Report

Halswell Aquatic Centre, Main Plant Room BU 1691-002 EQ2 & Swimming Club BU 1691-005 EQ2 Detailed Engineering Evaluation Quantitative Report

Prepared for Christchurch City Council (Client)

By Beca Carter Hollings & Ferner Ltd (Beca)

4 April 2014

Revision History

Revision Nº	Prepared By	Description	Date
A	Andreas Trapezaris	Draft for CCC review	22 January 2013
B	Andreas Trapezaris	Incorporating CCC comments	12 February 2013
C	Andreas Trapezaris	Final	4 October 2013
D	Andreas Trapezaris	Final Property Name Updated	4 April 2014

Document Acceptance

Action	Name	Signed	Date
Prepared by	Andreas Trapezaris		4 April 2014
Reviewed by	Nicholas Charman		4 April 2014
Approved by	David Whittaker		4 April 2014
on behalf of	Beca Carter Hollings & Ferner Ltd		

Halswell Aquatic Centre - Main Plant Room BU 1691-002 EQ2 and Swimming Club BU 1691-005 EQ2

Detailed Engineering Evaluation
Quantitative Report – SUMMARY
Version 1

Address
339 Halswell Road
Halswell
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) Revision 7 issued by the Engineering Advisory Group (EAG) on 2012.

A Qualitative Report was issued to CCC on 9 October 2012.

The Main Plant Room and Swimming Club building at Halswell Aquatic Centre is located at 339 Halswell Road, Halswell, Christchurch. The drawing available indicates the original ground floor structure (Main Plant Room) has been designed in 1971 followed by a later construction of the upper storey structure (Swimming Club). The drawing available for the upper storey structure is not dated. The building has an approximate total floor area of 100m^2. The building is constructed of reinforced concrete masonry block columns typically located at openings, end of walls and corners of the building, with unreinforced masonry block elsewhere. The first floor (Swimming Club) is precast with in-situ topping and timber framed roof. The ground floor is slab on grade and the building has an external steel frame staircase. Calculations have been undertaken as part of the Quantitative Assessment.

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

Key Damage Observed

Visual inspections on 29 August 2012 indicate the building has suffered moderate damage. The key damage observed includes:

- Vertical cracks in the blockwork lintel above the garage door.
- Mortar step cracks and blockwork cracks mainly at each corner of ground and upper floor walls.
- Vertical cracks in concrete masonry block lintel underneath the precast floor units.
- Cracking to asphalt pavement.
- Movement of areas of the block infill wall along the East side of the building and which appear to be loose/unrestrained.
- Displacement and separation of blockwall supporting the exterior precast first floor units (east wall).
- Differential levels of up to 64mm are evident from a post-earthquake level survey.

Critical Structural Weaknesses (CSW)

The following Critical Structural Weaknesses have been identified:

- Unreinforced masonry blockwalls
- Inadequate connection of upper floor masonry walls to first floor slab and roof structure
- Inadequate connection of the external deck precast first floor to its supporting wall (East wall)

Indicative Building Strength (from Detailed Assessment)

The building has been assessed to have a seismic capacity of 34%NBS (with the temporary strengthening works that have been completed) 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. This classifies the building as Earthquake Risk and Seismic Grade C.

The structural damage observed is moderate and the seismic capacity of the original (pre-strengthened) building score determined in this Quantitative Assessment is considered to have been reduced to around 30% due to the damage. Note, the temporary strengthening scheme brings the building to above 34%NBS and is not effected by damage to the original structure.

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

- Ground floor reinforced masonry columns have a seismic capacity of <33%NBS. Temporary steel framing has been installed to give the ground floor a current seismic capacity of 34%NBS.
- Connections between the masonry block walls and the roof, ground and first floor slab have a seismic capacity of <33%NBS. Temporary steel framing has been installed to give the ground floor a current seismic capacity of 34%NBS.
- First floor reinforced masonry columns have seismic capacity of 20%NBS, governed by flexural capacity. Temporary timber bracing has been installed to give the first floor a current seismic capacity of 34%NBS.
- Bond beam has a seismic capacity of 43%NBS, governed by flexural 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 earthquake risk, having an assessed capacity of between 34% and 67%NBS (with the temporary strengthening works that have been completed). 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.

The building has suffered damage to the original seismic or gravity load resisting system that is sufficient to impair or significantly reduce the ability to resist further loads, therefore the temporary strengthening works completed incorporating new load paths (refer Appendix D) allows continued occupancy of the building.

It is recommended that:

- A full damage assessment is carried out for insurance purposes.
- Repairs that would bring the building back to an “as new” condition are typically entitled under typical replacement insurance policies. We suggest you consult with your insurance advisor as to how you wish to proceed.

Table of Contents

Appendices

Appendix A - Photographs

Appendix B - Existing Drawings

Appendix C - Site Survey Results

Appendix D - Temporary Strengthening Scheme

Appendix E - CERA DEE Summary Data

Appendix F - Previous Reports and Assessments

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 Main Plant Room and Swimming Club building located at Halswell Aquatic Centre located at 339 Halswell Road, 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) Revision 7 issued by the Engineering Advisory Group (EAG) in 2012.

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

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

Partial structural drawings were made available and these have been used in our assessment of the buildings. The building description below is based on a review of the drawings and our visual inspections.

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

2 Compliance

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

2.1 Canterbury Earthquake Recovery Authority (CERA)

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

Section 38 – Works

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

Section 51 – Requiring Structural Survey

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

We understand that CERA will require a detailed engineering evaluation to be carried out for all buildings (other than those exempt from the Earthquake Prone Building definition in the Building Act). It is understood that CERA is adopting the Detailed Engineering Evaluation Procedure document (draft) issued by the Engineering Advisory Group on 19 July 2011, which sets out a methodology for both qualitative and quantitative assessments. We understand this report will be used in response to CERA Section 51.

The qualitative assessment includes a thorough visual inspection of the building coupled with a desktop review of available documentation such as drawings, specifications and IEP's. The quantitative assessment involves analytical calculation of the building's strength and may require non-destructive or destructive material testing, geotechnical testing and intrusive investigation.

It is anticipated that factors determining the extent of evaluation and strengthening level required will include:

- The importance level and occupancy of the building
- The placard status that was assigned during the state of emergency following the 22 February 2011 earthquake
- The age and structural type of the building
- Consideration of any Critical Structural Weaknesses
- The extent of any earthquake damage

2.2 Building Act

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

Section 112 – Alterations

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

Section 115 – Change of Use

This section requires that the territorial authority (in this case Christchurch City Council (CCC)) be satisfied that the building with a new use complies with the relevant sections of the Building Code 'as near as is reasonably practicable'. Regarding seismic capacity 'as near as reasonably practicable' has previously been interpreted by CCC as achieving a minimum of 67%NBS however where practical achieving 100%NBS is desirable. The New Zealand Society for Earthquake Engineering (NZSEE) recommend a minimum of 67%NBS.

Section 121 – Dangerous Buildings

The definition of dangerous building in the Act was extended by the Canterbury Earthquake (Building Act) Order 2010, and it now defines a building as dangerous if:

- In the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause injury or death or damage to other property; or
- In the event of fire, injury or death to any persons in the building or on other property is likely because of fire hazard or the occupancy of the building; or

- There is a risk that the building could collapse or otherwise cause injury or death as a result of earthquake shaking that is less than a ‘moderate earthquake’ (refer to Section 122 below); or
- There is a risk that that other property could collapse or otherwise cause injury or death; or
- A territorial authority has not been able to undertake an inspection to determine whether the building is dangerous.

Section 122 – Earthquake Prone Buildings

This section defines a building as earthquake prone if its ultimate capacity would be exceeded in a ‘moderate earthquake’ and it would be likely to collapse causing injury or death, or damage to other property. A moderate earthquake is defined by the building regulations as one that would generate ground shaking 33% of the shaking used to design an equivalent new building.

Section 124 – Powers of Territorial Authorities

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

Section 131 – Earthquake Prone Building Policy

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

2.3 Christchurch City Council Policy

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

The 2010 amendment includes the following:

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

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

It is understood that any building with a capacity of less than 33%NBS (including consideration of Critical Structural Weaknesses) will need to be strengthened to a target of 67%NBS of new building standard as recommended by the Policy.

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

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

2.4 Building Code

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

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

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

b. Serviceability Return Period Factor increased from 0.25 to 0.33 (80% increase in the serviceability design loads when combined with the Hazard Factor increase)

The increase in the above factors has resulted in a reduction in the level of compliance of an existing building relative to a new building despite the capacity of the existing building not changing.

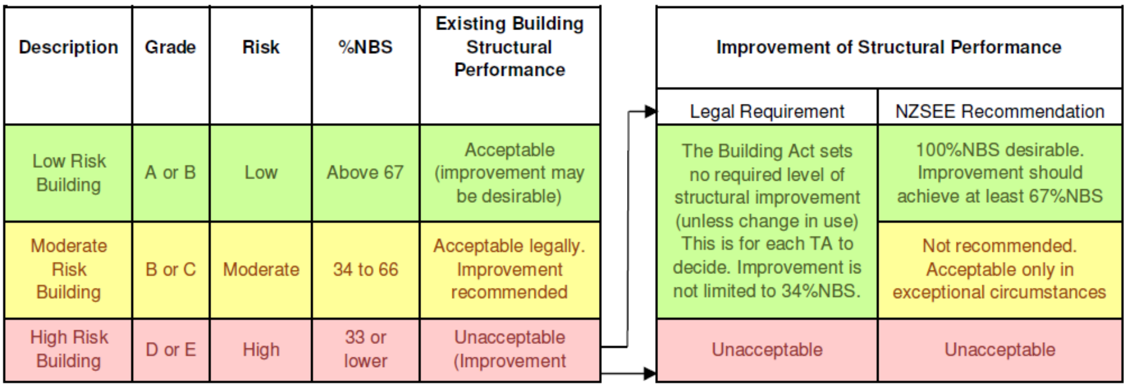
3 Earthquake Resistance Standards

For this assessment, the building's Ultimate Limit State earthquake resistance is compared with the current New Zealand Building Code requirements for a new building constructed on the site. This is expressed as a percentage of new building standard (%NBS). The new building standard load requirements have been determined in accordance with the current earthquake loading standard (NZS 1170.5:2004 Structural design actions - Earthquake actions - New Zealand).

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

The likely ultimate capacity of this building has been derived in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes' (AISPBE), 2006. These guidelines provide an Initial Evaluation Procedure that assesses a building's capacity based on a comparison of loading codes from when the building was designed and currently. It is a quick high-level procedure that can be used when undertaking a Qualitative analysis of a building. The guidelines also provide guidance on calculating a modified Ultimate Limit State capacity of the building which is much more accurate and can be used when undertaking a Quantitative analysis.

The New Zealand Society for Earthquake Engineering has proposed a way for classifying earthquake risk for existing buildings in terms of %NBS and this is shown in Figure 3.1 below.



Description	Grade	Risk	%NBS	Existing Building Structural Performance	Improvement of 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	Main Plant Room and Swimming Club at Halswell Aquatic Centre.	
Street Address	339 Halswell Road, Halswell, Christchurch.	
Age	The ground floor was originally built in 1971. Construction date of upper floor extension is unknown.	From drawings available
Description	Two storey masonry blockwork structure with a timber framed roof, concrete ground floor and precast concrete first floor.	A steel beam spans longitudinally between the blockwalls to support the roof. At western side, the external precast first floor deck is partially supported by an external steel frame structure.
Building Footprint / Floor Area	Approx. 50m^2 footprint, 100m^2 floor area (7.8m x 6.4m)	
No. of storeys / basements	Two storeys, no basement.	Small pit in ground floor for pump equipment.
Occupancy / use	Pump room ground level, miscellaneous on first level.	Importance Level 2
Construction	Concrete masonry blocks walls, precast flooring with insitu topping and timber roof.	From drawings available.

