE	MISCELLANEOUS DETAILS	SCALES 1:50 1:10	M93/A2



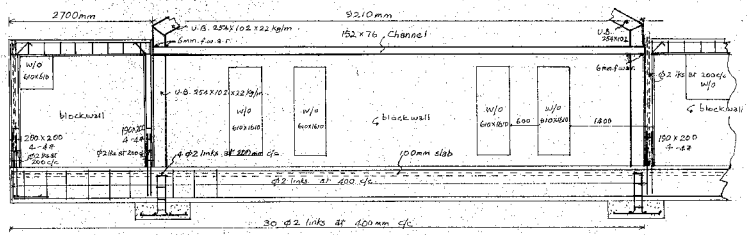
ELEVATION (1)



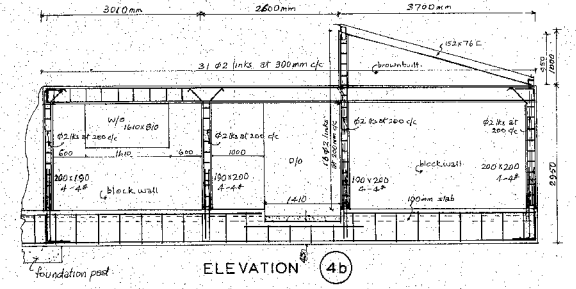
ELEVATION (3)



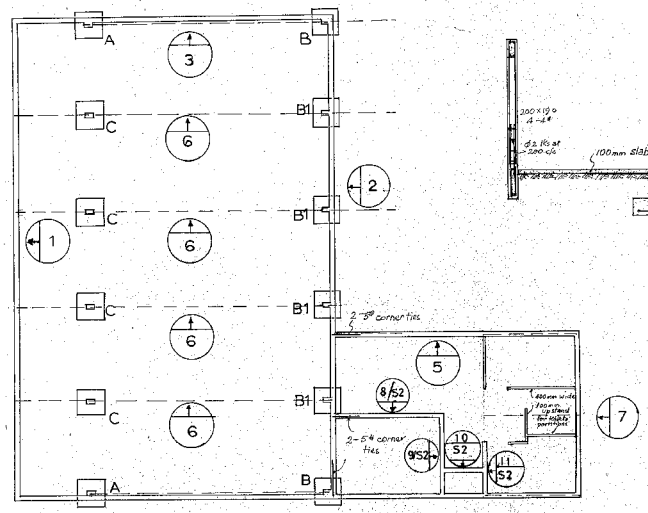
ELEVATION (2)



ELEVATION (4a)

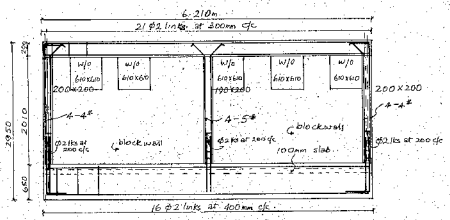


ELEVATION (4b)

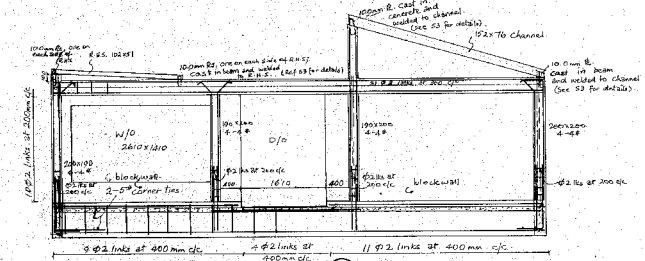


FOUNDATION PLAN

ELEVATION (6)



ELEVATION (7)



ELEVATION (5)

steel framing

- Floor and concrete paving to be reinforced with 665 mesh.
- Foundation pad B1, Section B minus transverse foundation beam.

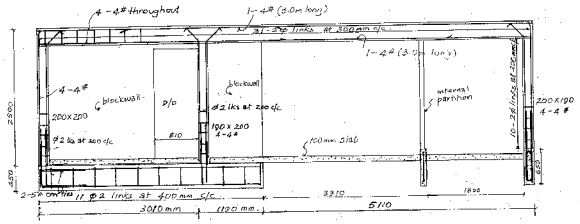
DETAILS OF REINFORCEMENTS

- ALL columns : 4–4* with Ø 2 links at 200 c/c (except middle col. in ELEV. 7 4-5* with Ø 2 at 200 c/c)
- ALL beams : 4–4* with Ø 2 links at 300 c/c (except beam shown in ELEV 8 in S2)
- ALL foundation beams : 4–4* with Ø 2 links at 400 c/c
- FLOOR & PAVING : 665 mesh

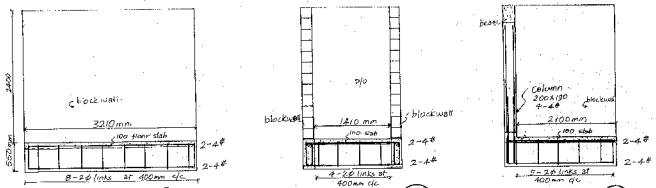
NOTE

BLOCKWORK REINFORCEMENTS ARE 12.5 mm BARS AT 600mm centres & 600mm centres HORZ.
ALL REINFORCING IN COLUMNS AND BEAMS ARE SIMILAR UNLESS OTHERWISE STATED.
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

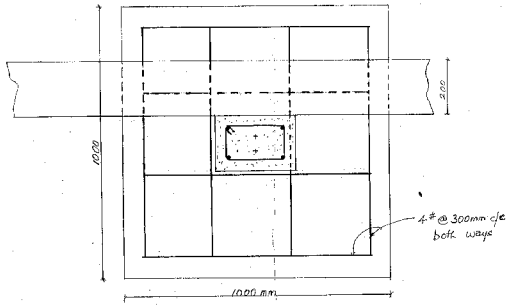
HEATHCOTE COUNTY COUNCIL	R.J. ANDERSON County Engineer JUNE 1975	LANDSDOWNE COMMUNITY CENTRE	FOUNDATION PLAN AND WALL ELEVATIONS	SCALES: 1:100 1:50	M93/S1

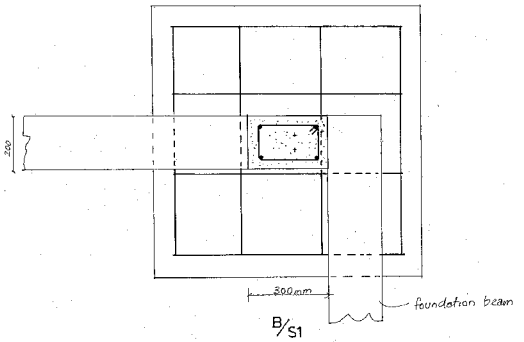


ELEVATION (8/S1)

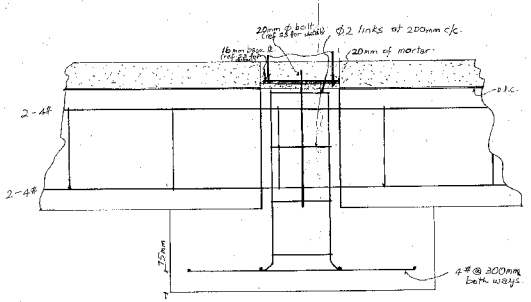


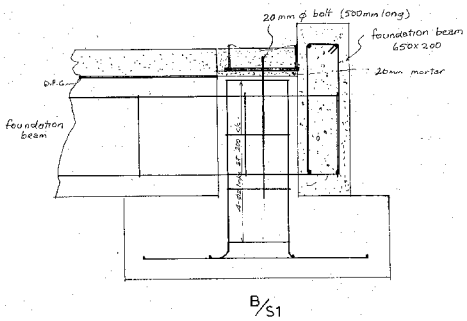
ELEVATION (9/S1) ELEVATION (10/S1) ELEVATION (11/S1)



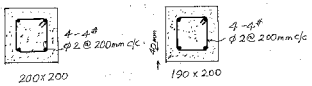


FOUNDATION PADS FOR PORTAL FRAMES

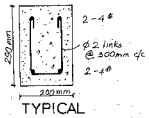




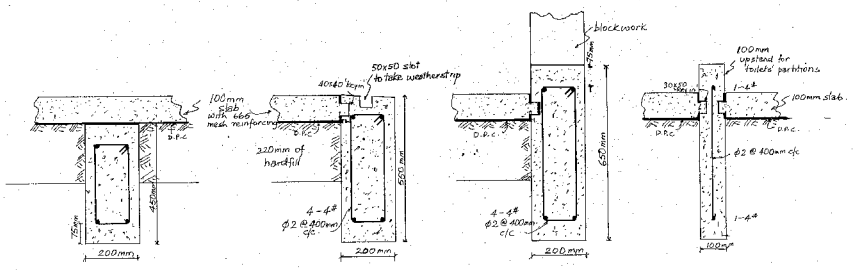
CROSS SECTIONS OF FOUNDATION PADS



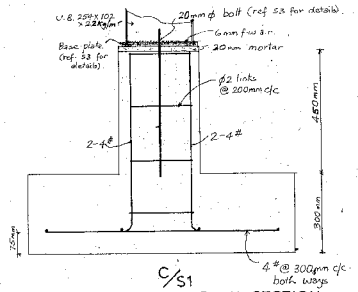
TYPICAL X-SECTIONS OF COLUMNS



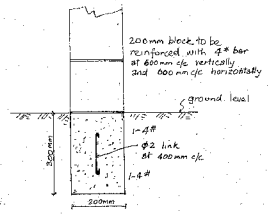
TYPICAL BEAM X-SECTION



FOUNDATION BEAMS CROSS SECTIONS



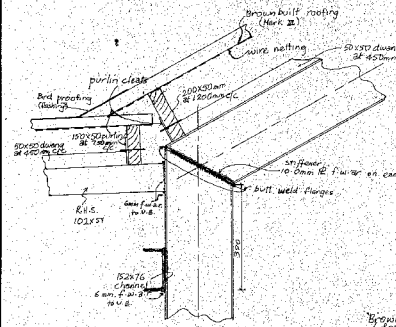
FOUNDATION PAD X-SECTION



FOUNDATION FOR EXTERIOR WALLS
(in CAR-PARK ETC.)

