Report

Halswell Aquatic Centre, Main Building Complex
Detailed Engineering Evaluation
BU 1691-001 EQ2
Quantitative Report

Prepared for Christchurch City Council (Client)

By Beca Carter Hollings & Ferner Ltd (Beca)

4 October 2013

Revision History

Revision Nº	Prepared By	Description	Date
A	Andreas Trapezaris	Draft for CCC review	22 January 2013
B	Laura Chen	Incorporating CCC comments	1 March 2013
C	Laura Chen	Final	4 October 2013

Document Acceptance

Action	Name	Signed	Date
Prepared by	Andreas Trapezaris		4 October 2013
Reviewed by	Nicholas Charman		4 October 2013
Approved by	David Whittaker		4 October 2013
on behalf of	Beca Carter Hollings & Ferner Ltd		

Halswell Aquatic Centre - Main Building Complex
BU 1691-001 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) in 2012.

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

The Main Building Complex is located at 339 Halswell Road, Halswell, Christchurch. The drawings indicate that the building was originally constructed in 1971 with further refurbishments and extensions in 1996. The Main Building Complex has an approximate total floor area of 150m^2 and is a single storey structure of regular plan and geometry. The Main Building Complex is constructed of concrete masonry blocks which are only reinforced at openings, end of walls and corners of the building acting as columns. The roof is timber framed lightweight metal roof sheeting with the timber framed internal wall partitions and ceilings lined with plasterboard. The ground floor is slab on grade and the walls are typically supported on strip foundations integral with the slab. 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 in May 2012 indicated that the building has suffered no earthquake damage which would affect the gravity or seismic capacity of the building.

A post-earthquake floor level survey indicates variations in floor levels, between high and low survey points of up to 67mm.

Critical Structural Weaknesses (CSW)

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

The internal block wall partitions have been identified as a collapse hazard. The wall is reinforced at its ends only, and does not span full height.

Indicative Building Strength (from Detailed Assessment)

The building has been assessed to have a seismic capacity of 65%NBS using the New Zealand Society for Earthquake Engineering (NZSEE) Detailed Assessment guideline ‘Assessment and Improvement of the Structural Performance of Buildings in Earthquakes’ (AISPBE), 2006, and is therefore classified as Earthquake Risk and Seismic Grade C.

No structural damage was observed 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:

- The main lateral resisting system is reinforced concrete masonry blocks acting as columns, typically located at openings and corners of the building in transverse and longitudinal directions. The reinforced masonry blocks in the longitudinal direction of the building have an out-of-plane flexural capacity of 65%NBS.
- The internal reinforced masonry block columns have an out-of-plane flexural capacity of 89%NBS.

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, and is classified as Seismic Grade C. The risk of collapse of an earthquake risk building of this grade is considered to be 5 to 10 times greater than that of an equivalent new building.

No damage was 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.

Temporary strengthening works have been developed for the internal block wall partitions. This is a precautionary measure as the walls pose a potential hazard based on observations of similar types of construction (refer to Appendix D for the temporary strengthening scheme). These temporary works have been completed prior to the issue of this report.

It is recommended that:

- A full damage assessment is carried out for insurance purposes.

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Appendices

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 Building Complex at Halswell Aquatic Centre located at 339 Halswell Road, Halswell, 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 drawings were made available and these have been used in our assessment of the building. 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) Revision 7 issued by the Engineering Advisory Group in 2012, 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.

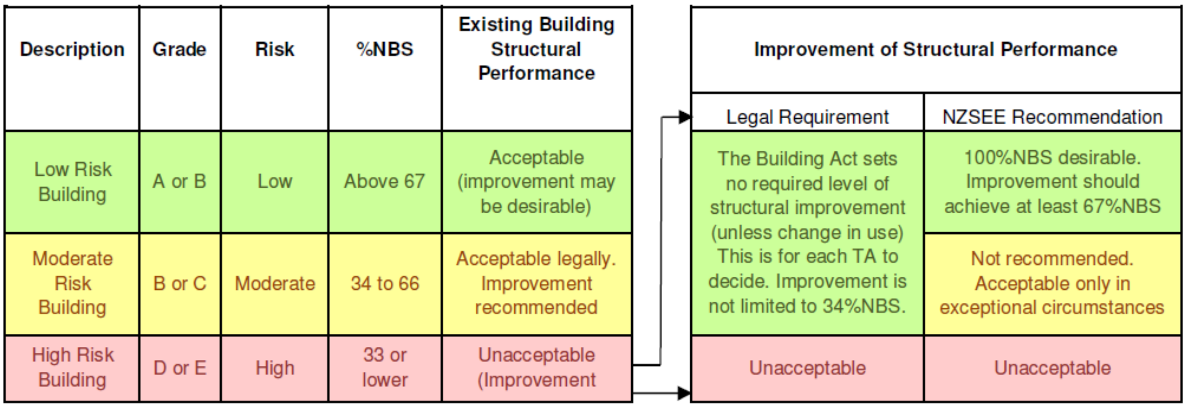
3 Earthquake Resistance Standards

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 Building Complex at Halswell Aquatic Centre	
Street Address	339 Halswell Road, Halswell, Christchurch	
Age	Built in 1971 with further extension and refurbishments in 1996.	From drawings available.
Description	Concrete masonry block wall building with a timber framed roof and concrete slab on grade.	
Building Footprint / Floor Area	Approx. 150m^2 (26m x 6m)	
No. of storeys / basements	Single storey no basement	
Occupancy / use	Offices, toilets & changing rooms	Importance Level 2
Construction	Concrete masonry blockwalls with timber framed roof.	From drawings available.
Gravity load resisting system	Gravity loads from the roof are resisted by the timber framed roof supported by concrete masonry block walls founded on strip foundations. The ground floor is a slab on grade.	Concrete masonry blocks which are only reinforced at openings, end of walls and corners of the building.
Seismic load resisting system	Lateral loads in both directions are resisted by reinforced concrete masonry blocks acting as columns, typically located at openings and corners of the building. The fixed plasterboard ceiling in	No roof bracing was observed during our visual inspection.

Item	Details	Comment
	parts of the building will assist in transferring the lateral loads from the roof to the walls.	
Foundation system	Shallow strip foundations with a concrete slab on grade.	From drawings available.
Stair system	No stairs	
Other notable features	Some areas of wall were constructed with concrete void blocks. Lightweight canopy over main entrance doors.	
External works	Asphalt paved car park and main entrance to the Aquatic Centre.	
Construction information	Limited architectural drawings from 1971 and partial architectural drawings from the 1996 extension were available.	
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:

- Unreinforced concrete masonry walls.
- Connection between masonry walls and foundations.
- Connections between the roof and walls.

5 Site Investigations

5.1 Previous Assessments

The building had a Level 2 rapid assessment undertaken on 21 June 2011 (refer to Appendix F).

Visual inspections as part of the Level 4 damage assessment were undertaken on 8 May 2012. A Qualitative Report was issued to CCC on 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. Refer to Appendix C.
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	✓				None observed during visual inspection.
Frame					No damage observed during visual inspection.
Concrete block walls					No damage observed during visual inspection.
Cracking to concrete floors					No damage observed during visual inspection.
Cladding /envelope					No damage observed during visual inspection.
building services	✓				No inspections of services were carried out.
other					

6.2 Surrounding Buildings

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

6.3 Residual Displacements and General Observations

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

Based on our limited visual inspection, the structure appears to be undamaged therefore we believe the structural capacity has not been affected.

7 Generic Issues

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

Unreinforced concrete masonry

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

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 variations in floor levels of up to 67mm across the Main Building Complex footprint (refer to Appendix C), however the levels of the building after construction or prior to the earthquakes is unknown. The drawings indicate drainage falls in the slab, but with no gradient specified. The survey also indicates the drainage has inconsistent gradients and therefore the drainage system may be affected. CCC may wish to undertake a verticality 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.

No earthquake damage was observed during our visual inspections. 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:

- 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

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

The internal block wall partitions have been identified as a potential collapse hazard, as the wall is reinforced at its ends only and does not span full height. However, calculations suggest that the lateral capacity of these elements is fairly high (89%NBS as indicated in Table 10.1 for Internal 90mm reinforced masonry block columns).