Item	Details	Comment
Gravity load resisting system	Gravity loads from the roof are transferred to the block walls which are founded on strip foundations. The first floor precast slab units are supported on perimeter block walls. The ground floor is reinforced concrete slab on grade.	Precast floor extends past the block walls as a cantilevering balcony.
Seismic load resisting system	Lateral loads in both directions are resisted by reinforced concrete masonry blocks acting as columns, typically at openings and corners of the building. The roof structure is assumed to have diagonal timber bracing.	Roof timber cross bracing is shown in the original designed in 1971 therefore is assumed to exist in the later extension.
Foundation system	Shallow foundations.	
Stair system	External stairs are steel framed with timber treads.	
Other notable features	External stair and mechanical pumps on ground level.	
External works	Concrete car park and driveway to the north.	
Construction information	Visual inspection and drawings available.	Royds, Sutherland, Evans & McLeay Consulting Engineers (1971)
Likely design standard	NZSS 1900, Chapter 8:1965	Inferred from age of building.
Heritage status	No heritage status.	
Other		

4.2 Structural 'Hot-spots'

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

- Connections between the roof diaphragm structure and the masonry block walls.
- Connections between first floor pre-cast concrete slab and block walls.
- Roof diaphragm structure.
- Connections of infill blockwork (three windows at Eastern side).
- Unreinforced concrete blockwalls.

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 F).

Visual inspections as part of the Level 4 damage assessment were undertaken on 29 August 2012. A Qualitative Report was issued to CCC 9 October 2012.

5.2 Level 5 Intrusive Investigations

No intrusive investigations were carried out as part of the Level 5 Quantitative Assessment.

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	✓				A level survey was undertaken indicating minor differential settlement. Refer to Appendix C for results.
tilt of building	✓				None observed during visual inspection. Verticality survey may be required to confirm.
liquefaction	✓				None observed during visual inspection. The aerial reconnaissance on 24 Feb 2011 shows that liquefaction occurred on neighbouring sites, where the extent was considered minor.
settlement of external ground	✓				None observed during visual inspection.
lateral spread / ground cracks		✓			External ground cracks widths up to 10mm were noted.
concrete block walls			✓		Stepped cracking was observed in the mortar bed joints at all corners and in the East, West and North walls. The East blockwall supporting the exterior precast floor has sheared off and could cause partial collapse of the external deck. Movement and cracks were noted at the infill blockwork along the Eastern side, loose top course of blockwork infill. Vertical cracks in blockwork lintel over garage door supporting exterior precast floor.
cracking to concrete floors					No damage observed during visual inspection.
precast flooring seating		✓			Separation and cracking was observed along the Eastern side between the extension (external deck) precast floor and blockwall.
stairs		✓			Minor movement stair connection to upper deck.

Damage type	Unknown	Minor	Moderate	Major	Comment
cladding /envelope					No damage observed during visual inspection.
building services	✓				No inspection of services was carried out.

6.2 Surrounding Buildings

The Halswell Aquatic Centre has a number of other structures on the site (See Site Layout in Appendix A), however there are no adjacent structures that are close enough that may affect the building during an earthquake.

6.3 Residual Displacements and General Observations

Permanent displacement of the east wall supporting the external deck was observed. A level survey was carried out for the Halswell Aquatic Centre (refer to Appendix C). A global verticality survey may reveal movement that could be described as damage under insurance entitlement.

6.4 Implication of Damage

The building has suffered structural damage which may have diminished the structural capacity. We have assumed that the damage has reduced the undamaged structural capacity determined in this Quantitative Assessment in the order of 30% of the building score.

7 Generic Issues

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

Unreinforced concrete masonry

- Inadequate shear strength
- Inadequate foundations
- Inadequate connections of floor and roof diaphragms to the walls
- Inadequate flexural strength

Precast concrete floor systems

- Inadequate connections of floor diaphragms to the vertical structure
- Inadequate support of precast units.

8 Geotechnical Consideration

No Geotechnical information was available for this site. During the inspection, any damage to the surrounding ground was noted and any affect to the structure was considered.

9 Survey

The level survey carried out indicates differential settlements of up to 64mm over a distance of 10.8m diagonally in the ground floor (refer to Appendix C), however the drawings show 25mm falls from the corners of the building to the centre of the floor plan, as well as duct set downs with a 25mm fall towards the western side of the building. CCC may wish to undertake a verticality 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 available.

The structure has suffered moderate damage. The damage to the original structure is assessed to have diminished the structural capacity in the order of 30% of the building’s score determined in this Quantitative Assessment. Note, temporary strengthening has been provided to bring the building to above 34%NBS.

10.2 Assumptions

The following assumptions were used in our quantitative assessment:

- Reinforcing steel yield strength, fy = 275 MPa
- Concrete compressive strength, f’c = 20 MPa
- Masonry compressive strength, f’m = 12 MPa

10.3 Critical Structural Weaknesses

The following Critical Structural Weakness was identified in the Qualitative Report:

- Inadequate connection of the external deck precast first floor to its supporting wall (east wall). The supporting wall has sheared off and could cause partial collapse of the external deck. This raises uncertainty about the rest of the building in regards to the connections between the diaphragm floor structure and supporting walls, and the diaphragm roof structure and the supporting walls.

A review of the drawings available has identified that the reinforcement of the upper walls is only anchored into the bond beam with terrier anchors. The ground floor masonry walls are unreinforced and no connection between the masonry walls and slab is shown on the available drawings. As a result of our quantitative assessment the following Critical Structural Weaknesses were identified:

- Inadequate connection of ground floor masonry walls to the concrete slab on grade.
- Unreinforced masonry blockwalls.
- Inadequate connection of upper floor masonry walls to first floor slab and roof structure
- Inadequate connection of the external deck precast first floor to its supporting wall (east wall).

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 the building has a seismic capacity of 34%NBS (with the temporary strengthening that has been completed). 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	Direction	Ductility, μ	Current Seismic Performance	Notes
Overall %NBS adopted from DEE	**Both**	**2.0**	**34%NBS**	**With temporary strengthening works completed.**
Ground floor	Both	1.0	34%NBS	Out-of-plane flexural capacity of masonry columns considered to be <33%NBS assessed with a ductility of 2.0 (and have a capacity less than the upper floor walls) before the temporary strengthening with steel framing was completed.
Masonry wall connections to ground, first floor and roof	Both	2.0	34%NBS	Considered to have a capacity of <33%NBS and less than the upper floor walls prior to the temporary strengthening completed.
Upper Floor	Both	1.0	34%NBS	Out-of-plane flexural capacity of masonry columns governed (20%NBS assessed with a ductility of 2.0) before temporary strengthening with timber bracing was completed.
Bond beam	Both	2.0	43%NBS	Flexural capacity governs

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

10.6 Discussion of results

The key findings of the assessment of the original (pre-strengthened) structure are as follows:

- The main lateral load resisting system in both directions is reinforced masonry block columns typically located at openings and corners of the building. These columns are irregularly distributed with the remaining masonry blockwalls unreinforced therefore the seismic capacity is less than 33%NBS as there is no reliable lateral load resisting system. Temporary steel framing has been installed to give the ground floor a current seismic capacity of 34%NBS.
- Connections between the masonry block walls and the roof, ground and first floor slab were assessed to have a seismic capacity of less than 33%NBS. Temporary steel framing has been installed to give the ground floor a current seismic capacity of 34%NBS.
- First floor reinforced masonry columns have seismic capacity of 20%NBS, governed by flexural capacity. Temporary timber bracing has been installed to give the first floor a current seismic capacity of 34%NBS.
- Bond beam has a seismic capacity of 43%NBS, governed by flexural capacity.

Based on the results of our Quantitative Assessment, temporary strengthening was carried out to bring the building to above 34%NBS and allow continued occupancy and is now considered Earthquake Risk as the seismic capacity was assessed to be between 33%NBS and 67%NBS, and 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 earthquake risk, having an assessed capacity of between 34% and 67%NBS (with the temporary strengthening works that have been completed). 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.

The building has suffered damage to the original seismic or gravity load resisting system that is sufficient to impair or significantly reduce the ability to resist further loads, therefore the temporary strengthening works completed incorporating new load paths (refer Appendix D) allows continued occupancy of the building.

11.2 Further Investigations, Survey or Geotechnical Work

It is recommended that:

- A full damage assessment is carried out 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. New load paths have been provided as part of the temporary strengthening works (see Appendix D) which have been completed.

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 A1: Site Plan (Main Plant Room indicated)

Photo 1: External view of North East elevation

Photo 2: Interior view at first floor

Photo 3: Blockwall at ground level.

Damage Description: Stepped cracks in mortar bed joints.

Photo 4: External asphalt pavement.

Damage Description: Ground cracks up to 10mm width

Photo 5: East blockwall supporting the exterior precast floor units

Damage Description: Blockwall displaced by 20 millimetres.

Photo 6: East wall showing blockwall infills

Damage Description: The blockwork window infill moved. Top course appears to be loose and dislodged.

Photo 7: East blockwall elevation

Damage Description: Stepped cracks between the masonry concrete units**.**

Photo 8: Ground level blockwall damage.

Damage Description: Mortar bed joint cracks and crack through the concrete block.

Photo 8: West blockwall underneath the precast floor units.

Damage Description: Vertical cracks in concrete masonry block lintel, mortar bed stepped cracking.

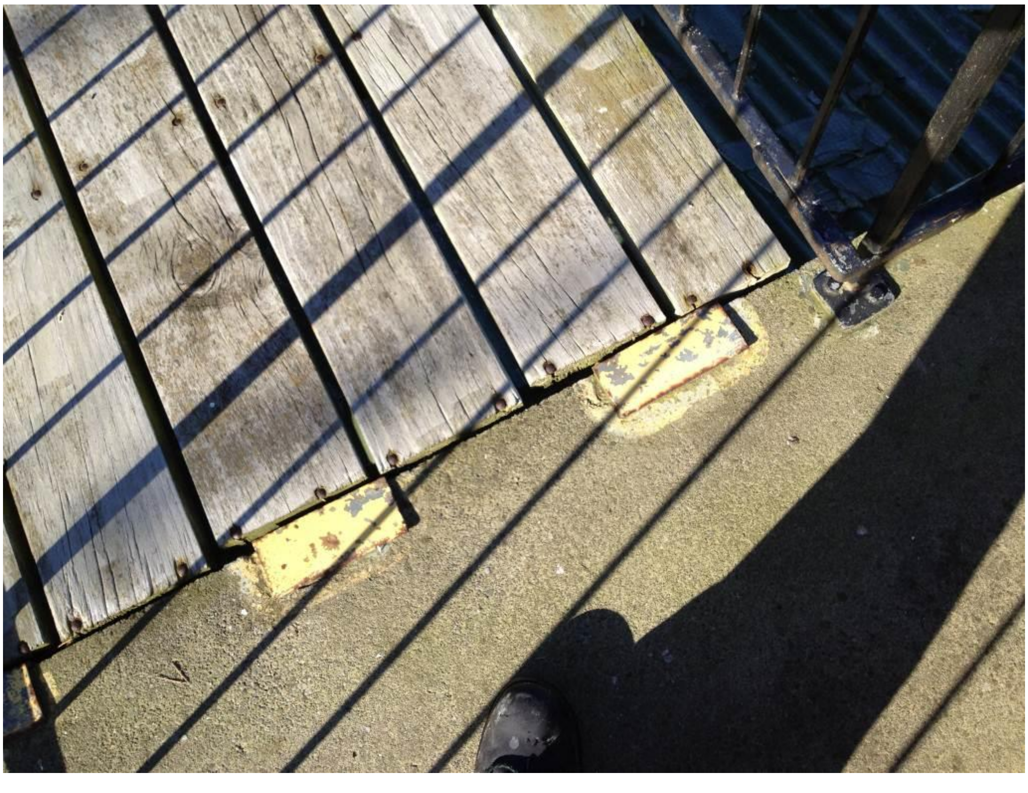
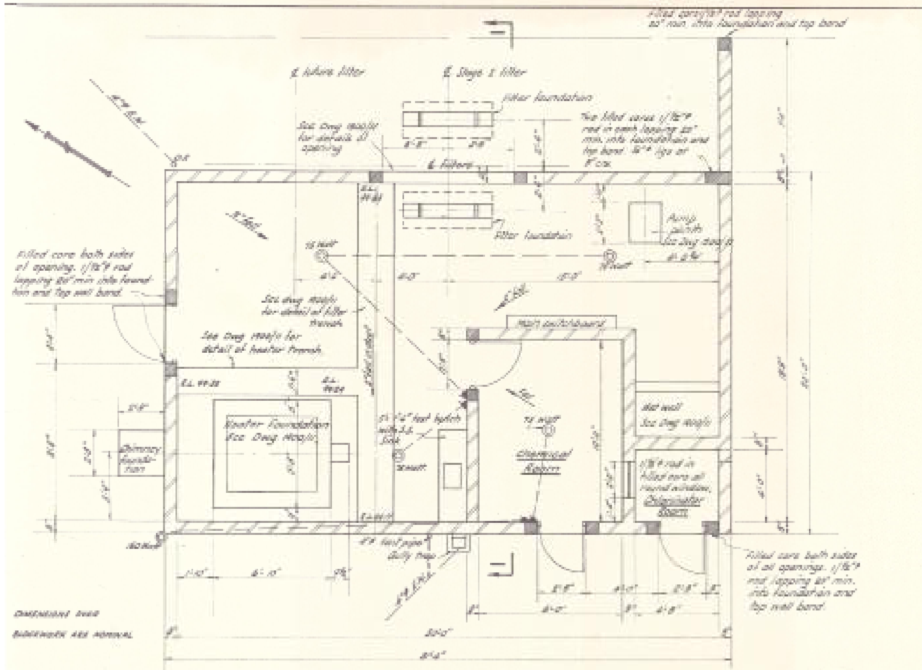


