Waimāero/
Fendalton-Waimairi-Harewood Community Board
MINUTES ATTACHMENTS

Date: Monday 15 March 2021
Time: 4.30pm
Venue: Boardroom, Fendalton Service Centre,
Corner Jeffreys and Clyde Roads, Fendalton

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Christchurch City Council

Sheldon Park Changing Sheds and Toilets PRK 0370 BLDG 003 EQ2

Detailed Engineering Evaluation

Quantitative Assessment Report

OPUS

Christchurch City Council

Sheldon Park Changing Sheds and Toilets

Quantitative Assessment Report

672-710 Main North Road, Belfast

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Date: November 2012
Reference: 6-QUCC1.47
Status: Final

Summary

Sheldon Park Changing Sheds and Toilets
PRK 0370-BLDG-003 EQ2

Detailed Engineering Evaluation
Quantitative Report - SUMMARY
Final

Background
This is a summary of the quantitative report for the Sheldon Park Changing Sheds and Toilet building, and is based on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011, visual inspections on 28 April 2011, measured-up sketch drawings and calculations.

Key Damage Observed
No major damage was identified however, there were a few moderate cracks in the external block wall.

Critical Structural Weaknesses
No critical structural weaknesses have been identified.

Indicative Building Strength
The Sheldon Park Changing Sheds and Toilet building comprises the original building and two later extensions. Based on the information available, and from undertaking a quantitative assessment, the building's seismic capacity has been assessed to be 62%NBS. The building is therefore not classed as an earthquake prone building under the NZSEE classification system.

We consider that the risk to continued occupancy is low. The lowest capacity element (62%NBS) is the unreinforced masonry infill of what appears to be an earlier door opening. All other structural elements have %NBS values greater than 70%. The number of occupants at any one time will be low, with short periods of occupancy confined mainly to weekday afternoons/evenings and weekends. We recommend that the building remain open for public use.

Recommendations
The following recommendations have been made for this site:

(a) The cracked wall and open wall joints be repaired.

(b) Strengthening works be undertaken to increase the seismic capacity of the building to at least 67%NBS.

(c) Geotechnical investigations of the foundation settlement should be undertaken to assess ground bearing capacity and liquefaction potential prior to determining strengthening options.

(d) Structural investigations should be undertaken taking into account the flexural capacity of the bond beams and walls. An invasive investigation should be undertaken to determine the diameter of bond beam reinforcement prior to determining strengthening options.

(e) The maintenance issue of the split verandah beam should be considered by CCC in the future.

(f) The building remain open for public use.

Contents

1 Introduction

Opus International Consultants Limited has been engaged by Christchurch City Council (CCC) to undertake a detailed seismic assessment of the Sheldon Park Changing Sheds and Toilet building, located at 672-710 Main North Rd, Belfast, following the Canterbury Earthquake Sequence since September 2010.

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

The seismic assessment and reporting have been undertaken based on the quantitative procedures detailed in the Detailed Engineering Evaluation Procedure (DEEP) document (draft) issued by the Structural Engineering Society (SESOC) on 19 July 2011.

2 Compliance

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

2.1 Canterbury Earthquake Recovery Authority (CERA)

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

Section 38 – Works

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

Section 51 – Requiring Structural Survey

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

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

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

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

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

2.2 Building Act

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

Section 112 - Alterations

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

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

Section 115 – Change of Use

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

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

Section 121 – Dangerous Buildings

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

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

4. There is a risk that other property could collapse or otherwise cause injury or death; or
5. A territorial authority has not been able to undertake an inspection to determine whether the building is dangerous.

Section 122 – Earthquake Prone Buildings

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

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

Section 124 – Powers of Territorial Authorities

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

Section 131 – Earthquake Prone Building Policy

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

2.3 Christchurch City Council Policy

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

The 2010 amendment includes the following:

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

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

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

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

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

2.4 Building Code

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

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

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

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

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

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

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

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

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

3 Earthquake Resistance Standards

For this assessment, the building's earthquake resistance is compared with the current New Zealand Building Code requirements for a new building constructed on the site. This is expressed

as a percentage of new building standard (%NBS). The loadings are in accordance with the current earthquake loading standard NZS1170.5 [1].

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

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

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

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

Table 1: %NBS compared to relative risk of failure

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

3.1 Minimum and Recommended Standards

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

3.1.1 Occupancy

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

3.1.2 Cordoning

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

3.1.3 Strengthening

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

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

3.1.4 Our Ethical Obligation

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

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

4 Building Description

4.1 General

Figure 2: Location of Sheldon Park Changing Shed and Toilets

The Sheldon Park Changing Sheds and Toilet building is a single storey, reinforced block wall and timber truss roof structure with steel sheet roof cladding. The building comprises the original structure and two later extensions.

The building is approximately 20.2m long in the east-west direction and 6.4m wide in the north-south direction. The apex of the roof is approximately 3.8m from the ground and the reinforced block wall height is 2.4m. The building age is unknown, but the original building is expected to have been built after the 1960s with two more recent additions.

4.2 Gravity Load Resisting System

Gravity loads are supported by the timber trussed roof on reinforced concrete masonry walls. The foundations are concrete slab-on-grade.

4.3 Seismic Load Resisting System

Seismic loads in both principal directions are resisted by fully-grouted, reinforced concrete block walls. The ply-lined roof sarking, acting as a flexible diaphragm, is expected to assist the masonry bond beams with distributing the seismic induced lateral loads to the masonry return walls.

5 Survey

Copies of the following drawings were referred to as part of the assessment:

- Measured-up sketches of the building completed by Opus International Consultants, titled "Sheldon Park Toilet and Changing Block".

No copies of the design calculations or structural drawings have been obtained for this building.

The sketch drawings and survey photos have been used to confirm the structural systems, investigate potential critical structural weaknesses (CSW) wherever possible, and identify details which required particular attention.

6 Damage Assessment

The building structure has suffered minor damage as a result of the recent earthquake events.

There are moderate wall cracks and opening up of the wall joints in both the front and rear external walls at the joints created by the extensions to the building. The opening of the joint is wider at the top indicating that differential foundation settlement has occurred at the ends of the building.

There is a split in the verandah timber beam above the column location however it is unlikely to have been caused by the recent earthquake events.

7 General Observations

Overall the building has performed well under seismic conditions which would be expected for a single-storey structure. The building has sustained only minor damage, primarily at the wall joints of the building extensions.

Due to the non-intrusive nature of the original survey, many connection details could not be ascertained, such as ceiling diaphragm connections, and dowelling at wall joints.

8 Detailed Seismic Assessment

8.1 Critical Structural Weaknesses

As outlined in the Critical Structural Weakness and Collapse Hazards draft briefing document, issued by the Structural Engineering Society (SESOC) on 7 May 2011, the term 'Critical Structural Weakness' (CSW) refers to a component of a building that could contribute to increased levels of damage or cause premature collapse of the building.

We have not identified any critical structural weaknesses with this building.

8.2 Seismic Coefficient Parameters

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

- Site soil class D, clause 3.1.3 NZS 1170.5:2004;
- Site hazard factor, Z=0.3, B1/VM1 clause 2.2.14B;
- Return period factor R_u = 1.0 from Table 3.5, NZS 1170.5:2004, for an Importance Level 2 structure with a 50 year design life;
- μ_{max} = 1.25 and S_p = 0.9 (nominally ductile) for the reinforced concrete masonry walls

8.3 Detailed Seismic Assessment Results

A summary of the structural performance of the building is shown in the following table.