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 in the order of 65%NBS. This is higher than the IEP assessment of 18%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	Direction	Ductility, μ	Seismic Performance	Notes
Overall %NBS adopted from DEE	**Longitudinal**	**2.0**	**65%NBS**	**Governed by flexural capacity of perimeter block columns**
Bond beam, out of plane flexural capacity	Both	2.0	>100%NBS	
Internal 90mm reinforced masonry block columns	Transverse	2.0	89%NBS	Out-of-plane flexural capacity
Perimeter 190mm reinforced masonry block column	Longitudinal	2.0	65%NBS	Out-of-plane flexural capacity

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:

- The main lateral resisting system is reinforced concrete masonry blocks acting as columns, typically located at openings and corners of the building in transverse and longitudinal directions. The reinforced masonry blocks in the longitudinal direction of the building have an out-of-plane flexural capacity of 65%NBS.
- The internal reinforced masonry block columns have an out-of-plane flexural capacity of 89%NBS.

Based on the results of our Quantitative Assessment, the Main Building Complex is considered Earthquake Risk as the seismic capacity was assessed to be between 34%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 earthquake risk, having an assessed capacity of between 34% and 67%NBS, and is classified as Seismic Grade C. 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 was 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.

Temporary strengthening works have been developed for the internal block wall partitions. This is a precautionary measure as the walls pose a potential hazard based on observations of similar types of construction (refer to Appendix D for the temporary strengthening scheme). These temporary works have been completed prior to the issue of this report.

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

Based on our limited visual inspection, no structural repairs are required to the Main Building Complex.

12 Design Features Report

No repairs are required to reinstate the existing structural system. Localised temporary bracing has been added to some internal block walls as a precautionary measure to mitigate collapse hazards (see Appendix D).

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 Building Complex indicated)

Photo 1: External view

Photo 2: External view

Photo 3: Internal view of changing room

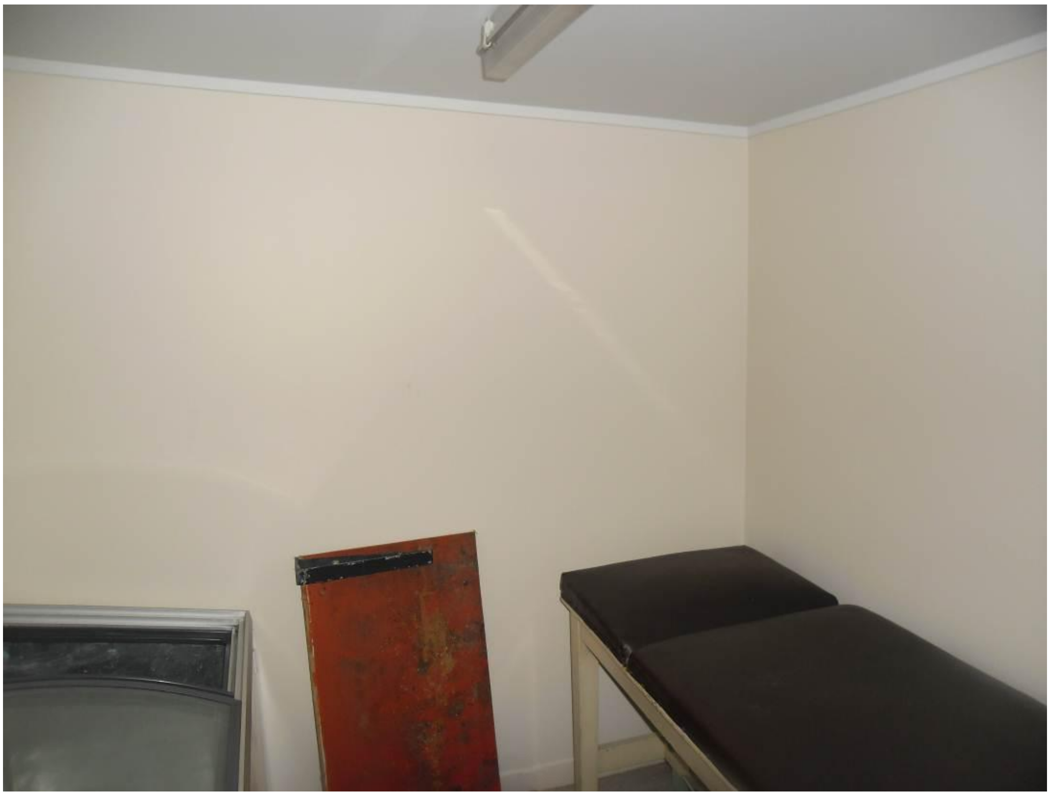
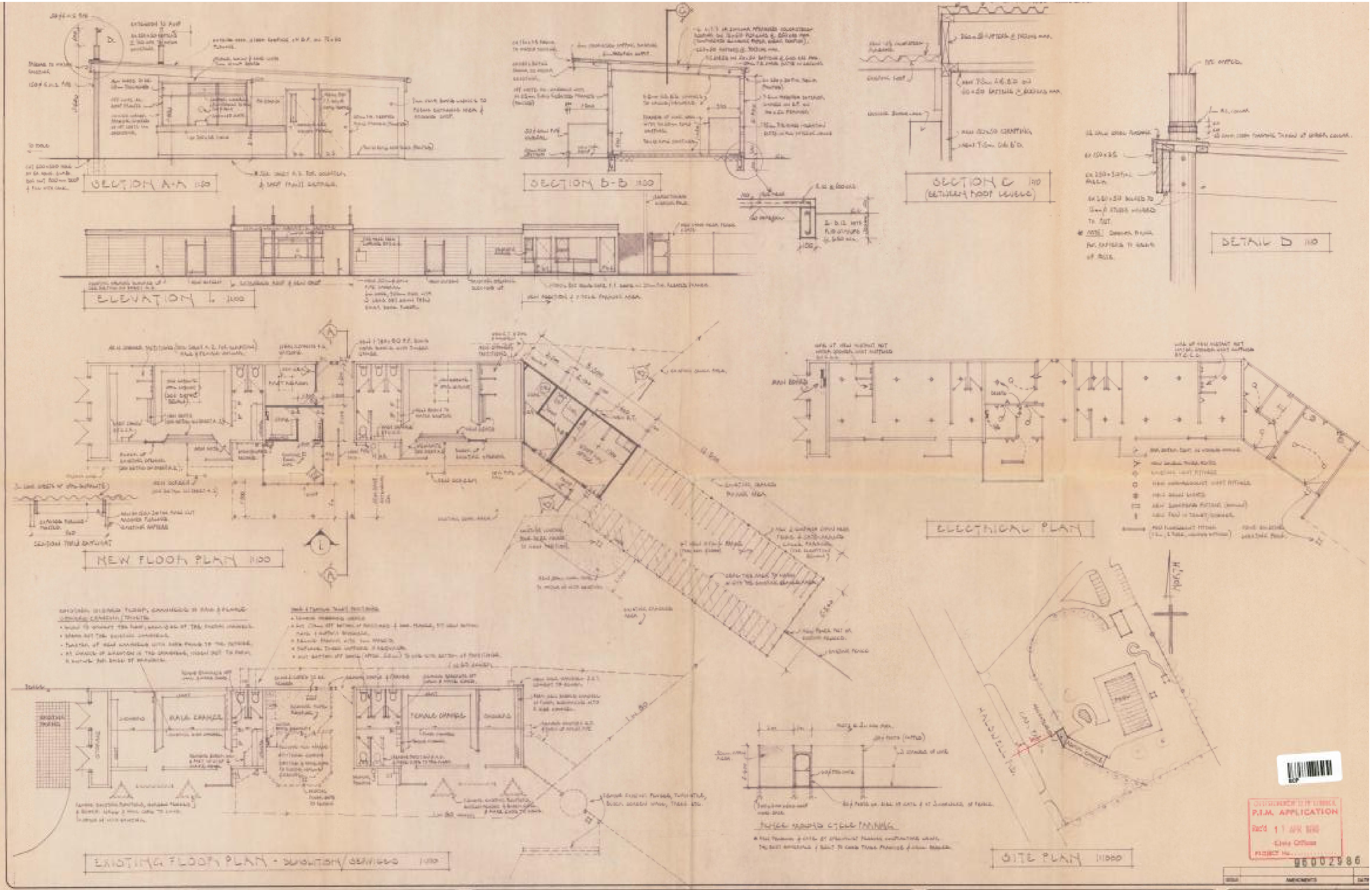


Photo 4: Internal view

Appendix B

Existing Drawings



CHRISTCHURCH CITY COUNCIL
P.I.M. APPLICATION
Rec'd 11 APR 1996
Civic Offices
PROJECT No. ....