Photo 9: South staircase upper deck

Damage Description: Movement of stair relative to concrete deck.

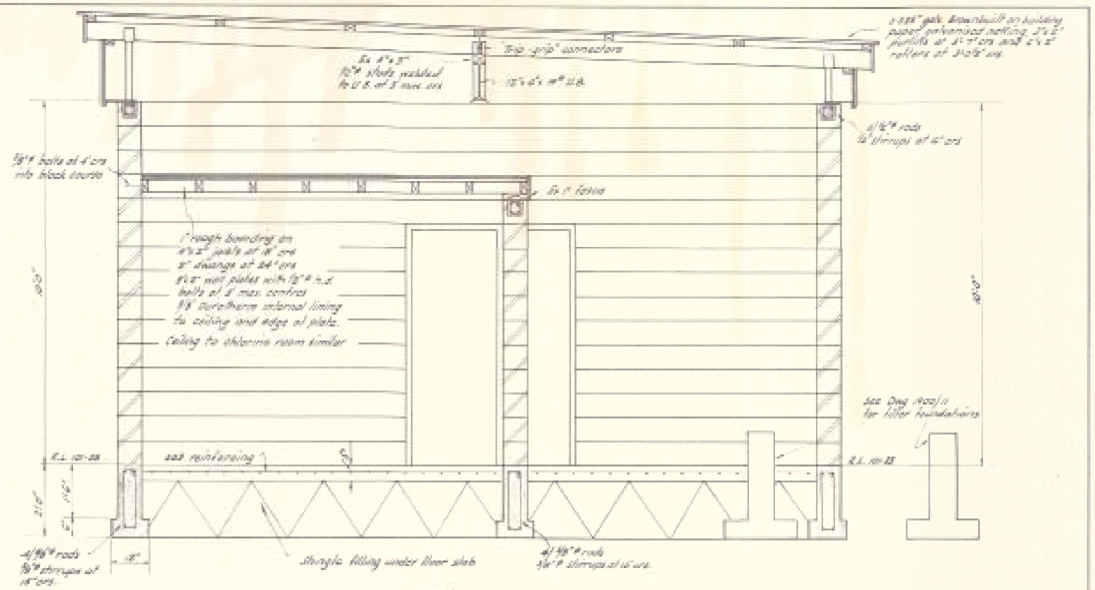
Appendix B

Existing Drawings



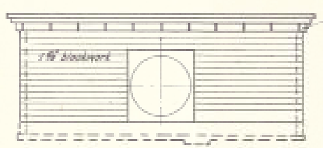
PLAN OF PLANTHOUSE

Scale: ¼" = 1'0"

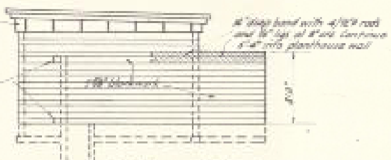


SECTION 1-1

Scale: ½" = 1'-0"

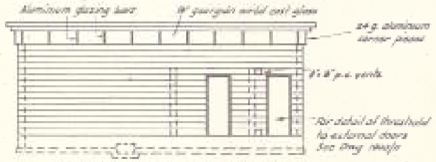


NORTH EAST ELEVATION

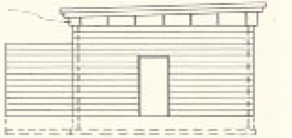


SOUTH EAST ELEVATION

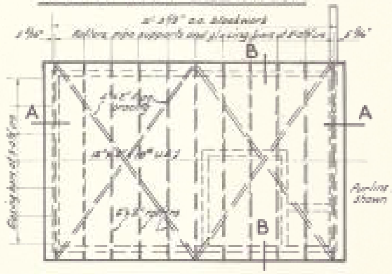
Scale: ⅛" = 1'0"



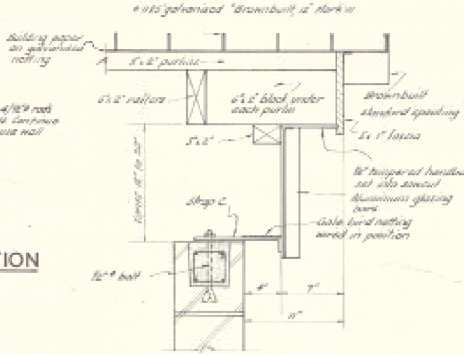
SOUTH WEST ELEVATION



NORTH WEST ELEVATION

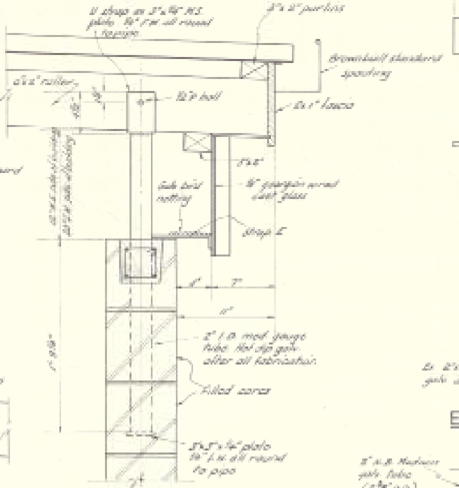


ROOF PLAN



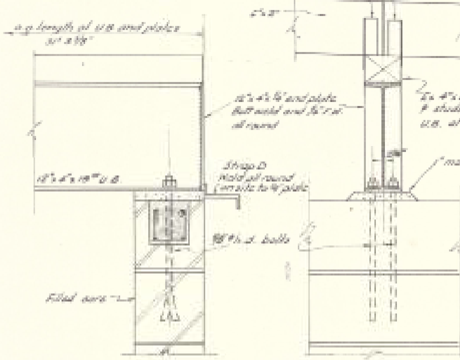
DETAIL A

Scale: 1½" = 1'-0"



DETAIL B

Scale: 1½" = 1'-0"

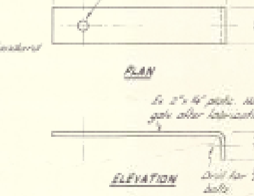


DETAIL AT ENDS OF U.B.

Scale: 1½" = 1'0"

NOTES

Cover to main reinforcing in foundations to be 3" were poured against ground and 2" elsewhere unless stated otherwise.
Provide minimum of ⅝" cover between blockwork and all reinforcing.
All reinforcing to be deformed steel except for stirrups to blockwork.



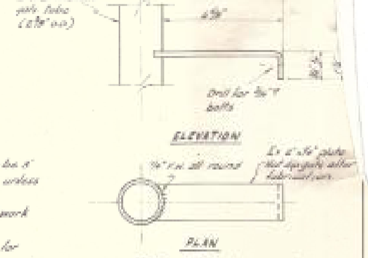
STRAP C (12 OFF)

Scale: ¼ full size

ELEVATION STRAP D

(2 OFF)

Scale: ¼ full size



STRAP E (22 OFF)

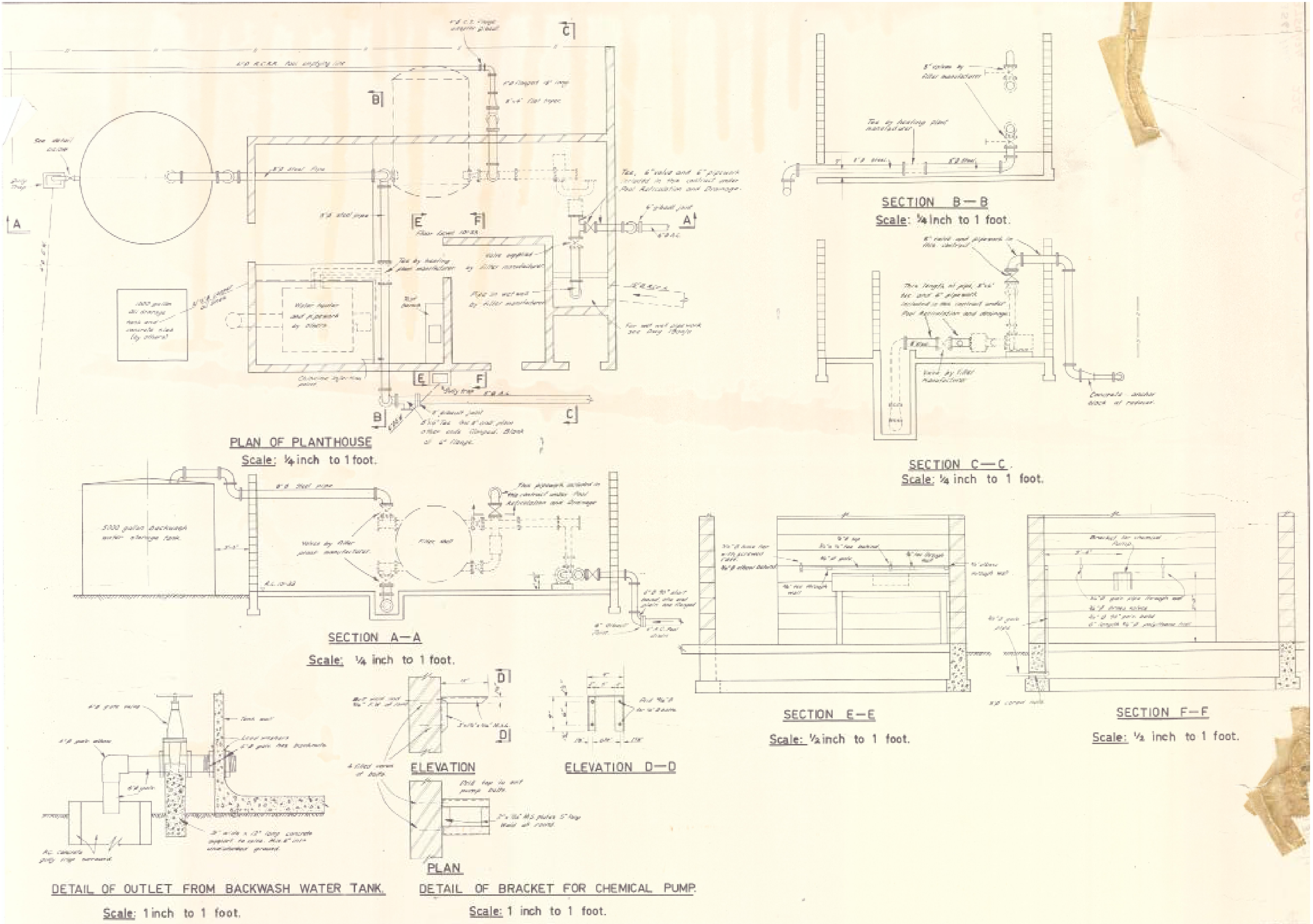
Scale: ¼ full size

		Amendments:-
	N.H.T.	
	I.McQ.	