Table 2: Summary of Seismic Performance

Structural Element/System	Description/Discussion	% NBS based on calculated capacity
Masonry walls, along	Out of plane flexural capacity	73%
Masonry bond beam, along	Out of plane flexural capacity	70%
Masonry walls, across	Out of plane flexural capacity	78%
Masonry bond beam, across	Out of plane flexural capacity	70%
Walls(W5/W6) in the north-south direction i.e. across building	Out of plane flexural capacity	78%
Bond beam (above Wall W5/ W6), across	Out of plane flexural capacity	77%
Unreinforced infill masonry, across	Out of plane capacity	62%

8.4 Discussion of Results

The building has a calculated capacity of 62%NBS, as limited by the out-of-plane flexural capacity of the masonry wall infill.

As the building has a capacity of between 33%NBS and 67%NBS it is defined as a moderate earthquake risk building under the NZSEE classification system.

The masonry walls and foundations of the extensions are likely connected to the original building with steel dowels. Building rotation due to foundation settlement and bonding of the dowels is the likely cause of the cracking adjacent these joints. The cracking and opening of the joint has not significantly affected the wall strength and only minor repairs are required.

We consider that the risk to continued occupancy is low. The lowest capacity element (62%NBS) is the unreinforced masonry infill of what appears to be an earlier door opening.

All other structural elements have %NBS values greater than 70%. The number of occupants at any one time will be low, with short periods of occupancy confined mainly to weekday afternoons/evenings and weekends. We recommend that the building remain open for public use.

8.5 Limitations and Assumptions in Results

Our analysis and assessment is based on an assessment of the building in its undamaged state.

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

- Simplifications made in the analysis, including boundary conditions such as foundation fixity;
- Assessments of material strengths based on limited drawings, specifications and site inspections;
- The normal variation in material properties which change from batch to batch;
- Approximations made in the assessment of the capacity of each element, especially when considering the post-yield behaviour.
- The block wall and bond beam reinforcement bar diameter is assumed as D12.

9 Geotechnical

Due to a lack of observed ground damage, no geotechnical assessment has been undertaken at this site. The site parameters used for the structural analysis have been taken as site subsoil class D, based on geotechnical advice.

10 Conclusions

The building has a seismic capacity of greater than 33%NBS and is therefore not classified as earthquake prone in accordance with the Building Act 2004.

11 Recommendations

We recommend that the following be undertaken:

(a) Remedial repair work to cracked wall and open wall joints.

(b) Strengthening works be undertaken to increase the seismic capacity of the building to at least 67%NBS.

(c) Geotechnical investigations of the foundation settlement should be undertaken to assess ground bearing capacity and liquefaction potential prior to determining strengthening options.

(d) Structural investigations should be undertaken taking into account the flexural capacity of the bond beams and walls. An invasive investigation should be undertaken to determine the diameter of bond beam reinforcement prior to determining strengthening options.

(e) The maintenance issue of the split verandah beam should be considered by CCC in the future.

12 Limitations

(a) This report is based on an inspection of the structure with a focus on the damage sustained from the 22 February 2011 Canterbury Earthquake and aftershocks only. Some non-structural damage is mentioned but this is not intended to be a comprehensive list of non-structural items.

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

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

13 References

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

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

[3] Engineering Advisory Group, *Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury, Part 2 Evaluation Procedure*, Draft Prepared by the Engineering Advisory Group, Revision 5, 19 July 2011.

[4] Engineering Advisory Group, *Guidance on Detailed Engineering Evaluation of Non-residential buildings, Part 3 Technical Guidance*, Draft Prepared by the Engineering Advisory Group, 13 December 2011.

[5] SESOC, *Practice Note – Design of Conventional Structural Systems Following Canterbury Earthquakes*, Structural Engineering Society of New Zealand, 21 December 2011.