96002986

ISSUE	AMENDMENTS	DATE

DESIGN SERVICES UNIT

CHRISTCHURCH
THE GARDEN CITY

	INITIALS	DATE		
DESIGNED			DATUM	
DRAWN	A.H.L.	06.96	BENCH MK	
TRACED			SURVEY FB	
DWG CHK	J.P.H.	11.6.96	SURVEY LB	
DES CHK			COMETS FB	
ROADED			COMETS LB	

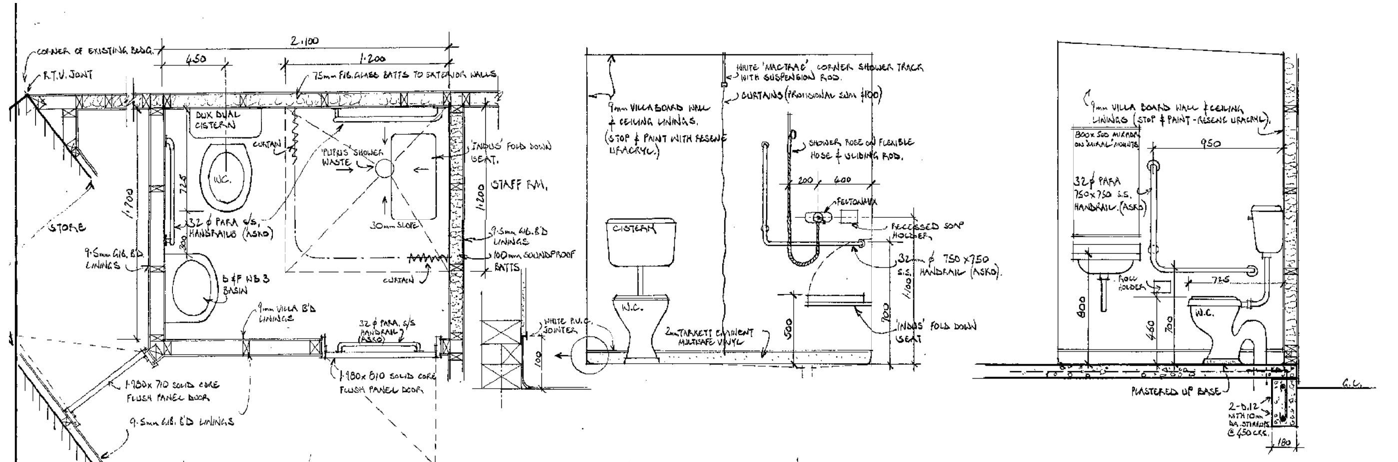
APPROVED
DATE 11/6/96
DESIGN SERVICES MANAGER

JOB TITLE
HALSWELL POOL ALTERATIONS
339 HALSWELL ROAD

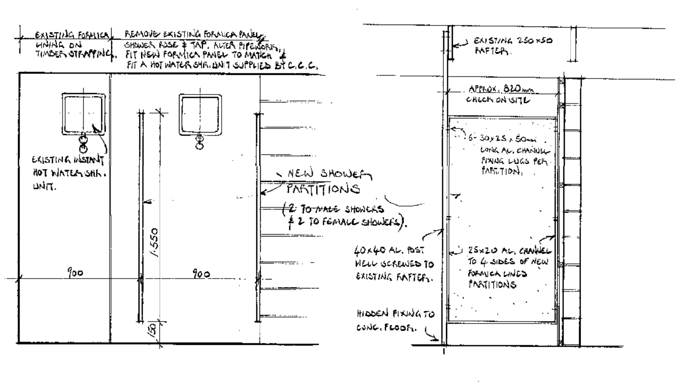
DRAWING TITLE
SITE PLAN
PLANS, ELEVATION, SECTIONS & DETAILS

SCALES
1:1000
1:100
1:50
1:10

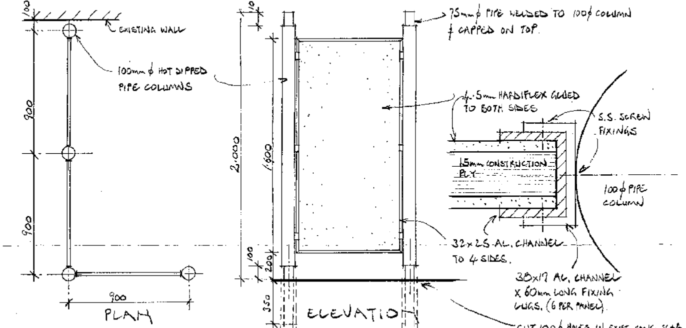
C.N. 95/96-377
508.70
SHEET A.1 OF 2



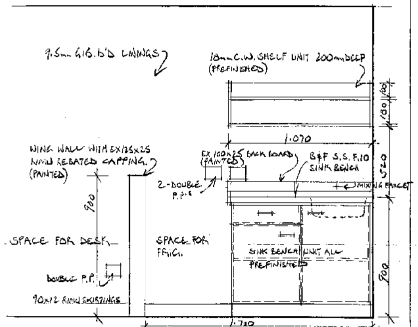
NEW TOILET/SHOWER PLAN, ELEVATIONS & DETAILS 1:20



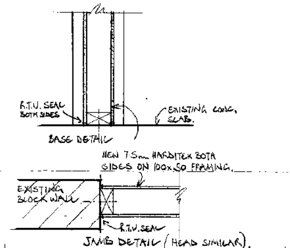
MALE & FEMALE SHOWERS - ALTERATIONS & NEW PARTITIONS 1:20



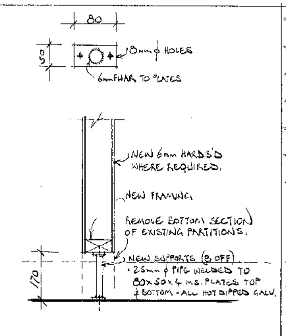
NEW EXTERIOR SCREENS 1:20 2 OFF.



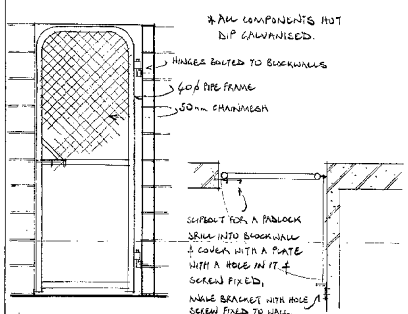
STAFF RM. SINK BENCH 1:20



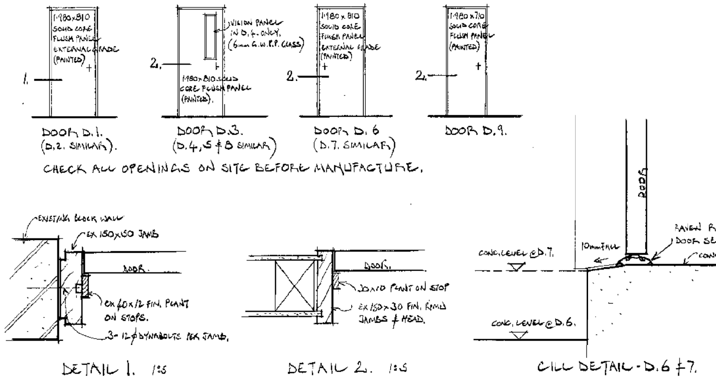
BLOCKING UP OPENINGS INTO EXISTING CHANGING ROOMS



SUPPORT BRACKETS TO ALTERED TOILET PARTITIONS



NEW GATES TO CHANGING ROOMS 2 OFF 1:20



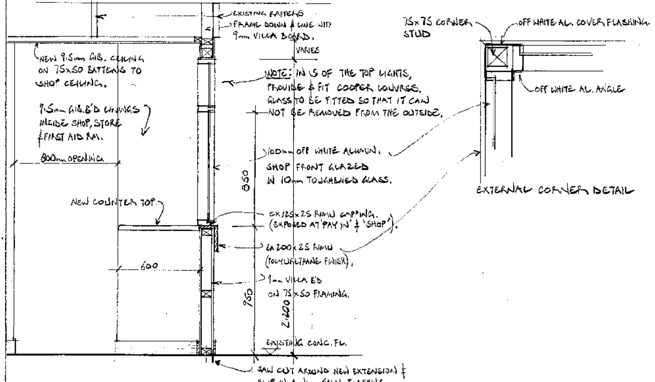
CHECK ALL OPENINGS ON SITE BEFORE MANUFACTURE.