NOTE
ALL REFORCING IN COLUMNS AND BEAMS ARE SIMILAR UNLESS OTHERWISE STATED
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

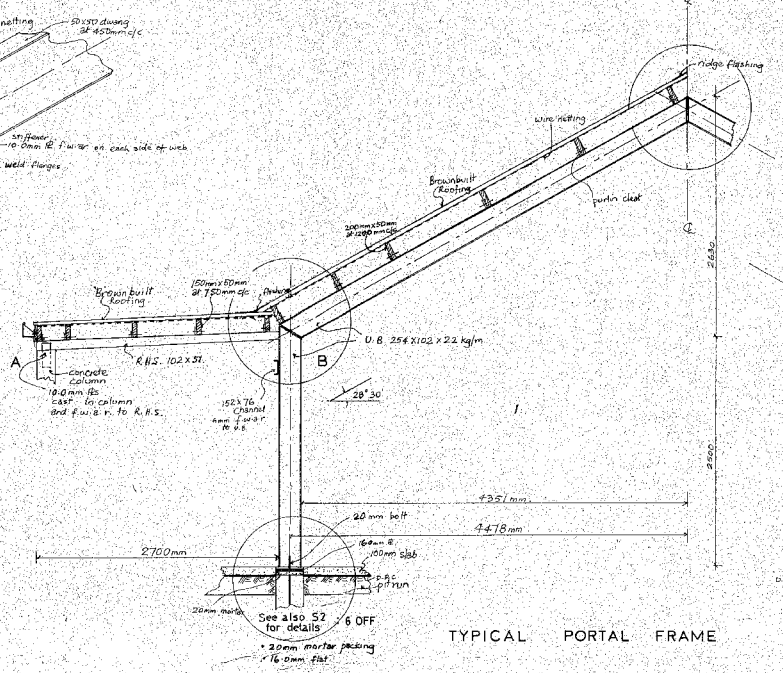
HEATHCOTE COUNTY COUNCIL	R. J. ANDERSON County Engineer JUNE 1975	LANDSDOWNE COMMUNITY CENTRE	FOUNDATION & WALL ELEVATIONS, CROSS SECT.	SCALES 1:50 1:10	M93/S2



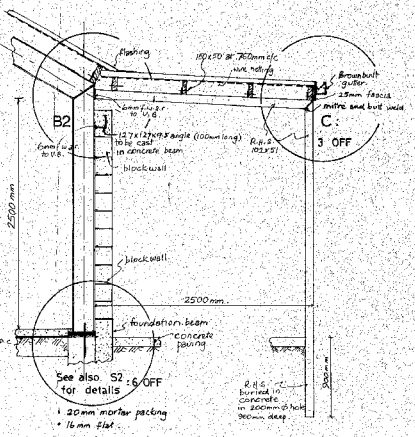
SECTION B

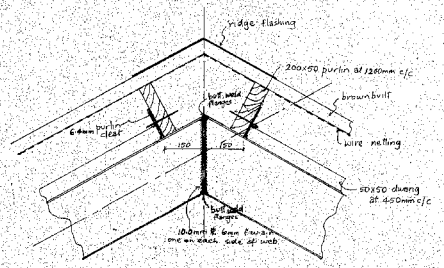
JOINT B	4 OFF
JOINT B1	2 OFF
joint B minus R.H.S.	
JOINT B2 plus angle	3 OFF
JOINT B3	3 OFF
joint B2 minus R.H.S.	

- Stiffeners : 10 mm flat :
- 45 x 10 flats, 283 long : 24 OFF.
- butt weld flanges
- 6mm f.w. s.r. on to webs and flanges



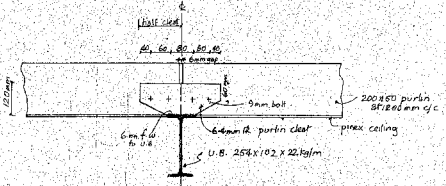
TYPICAL PORTAL FRAME

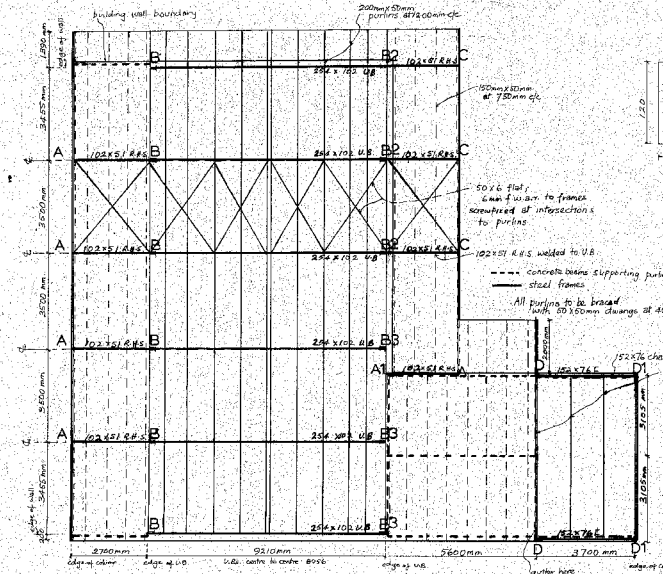




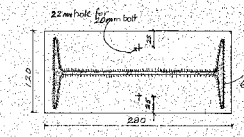
APEX JOINT (6 OFF)

- Stiffeners : 10 mm flat
- (45 x 10 flat ; 275 mm long : 12 OFF)
- butt weld flanges
- 6mm f.w.s.r. on to webs and flanges



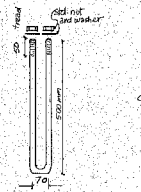


ROOF PLAN

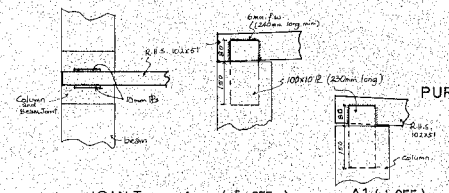


BASE PLATE : 12 OFF

- 120 x 16 flat 280 long
- 6mm. f.w.s.r. to U.B.
- drill two 22 holes for 20 bolts.



20mm. bolt
(12 OFF)



JOINT A (5 OFF)
(100 X 10 fl. 230 LONG: 12 OFF)

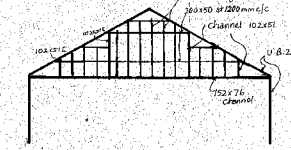
- 6 mm f.w.s.r, min: 240 weld for flat and R.H.S.

A1 (1 OFF)

PURLIN AND RAFTER CONNECTION

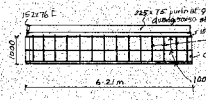
CLEATS	101 OFF
HALF CLEATS	47 OFF

- 6mm f.w.s.r. purlin cleat and U.B.
- 4 - 11mm hole for 9mm bolts.
- 6.4mm flat for purlin cleat.

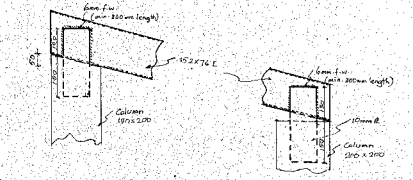


END FRAME
(See also ELEV 3 & 4a on S1)

- 6mm f.w.s.r. 102x51 l.s. to U.B and 152x76 L



WALL D-D
(See also ELEV. 4b & 5 on S1)



JOINT D (2 OFF)
(100 X 10 fl. 250 LONG: 2 OFF)

- min 300 weld, 6mm. f.w.s.r. flat to channel

JOINT D1 (2 OFF)
(100 X 10 fl. 280 LONG: 2 OFF)

- min. 300 weld, 6mm f.w.s.r. flat to channel

NOTE
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

HEATHCOTE COUNTY COUNCIL	R.J. ANDERSON County Engineer JUNE 1975	LANDSDOWNE COMMUNITY CENTRE	STRUCTURAL STEEL DETAILS	SCALES 1:30 1:100 1:10 1:40	M93/S3

Appendix C

CERA DEE Summary Data

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Landsdowne Community Centre			Reviewer:	David Whittaker
	Unit	No:	Street	CPEng No:	123089
Building Address:		8	Landsdowne Terrace, Cashmere	Company:	Beca
Legal Description:				Company project number:	5323355
				Company phone number:	03 3663521
	Degrees	Min	Sec		
GPS south:				Date of submission:	15/07/2013
GPS east:				Inspection Date:	8/08/2012
				Revision:	Final
Building Unique Identifier (CCC):	BU 1771-001			Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	0
Soil type:		Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to cliff top (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):	0.00
Storeys below ground	0				
Foundation type:	other (describe)			if Foundation type is other, describe:	Shallow foundations
Building height (m):	5.13			height from ground to level of uppermost seismic mass (for IEP only) (m):	5.13
Floor footprint area (approx):	280				
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):	other (specify)			Brief strengthening description:	
Use (upper floors):					
Use notes (if required):	Child care centre				
Importance level (to NZS1170.5):	IL2				

Gravity Structure

Gravity System:	frame system		
Roof:	steel framed	rafter type, purlin type and cladding	steel portal rafters, timber purlins and lightweight metal sheeting
Floors:	concrete flat slab	slab thickness (mm)	100
Beams:	steel non-composite	beam and connector type	254 x 102 x 22 UB, note concrete beams used in kitchen
Columns:	structural steel	typical dimensions (mm x mm)	254 x 102 x 22 UB, note concrete columns used in walls
Walls:	partially filled concrete masonry	thickness (mm)	190

Lateral load resisting structure

Lateral system along:	concrete frame with infill		**Note: Define along and across in detailed report!**	note total length of wall at ground (m):	38
Ductility assumed, μ:	1.25			wall thickness (m):	0.2
Period along:	0.40	0.01	from parameters in sheet	estimate or calculation?	estimated
Total deflection (ULS) (mm):				estimate or calculation?	
maximum interstorey deflection (ULS) (mm):				estimate or calculation?	
Lateral system across:	welded and bolted steel moment frame			note typical bay length (m)	9.2
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:			none
Wall cladding:	exposed structure	describe	Painted masonry walls
Roof Cladding:	Metal	describe	Lightweight metal sheeting
Glazing:	aluminium frames		
Ceilings:	plaster, fixed		
Services(list):	Electrical, plumbing		

Available documentation

Architectural	full	original designer name/date	
Structural	full	original designer name/date	County Engineer RJ Anderson/1975
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:	Good	Describe damage:	No damage 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:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	none apparent	notes (if applicable):	

Building:

	Current Placard Status:	green		
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	minor step cracks in masonry blocks
	Describe (summary):			
Across	Damage ratio:	0%		
	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:	minor step cracks in masonry blocks
	Building Consent required:	no		Describe:	
	Interim occupancy recommendations:	full occupancy		Describe:	
Along	Assessed %NBS before:	68%	#### %NBS from IEP below	If IEP not used, please detail assessment methodology:	Force Based Quantitative Assessment
	Assessed %NBS after:	68%			
Across	Assessed %NBS before:	66%	#### %NBS from IEP below		
	Assessed %NBS after:	66%			

IEP **Use of this method is not mandatory - more detailed analysis may give a different answer, which would take precedence. Do not fill in fields if not using IEP.**

Period of design of building (from above): 1965-1976 — h_n from above: 5.13m

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

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

Note:1 for specifically design public buildings, to the code of the day: pre-1965 = 1.25; 1965-1976, Zone A =1.33; 1965-1976, Zone B = 1.2; all else 1.0
Note 2: for RC buildings designed between 1976-1984, use 1.2
Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0)

	along	across
Final $(\%NBS)_{nom}$:	**0%**	**0%**

2.2 Near Fault Scaling Factor

Near Fault scaling factor, from NZS1170.5, cl 3.1.6:

	along	across
Near Fault scaling factor (1/N(T,D), **Factor A**:	#DIV/0!	#DIV/0!