Appendix A – Photographs

Photo 1: View of the building from east

Photo 2: Rear view of the building

Photo 3: Side view of the building

Photo 4: View of the building from west

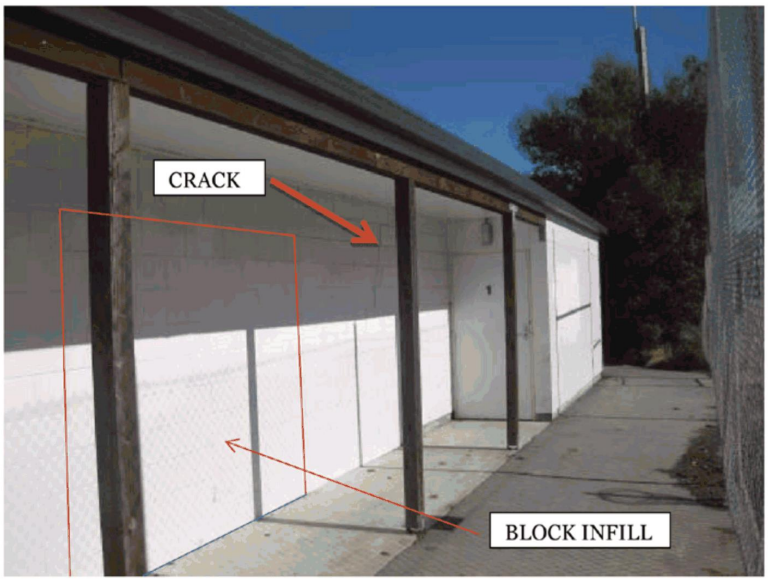


Photo 5: Front wall

Photo 6: Crack in the front wall

Photo 7: Crack in the rear wall

Photo 8: Diagonal crack in the front wall

Photo 9: Roof truss and lining

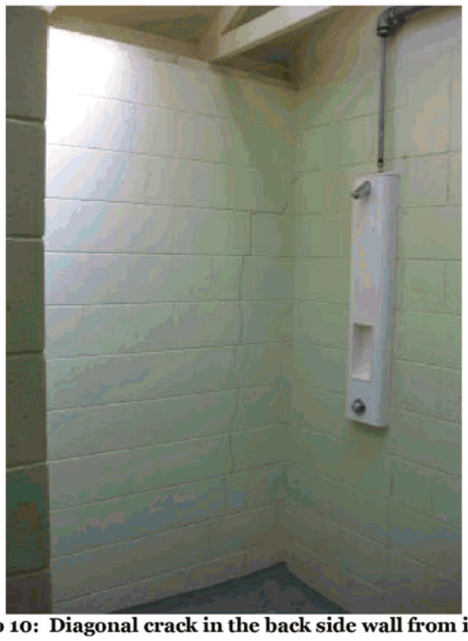
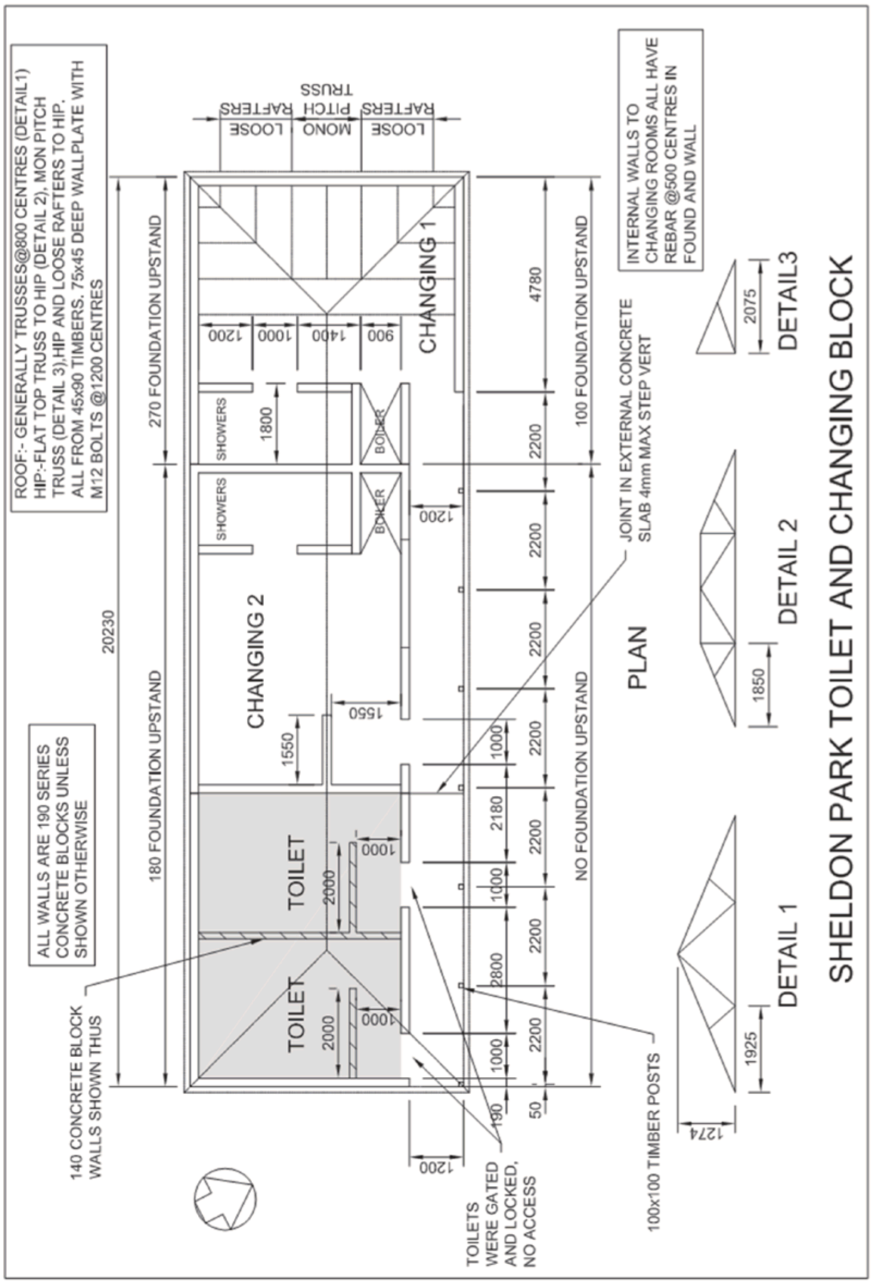
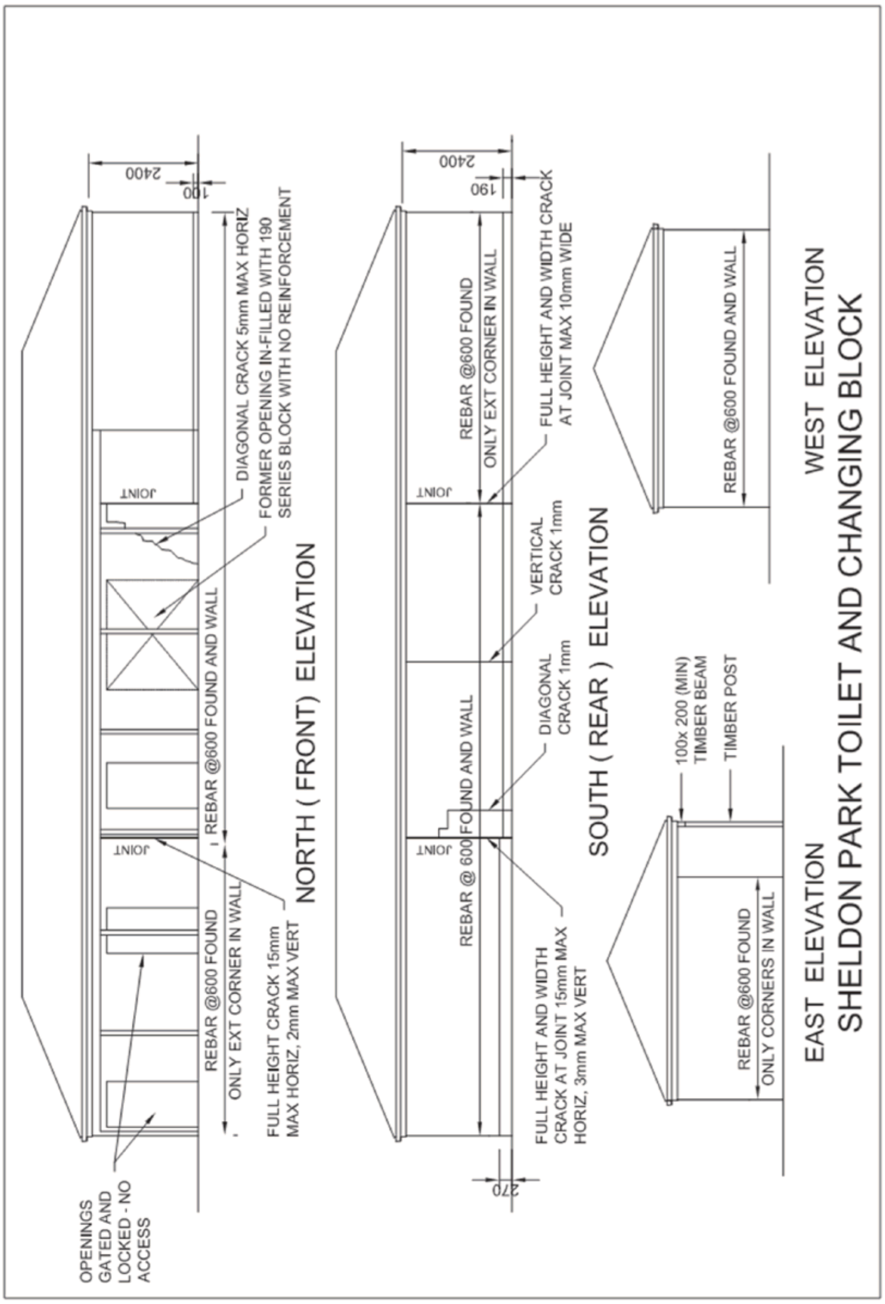