PAPARUA COUNTY COUNCIL

Royds, Sutherland, Evans & McLeay
Consulting Engineers.

Scale: As shown
F.B.



PLAN OF PLANTHOUSE

Scale: ¼ inch to 1 foot.

SECTION B — B

Scale: ¼ inch to 1 foot.

SECTION C — C.

Scale: ¼ inch to 1 foot.

SECTION A—A

Scale: ¼ inch to 1 foot.

SECTION E—E

Scale: ½ inch to 1 foot.

SECTION F—F

Scale: ½ inch to 1 foot.

DETAIL OF OUTLET FROM BACKWASH WATER TANK.

Scale: 1 inch to 1 foot.

DETAIL OF BRACKET FOR CHEMICAL PUMP.

Scale: 1 inch to 1 foot.

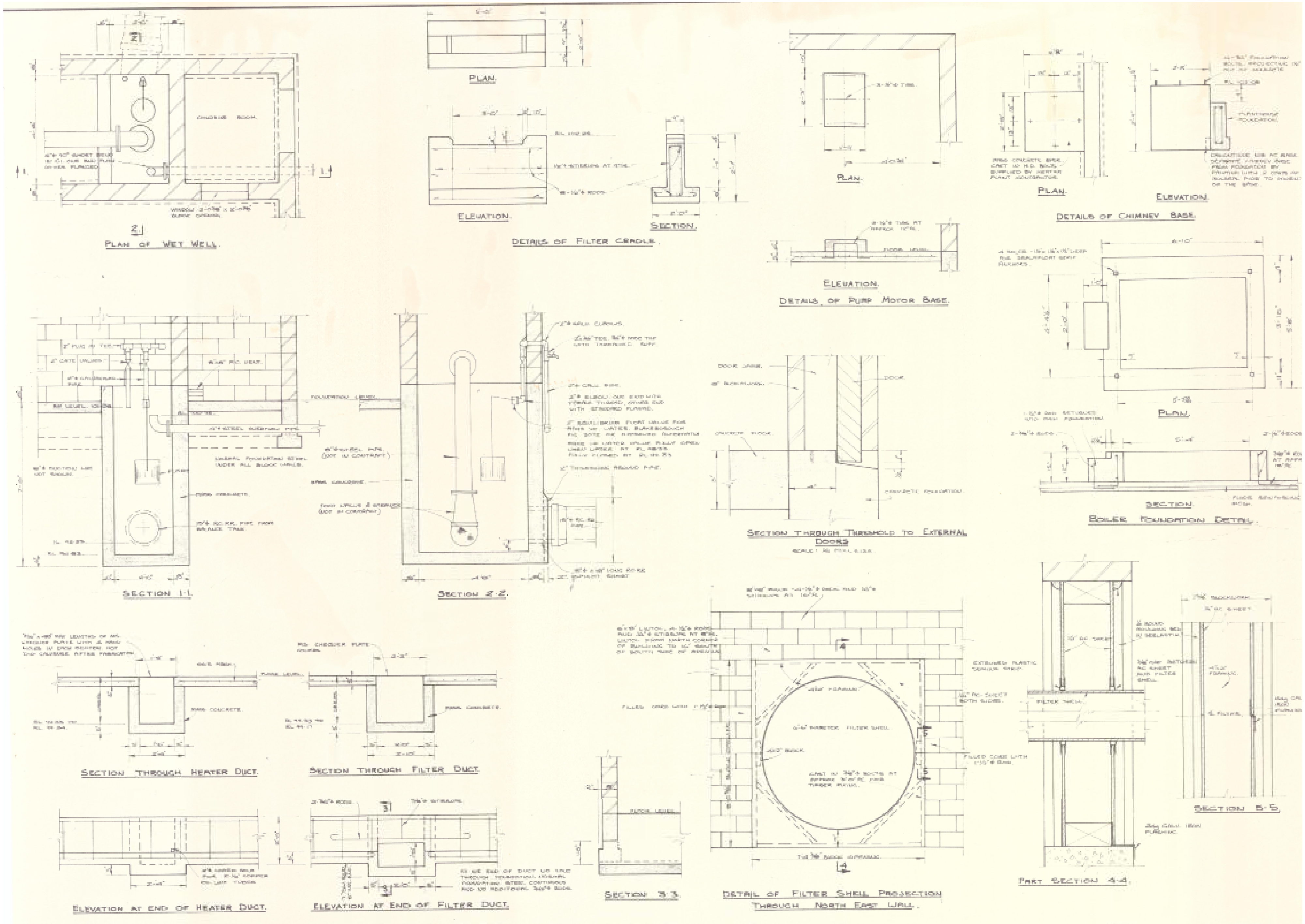
Surv.		Amendments :—
Dr.	N.M.T.	
Tr.	N.T.M.	
Ch.		

PAPARUA COUNTY COUNCIL.

HALSWELL SWIMMING POOL — PLANTHOUSE PIPEWORK & MISCELLANEOUS.

Royds, Sutherland, Evans & McLeay,
Consulting Engineers,
Christchurch, N.Z.
Date: 24th February, 1971.

Scale: As Shown
F.B.
1900/12

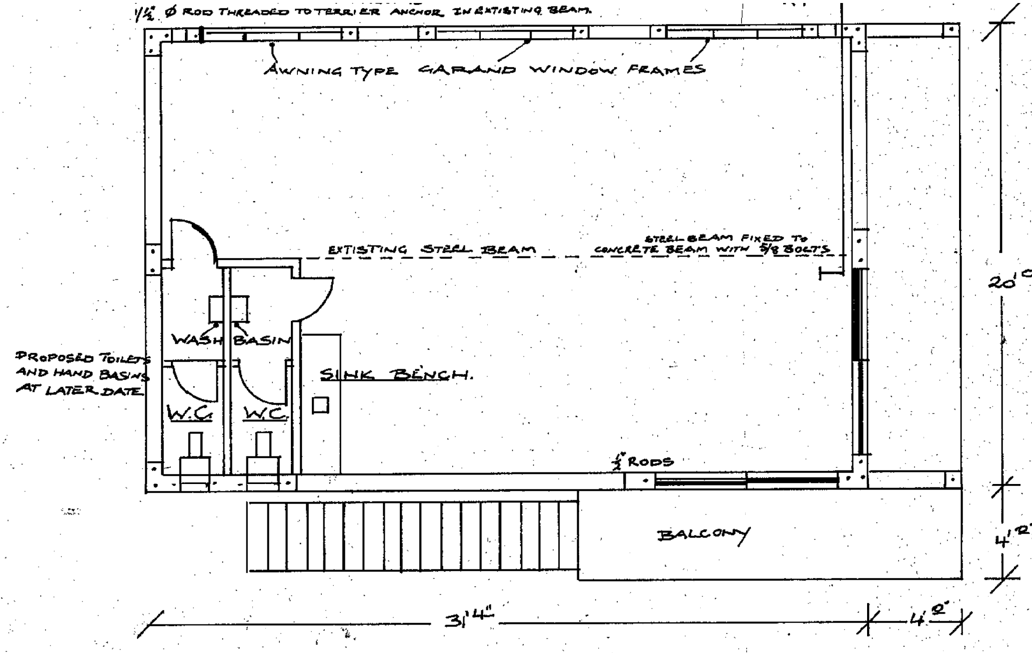


Surv.		Amendments:
Dr.	N.M.T.	
Tr.	I.McQ.	
Ch.		

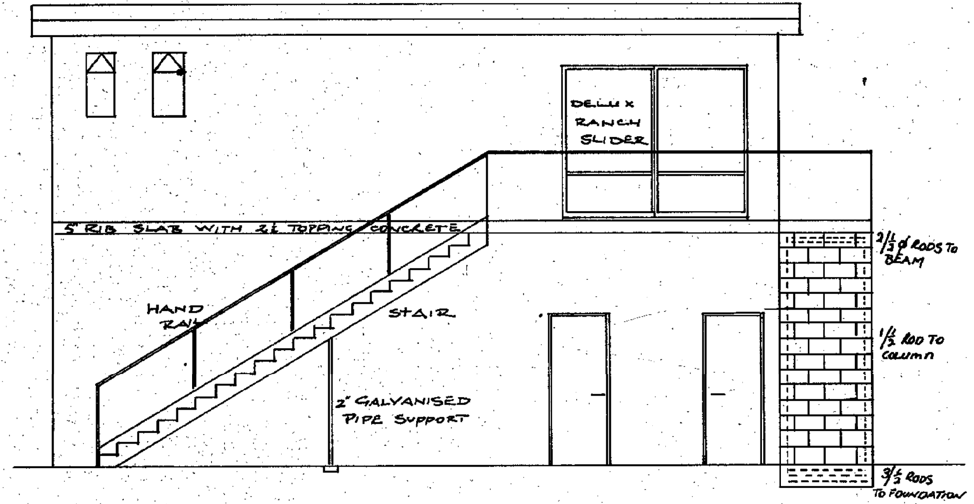
PAPARUA COUNTY COUNCIL
HALSWELL SWIMMING POOL · MISCELLANEOUS PLANTHOUSE DETAILS

Royds, Sutherland, Evans & McLeary,
Consulting Engineers,
Christchurch, N.Z.
Date: 22/2/71