DETAIL 1. 1:5

DETAIL 2. 1:5

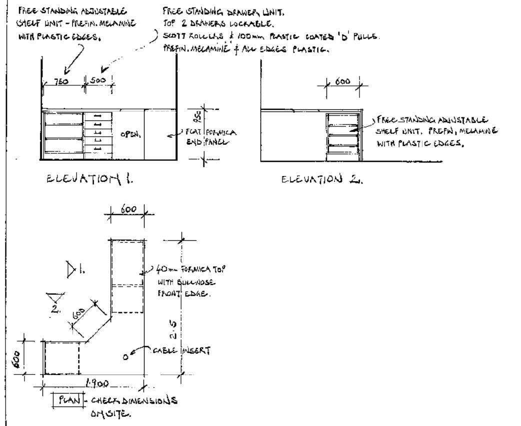
CILL DETAIL - D.6 & 7.

DOOR SCHEDULE & DETAILS



TYPICAL SECTION THRU SHOP WALL

SHOP FRONT SECTION & DETAILS 1:20



COUNTER DETAILS

ISSUE	AMENDMENTS	DATE

DESIGN SERVICES UNIT

CHRISTCHURCH
THE GARDEN CITY

	INITIALS	DATE		
DESIGNED			DATUM	
DRAWN	A.M.L	10.4.96	BENCH MK.	
TRACED			SURVEY FB	
DRW. CHK.	G F H	11-4-96	SURVEY LB	
DES. CHK.			CONSTN. EB	

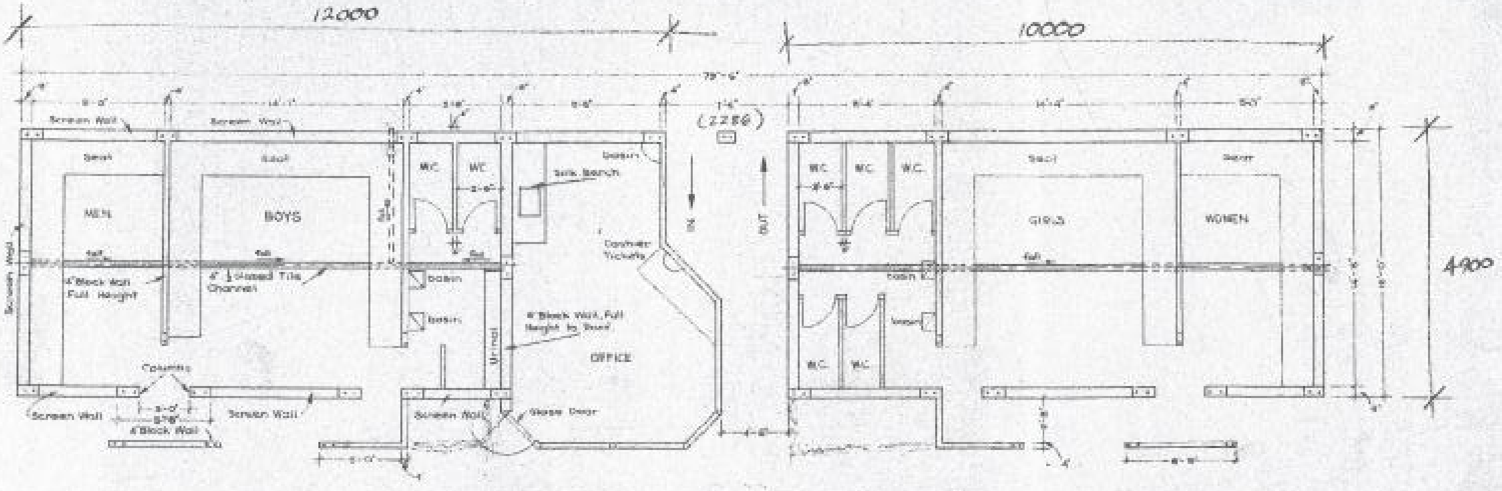
APPROVED
DATE: 11/4/96
R. L. Harper

JOB TITLE
HALSWELL POOL ALTERATIONS
339 HALSWELL ROAD

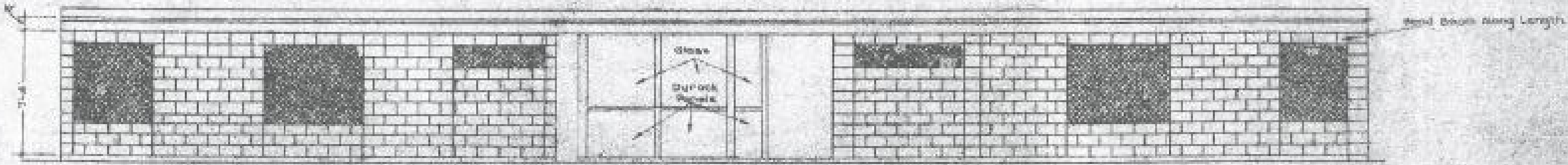
DRAWING TITLE
INTERNAL ELEVATIONS & DETAILS