Photo 10: Diagonal crack in the back side wall from inside

Appendix B – Measured-up Sketches


SHELDON PARK TOILET AND CHANGING BLOCK
PLAN
CHANGING 1
CHANGING 2
TOILET
TOILET
SHOWERS
SHOWERS
BOILER
BOILER
DETAIL 1
DETAIL 2
DETAIL3
ROOF:- GENERALLY TRUSSES@800 CENTRES (DETAIL1)
HIP:-FLAT TOP TRUSS TO HIP (DETAIL 2), MON PITCH
TRUSS (DETAIL 3),HIP AND LOOSE RAFTERS TO HIP.
ALL FROM 45x90 TIMBERS. 75x45 DEEP WALLPLATE WITH
M12 BOLTS @1200 CENTRES
ALL WALLS ARE 190 SERIES
CONCRETE BLOCKS UNLESS
SHOWN OTHERWISE
140 CONCRETE BLOCK
WALLS SHOWN THUS
180 FOUNDATION UPSTAND
270 FOUNDATION UPSTAND
100 FOUNDATION UPSTAND
NO FOUNDATION UPSTAND
INTERNAL WALLS TO
CHANGING ROOMS ALL HAVE
REBAR @500 CENTRES IN
FOUND AND WALL
JOINT IN EXTERNAL CONCRETE
SLAB 4mm MAX STEP VERT
100x100 TIMBER POSTS
TOILETS
WERE GATED
AND LOCKED,
NO ACCESS
LOOSE
RAFTERS
MONO
PITCH
LOOSE
RAFTERS
TRUSS
20230
4780
2200
1200
1000
1400
900
1800
1550
2180
2800
190
50
2075
1850
1925
1274


NORTH (FRONT) ELEVATION
SOUTH (REAR) ELEVATION
WEST ELEVATION
EAST ELEVATION
SHELDON PARK TOILET AND CHANGING BLOCK
2400
100
190
270
JOINT
REBAR @600 FOUND AND WALL
ONLY EXT CORNER IN WALL
REBAR @600 FOUND
DIAGONAL CRACK 5mm MAX HORIZ
FORMER OPENING IN-FILLED WITH 190 SERIES BLOCK WITH NO REINFORCEMENT
FULL HEIGHT CRACK 15mm MAX HORIZ, 2mm MAX VERT
OPENINGS GATED AND LOCKED - NO ACCESS
FULL HEIGHT AND WIDTH CRACK AT JOINT MAX 10mm WIDE
VERTICAL CRACK 1mm
DIAGONAL CRACK 1mm
FULL HEIGHT AND WIDTH CRACK AT JOINT 15mm MAX HORIZ, 3mm MAX VERT
100x 200 (MIN) TIMBER BEAM
TIMBER POST
REBAR @600 FOUND ONLY CORNERS IN WALL

Appendix C – CERA DEE Data Sheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Sheldon Park Toilet and Changing Room				Reviewer:	Paul Campbell	
		Unit	No:	Street	CPEng No:	197688	
Building Address:			672-71	Main North Road, Belfast	Company:	Opus International Consultants Ltd	
Legal Description:					Company project number:	6-CUCC1.47	
					Company phone number:	03 363 5400	
		Degrees	Min	Sec			
GPS south:		43	27	18.06	Date of submission:	29-Nov-12	
GPS east:		172	37	45.68	Inspection Date:	28/04/2011	
					Revision:	Final	
Building Unique Identifier (CCC):	PRK 0370 BLDG 003 EQ2				Is there a full report with this summary?	yes	

Site

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

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):	
Ground floor split?	no		Ground floor elevation above ground (m):	2.30
Storeys below ground	0			
Foundation type:	other (describe)		if Foundation type is other, describe:	
Building height (m):	3.80		height from ground to level of uppermost seismic mass (for IEP only) (m):	
Floor footprint area (approx):	129			
Age of Building (years):			Date of design:	
Strengthening present?	no		If so, when (year)?	
			And what load level (%g)?	
Use (ground floor):	public		Brief strengthening description:	
Use (upper floors):				
Use notes (if required):	open ground floor			
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber truss	truss depth, purlin type and cladding	
Floors:	other (note)	describe sytem	
Beams:			
Columns:			
Walls:			

Lateral load resisting structure

Lateral system along:	fully filled CMU	**Note: Define along and across in detailed report!**		Fully grouted reinforced block wall
Ductility assumed, μ:	1.25		note total length of wall at ground (m):	
Period along:	0.23	##### enter height above at H31	estimate or calculation?	estimated
Total deflection (ULS) (mm):	1		estimate or calculation?	estimated
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	fully filled CMU			Fully grouted reinforced block wall
Ductility assumed, μ:	1.25		note total length of wall at ground (m):	
Period across:	0.23	##### enter height above at H31	estimate or calculation?	estimated
Total deflection (ULS) (mm):	1		estimate or calculation?	estimated
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

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

Non-structural elements

Stairs:		
Wall cladding:		
Roof Cladding:		
Glazing:		
Ceilings:		
Services(list):		

Available documentation

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

Damage

Site: (refer DEE Table 4-2)

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

Building:

	Current Placard Status:	green		
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	
	Describe (summary):			
Across	Damage ratio:	0%	$Damage\_Ratio = \frac{(\%NBS(before) - \%NBS(after))}{\%NBS(before)}$	
	Describe (summary):			
Diaphragms	Damage?:	no	Describe:	
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	no	Describe:	

Recommendations

	Level of repair/strengthening required:	minor non-structural	Describe:	Repair wall cracks & seal joints
	Building Consent required:	no	Describe:	geotech investigation of ground bearing
	Interim occupancy recommendations:	full occupancy	Describe:	
Along	Assessed %NBS before e'quakes:	70%	##### %NBS from IEP below	If IEP not used, please detail assessment methodology: Quantitative
	Assessed %NBS after e'quakes:	70%		
Across	Assessed %NBS before e'quakes:	62%	##### %NBS from IEP below	
	Assessed %NBS after e'quakes:	62%		

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Christchurch City Council

City Services – Technical Services and Design

Design Features Report

for

Sheldon Park Changing Rooms and Toilet Block

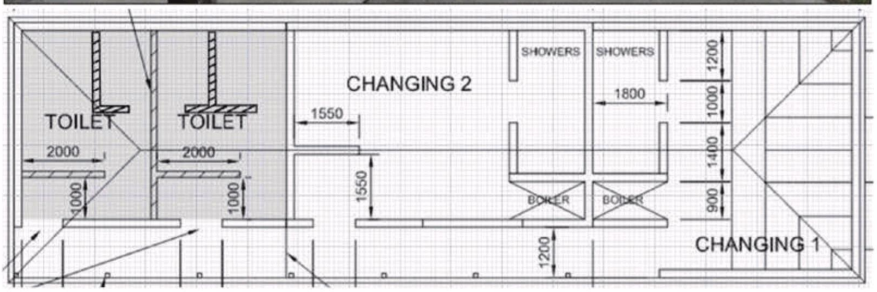
STRUCTURE: Sheldon Park changing rooms and toilet block	
ADDRESS: 672 Main North Rd, Belfast	
YEAR BUILT: Unknown.	
INSPECTION BY: Paul Ferguson	DATE: 18/12/2019
REPORT PREPARED BY: Thomas Wright	DATE: 23/12/2019
REVIEW BY: Paul Ferguson	DATE: 14/02/2020