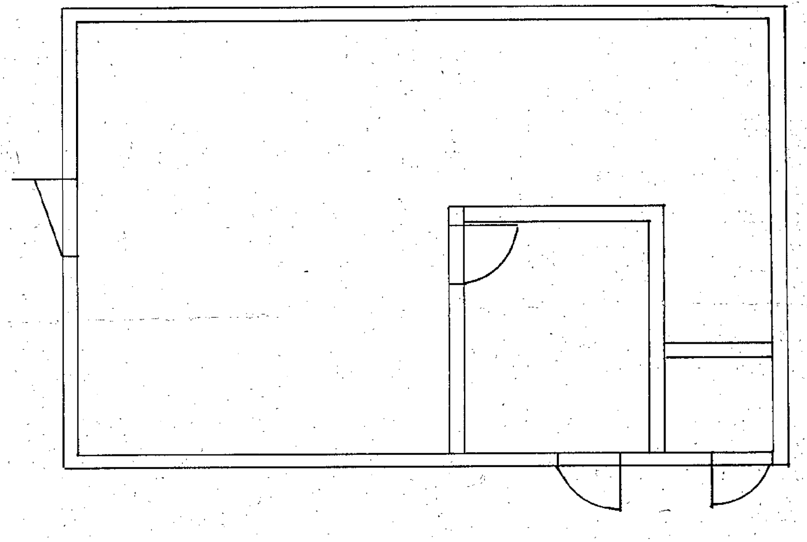
Scale: ½"=1'
F.B.
1900/11



CLUB ROOMS

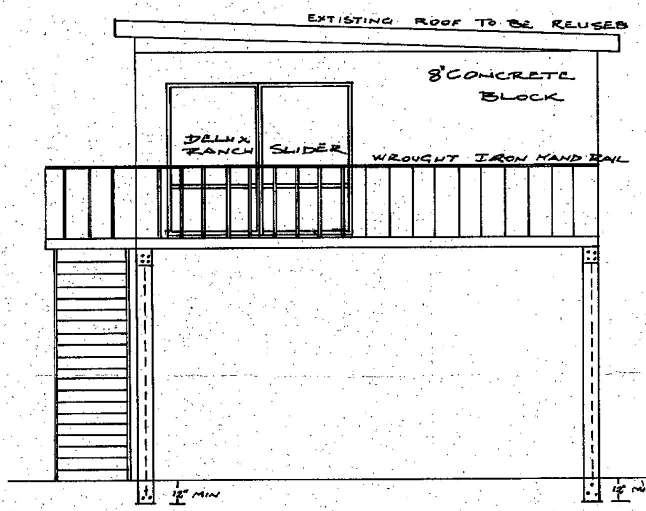


SOUTH ELEVATION

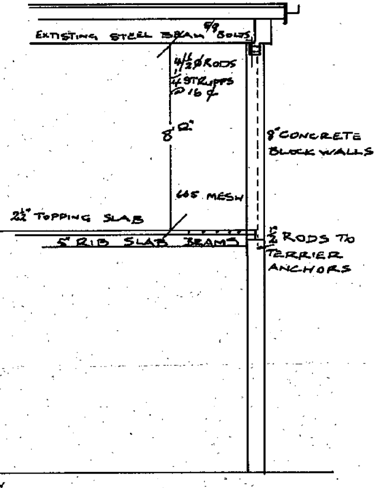


PLANT HOUSE

SCALE ¼ TO 1FT



EAST ELEVATION



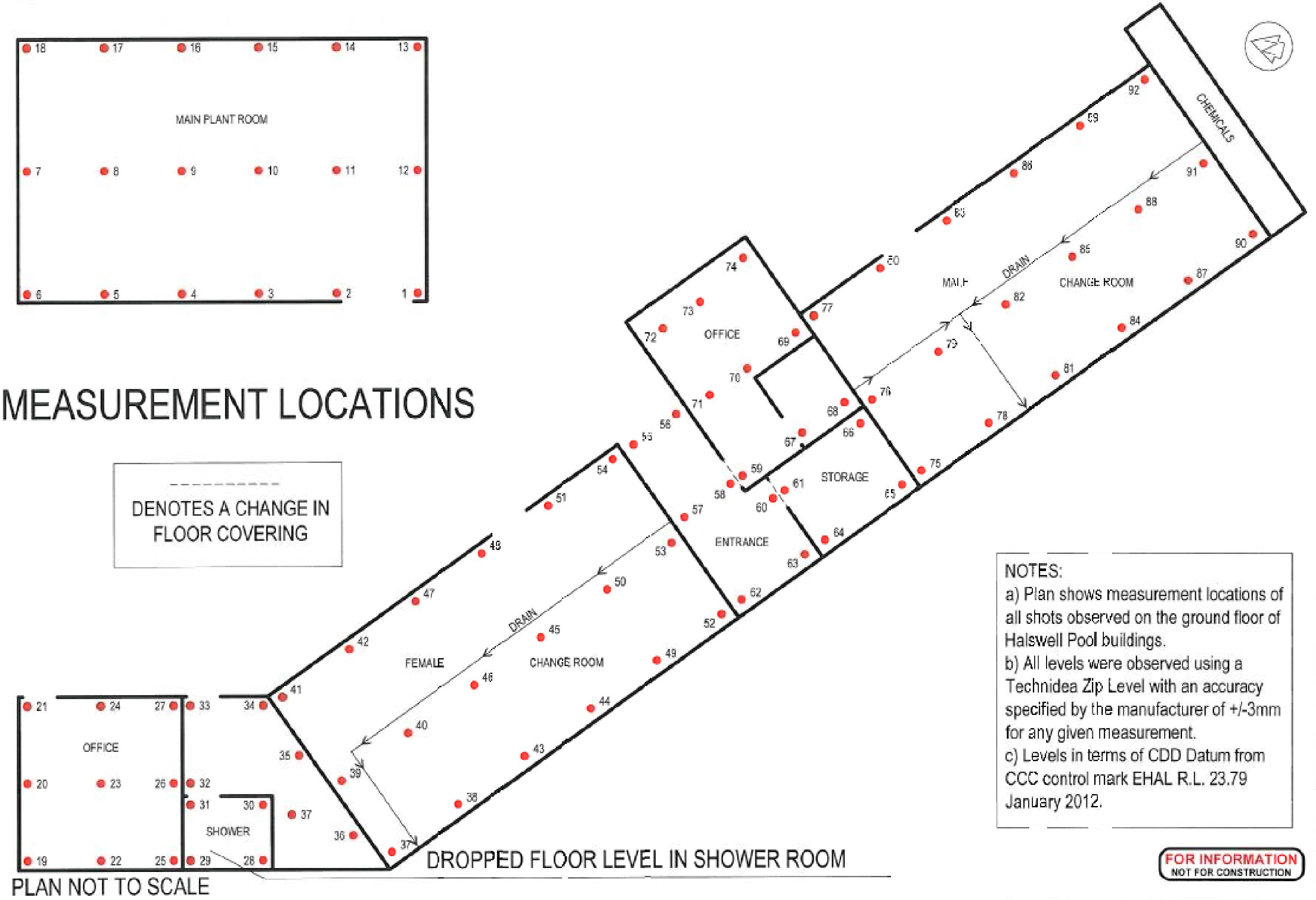
SECTION A-A

PROPOSED CLUB ROOMS
FOR HALSWELL SWIMMING CLUB
DRAWN BY T. M. GREENLEES

Appendix C

Site Survey Results

MEASUREMENT LOCATIONS



DENOTES A CHANGE IN FLOOR COVERING

NOTES:

a) Plan shows measurement locations of all shots observed on the ground floor of Halswell Pool buildings.

b) All levels were observed using a Technidea Zip Level with an accuracy specified by the manufacturer of +/-3mm for any given measurement.

c) Levels in terms of CDD Datum from CCC control mark EHAL R.L. 23.79 January 2012.

DROPPED FLOOR LEVEL IN SHOWER ROOM

PLAN NOT TO SCALE

FOR INFORMATION
NOT FOR CONSTRUCTION

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CHRISTCHURCH CITY COUNCIL

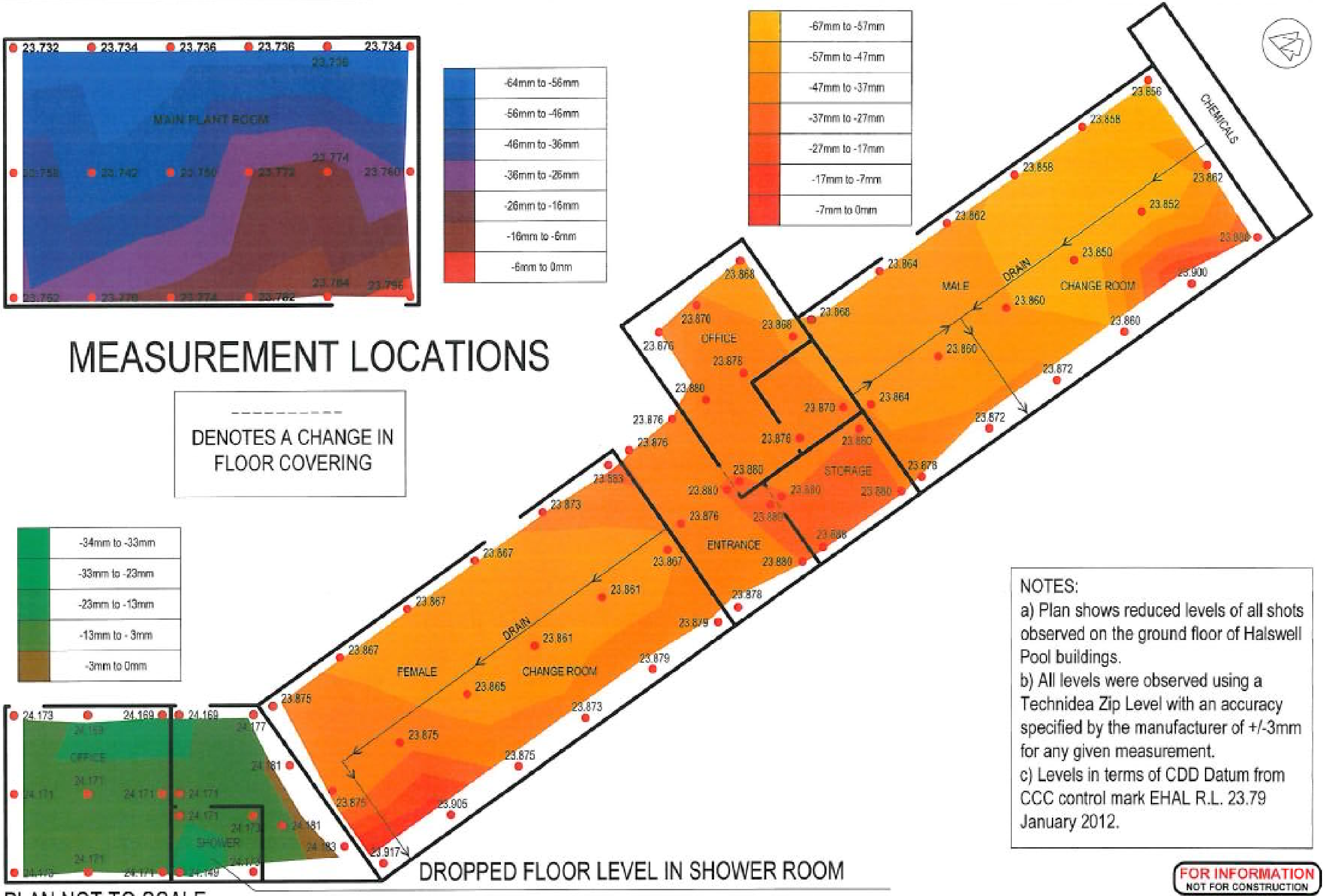
HALSWELL AQUATIC CENTRE

HALSWELL POOL
FLOOR LEVEL SURVEY
MEASUREMENT LOCATIONS

GEOSPATIAL

5323356-GS-001

A



MEASUREMENT LOCATIONS

DENOTES A CHANGE IN FLOOR COVERING

DROPPED FLOOR LEVEL IN SHOWER ROOM

PLAN NOT TO SCALE

NOTES:

a) Plan shows reduced levels of all shots observed on the ground floor of Halswell Pool buildings.

b) All levels were observed using a Technidea Zip Level with an accuracy specified by the manufacturer of +/-3mm for any given measurement.

c) Levels in terms of CDD Datum from CCC control mark EHAL R.L. 23.79 January 2012.