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3:
Z_{1992}, from NZS4203:1992
Hazard scaling factor, **Factor B:** #DIV/0!

2.4 Return Period Scaling Factor

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

2.5 Ductility Scaling Factor

	along	across
Assessed ductility (less than max in Table 3.2)		
Ductility scaling factor: =1 from 1976 onwards; or =k_μ, if pre-1976, fromTable 3.3:		
Ductility Scaling Factor, **Factor D**:	0.00	0.00

2.6 Structural Performance Scaling Factor:

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

2.7 Baseline %NBS, $(NBS\%)_b = (\%NBS)_{nom}$ x A x B x C x D x E

$\%NBS_b$:	**#DIV/0!**	**#DIV/0!**

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

3.1. Plan Irregularity, factor A: 1

3.2. Vertical irregularity, Factor B: 1

3.3. Short columns, Factor C: 1

3.4. Pounding potential
Pounding effect D1, from Table to right
Height Difference effect D2, from Table to right

Therefore, Factor D: 0

3.5. Site Characteristics 1

Table for selection of D1	Severe	Significant	Insignificant/none
Separation	0<sep<.005H	.005<sep<.01H	Sep>.01H
Alignment of floors within 20% of H	**0.7**	**0.8**	**1**
Alignment of floors not within 20% of H	**0.4**	**0.7**	**0.8**

Table for Selection of D2	Severe	Significant	Insignificant/none
Separation	0<sep<.005H	.005<sep<.01H	Sep>.01H
Height difference > 4 storeys	0.4	0.7	1
Height difference 2 to 4 storeys	0.7	0.9	1
Height difference < 2 storeys	1	1	1

3.6. Other factors, Factor F

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

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

3.7. Overall Performance Achievement ratio (PAR)

	0.00	**0.00**

4.3 PAR x (%NBS)b:

PAR x Baselline %NBS:	**#DIV/0!**	**#DIV/0!**

4.4 Percentage New Building Standard (%NBS), (before) **#DIV/0!**

Official Use only:

Accepted By:
Date:

Appendix D

Previous Reports and Assessments

Jared Sullivan 021-190009

Christchurch Eq. RAPID Assessment Form - LEVEL 1

Inspector Initials	JRS	Date of Inspection	13/6/2011	Exterior Only	
Territorial Authority	Christchurch City	Time		Exterior and Interior	✓

Building Name: Lundsdown Community Ctr.
Short Name: BU1771-001
Address: 8 Lundsdown Tce.
GPS Co-ordinates: S° E°
Contact Name:
Contact Phone:

Storeys at and above ground level: 1
Below ground level: 0
Total gross floor area (m²): 600.620
Year built: 1976
No of residential Units: N/A

Photo Taken: (Yes) No

Type of Construction
- ☐ Timber frame
- ☑ Steel frame
- ☐ Tilt-up concrete
- ☐ Concrete frame
- ☐ RC frame with masonry infill
- ☐ Concrete shear wall
- ☐ Unreinforced masonry
- ☑ Reinforced masonry
- ☐ Confined masonry
- ☐ Other:

Primary Occupancy
- ☐ Dwelling
- ☐ Other residential
- ☑ Public assembly
- ☐ School
- ☐ Religious
- ☐ Commercial/ Offices
- ☐ Industrial
- ☐ Government
- ☐ Heritage Listed
- ☐ Other

Investigate the building for the conditions listed below:

Overall Hazards / Damage	Minor/None	Moderate	Severe	Comments
Collapse, partial collapse, off foundation	☑	☐	☐	
Building or storey leaning	☑	☐	☐	
Wall or other structural damage	☑	☐	☐	No damage observed.
Overhead falling hazard	☑	☐	☐	
Ground movement, settlement, slips	☑	☐	☐	
Neighbouring building hazard	☑	☐	☐	
Other	☑	☐	☐	

Choose a posting based on the evaluation and team judgement. Severe conditions affecting the whole building are grounds for an UNSAFE posting. Localised Severe and overall Moderate conditions may require a RESTRICTED USE. Place INSPECTED placard at main entrance. Post all other placards at every significant entrance.

INSPECTED	RESTRICTED USE	UNSAFE
GREEN ☑	YELLOW ☐	RED ☐

Record any restriction on use or entry:

Further Action Recommended:

Tick the boxes below only if further actions are recommended
- ☐ Barricades are needed (state location):
- ☐ Level 2 or detailed engineering evaluation recommended
  - ☐ Structural ☐ Geotechnical ☐ Other:
- ☐ Other recommendations:

Estimated Overall Building Damage (Exclude Contents)

None	☐		
0-1 %	☑	31-60 %	☐
2-10 %	☐	61-99 %	☐
11-30 %	☐	100 %.	☐

Sign here on completion

Date & Time: 13/6/2011
ID: 209474

CHCH

Inspection ID _____ (Office Use Only)

Christchurch Eq RAPID Assessment Form - LEVEL 2

Inspector Initials		Date		Final Posting (e.g. UNSAFE)	
Territorial Authority	Christchurch City	Time			

Building Name
Short Name
Address
GPS Co-ordinates S° E°
Contact Name
Contact Phone
Storeys at and above ground level
Below ground level
Total gross floor area (m^2)
Year built
No of residential Units
Photo Taken Yes No

Type of Construction

- ☐ Timber frame
- ☐ Steel frame
- ☐ Tilt-up concrete
- ☐ Concrete frame
- ☐ RC frame with masonry infill
- ☐ Concrete shear wall
- ☐ Unreinforced masonry
- ☐ Reinforced masonry
- ☐ Confined masonry
- ☐ Other:

Primary Occupancy

- ☐ Dwelling
- ☐ Other residential
- ☐ Public assembly
- ☐ School
- ☐ Religious
- ☐ Commercial/ Offices
- ☐ Industrial
- ☐ Government
- ☐ Heritage Listed
- ☐ Other

Investigate the building for the conditions listed on page 1 and 2, and check the appropriate column. A sketch may be added on page 3

Overall Hazards / Damage	Minor/None	Moderate	Severe	Comments
Collapse, partial collapse, off foundation	☐	☐	☐	
Building or storey leaning	☐	☐	☐	
Wall or other structural damage	☐	☐	☐	
Overhead falling hazard	☐	☐	☐	
Ground movement, settlement, slips	☐	☐	☐	
Neighbouring building hazard	☐	☐	☐	
Electrical, gas, sewerage, water, hazmats	☐	☐	☐	

Record any existing placard on this building:

Existing Placard Type (e.g. UNSAFE)

Choose a new posting based on the new evaluation and team judgement. Severe conditions affecting the whole building are grounds for an UNSAFE posting. Localised Severe and overall Moderate conditions may require a RESTRICTED USE. Place INSPECTED placard at main entrance. Post all other placards at every significant entrance. Transfer the chosen posting to the top of this page.

INSPECTED			RESTRICTED USE			UNSAFE			
GREEN	*G1*	*G2*	*YELLOW*	*Y1*	*Y2*	*RED*	*R1*	*R2*	*R3*

Record any restriction on use or entry:

Further Action Recommended:

Tick the boxes below only if further actions are recommended

- ☐ Barricades are needed (state location):
- ☐ Detailed engineering evaluation recommended
  - ☐ Structural ☐ Geotechnical
- ☐ Other recommendations:
- ☐ Other:

Estimated Overall Building Damage (Exclude Contents)

None	☐		
0-1 %	☐	31-60 %	☐
2-10 %	☐	61-99 %	☐
11-30 %	☐	100 %	☐

Sign here on completion

Date & Time
ID

Inspection ID: _____ *(Office Use Only)*

PROP1:

Structural Hazards/ Damage	Minor/None	Moderate	Severe	Comments
Foundations	☑	☐	☐	
Roofs, floors (vertical load)	☑	☐	☐	
Columns, pilasters, corbels	☑	☐	☐	
Diaphragms, horizontal bracing	☑	☐	☐	
Pre-cast connections	☑	☐	☐	
Beam	☑	☐	☐	
Non-structural Hazards / Damage				
Parapets, ornamentation	☑	☐	☐	
Cladding, glazing	☑	☐	☐	
Ceilings, light fixtures	☑	☐	☐	
Interior walls, partitions	☑	☐	☐	
Elevators	☑	☐	☐	
Stairs/ Exits	☑	☐	☐	
Utilities (eg. gas, electricity, water)	☑	☐	☐	
Other	☑	☐	☐	
Geotechnical Hazards / Damage				
Slope failure, debris	☑	☐	☐	
Ground movement, fissures	☑	☐	☐	
Soil bulging, liquefaction	☑	☐	☐	

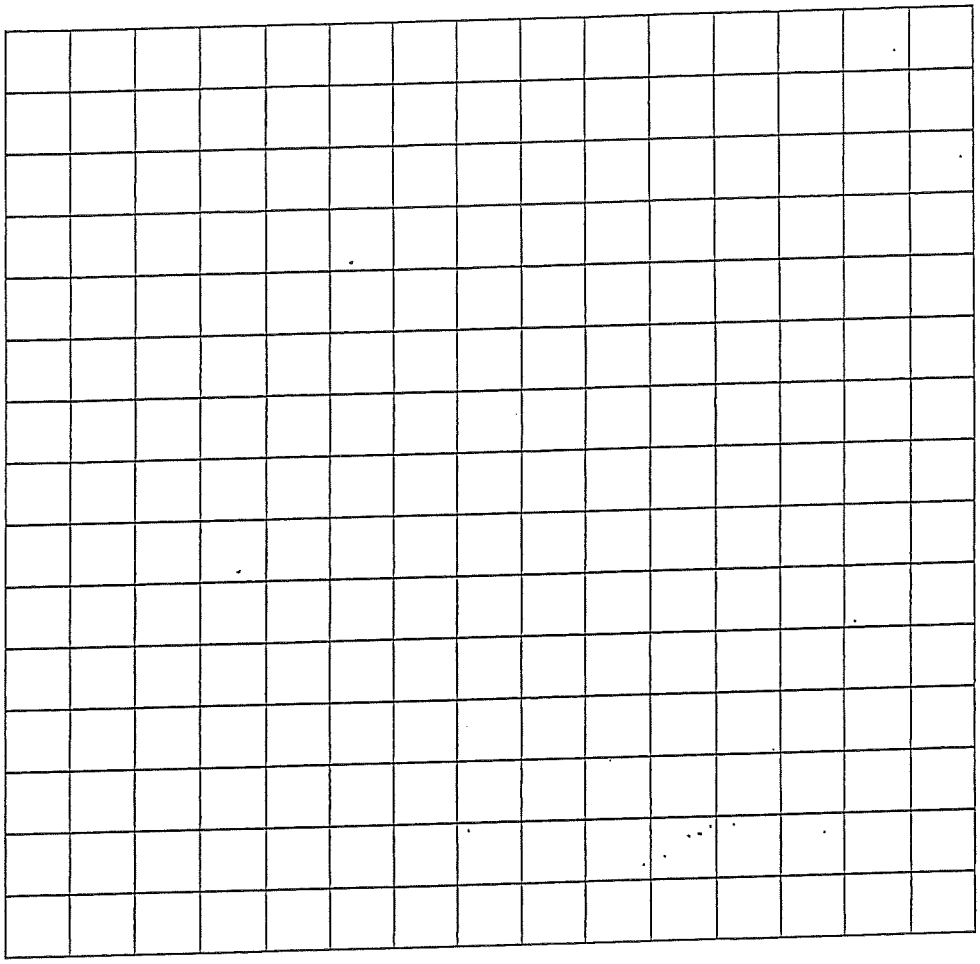
General Comment No damage observed

Minor crack at joint between toilet block + main building

Usability Category

Damage Intensity	Posting	Usability Category	Remarks
Light damage *Low risk*	Inspected (Green)	G1. Occupiable, no immediate further investigation required	
		G2. Occupiable, repairs required	
Medium damage *Medium risk*	Restricted Use (Yellow)	Y1. Short term entry	
		Y2. No entry to parts until repaired or demolished	
Heavy damage *High risk*	Unsafe (Red)	R1. Significant damage: repairs, strengthening possible	
		R2. Severe damage: demolition likely	
		R3. At risk from adjacent premises or from ground failure	