Sheldon Park Changing Rooms and Toilet Block

Building Location Plan

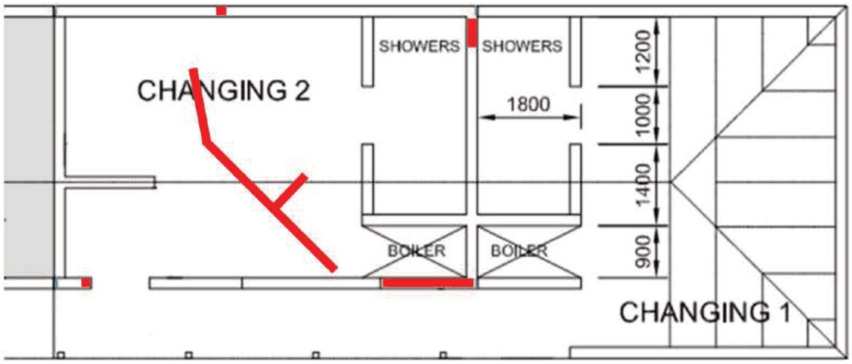
Introduction and scope of proposed works

Sheldon Park Changing Rooms and Toilets have suffered damage following the 2010 and 2011 Canterbury Earthquakes. A series of cracks have formed throughout the building. The age of the building is unknown but it is known that changing room 1 and 2 have been added onto the original toilet block over time.

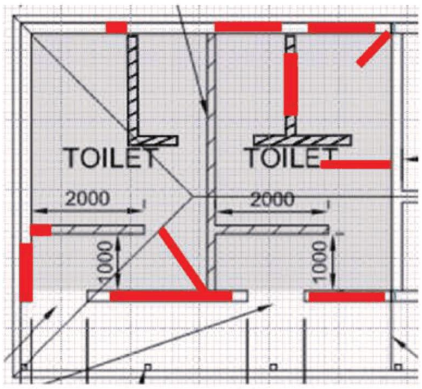


Plan of Sheldon Park Changing Rooms and Toilet Block

Crack repairs, bracket fitting and earthquake strengthening are required to bring the rating of the building up to 67% NBS as described below and on the drawing.



Location of prominent cracks in changing room 1 and 2.



Location of prominent cracks in male and female toilets.

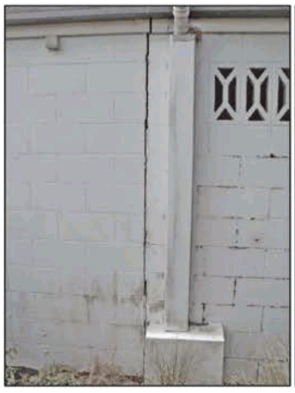
The above figures displays locations of known cracks that require repair in red and locations for new sealant application in blue. Please note that this may not include all cracks throughout the structure and others should be identified by the contractor before work commences as outlined in provided specifications.

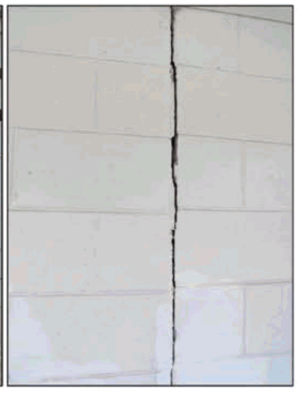
Strengthening of verandah beams

The existing timber beams have been connected using nails that come from the side diagonally. Additonal brackets are to be installed. New BOWMAC B38 T-Straps are to be retrofitted to the building. BOWMAC B38 T-Straps are to be installed as per manufacturer's specifications. Currently, one of the seven connections have an existing T-Strap and this does not need to be replaced.

Sealant Application on joints

Where indicated in the plan on page 3, the contractor is to apply a sealant at the construction joints. Photos of two of the construction joints are shown below. Sikaflex Construction AP sealant, or an equivalent product approved by the designer, is to be installed in the crack in accordance with the manufacturer's specification.



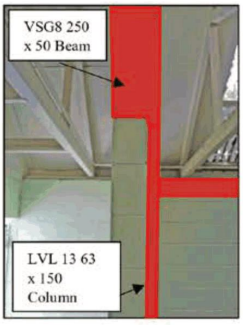


Concrete Slab Crack Repairs

It is assumed that the concrete slab is unreinforced. Cracks within the slab shall be repaired as per provided specifications.

Earthquake Strengthening for Male and Female Toilets

The contractor is to install timber columns and beams as specified in the drawing. All strengthening work shall be conducted after completion and curing of crack repairs.



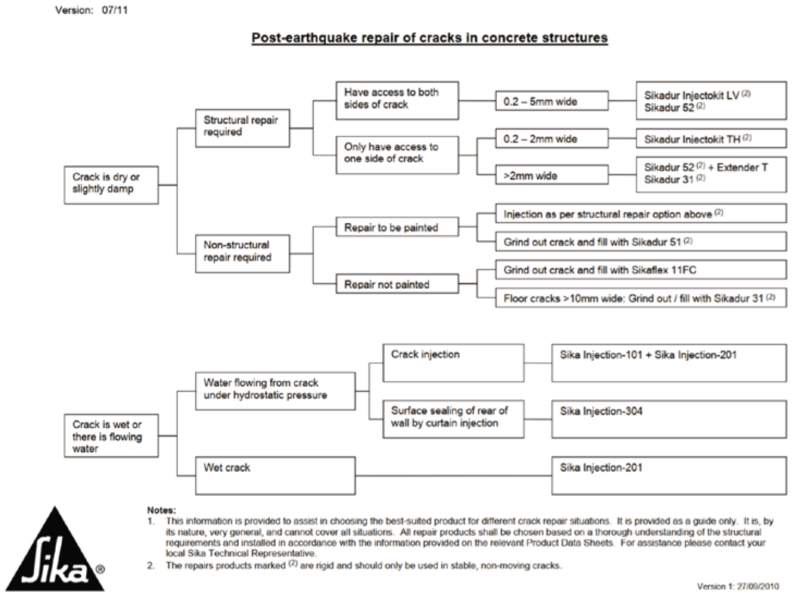
Specification for crack repairs

For **male and female toilets walls**:

- Locate all cracks
- Remove any loose mortar surrounding the cracks
- Fill cracks with strong mortar. It is suggested to use a mix of: **5 parts builders mix : 1 part cement**

For **changing rooms 1 and 2 walls and cracks within the floor**:

The contractor is to locate all cracks within the building. The contractor is to follow the following flowchart to choose an appropriate repair strategy for each crack. It is suggested to use SIKA products but equivalent can be used with the engineer's approval. All work shall be conducted to the manufacturer's specifications.