SCALES
1:20, 1:5

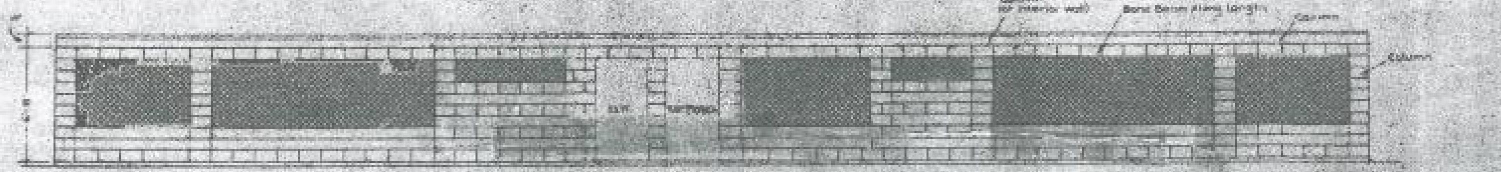
C.N. 95/96-377
508.70



PLAN



POOL ELEVATION



ENTERANCE ELEVATION

Amendment	Initial	Date			
			Designed		
			Drawn		
			Traced		
			Checked		

PAPARUA COUNTY COUNCIL

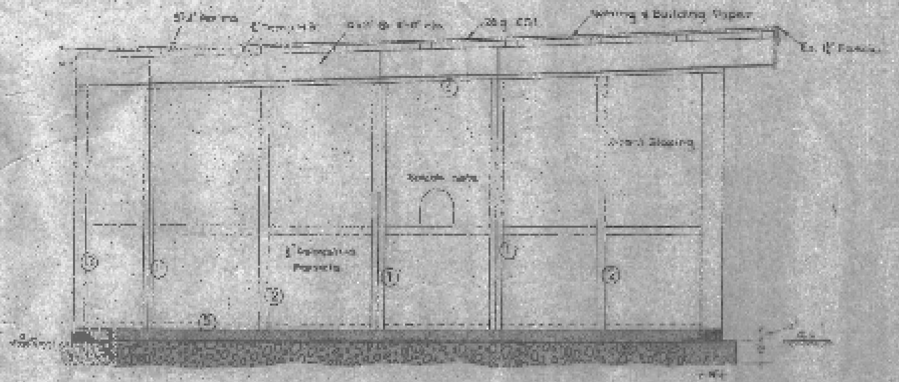
HALSWELL SWIMMING POOL

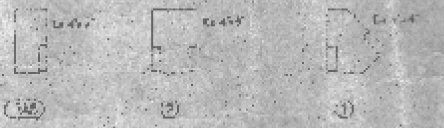
AMENITY BUILDING - CONSTRUCTION PLAN

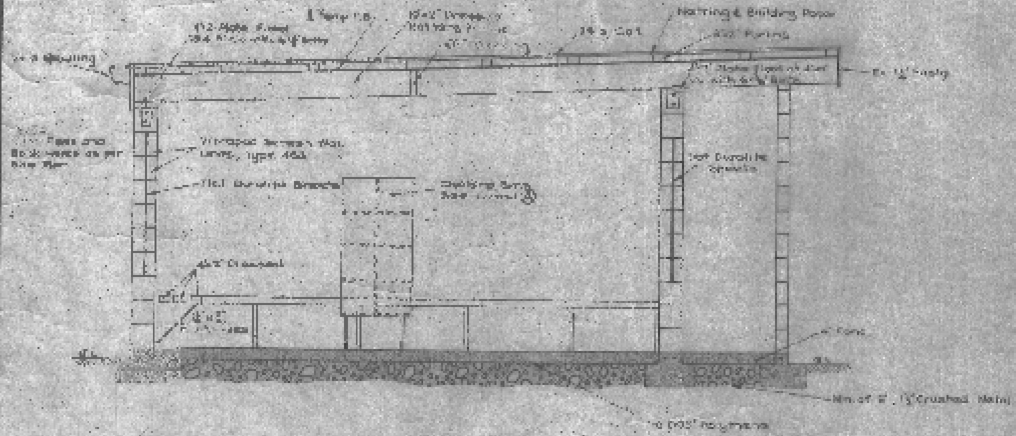
Approved

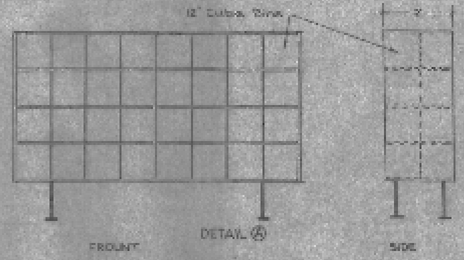
Scale

DWG. G. 540 / 4

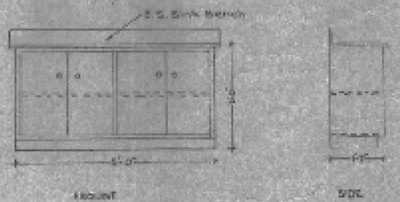




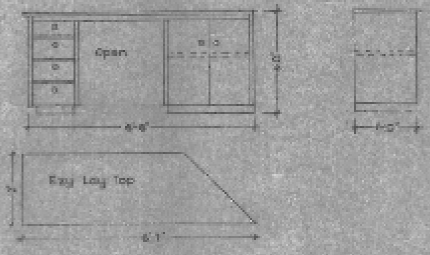




Provide 2 Units as per Detail Ⓐ
ALSO Provide 2 Single sided units fixed
To Wall in Mens and Ladies Dressing Sheds



SINK UNIT



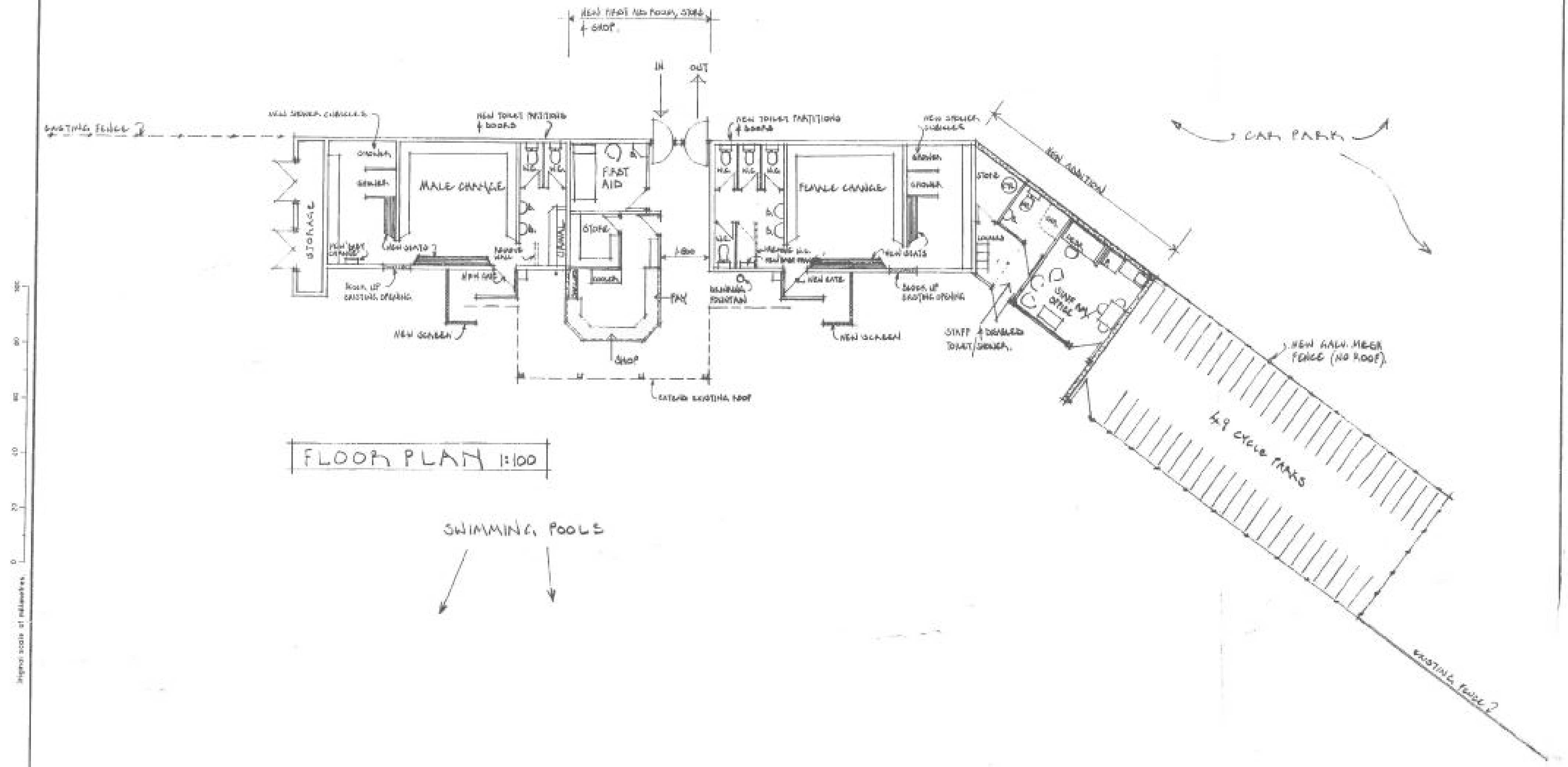
COUNTER

Amendment	Initial	Date			
			Designed	R.D.B.	March-71
			Drawn		
			Traced		July-71
			Checked		

PAPARUA COUNTY COUNCIL
HALSWELL SWIMMING POOL
AMENITY BUILDING - CONSTRUCTION PLAN

APPROVED -
M.M.Z.E.
County Engineer
REF

SCALE 1" = 2 feet
FILE No.
DWG. G 540 / 4
Sheet No. 2 of 3



FLOOR PLAN 1:100

DESIGN SERVICES UNIT

CHRISTCHURCH
THE GARDEN CITY
The city that shines

	INITIALS	DATE		
DESIGNED			DATUM	
DRAWN	GML	13.11.95	BENCH MK	
TRACED			SURVEY FB	
DRW. CHK			SURVEY LB	
DES. CHK			CONSTN. EB	
INDEXED			CONSTN. LB	