FOR INFORMATION
NOT FOR CONSTRUCTION

Beca

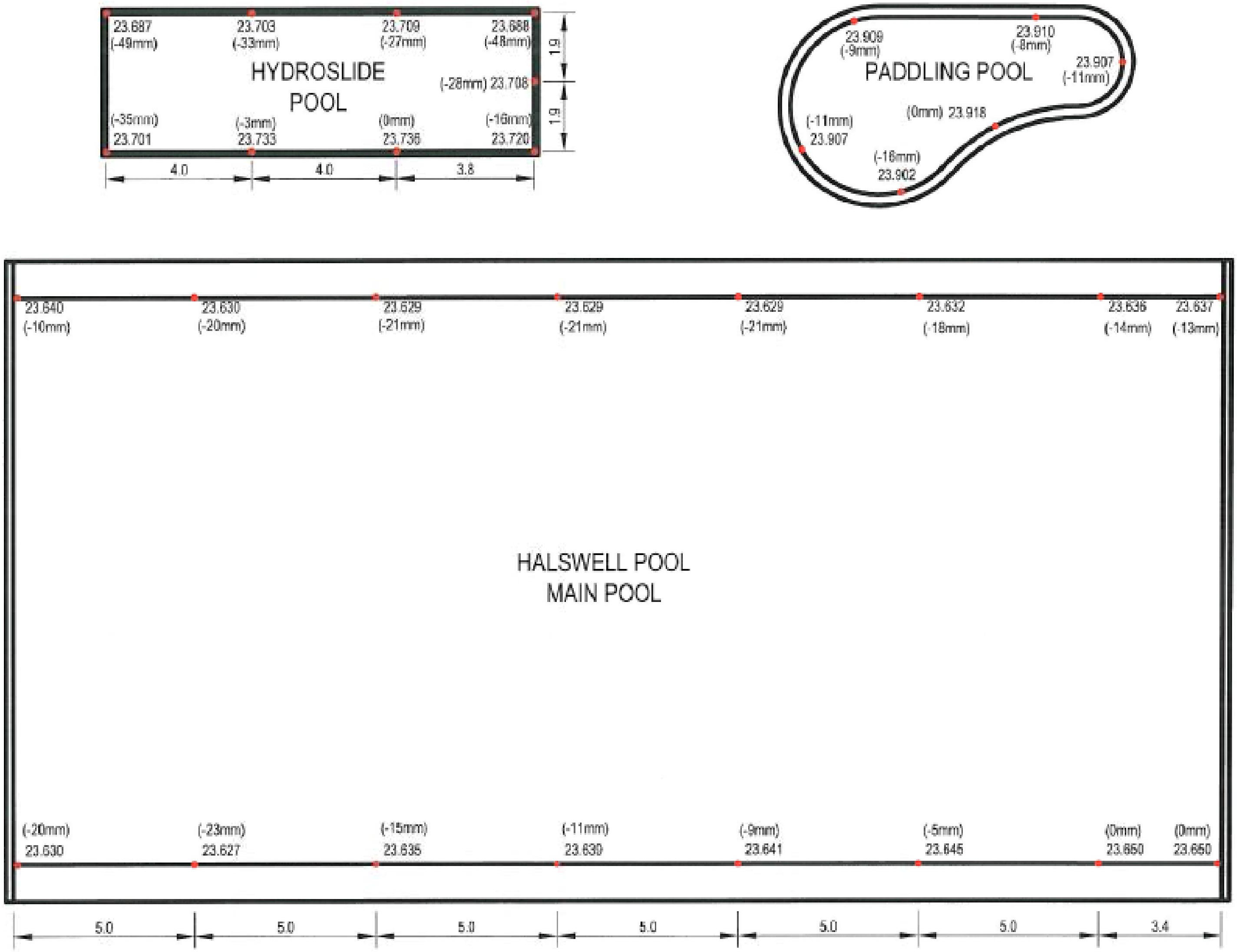
CHRISTCHURCH CITY COUNCIL

HALSWELL AQUATIC CENTRE

HALSWELL POOL
FLOOR LEVEL SURVEY
REDUCED LEVELS

GEOSPATIAL

5323355-GS-002



PLAN NOT TO SCALE

NOTES:

a) Plan shows reduced levels of all shots observed on the perimeter of the pools at the Halswell Aquatic Centre.

b) All levels were observed using a Topcon AT-30 Automatic Level which has an accuracy of +/- 2mm for any given measurement.

c) Levels in terms of CDD Datum from CCC control mark EHAL R.L. 23.79 January 2012.

FOR INFORMATION
NOT FOR CONSTRUCTION

Beca

CHRISTCHURCH CITY COUNCIL

HALSWELL AQUATIC CENTRE

HALSWELL POOL
POOL LEVEL SURVEY
REDUCED LEVELS

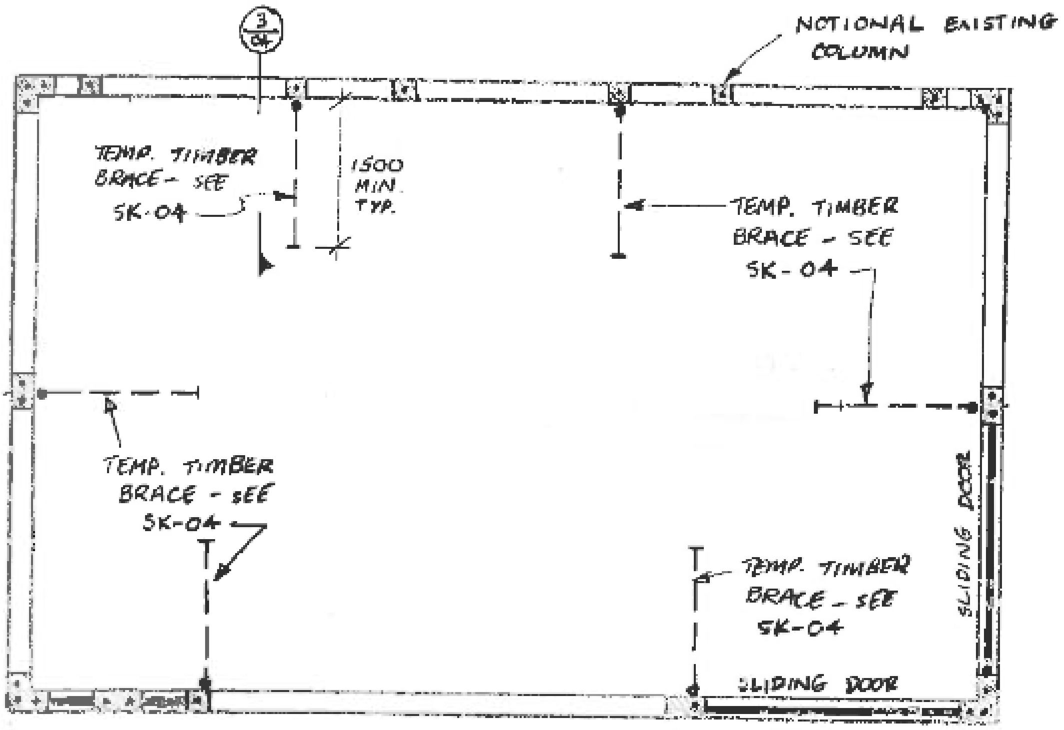
GEOSPATIAL

5323355-GS-003

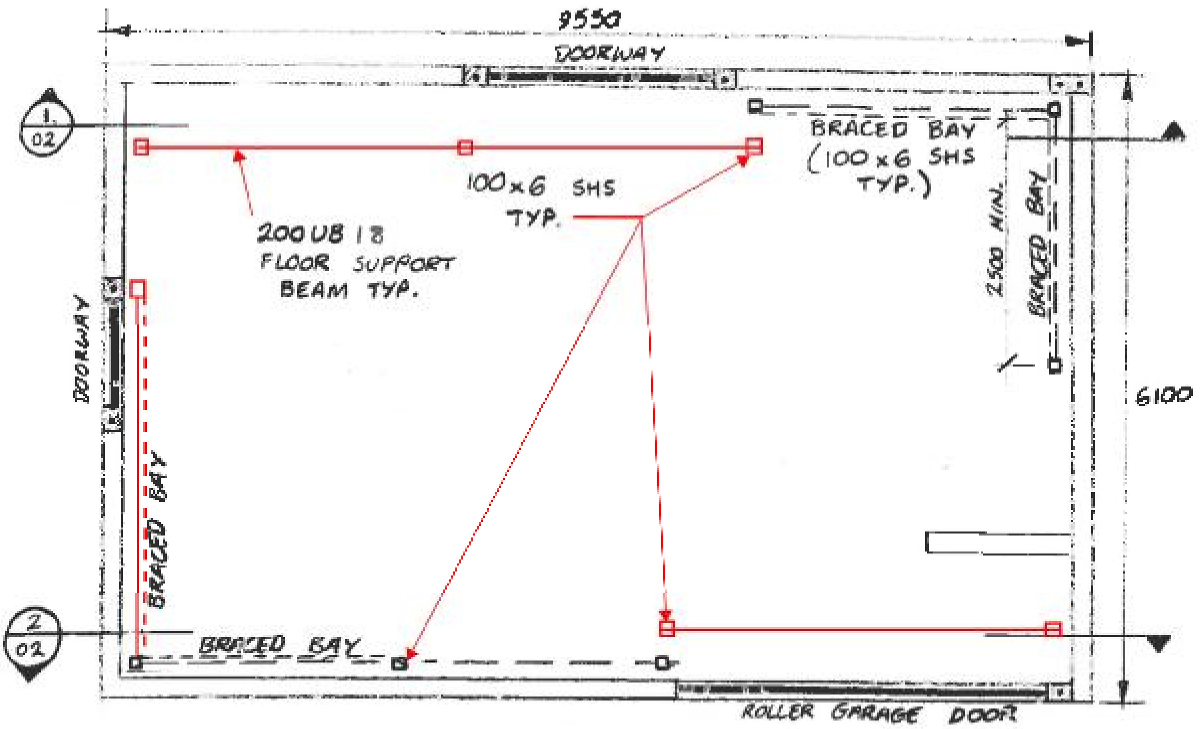
Appendix D

Temporary Strengthening Scheme

FLOOR PLANS



FIRST FLOOR - CLUB ROOMS



GROUND FLOOR - PLANT HOUSE

NOTE:
TEMPORARY STRENGTHENING SCHEME TO ACHIEVE 34% NBS. RESTRICTED ACCESS ONLY ALLOWED FOLLOWING STRENGTHENING.

FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
B	CHANGES IN RED				
A	FOR CONSTRUCTION	MB	SR	DW	11/12

Beca

Client: CHRISTCHURCH CITY COUNCIL

Project: BUILDING ASSESSMENTS

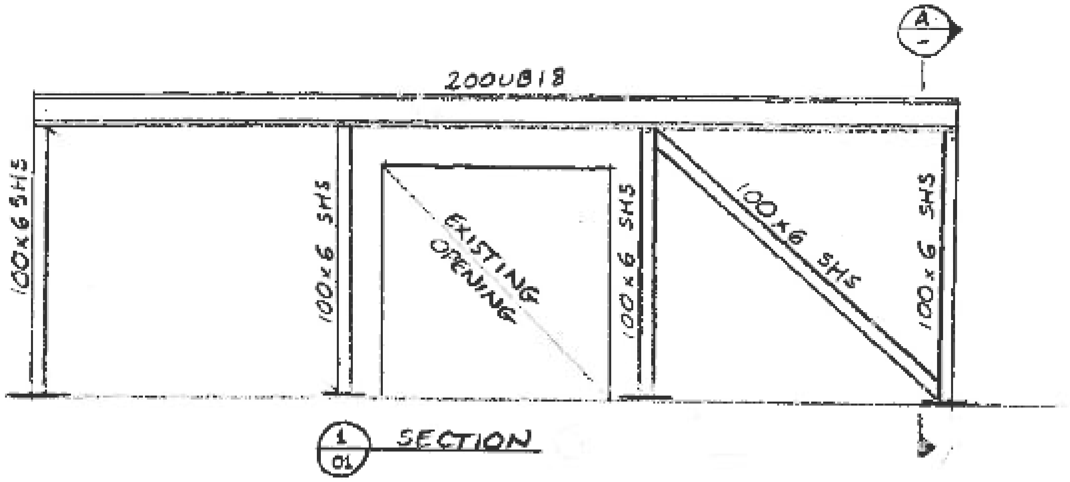
Title: HALSWELL AQUATIC CENTRE - TEMP. WORKS

Approved for Construction *
Date: 7/11/12
* Refer to Revision 1 for Original Signatures

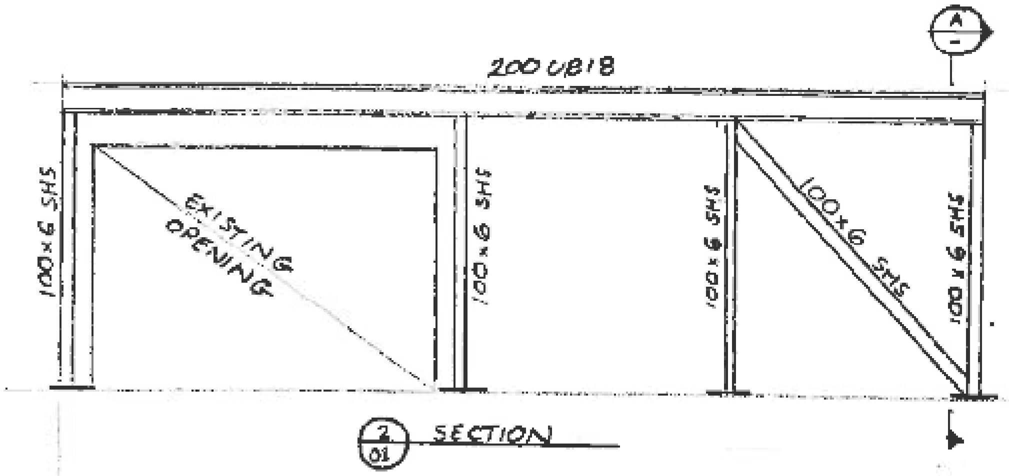
Design	MB	NOV '12
Drawn	MB	NOV '12
Dsg Verifier	SR	NOV '12
Dwg Check	SR	NOV '12