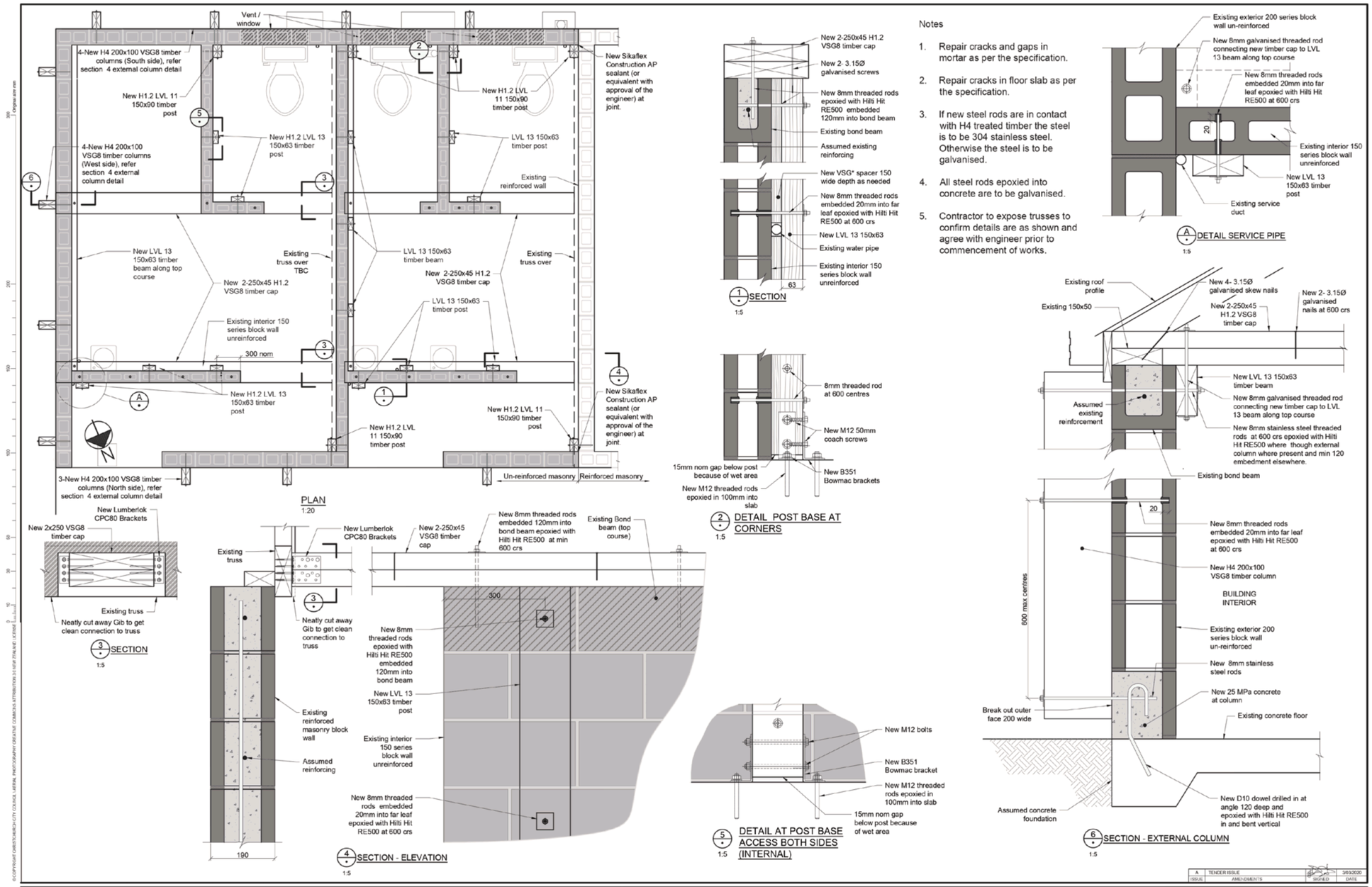
Safety in design considerations

A Site-specific safety plan will be required to address the hazards below, as well as other hazards the contractor identifies:

- The proposed design does not worsen the structural condition of the building at any time.
- The site is to be secured from pedestrians, in particularly school children that share the public park that the site is located within.
- The contractor is to liaise directly with user of the building to keep them informed of temporary closures, if any.

Documentation Required

1. A site-specific safety plan.
2. A pedestrian traffic management plan. (The site is within a public park with a primary school situated next to the site).
3. An environmental management plan.


Vent / window
4-New H4 200x100 VSG8 timber columns (South side), refer section 4 external column detail
New H1.2 LVL 11 150x90 timber post
New H1.2 LVL 13 150x63 timber post
4-New H4 200x100 VSG8 timber columns (West side), refer section 4 external column detail
New LVL 13 150x63 timber beam along top course
Existing truss over TBC
New 2-250x45 H1.2 VSG8 timber cap
Existing interior 150 series block wall unreinforced
300 nom
New H1.2 LVL 13 150x63 timber post
New H1.2 LVL 11 150x90 timber post
3-New H4 200x100 VSG8 timber columns (North side), refer section 4 external column detail
New Lumberlok CPC80 Brackets
New 2x250 VSG8 timber cap
Existing truss
Neatly cut away Gib to get clean connection to truss
3 SECTION 1:5
PLAN 1:20
New Sikaflex Construction AP sealant (or equivalent with approval of the engineer) at joint.
LVL 13 150x63 timber post
Existing reinforced wall
LVL 13 150x63 timber beam
Existing truss over
New 2-250x45 H1.2 VSG8 timber cap
LVL 13 150x63 timber post
Un-reinforced masonry
Reinforced masonry
New 2-250x45 H1.2 VSG8 timber cap
New 2- 3.15Ø galvanised screws
New 8mm threaded rods epoxied with Hilti Hit RE500 embedded 120mm into bond beam
Existing bond beam
Assumed existing reinforcing
New VSG* spacer 150 wide depth as needed
New 8mm threaded rods embedded 20mm into far leaf epoxied with Hilti Hit RE500 at 600 crs
New LVL 13 150x63
Existing water pipe
Existing interior 150 series block wall unreinforced
63
1 SECTION 1:5
8mm threaded rod at 600 centres
New M12 50mm coach screws
15mm nom gap below post because of wet area
New M12 threaded rods epoxied in 100mm into slab
New B351 Bowmac brackets
2 DETAIL POST BASE AT CORNERS 1:5
New 8mm threaded rods embedded 120mm into bond beam epoxied with Hilti Hit RE500 at min 600 crs
Existing Bond beam (top course)
New 2-250x45 VSG8 timber cap
New Lumberlok CPC80 Brackets
Existing truss
Neatly cut away Gib to get clean connection to truss
300
New 8mm threaded rods epoxied with Hilti Hit RE500 embedded 120mm into bond beam
New LVL 13 150x63 timber post
Existing interior 150 series block wall unreinforced
Existing reinforced masonry block wall
Assumed reinforcing
New 8mm threaded rods embedded 20mm into far leaf epoxied with Hilti Hit RE500 at 600 crs
190
4 SECTION - ELEVATION 1:5
New M12 bolts
New B351 Bowmac bracket
New M12 threaded rods epoxied in 100mm into slab
15mm nom gap below post because of wet area
5 DETAIL AT POST BASE ACCESS BOTH SIDES (INTERNAL) 1:5
Notes
1. Repair cracks and gaps in mortar as per the specification.
2. Repair cracks in floor slab as per the specification.
3. If new steel rods are in contact with H4 treated timber the steel is to be 304 stainless steel. Otherwise the steel is to be galvanised.
4. All steel rods epoxied into concrete are to be galvanised.
5. Contractor to expose trusses to confirm details are as shown and agree with engineer prior to commencement of works.
Existing exterior 200 series block wall un-reinforced
New 8mm galvanised threaded rod connecting new timber cap to LVL 13 beam along top course
New 8mm threaded rods embedded 20mm into far leaf epoxied with Hilti Hit RE500 at 600 crs
20
Existing interior 150 series block wall unreinforced
New LVL 13 150x63 timber post
Existing service duct
A DETAIL SERVICE PIPE 1:5
Existing roof profile
Existing 150x50
New 4- 3.15Ø galvanised skew nails
New 2-250x45 H1.2 VSG8 timber cap
New 2- 3.15Ø galvanised nails at 600 crs
New LVL 13 150x63 timber beam
Assumed existing reinforcement
New 8mm galvanised threaded rod connecting new timber cap to LVL 13 beam along top course
New 8mm stainless steel threaded rods at 600 crs epoxied with Hilti Hit RE500 where though external column where present and min 120 embedment elsewhere.
Existing bond beam
20
New 8mm threaded rods embedded 20mm into far leaf epoxied with Hilti Hit RE500 at 600 crs
New H4 200x100 VSG8 timber column
BUILDING INTERIOR
600 max centres
Existing exterior 200 series block wall un-reinforced
New 8mm stainless steel rods
New 25 MPa concrete at column
Existing concrete floor
Break out outer face 200 wide
Assumed concrete foundation
New D10 dowel drilled in at angle 120 deep and epoxied with Hilti Hit RE500 in and bent vertical
6 SECTION - EXTERNAL COLUMN 1:5
A TENDER ISSUE 3/03/2020
ISSUE AMENDMENTS SIGNED DATE
Christchurch City Council
TECHNICAL SERVICES & DESIGN
DESIGNED P. Ferguson 3/03/2020
DES. REVIEW G. Aitken 3/03/2020
DRAWN G. Cosslett 3/03/2020
DRW. CHECK P. Ferguson 3/03/2020
APPROVED
FOR TENDER
3/03/2020
FOR CONSTRUCTION
PROJECT TITLE
SHELDON PARK TOILETS AND CHANGING ROOMS
DRAWING TITLE
EARTHQUAKE REPAIR DETAILS
CAD DRAWING FILE REF sd134401.dwg
A1
AS SHOWN
S01 OF 1