APPROVED

/ /
DATE

DESIGN SERVICES MANAGER

ISSUE	AMENDMENTS

DRAWING TITLE

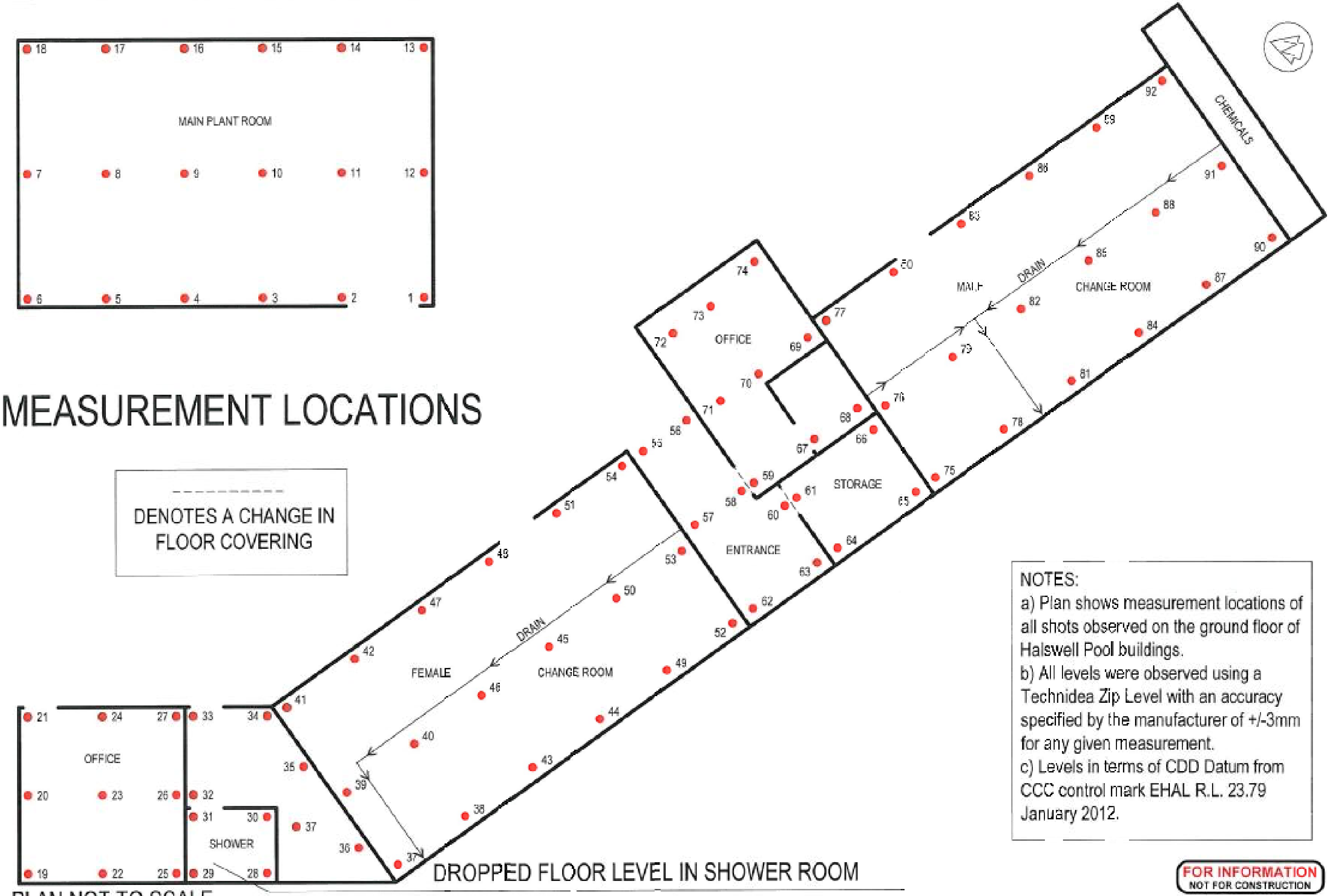
HALSWELL POOL AMENITIES BUILDING
PROPOSED ALTERATIONS

SCALES	C.N.
1:100	508.
	SHEET SP.1.

Appendix C

Site Survey Results

MEASUREMENT LOCATIONS



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.

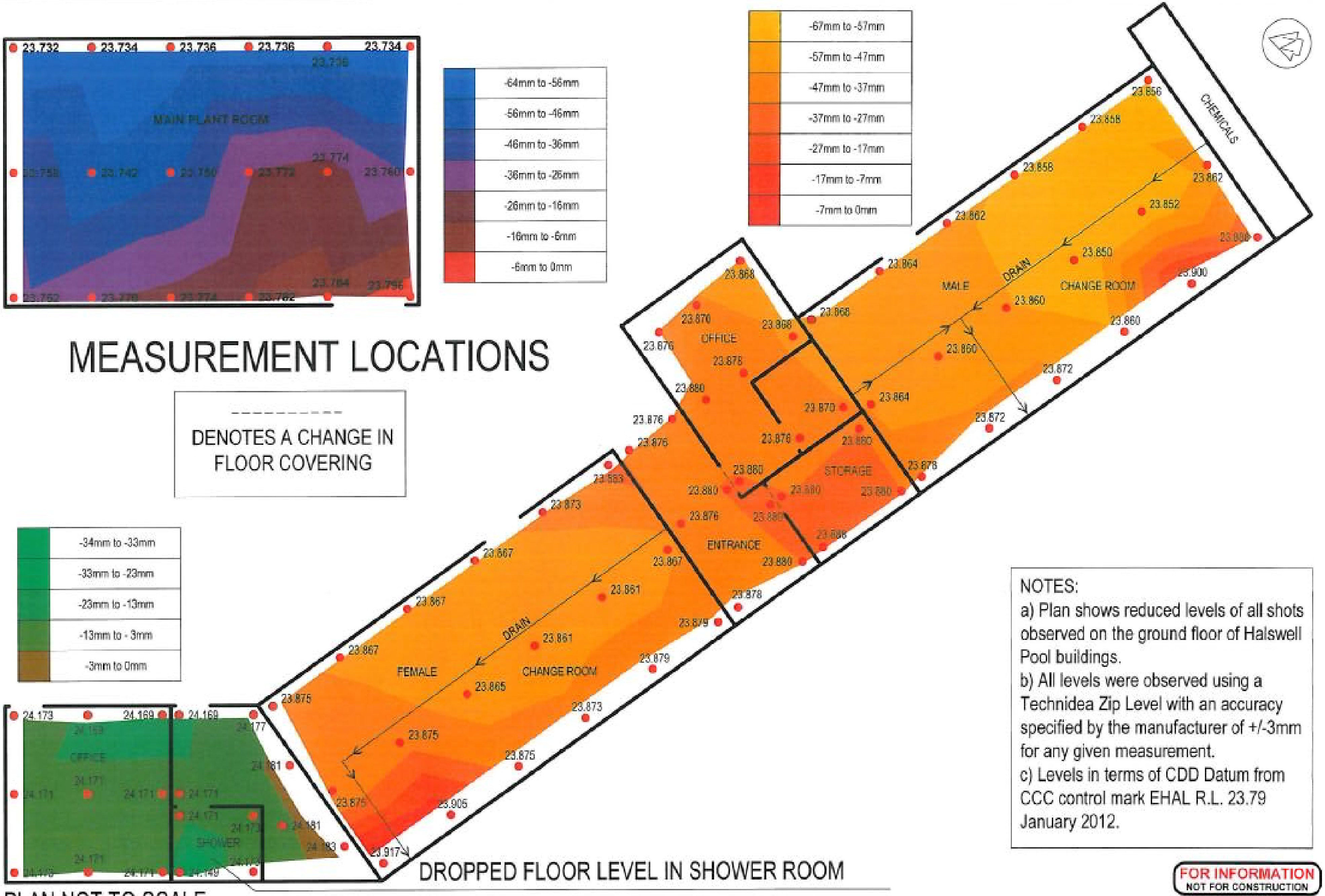
c) Levels in terms of CDD Datum from CCC control mark EHAL R.L. 23.79 January 2012.

FOR INFORMATION
NOT FOR CONSTRUCTION

Beca	CHRISTCHURCH CITY COUNCIL	HALSWELL AQUATIC CENTRE	HALSWELL POOL FLOOR LEVEL SURVEY MEASUREMENT LOCATIONS	GEOSPATIAL 5323356-GS-001	A

www.beca.com

MEASUREMENT LOCATIONS



NOTES:

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

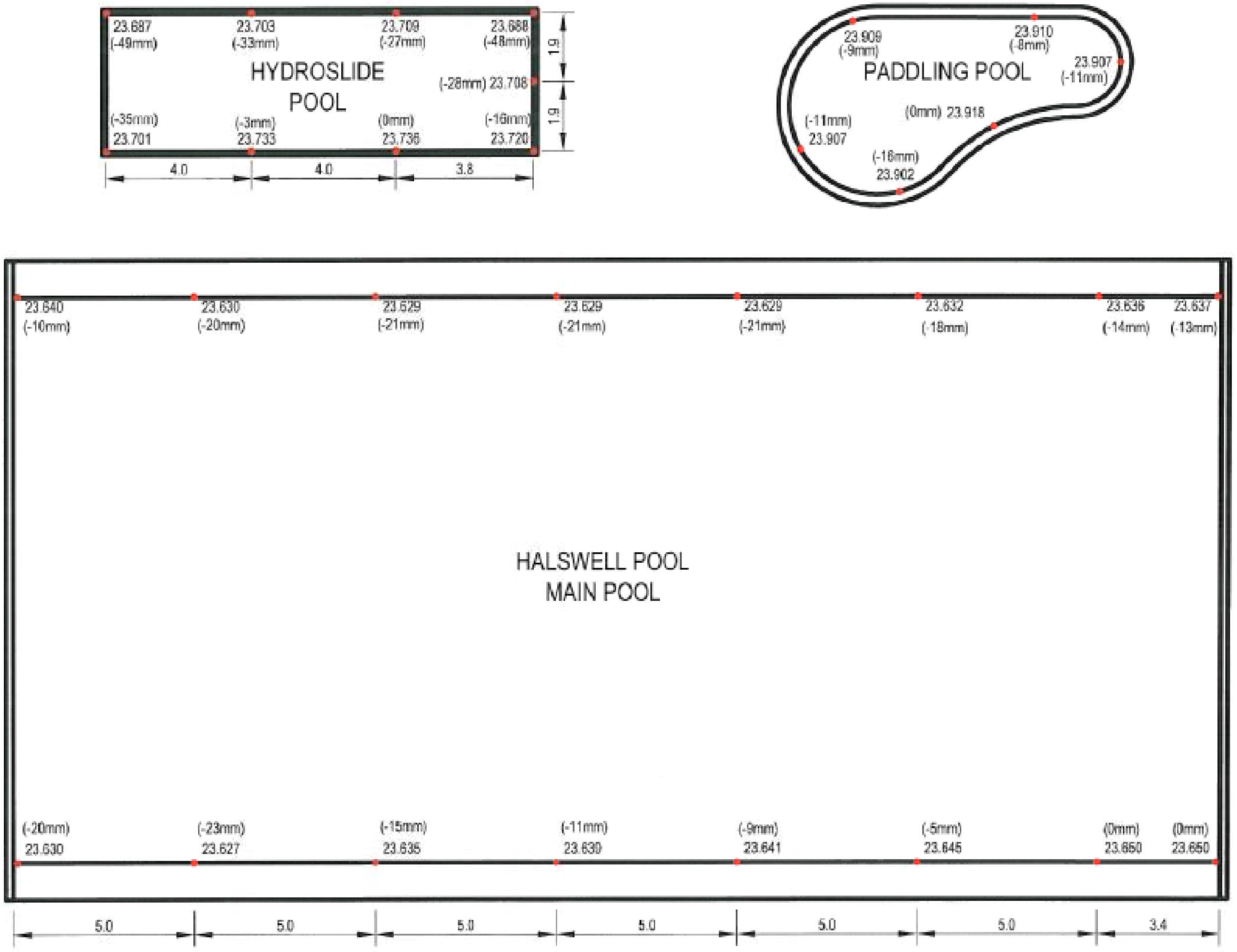
b) All levels were observed using a Technidea Zip Level with an accuracy specified by the manufacturer of +/-3mm for any given measurement.