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



Recommendations for Repair and Reconstruction or Demolition (Optional)

Appendix E

Site Investigations

Calculation Sheet

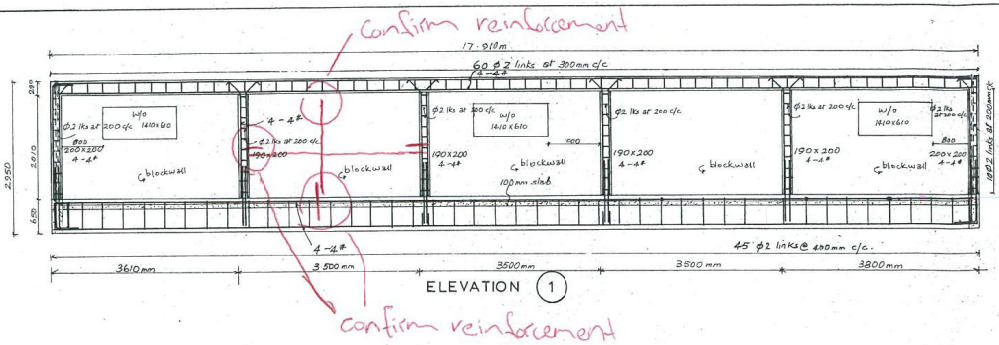
Job Name: Landsdowne Community Centre **Job No:** 5323355

Subject: Level 5 DEE **Page No:** 2 **of**

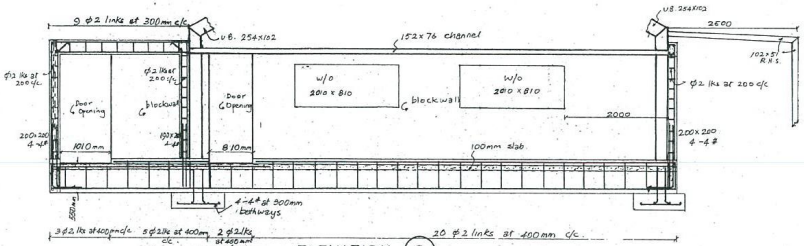
By: A J S (2 5 6) **Date:** 16/10/12

Notes for investigation

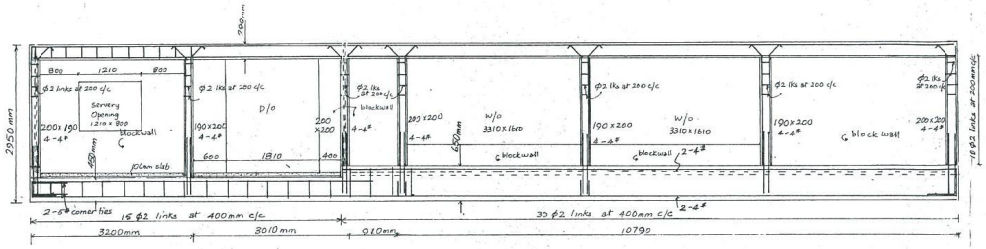
1. Locate investigation site (along elevation D). Location will occur near the entrance to the Ladies toilets, (not shown on drawings)
2. Use a cover meter to locate the reinforcement in the wall before commencing the investigative scan. Main wall reinforcement is Ø12 bars at 600mm c/c.
3. Align the investigative scan area centrally to the main wall reinforcing bar.
4. Record and report the results of the x-ray scan. Show location of all reinforcement within the scanned area.



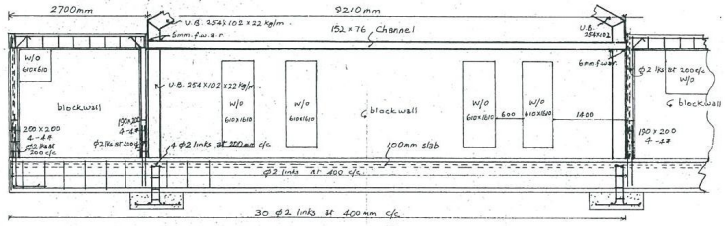
ELEVATION (1)



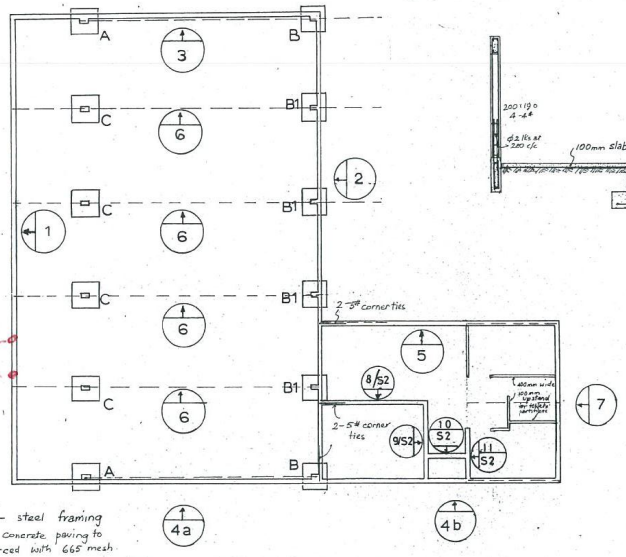
ELEVATION (3)



ELEVATION (2)



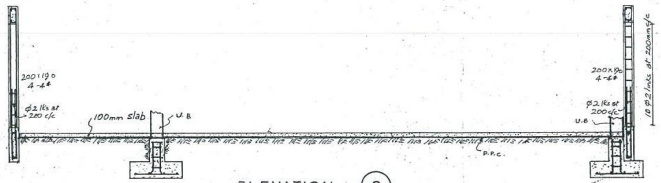
ELEVATION (4a)



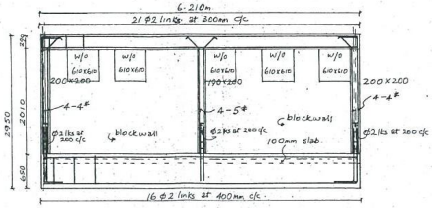
FOUNDATION PLAN

— — — steel framing

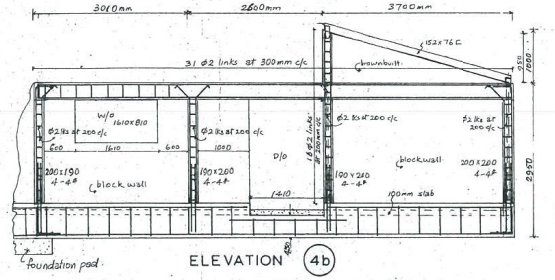
- Floor and concrete paving to be reinforced with 665 mesh
- Foundation pad B1, Section B minor transverse foundation beam.



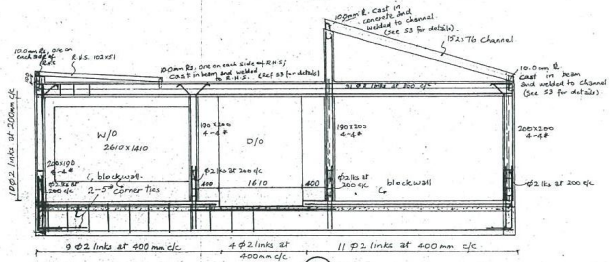
ELEVATION (6)



ELEVATION (7)



ELEVATION (4b)



ELEVATION (5)

DETAILS OF REINFORCEMENTS

- ALL columns : 4–4# with Ø 2 links at 200 c/c (except middle col. in ELEV. 7 4-5# with Ø 2 at 200c/c)
- ALL beams : 4–4# with Ø 2 links at 300 c/c (except beam shown in ELEV 8 in S2)
- ALL foundation beams : 4–4# with Ø 2 links at 400 c/c
- FLOOR & PAVING : 665 mesh

NOTE

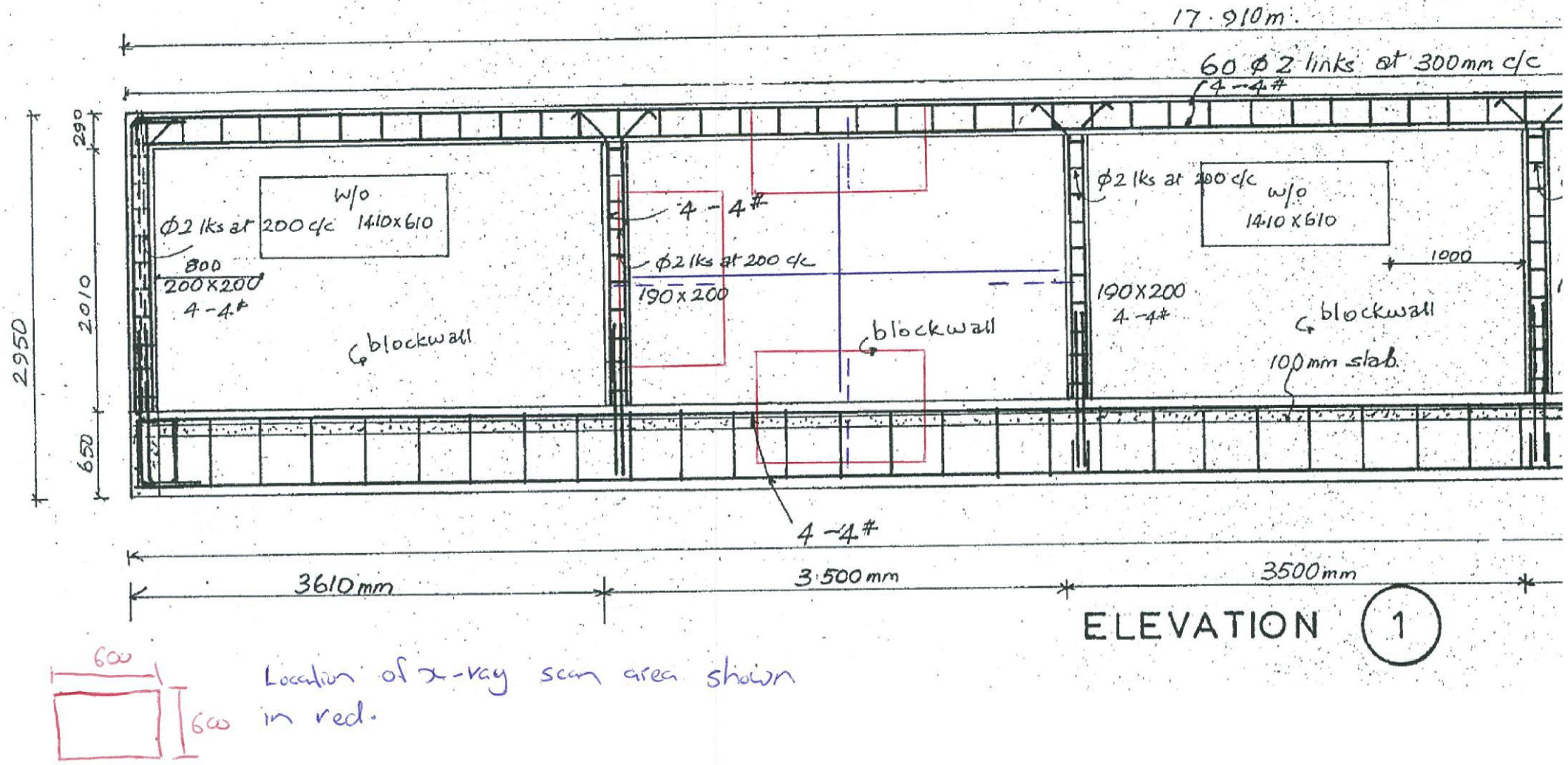
BLOCKWORK REINFORCEMENTS ARE 12.5mm BARS AT 600mm centres & 600mm centres HORZ.
ALL REINFORCING IN COLUMNS AND BEAMS ARE SIMILAR UNLESS OTHERWISE STATED.
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