Scale as drawn (A4) NTS
Discipline STRUCT
Drawing No. 5323355-103-SK-01
Rev. B

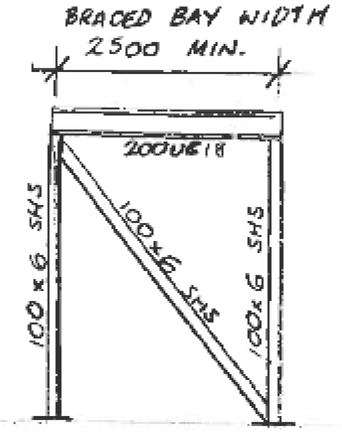
STEEL FRAME ELEVATIONS:



1/01 SECTION



2/01 SECTION



A/– SECTION

ALL BRACED BAYS TO BE AS SHOWN ON SK-03 WITH A MINIMUM BAY WIDTH OF 2500mm AND CONNECTED TO THE FIRST FLOOR AND GROUND SLAB AS SHOWN.

ORIENTATION OF 100x6 SHS
BRACE MAY CHANGE TO SUIT
EGRESS LOCATIONS ON SITE

FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
B	CHANGES IN RED				
A	FOR CONSTRUCTION	MB	SR	GW	11/12

Beca

Client: CHRISTCHURCH CITY COUNCIL

Project: BUILDING ASSESSMENTS

Design	MB	NOV '12
Drawn	MB	NOV '12
Dsg Verifier	SR	NOV '12
Dwg Check	SR	NOV '12

Title: HALSWELL AQUATIC CENTRE - TEMP. WORKS

Approved for Construction *
Date: 7/11/12
* Refer to Revision 1 for Original Signatures

Scale as drawn (A4) NTS

Discipline STRUCT

Drawing No. 5323355-103-SK-02

Rev. B

DO NOT SCALE

IF IN DOUBT ASK.

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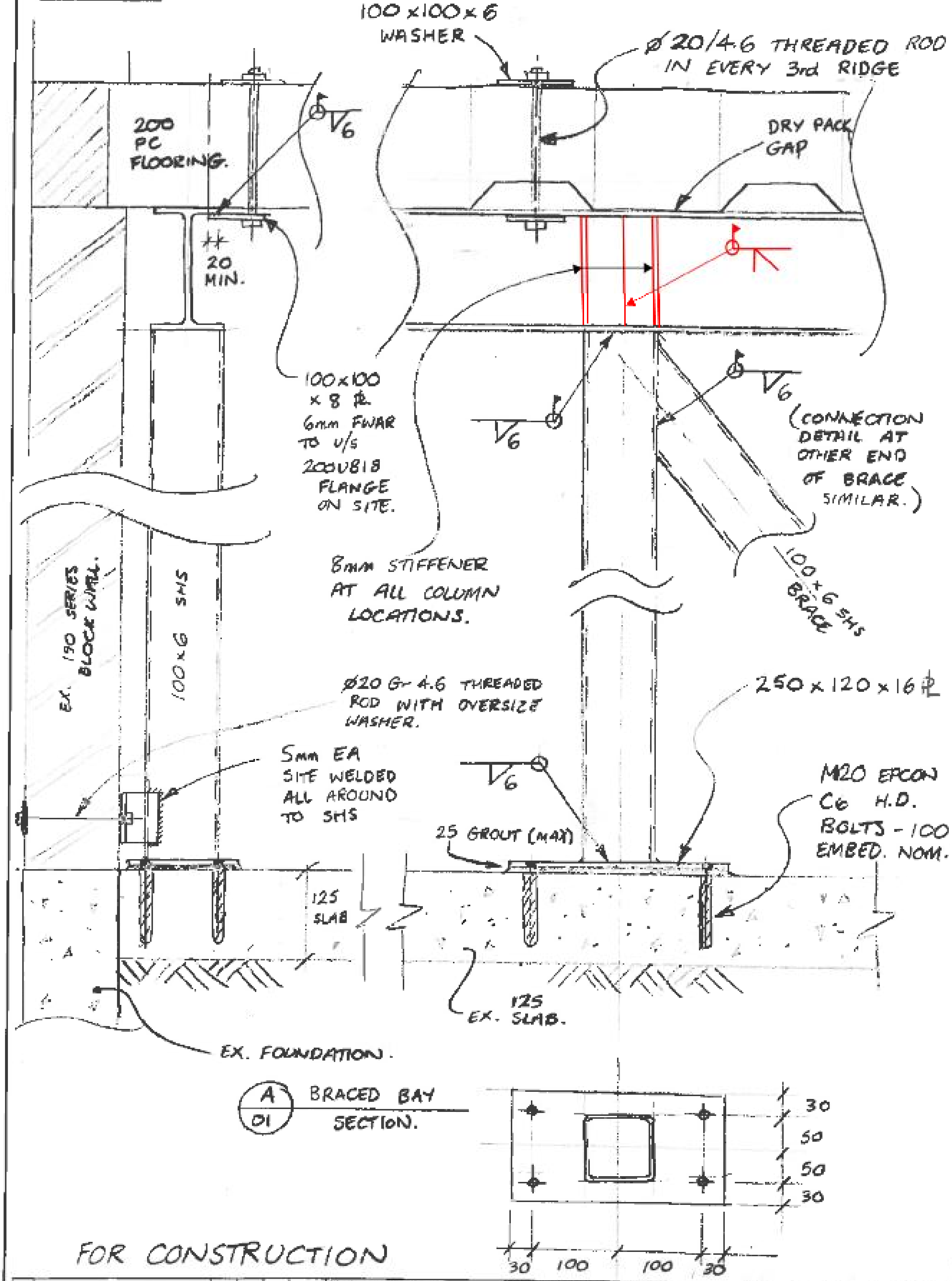
Document No. 00A4-P00_NoGrid.dwg

DETAILS



FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
B	CHANGES IN RED				
A	FOR CONSTRUCTION	MB	SR	DW	11/12

Beca

Client: CHRISTCHURCH CITY COUNCIL

Project: BUILDING ASSESSMENTS

Design	MB	NOV '12
Drawn	MB	NOV '12
Dsg Verifier	SR	NOV '12
Dwg Check	SR	NOV '12

Title: HALSWELL AQUATIC CENTRE - TEMP. WORKS

Approved for Construction *
Date: 7/11/12
* Refer to Revision 1 for Original Signatures

Scale as drawn (A4) NTS

Discipline STRUCT.

Drawing No. 5323955-103-SK-03

Rev B

DO NOT SCALE

IF IN DOUBT ASK.

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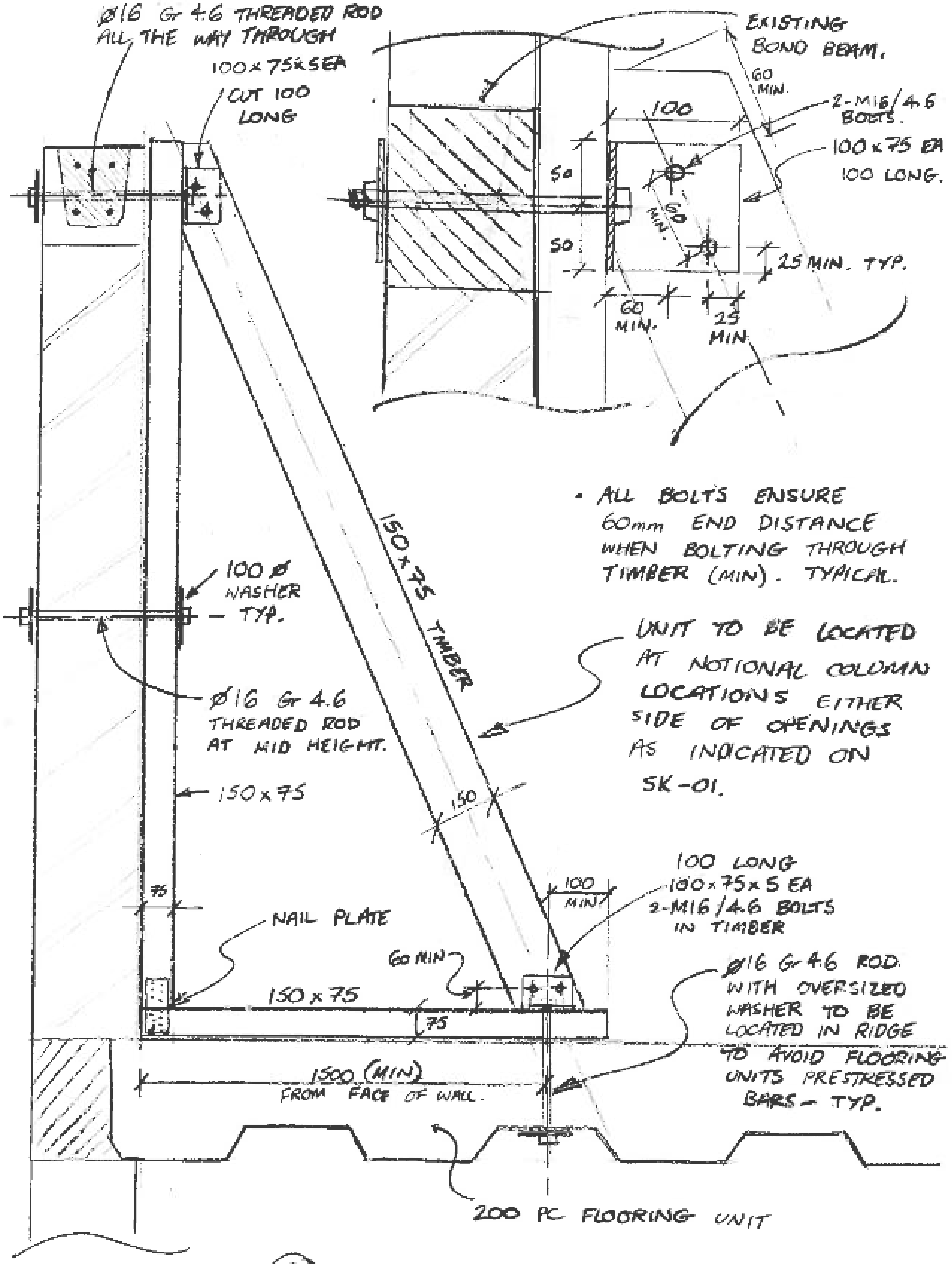

3/01 TIMBER PROP SECTION.

FOR CONSTRUCTION

No.	Revision	By	Chk	Appv	Date
A	FOR CONSTRUCTION	MB	SR	GW	11/12

Beca

Client: CHRISTCHURCH CITY COUNCIL

Project: BUILDING ASSESSMENTS

Design	MB	NOV '12
Drawn	MB	NOV '12
Dsg Verifier	SR	NOV '12
Dwg Check	SR	NOV '12

Title: HALSWELL AQUATIC CENTRE - TEMP. WORKS.