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



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.

PLAN NOT TO SCALE

FOR INFORMATION
NOT FOR CONSTRUCTION

Beca

CHRISTCHURCH CITY COUNCIL

HALSWELL AQUATIC CENTRE

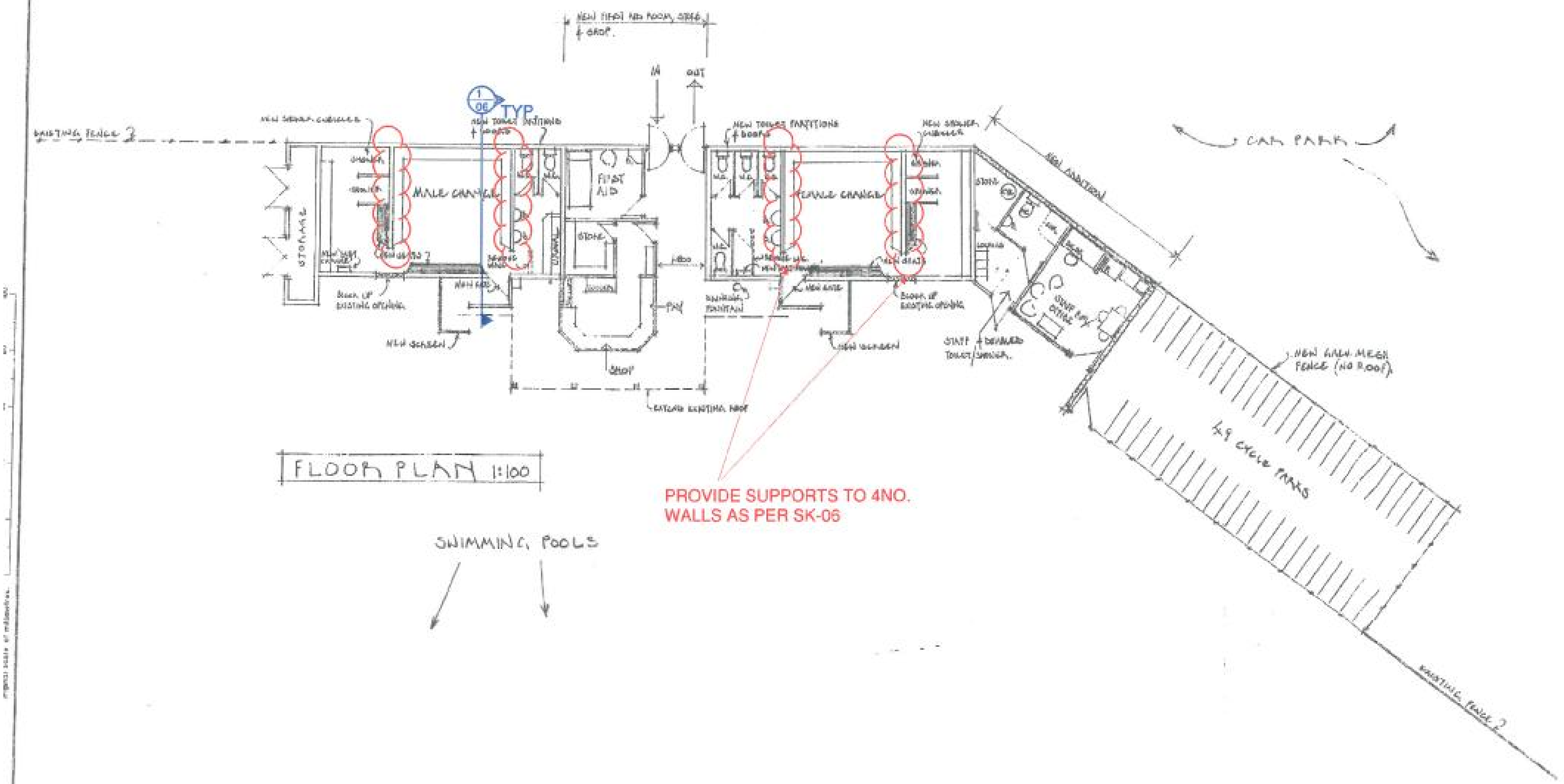
HALSWELL POOL
POOL LEVEL SURVEY
REDUCED LEVELS

GEOSPATIAL

5323355-GS-003

Appendix D

Temporary Strengthening Scheme



PROVIDE SUPPORTS TO 4NO.
WALLS AS PER SK-06

DRAWING NO.
5323355-103-SK-05

REV.
A

ISSUE | AMENDMENTS

DESIGN SERVICES UNIT

CHRISTCHURCH
THE GARDEN CITY
The city that shines

	INITIALS	DATE		
DESIGNED			DATUM	
DRAWN	GML	13.11.95	BENCH MK	
TRACED			SURVEY FB	
DSN. CHK			SURVEY LB	
DFG. CHK			CONSTN. EL	
WORKED			CONSTN. LB	

APPROVED
/ /
DATE
DESIGN SERVICES MANAGER

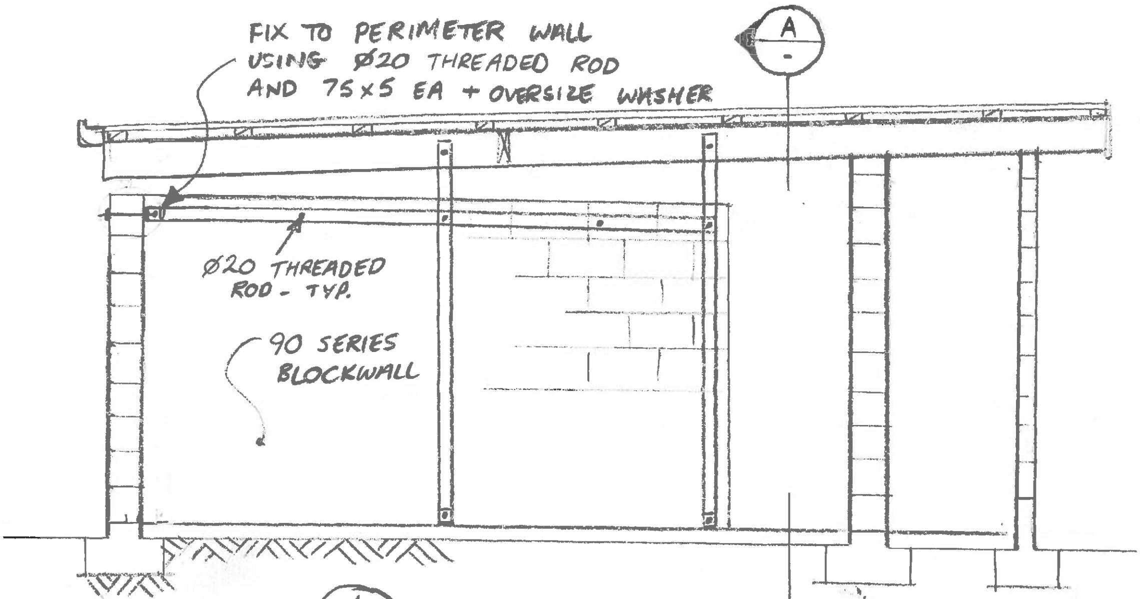
DRAWING TITLE
HALSWELL POOL AMENITIES BUILDING
PROPOSED ALTERATIONS

SCALES
1:100

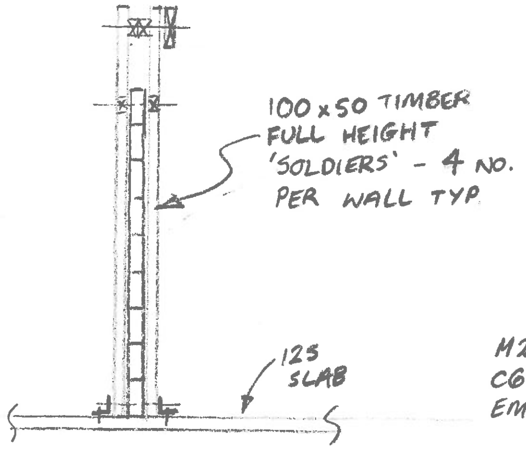
C.N.
508.7

SHEET SP.1.