* Investigation marked on drawing

HEATHCOTE COUNTY COUNCIL	R.J. ANDERSON County Engineer JUNE 1975	LANDSDOWNE COMMUNITY CENTRE	FOUNDATION PLAN AND WALL ELEVATIONS	SCALES: 1:100 1:50	M93/S1

Landsdowne Intrusive Investigation

* Expect ϕ12 reinforcement bars @ 600 c/c.
* Align bar central to x-ray scan area.



ELEVATION (1)

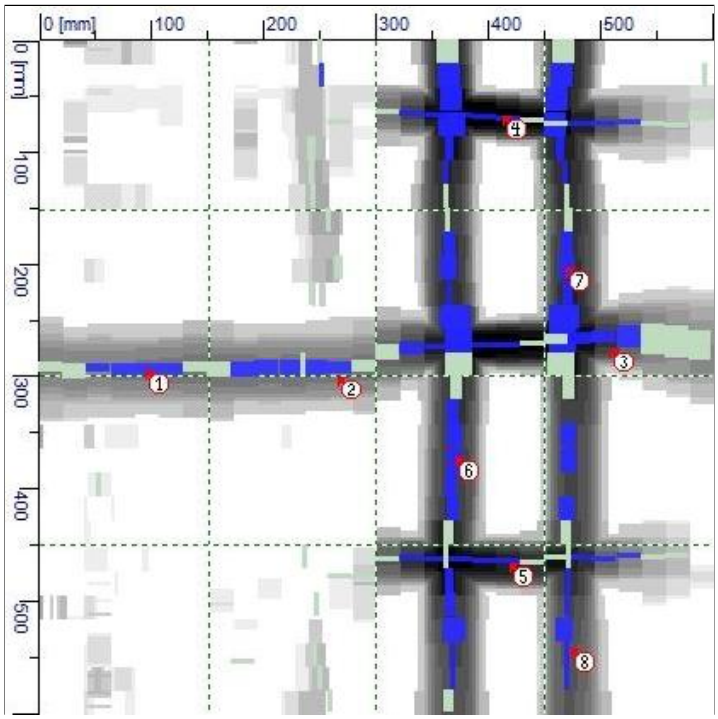
Location of x-ray scan area shown in red.

Landsdowne Community Centre - Investigation

* Investigation x ray scan areas shown. (approximate location)
* Confirm reinforcing bar location before completing scan.

Imagescan: *FS002261.XFF*

Date / Time: 2012-10-29 10:59:05 SSN: 04806010 [mm]



Customer: Mike - Citycare

Location: 4 Landsdowne Terrace, Cashmere Operator: Frank Kang

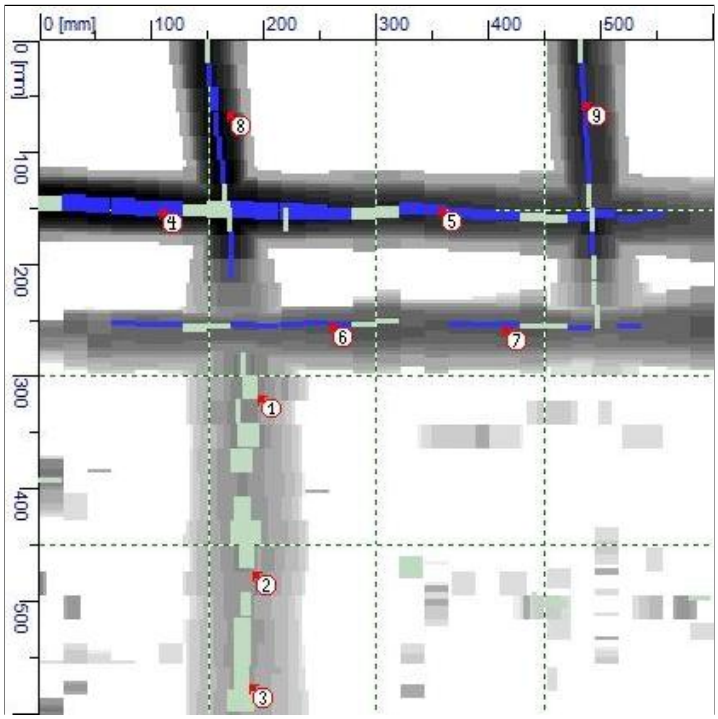
Comment:

Marker	x: [mm]	y: [mm]	Comment:
1	95	295	Concrete cover = 57mm, Estimated bar size = 12mm
2	266	300	Concrete cover = 56mm, Estimated bar size = 12mm
3	510	275	Concrete cover = 40mm, Estimated bar size = 12mm
4	414	67	Concrete cover = 25mm, Estimated bar size = 6mm
5	421	467	Concrete cover = 30mm, Estimated bar size = 6mm
6	373	374	Concrete cover = 42mm, Estimated bar size = 14mm
7	470	203	Concrete cover = 39mm, Estimated bar size = 12mm
8	475	542	Concrete cover = 47mm, Estimated bar size = 16mm

Project: Landsdowne Community Centre

Imagescan: *FS002262.XFF*

Date / Time: 2012-10-29 11:07:08 SSN: 04806010 [mm]



Customer: Mike - Citycare

Location: 4 Landsdowne Terrace, Cashmere Operator: Frank Kang

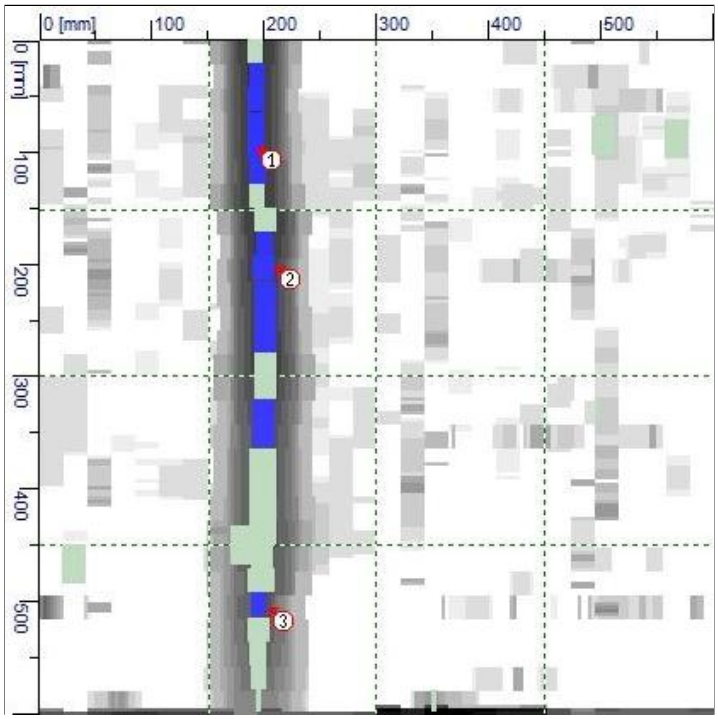
Comment:

Marker	x: [mm]	y: [mm]	Comment:
1	195	318	Concrete cover = 86mm, Estimated bar size = 14mm
2	190	475	Concrete cover = 87mm, Estimated bar size = 14mm
3	188	575	Concrete cover = 92mm, Estimated bar size = 14mm
4	107	151	Concrete cover = 45mm, Estimated bar size = 14mm
5	356	149	Concrete cover = 50mm, Estimated bar size = 12mm
6	259	252	Concrete cover = 51mm, Estimated bar size = 6mm
7	415	255	Concrete cover = 52mm, Estimated bar size = 6mm
8	167	64	Concrete cover = 43mm, Estimated bar size = 8mm
9	486	55	Concrete cover = 45mm, Estimated bar size = 6mm

Project: Landsdowne Community Centre

Imagescan: *FS002263.XFF*

Date / Time: 2012-10-29 11:10:06 SSN: 04806010 [mm]



Customer: Mike - Citycare

Location: 4 Landsdowne Terrace, Cashmere Operator: Frank Kang

Comment:

Marker	x: [mm]	y: [mm]	Comment:
1	195	95	Concrete cover = 52mm, Estimated bar size = 16mm
2	211	200	Concrete cover = 51mm, Estimated bar size = 16mm
3	205	507	Concrete cover = 59mm, Estimated bar size = 14mm

Project: Landsdowne Community Centre

Calculation Sheet

Job Name:	Landsdowne Community Centre	**Job No:**	5 3 2 3 3 5 5
Subject:	Further Investigations	**Page No:**	1 of 9
By:	A J S (2 5 6)	**Date:**	2 4 / 1 0 / 1 2

Aim:

To confirm the connection between the 152 x 76 PFC in the end bay frame and the wall as well as the orientation of the PFC