Version: 07/11

Standard Specifications

for

Repair of cracks in concrete structures

and

Repair of spalled concrete

PROJECT NAME:	
PROJECT LOCATION:	
SCOPE OF WORK:	
SPECIFICATION DATE:	SPECIFICATION No.:

Version: 07/11

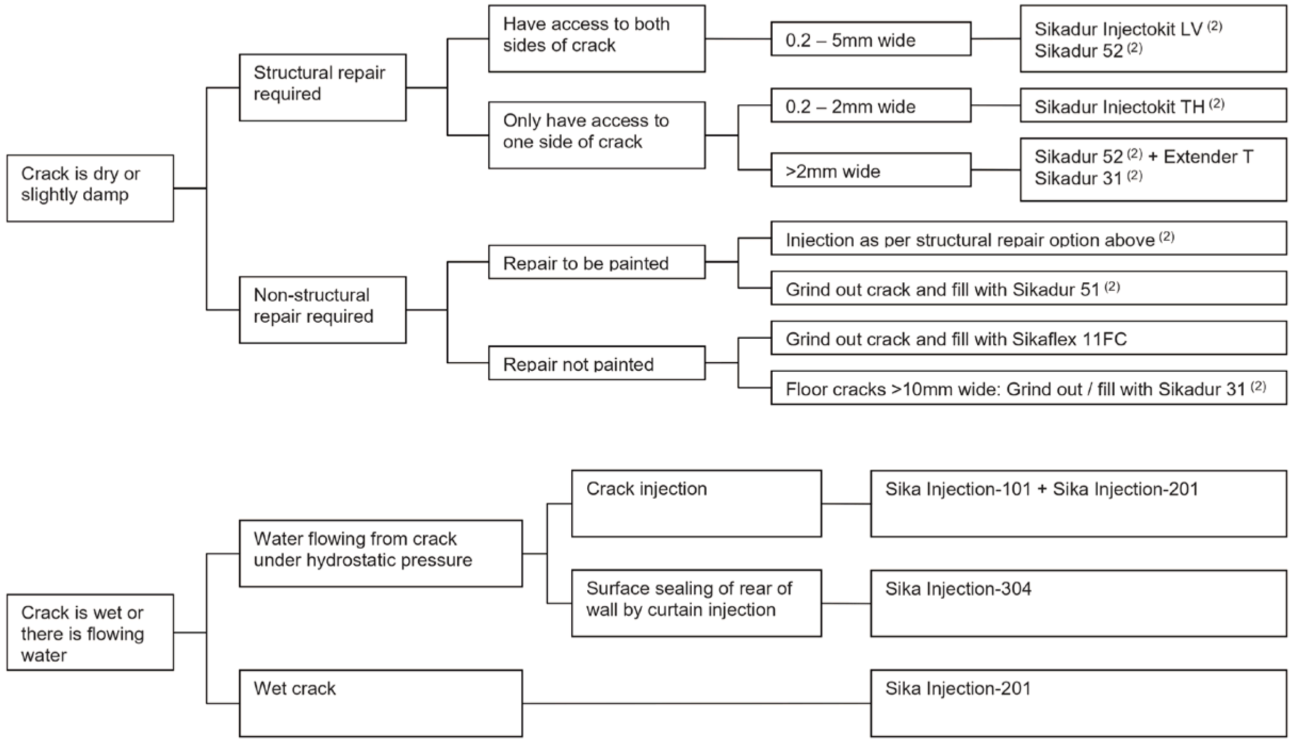
Contents

Memos

Christchurch City Council

Version: 07/11

Post-earthquake repair of cracks in concrete structures



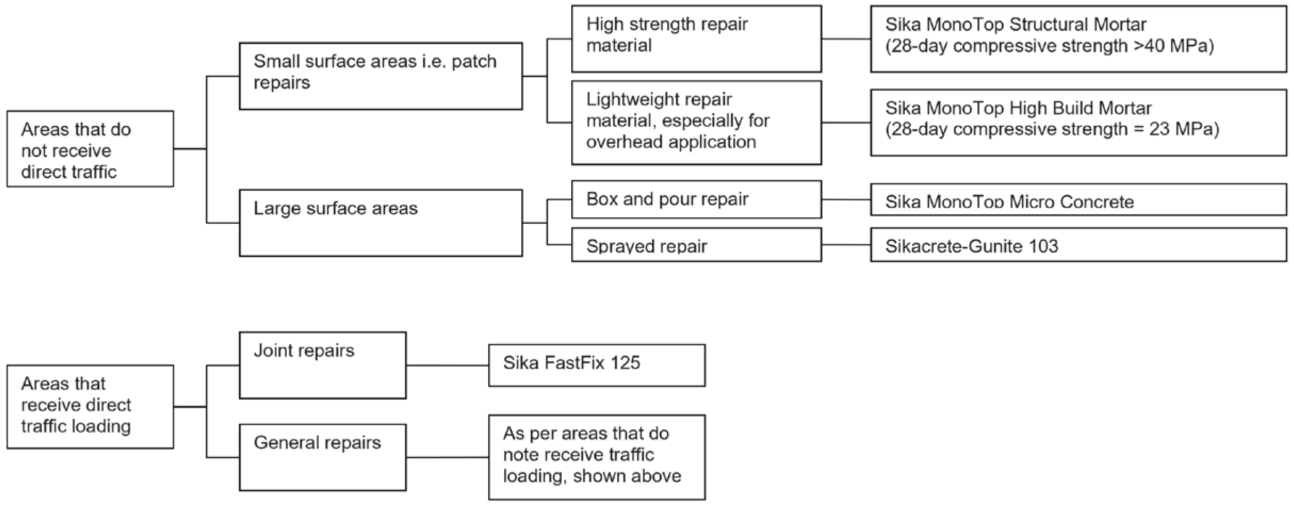
Notes:

1. This information is provided to assist in choosing the best-suited product for different crack repair situations. It is provided as a guide only. It is, by its nature, very general, and cannot cover all situations. All repair products shall be chosen based on a thorough understanding of the structural requirements and installed in accordance with the information provided on the relevant Product Data Sheets. For assistance please contact your local Sika Technical Representative.
2. The repairs products marked (2) are rigid and should only be used in stable, non-moving cracks.