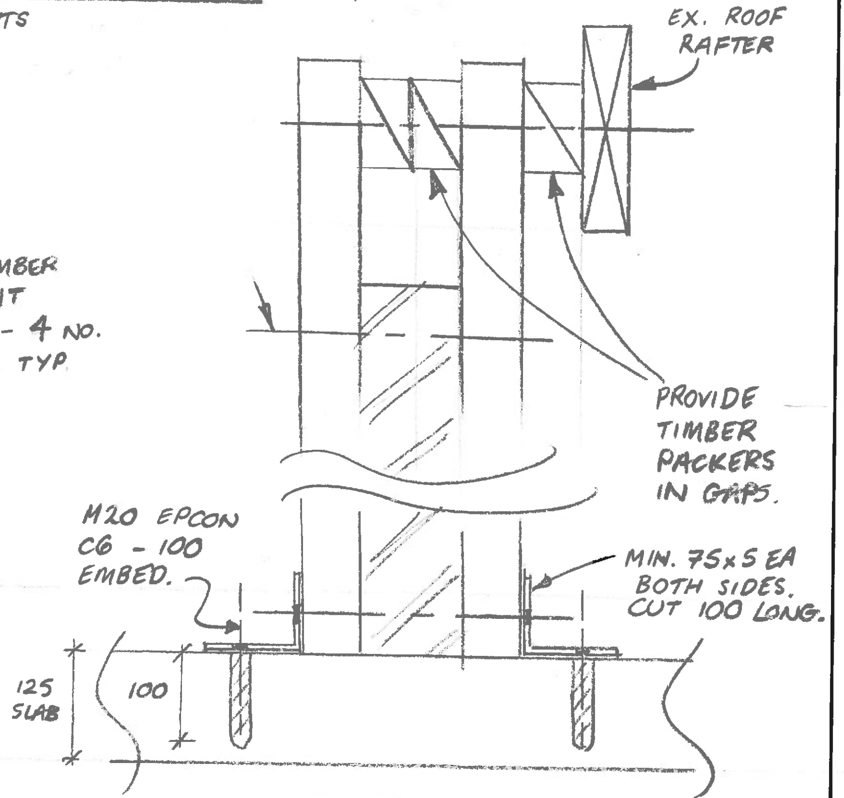
Drawing Plotted: 15 Jul 2008 11:45



1
05
TYPICAL WALL
NTS



A
-
SECTION
NTS



DETAILS

www.beca.com

No.	Revision	By	Chk	Appd	Date

Beca

Client: CHRISTCHURCH CITY COUNCIL

Project: HALSWELL AQUATIC CENTRE

Title: TEMPORARY SHORING - MAIN BUILDING COMPLEX

Design
Drawn
Dsg Verifier
Dwg Check

Approved for Construction *
Date:
* Refer to Revision 1 for Original Signatures

Scale as drawn (A4)
Discipline
Drawing No. 5323355-103-SK-06
Rev. A

DO NOT SCALE

IF IN DOUBT ASK.

Document No. 00A4-P00_NoGrid.dwg

Appendix E

CERA DEE Summary Data

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name: Main Building Complex
Building Address: Halswell Aquatic Centre
Unit No: 339
Street: Halswell Road
Legal Description:
GPS south: (Degrees / Min / Sec)
GPS east: (Degrees / Min / Sec)
Building Unique Identifier (CCC): BU 1691-001 EQ2

Reviewer: David Whittaker
CPEng No: 123089
Company: Beca
Company project number: 5323355
Company phone number: 03 3663521
Date of submission:
Inspection Date: 8/05/2012
Revision:
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
If Ground improvement on site, describe:
Approx site elevation (m): 0.00

Building

No. of storeys above ground: 1 single storey = 1
Ground floor split? no
Storeys below ground 0
Foundation type: other (describe)
Building height (m): 3.50
Floor footprint area (approx): 150
Age of Building (years): 41

Ground floor elevation (Absolute) (m):
Ground floor elevation above ground (m): 0.00
if Foundation type is other, describe: Shallow foundations
height from ground to level of uppermost seismic mass (for IEP only) (m): 3.5
Date of design: 1965-1976

Strengthening present?
Use (ground floor): other (specify)
Use (upper floors):
Use notes (if required): Offices, toilet facilities & changing rooms
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: concrete flat slab
Beams: none
Columns: load bearing walls
Walls: partially filled concrete masonry

rafter type, purlin type and cladding Timber rafters, timber purlins metal sheeting
slab thickness (mm) Slab on grade
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): leave blank if not relevant
east (mm):
south (mm):
west (mm):

Non-structural elements

Stairs: other (specify) describe none
Wall cladding: exposed structure describe Concrete masonry block walls
Roof Cladding: Metal describe Lightweight metal
Glazing: aluminium frames
Ceilings: plaster, fixed
Services(list):

Available documentation

Architectural partial original designer name/date Christchurch design services unit / 1996
Structural partial original designer name/date R.D.B / 1971
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 site damage was 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 (summary):
Describe how damage ratio arrived at: No damage was observed

Across Damage ratio: 0%
Describe (summary):

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

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

Recommendations

Level of repair/strengthening required: none Describe:
Building Consent required: no Describe:
Interim occupancy recommendations: full occupancy Describe: After localised bracing to internal walls

Along Assessed %NBS before: 89% ##### %NBS from IEP below
Assessed %NBS after: 89%
If IEP not used, please detail assessment methodology: Force based quantitative assessment.

Across Assessed %NBS before: 65% ##### %NBS from IEP below
Assessed %NBS after: 65%

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: 3.5m

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:

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 1.0
Height Difference effect D2, from Table to right 1.0

Therefore, Factor D: 1

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 F

Previous Reports and Assessments

Christchurch Eq RAPID Assessment Form - LEVEL 2

Inspector Initials: MK
Territorial Authority: Christchurch City
Date: 21/06/2011
Time: 10.25
Final Posting (e.g. UNSAFE): G1

Building Name: HALSWELL POOL
Short Name: MAIN BUILDING
Address: COMPLEX
301 HALSWELL POOL
GPS Co-ordinates: S° E°
Contact Name:
Contact Phone:
Storeys at and above ground level:
Below ground level:
Total gross floor area (m²):
Year built:
No of residential Units:
Photo Taken: Yes ✓ No

Type of Construction

- ☑ Timber frame with block work infill
- ☐ 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	☑	☐	☐	The building has been inspected
Building or storey leaning	☑	☐	☐	only from outside (no access)
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): 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):
- ☐ Detailed engineering evaluation recommended
  - ☐ Structural
  - ☐ Geotechnical
  - ☐ Other:
- ☐ Other recommendations:

Estimated Overall Building Damage (Exclude Contents)

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

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) not inspected	☐	☐	☐	
Columns, pilasters, corbels	☑	☐	☐	
Diaphragms, horizontal bracing	☑	☐	☐	
Pre-cast connections	☐ N/A	☐	☐	
Beam	☐ N/A	☐	☐	
Non-structural Hazards / Damage				
Parapets, ornamentation	☑	☐	☐	
Cladding, glazing	☑	☐	☐	
Ceilings, light fixtures	☑	☐	☐	
Interior walls, partitions not inspected	☐	☐	☐	
Elevators	☐ N/A	☐	☐	
Stairs/ Exits	☐ N/A	☐	☐	
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	
		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	

Inspection ID: __________ *(Office Use Only)*

Sketch (optional)

Provide a sketch of the entire building or damage points. Indicate damage points.

Recommendations for Repair and Reconstruction or Demolition (Optional)