Investigation Required

1 Removed external cladding to reveal the PFC (if this provides inadequate access open internal face as well).

2 It is suggested that the investigation occurs in the corner, near the portal frame knee (see photo)

3 Perform investigation at both ends of the building. Open external face of wall first.

4 Confirm the orientation of the beam. Mark up on page 2 and show additional details if present

5 Confirm the connection detail. Mark up on page 3 and show additional details if present.

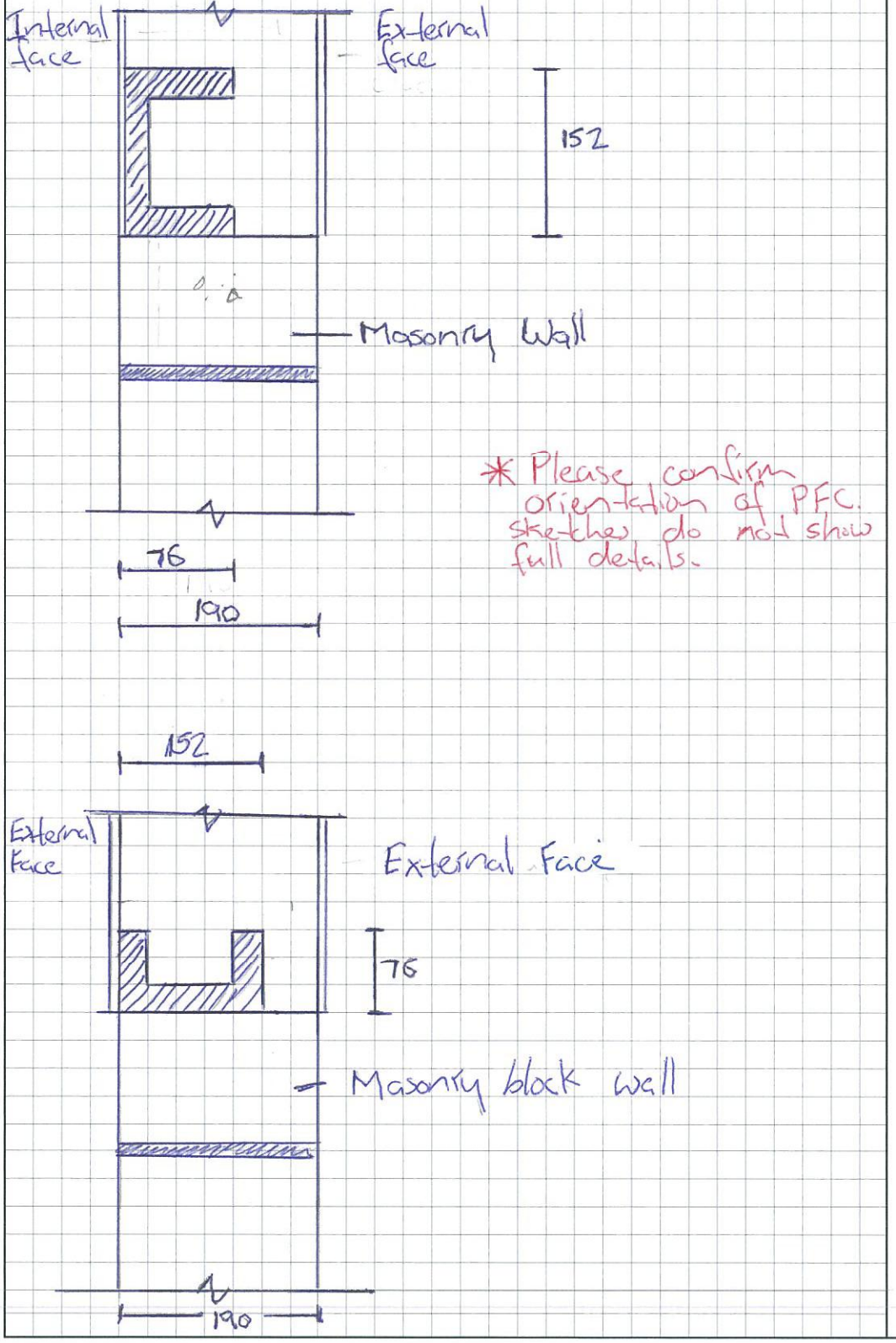
If the connection detail is different to those assumed on page 3 then sketch up connection and photograph the connection.

7 Photograph the investigation

Calculation Sheet

Job Name: Landsdowne Community Centre **Job No:** 532 3355
Subject: Further Investigations **Page No:** 2 **of** 9
By: A J S (2 5 6) **Date:** 24/10/12

1. Orientation of the 152x76 PFC Section

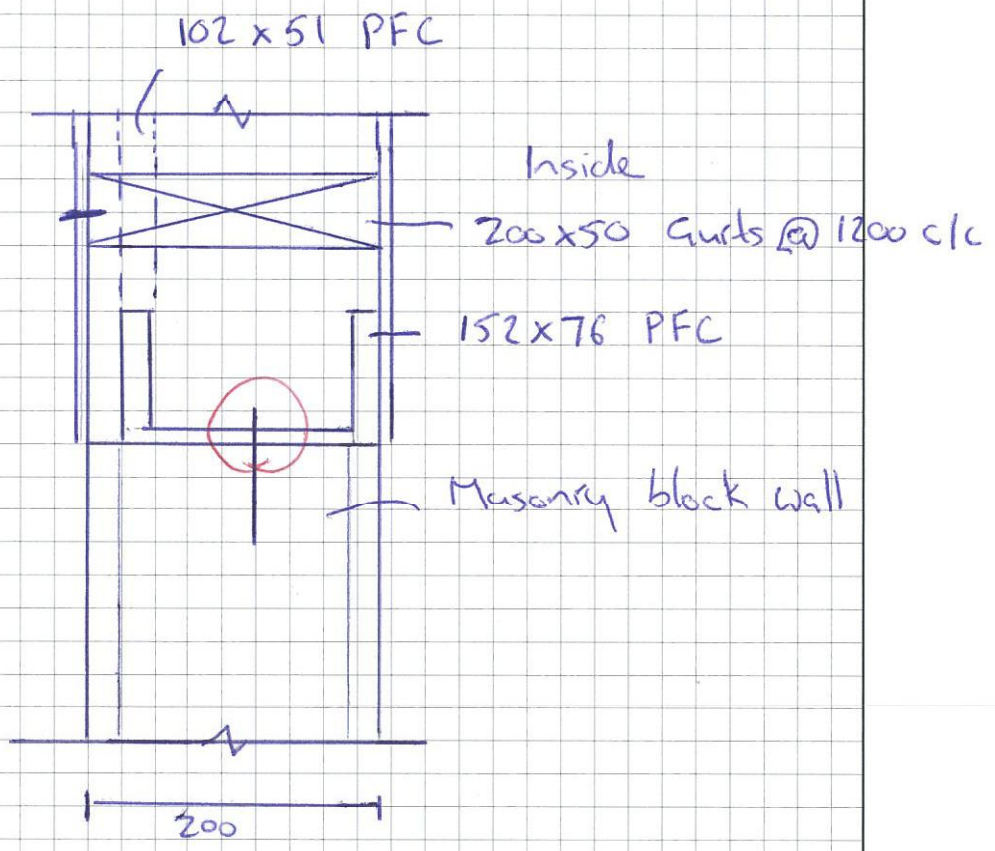


* Please confirm orientation of PFC. sketches do not show full details.

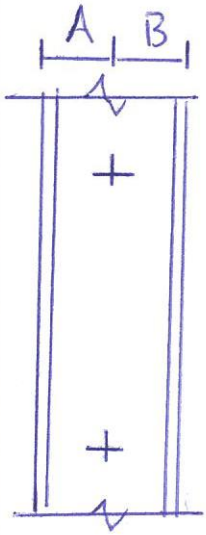
Calculation Sheet

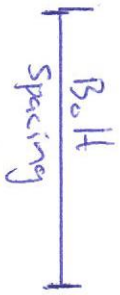
Job Name: Lansdowne Community Centre **Job No:** 5323355
Subject: Further Investigations **Page No:** 3 **of** 9
By: A J S (2 5 6) **Date:** 24/10/12

Connection between 152 x 76 PFC Section and Wall.



○ shows investigation location.





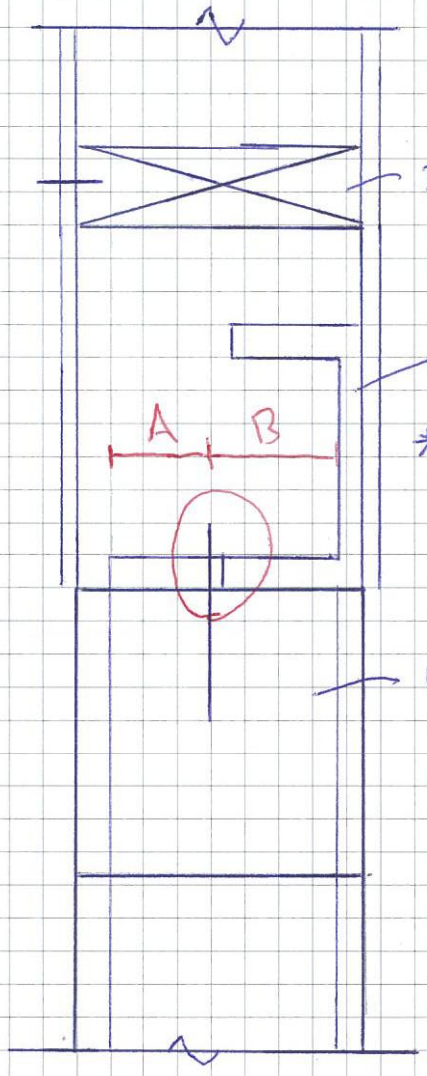
Investigation

Bolt diameter	=	mm
Bolt Spacing	=	mm
Edge Distance A	=	mm
Edge Distance B	=	mm

Calculation Sheet

Job Name: Landsdowne Community Centre **Job No:** 5323355
Subject: Further Investigations **Page No:** 4 **of** 9
By: A J S (2 5 6) **Date:** 24/10/12

Connection between 152 x 76 PFC Section and Wall.



Investigation

Bolt diameter = mm

Bolt Spacing = mm → See diagram on page

Edge Distance A = mm

Edge Distance B = mm

Location of investigation area (typical) shown in red.

Notes:

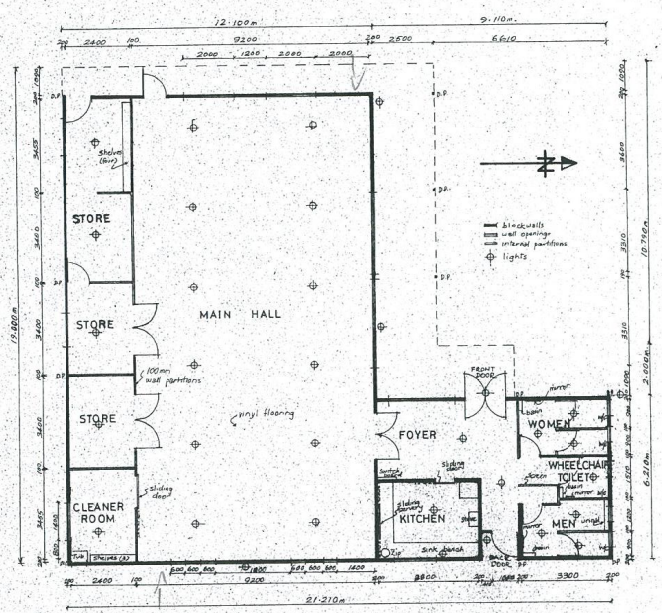
1. Open up external face first, if this is inadequate for investigation then open up internal face as well.
2. Perform investigation for both ends of the building as shown on the drawings.