Approved for Construction *
Date: 7/11/12
* Refer to Revision 1 for Original Signature

Scale as drawn (A4) NTS
Discipline STRUCT
Drawing No. 5323355-103-SK-04
Rev. A

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Document No. 6644 P00_KeGrid.dwg

Appendix E

CERA DEE Summary Data

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name: Main Plant Room & Swimming Club
Unit No: Street
Building Address: Halswell Aquatic Centre 339 Halswell Road
Legal Description:
Degrees Min Sec
GPS south:
GPS east:
Building Unique Identifier (CCC): BU 1691-002 EQ2 & BU 1691-005 EQ2

Reviewer: David Whittaker
CPEng No: 123089
Company: Beca
Company project number: 5323355
Company phone number: 03 3663521
Date of submission: 4/04/2014
Inspection Date: 29/08/2012
Revision: D
Is there a full report with this summary? yes

Site

Site slope: flat
Soil type:
Site Class (to NZS1170.5): D
Proximity to waterway (m, if <100m):
Proximity to clifftop (m, if < 100m):
Proximity to cliff base (m,if <100m):

Max retaining height (m): 0
Soil Profile (if available): Unknown, not available.
If Ground improvement on site, describe:
Approx site elevation (m): 0.00

Building

No. of storeys above ground: 2 single storey = 1
Ground floor split? no
Storeys below ground 0
Foundation type: other (describe)
Building height (m): 6.00
Floor footprint area (approx): 50
Age of Building (years): 49

Ground floor elevation (Absolute) (m):
Ground floor elevation above ground (m): 0.00
if Foundation type is other, describe: Slab on grade with strip footings
height from ground to level of uppermost seismic mass (for IEP only) (m): 6
Date of design: 1935-1965

Strengthening present? no
Use (ground floor): other (specify)
Use (upper floors): other (specify)
Use notes (if required): Plant room at ground level
Importance level (to NZS1170.5): IL2

If so, when (year)?
And what load level (%g)?
Brief strengthening description:

Gravity Structure

Gravity System: load bearing walls
Roof: timber framed
Floors: precast concrete with topping
Beams: none
Columns: load bearing walls
Walls: partially filled concrete masonry

rafter type, purlin type and cladding: Timber rafters, timber purlins metal sheeting
unit type and depth (mm), topping:
overall depth x width (mm x mm):
typical dimensions (mm x mm):
thickness (mm):

Lateral load resisting structure

Lateral system along: partially filled CMU
Ductility assumed, μ: 2.00
Period along: 0.40 ##### enter height above at H31
Total deflection (ULS) (mm):
maximum interstorey deflection (ULS) (mm):

Note: Define along and across in detailed report!

note total length of wall at ground (m):
wall thickness (m):
estimate or calculation? estimated
estimate or calculation?
estimate or calculation?

Lateral system across: partially filled CMU
Ductility assumed, μ: 2.00
Period across: 0.40 ##### enter height above at H31
Total deflection (ULS) (mm):
maximum interstorey deflection (ULS) (mm):

note total length of wall at ground (m):
wall thickness (m):
estimate or calculation? estimated
estimate or calculation?
estimate or calculation?

Separations:

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

Non-structural elements

Stairs: steel
Wall cladding: exposed structure
Roof Cladding: Metal
Glazing: aluminium frames
Ceilings: plaster, fixed
Services(list):

describe supports: External steel post supports
describe: Blockwalls
describe: Lightweight metal

Available documentation

Architectural: none
Structural: none
Mechanical: none
Electrical: none
Geotech report: none

original designer name/date:
original designer name/date:
original designer name/date:
original designer name/date:
original designer name/date:

Damage

Site:
(refer DEE Table 4-2)
Site performance: Good
Describe damage: Minor external ground cracks.

Settlement: 25-100m
Differential settlement: 0-1:350
Liquefaction: none apparent
Lateral Spread: none apparent
Differential lateral spread: none apparent
Ground cracks: 20-100mm/20m
Damage to area: slight

notes (if applicable):
notes (if applicable):
notes (if applicable):
notes (if applicable):
notes (if applicable):
notes (if applicable): Estimated
notes (if applicable): Minor damage typically observed.

Building:

Current Placard Status: yellow

Along Damage ratio: #VALUE!
Describe (summary): Shear cracks
Describe how damage ratio arrived at: Based on level of damaged observed.

Across Damage ratio: #VALUE!
Describe (summary): Shear cracks

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

Diaphragms Damage?: no Describe:
CSWs: Damage?: no Describe:
Pounding: Damage?: no Describe:
Non-structural: Damage?: no Describe:

Recommendations

Level of repair/strengthening required: significant structural and strengthening
Building Consent required: yes
Interim occupancy recommendations: partial occupancy

Describe: Cracking and movement of masonry wall
Describe:
Describe: Following temporary strengthening

Along Assessed %NBS before: <33% ##### %NBS from IEP below
Assessed %NBS after: 34%

If IEP not used, please detail assessment methodology: <33%NBS based on Force based quantitative assessment. 34%NBS with temporary propping.

Across Assessed %NBS before: <33% ##### %NBS from IEP below
Assessed %NBS after: 34%

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): 1935-1965

h_n from above: 6m

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 =kμ, if pre-1976, fromTable 3.3:		
Ductiity Scaling Factor, **Factor D**:	0.00	0.00

2.6 Structural Performance Scaling Factor:

	along	across
Sp:		0.925
Structural Performance Scaling Factor **Factor E**:	#DIV/0!	1.081081081

	along	across
2.7 Baseline %NBS, $(NBS\%)_b = (\%NBS)_{nom} \times A \times B \times C \times D \times E$ **$\%NBS_b$:**	**#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 value =1.5, no minimum		
Rationale for choice of F factor, if not 1		

Detail Critical Structural Weaknesses: (refer to DEE Procedure section 6)

List any: Refer also section 6.3.1 of DEE for discussion of F factor modification for other critical structural weaknesses

	along	across
3.7. Overall Performance Achievement ratio (PAR)	**0.00**	**0.00**
4.3 PAR x $(\%NBS)_b$: PAR x Baselline %NBS:	**#DIV/0!**	**#DIV/0!**
4.4 Percentage New Building Standard (%NBS), (before)		**#DIV/0!**

Official Use only:

Accepted By

Date:

Appendix F

Previous Reports and Assessments

Christchurch Eq RAPID Assessment Form - LEVEL 2

Inspector Initials: MK
Territorial Authority: Christchurch City
Date: 21/06/2011
Time: 9:40
Final Posting (e.g. UNSAFE): Y1
however needs further inspection

Building Name: HALSWELL POOL
Short Name: SWIMMING CLUB
Address: BU 1691-005-EQ2

GPS Co-ordinates: S° E°
Contact Name:
Contact Phone:
Storeys at and above ground level: 2
Below ground level:
Total gross floor area (m²):
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 with timber roof and precast floors
- ☐ 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
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	☑	☐	☐

Comments:
vertical cracks in blockwork over the garage door
step cracks at each corner
The rear wall supporting the balcony sheared off
→ blockwork infil (3 windows at the back of the building) Loose top layer of blockwork

Record any existing placard on this building:
Existing Placard Type (e.g. UNSAFE): GREEN (COMPLEX

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 GREEN: G1 G2
RESTRICTED USE YELLOW: [✓ Y1] Y2
UNSAFE 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): Tape off area at rear - blockwork fall hazard
- ☑ Detailed engineering evaluation recommended
  - ☑ Structural
  - ☑ Geotechnical
  - ☐ Other:
- ☐ Other recommendations:

Estimated Overall Building Damage (Exclude Contents)

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

Sign here on completion: Kozlowska
Date & Time: 22/06/11
ID:

Inspection ID: ________ *(Office Use Only)*

PRUP1:

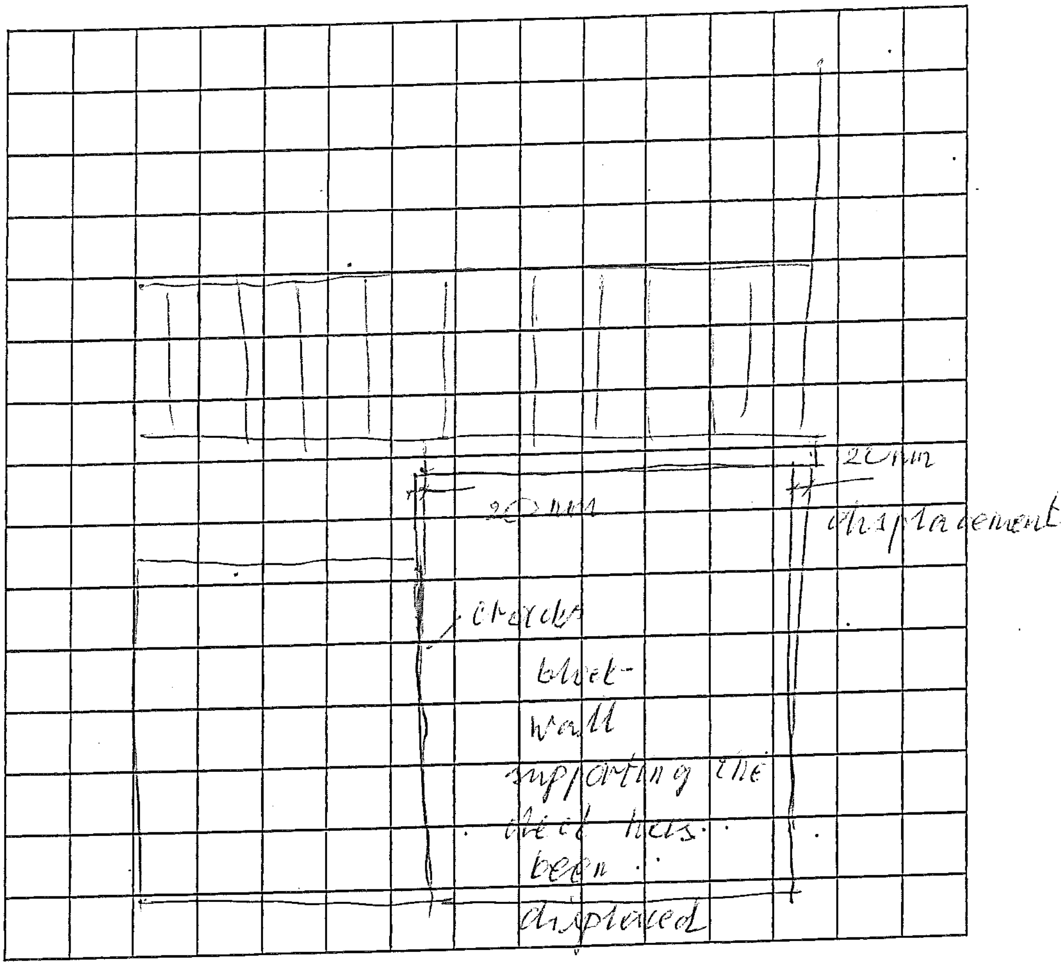
Structural Hazards/ Damage	Minor/None	Moderate	Severe	Comments
Foundations	☑	☐	☐	
Roofs, floors (vertical load)	☑	☐	☐	
Columns, pilasters, corbels	☑	☑	☐	wall supporting the top deck
Diaphragms, horizontal bracing	☑	☐	☐	has been displaced 20mm
Pre-cast connections	☑	☐	☐	see attached sketch
Beam	☑	☐	☐	Back-wall → diagonal
Non-structural Hazards / Damage				cracks
Parapets, ornamentation	☑	☐	☐	→ blockwork infill poorly done
Cladding, glazing	☑	☐	☐	top layer of blockwork appears
Ceilings, light fixtures not checked	☑	☐	☐	to be loose.
Interior walls, partitions not checked	☐	☐	☐	
Elevators	☐ N/A	☐	☐	
Stairs/ Exits	☑	☐	☐	
Utilities (eg. gas, electricity, water) not checked	☐	☐	☐	
Other	☐	☐	☐	
Geotechnical Hazards / Damage				
Slope failure, debris	☑	☐	☐	
Ground movement, fissures	☑	☐	☐	
Soil bulging, liquefaction	☑	☐	☐	

General Comment

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	Secure blockwork at high level at rear.
		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)