5/9

Location of investigation area (typical) shown in red.

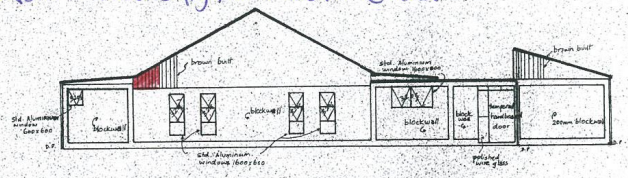
Notes:

1. Open up external face first, if this is inadequate for investigation then open up internal face as well.
2. Perform investigation for both ends of the building as shown on the drawings.

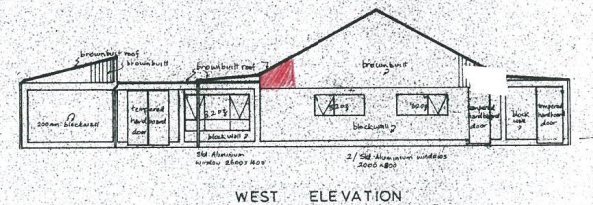


PLAN

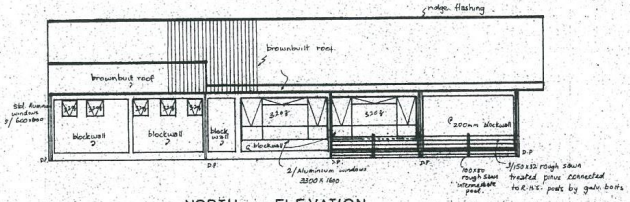
1. Open area marked in red for investigation.
2. Confirm PFC orientation (refer notes)
3. Confirm PFC connection (refer notes)
4. Perform investigation both ends.



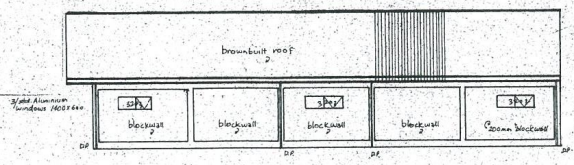
EAST ELEVATION



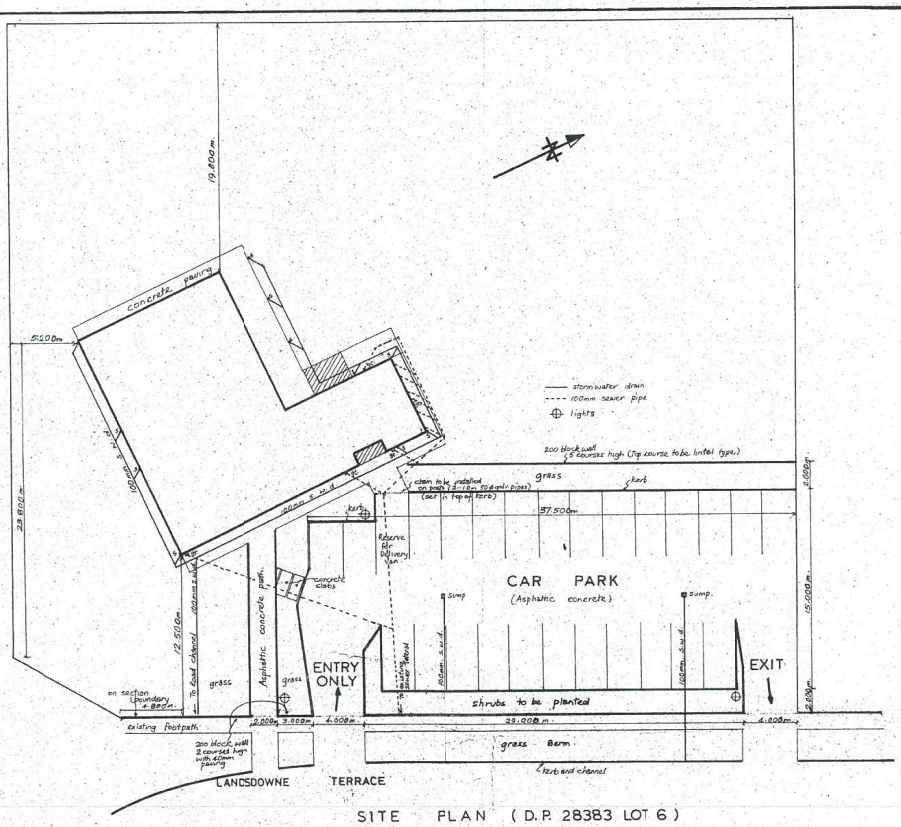
WEST ELEVATION



NORTH ELEVATION



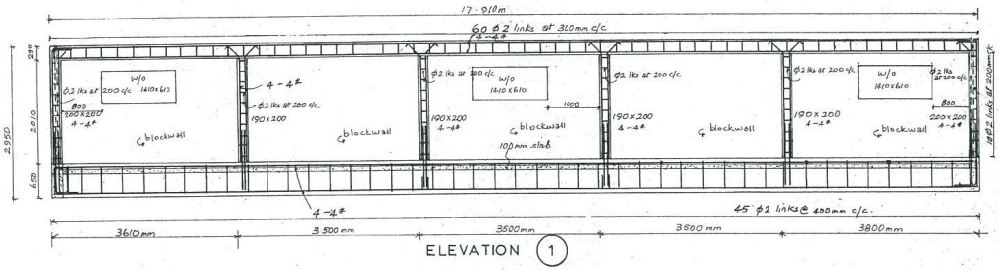
SOUTH ELEVATION



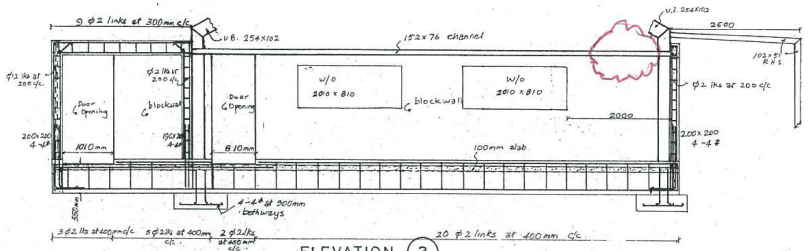
SITE PLAN (D.P. 28383 LOT 6)

NOTE:
ROOFING IS OF BROWNBUILT 300 MARK III.
EXTERIOR WALLS ARE OF 200 BLOCKWORK
WINDOWS ARE OF STD. ALUMINIUM TYPE ELSE OTHERWISE STATED
CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK.

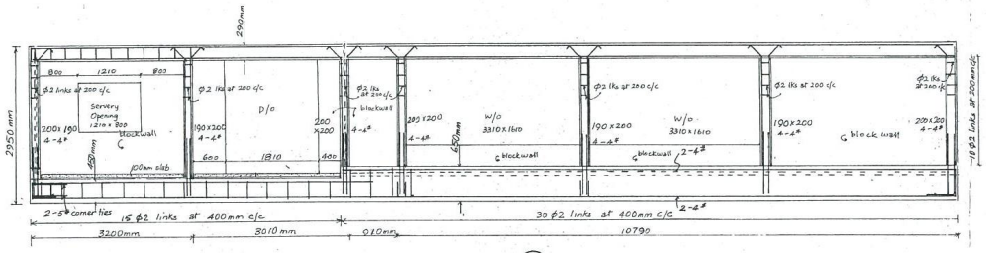
HEATHCOTE COUNTY COUNCIL	R. J. ANDERSON County Engineer JUNE 1975	LANDSDOWNE COMMUNITY CENTRE	PLAN, SITE PLAN AND ELEVATIONS	SCALES 1:100 1:200	M93/A1



ELEVATION (1)

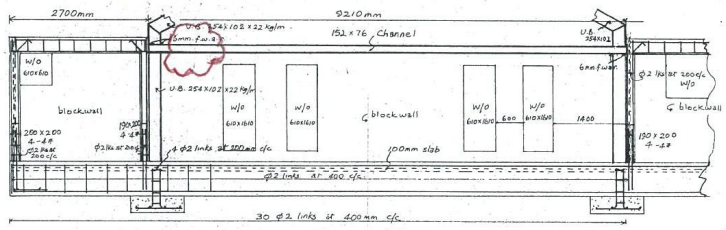


ELEVATION (3)



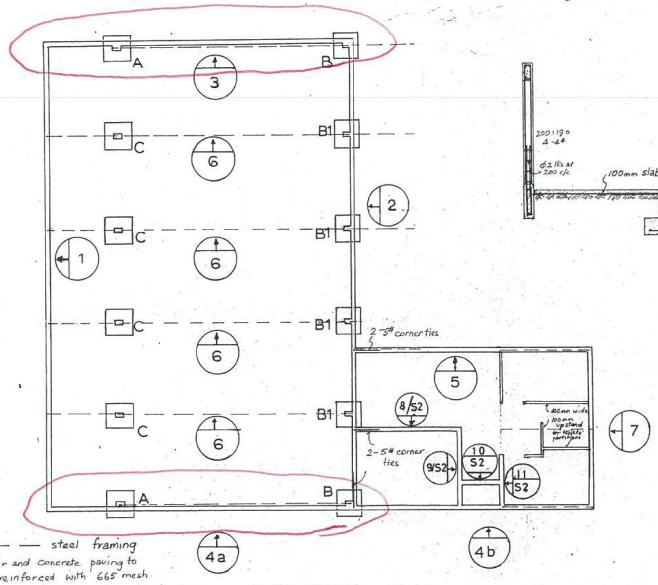
ELEVATION (2)

Investigation areas shown.

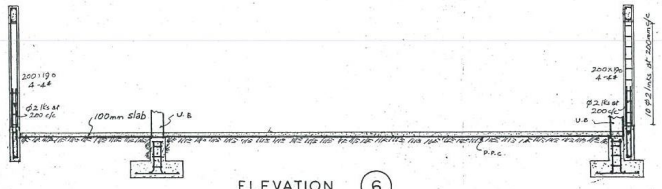


ELEVATION (4a)

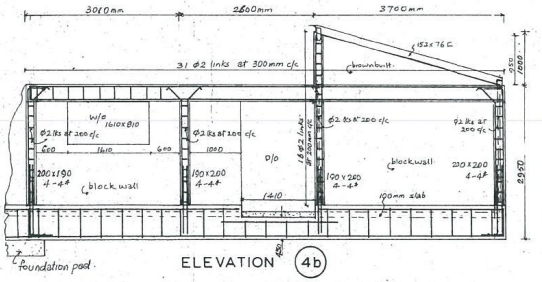
Perform investigation both ends.



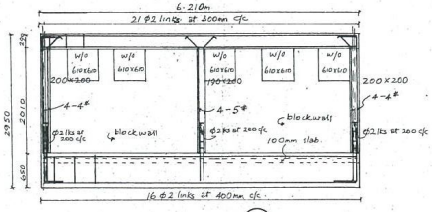
FOUNDATION PLAN



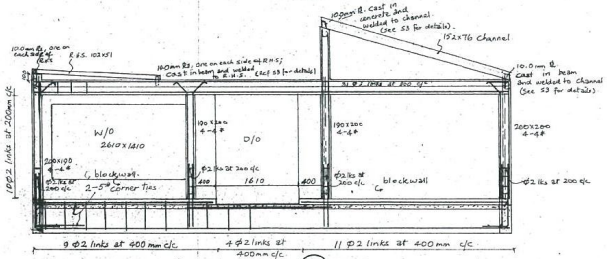
ELEVATION (6)



ELEVATION (4b)



ELEVATION (7)



ELEVATION (5)

DETAILS OF REINFORCEMENTS

- ALL columns : 4–4# with Ø 2 links at 200 c/c (except middle col. in ELEV. 7 4–5# with Ø 2 at 200 c/c)
- ALL beams : 4–4# with Ø 2 links at 300 c/c (except beam shown in ELEV 8 in S2)
- ALL foundation beams : 4–4# with Ø 2 links at 400 c/c
- FLOOR & PAVING : 665 mesh

NOTE

BLOCKWORK REINFORCEMENTS ARE 12.5mm BARS AT 600mm centres & 600mm centres HORZ. ALL REINFORCING IN COLUMNS AND BEAMS ARE SIMILAR UNLESS OTHERWISE STATED. CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK

HEATHCOTE COUNTY COUNCIL	R.J. ANDERSON County Engineer JUNE 1975	LANDSDOWNE COMMUNITY CENTRE	FOUNDATION PLAN AND WALL ELEVATIONS	SCALES: 1:100 1:50	M93/S1

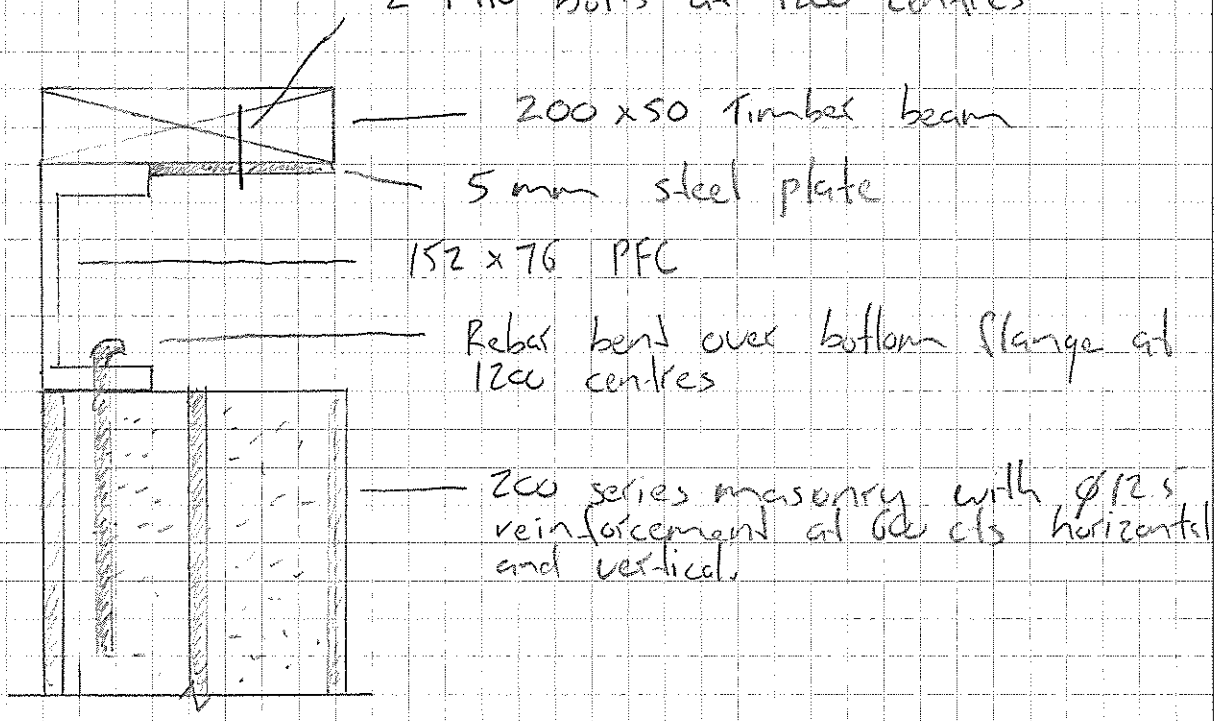
JOB TITLE: Landsdowne Community Centre
SUBJECT: Intrusive Investigation 2 - Results
DESIGNER/DATE: AJS CHECK DATE:

JOB NO: 532 3355
PAGE NO: 1 OF: 2
SECTION: 256 FILE: SEK 01

Intrusive Investigation 2 Results - End Wall PFC.

- Investigation performed by L. CHEN on 12/11/2012.
- See Page 2 of 2

Section through Wall 4a and 3 (typ)



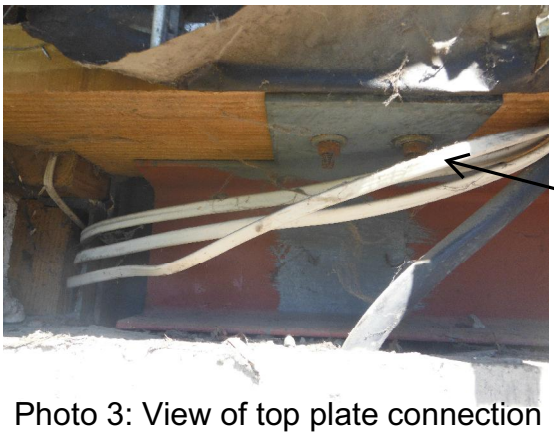
See photos on next page.

152 x 76 PFC Beam along end wall grids

Photo 1: View from outside onto end wall

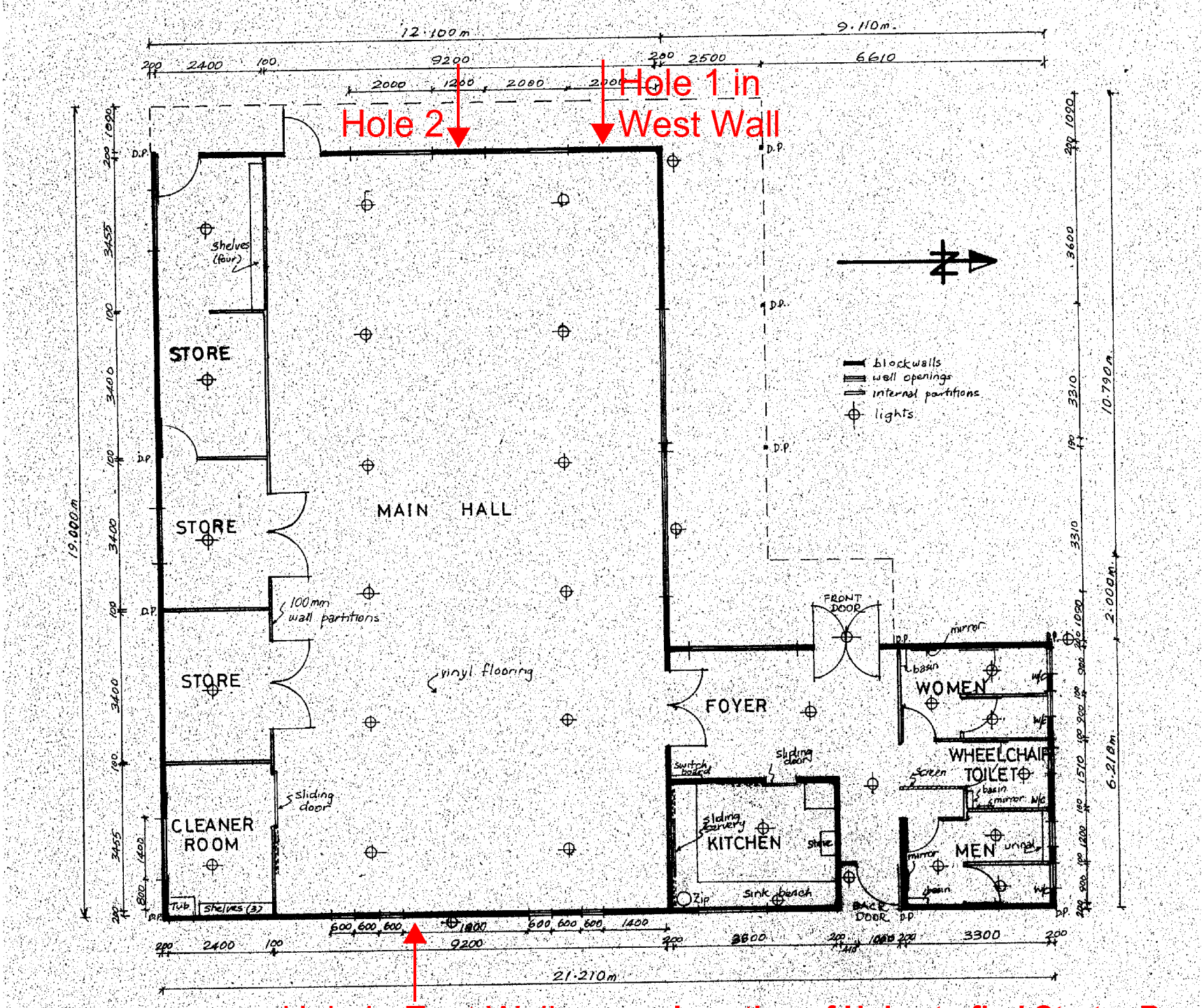
Reinforcing bar bent over bottom flange of PFC to connect PFC and wall. Connections at 1200 centres.

Photo 2: View along end wall



2 M10 bolts into 5mm plate welded to top flange of PFC to connect to 200 x 50 timber beam above. Connections at 1200 centres.

Photo 3: View of top plate connection



Location of Holes to find Starter Bar
Landsdowne Community Centre
05 July 2013

Beca CALCULATION SHEET ABN 85 004 974 341

JOB TITLE: Landsdowne Community Centre
SUBJECT: Intrusive Investigation - End Walls Starter Bars
DESIGNER/DATE: AJS CHECK DATE:

JOB NO: 532 3355
PAGE NO: 1 OF: 1
SECTION: 256 FILE: SEK-02

Intrusive investigations performed on 05/07/2013 to confirm the presence of starter bars in the end walls.

It was found that the vertical wall reinforcement continued into the foundation beams. The wall is reinforced vertically with 12.5mm bars at 600mm centres. The reinforced cores were typically filled at the location of reinforcing.

Note: At hole location 1 on the west wall the wall reinforcement was bent to avoid contacting the joint in the masonry. At hole location 2 on the wall wall the masonry core was not filled due to the location of electrical socket.

Photo 1: West wall hole 1

Photo 2: West wall hole 2

Photo 3: East wall hole 1

Photo 4: East wall hole 1

Photos 3 and 4 are representative of typical situation expected.