Version 1: 27/09/2010

Version: 07/11

Post-earthquake repair of spalled concrete



Notes:

1. This information is provided to assist in choosing the best-suited product for the repair of concrete that has spalled off due to seismic loading. It is not intended to be used for situations where spalling has resulted from reinforcement corrosion, chemical attack or other disintegration mechanisms. It is provided as a guide only. It is, by its nature, very general, and cannot cover all situations. All repair products shall be chosen based on a thorough understanding of the structural requirements and installed in accordance with the information provided on the relevant Product Data Sheets. For assistance please contact your local Sika Technical Representative.

Version 1a: 7/10/2010

Version: 07/11

SPECIFICATION FOR CRACK INJECTION USING SIKADUR INJECTOKIT-LV

Specification

PRODUCTS:	5 Minute Epoxy	(The current data sheet is dated 02/08)
	Sikadur UA	(The current data sheet is dated 02/08)
	Sikadur Injectokit-LV	(The current data sheet is dated 08/09)

1 General

1.1 This technical specification is to be read in conjunction with the project Contract Documents and Specification.
1.2 All work to be carried out in accordance with the current Sika (NZ) Ltd data sheets.

2 Surface preparation

2.1 All concrete surfaces must be clean and free from any loosely adhering particles, or contaminants such as dirt, oil, dust, grease, etc.
2.2 The cracks must be blown out with oil-free, dry compressed air.

3 Application of the surface sealant

3.1 5 Minute Epoxy or Sikadur UA CONCRETE FIX can be used as the surface sealant, depending on the waiting period between application of the surface sealant and injection.
3.2 Immediately after mixing, apply a small amount of compound to the back of each nipple making sure that the valve will not be blocked, and place the nipple over the crack. (Ensure that the valve is centred over the crack.)
3.3 Nipples should be placed between 200 mm and 500 mm apart dependent on crack size.
3.4 Additional sealant should be applied onto the flange of the nipple to ensure a resin tight seal to the substrate.
3.5 Surface sealant should be knifed into the crack between nipples to ensure a resin tight seal.
3.6 Continue the sealant 50 mm beyond the end of the line of the visible crack.
3.7 Application of the injection system may be commenced as soon as the surface sealant has fully hardened.

4 Injection of the Sikadur Injectokit-LV epoxy resin

4.1 Hit the side of the capsule near the base with a hammer 2 or 3 times on different sides to break the internal glass container of hardener. (The glass can be heard moving when broken.)
4.2 To mix the resin, invert the cartridge 20-30 times slowly. Do not shake vigorously otherwise air will be incorporated.
4.3 Use the mixed material within the usable life.
4.4 Pierce the foil seal in the threaded end of the cartridge.
4.5 Screw the Sikadur Injectokit-LV hose onto the cartridge.
4.6 Ensure that the rubber 'O' ring is in place on the cartridge.

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4.7 Do not over tighten the fitting as this may distort the 'O' ring.
4.8 Place the cartridge into a standard sealant gun.
4.9 Push the free end of the Sikadur Injectokit-LV hose onto the first (lowest) nipple and tighten down the locking cap. Do not over tighten.
4.10 Insert an air release pin into the next nipple above the injection point. (Do not start pumping until the air release pin is inserted to open the non return valve and release trapped air.)
4.11 Commence pumping slowly, do not use excessive pressure.
4.12 When resin appears at the nipple next to the injection point:
(a) stop pumping
(b) release the pressure on the injection gun
(c) remove the air release pin
(d) unscrew the cap and with a twisting movement pull off the Sikadur Injectokit-LV hose.
4.13 Attach the Sikadur Injectokit-LV hose to the next nipple.
4.14 Insert air release pin in nipple beyond and recommence pumping.
4.15 Repeat the process until the entire length of crack has been injected.
4.16 On completion of pumping, the last cartridge can be left connected and pressurised slightly to allow for possible seepage into deep seated cracks.

5 Making good

5.1 After the Sikadur Injectokit-LV injection resin has set, remove the nipples. These can be knocked off with a hammer.
5.2 Make good any holes or voids with the selected surface sealant.
5.3 The existing surface sealant can then be removed by either grinding or heating with a hot air gun and scraping the surface until the original substrate profile is restored.

6 Cleaning

6.1 Tools and application equipment should be cleaned using Sika Colma Cleaner.

Note: This outline procedure details the key components of the work required. For specific details regarding surface preparation, mixing of the products and application, refer to the product data sheet.

Sika®

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SPECIFICATION FOR CRACK INJECTION USING SIKADUR INJECTOKIT-TH

Specification

PRODUCTS:	**5 Minute Epoxy**	**(The current data sheet is dated 02/08)**
	Sikadur UA	**(The current data sheet is dated 02/08)**
	Sikadur Injectokit-TH	**(The current data sheet is dated 08/09)**

1 General

1.1 This technical specification is to be read in conjunction with the project Contract Documents and Specification.

1.2 All work to be carried out in accordance with the current Sika (NZ) Ltd data sheets.

2 Surface preparation

2.1 All concrete surfaces must be clean and free from any loosely adhering particles, or contaminants such as dirt, oil, dust, grease, etc.

2.2 The cracks must be blown out with oil-free, dry compressed air.

3 Application of the surface sealant

3.1 5 Minute Epoxy or Sikadur UA CONCRETE FIX can be used as the surface sealant, depending on the waiting period between application of the surface sealant and injection.

3.2 Immediately after mixing, apply a small amount of compound to the back of each nipple making sure that the valve will not be blocked, and place the nipple over the crack. (Ensure that the valve is centred over the crack.)

3.3 Nipples should be placed between 200 mm and 500 mm apart dependent on crack size. (Where cracks can be sealed on one side only, nipples should be placed at centres which are 80% of the depth to which the resin is required to penetrate.)

3.4 Additional sealant should be applied onto the flange of the nipple to ensure a resin tight seal to the substrate.

3.5 Surface sealant should be knifed into the crack between nipples to ensure a resin tight seal.

3.6 Continue the sealant 50 mm beyond the end of the line of the visible crack.

3.7 Application of the injection system may be commenced as soon as the surface sealant has fully hardened.

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4 Injection of the Sikadur Injectokit-TH epoxy resin

4.1 Cut the top off the conical nozzle.
4.2 Insert T-shaped rod and turn clockwise to engage stirring head in cartridge.
4.3 Push rod down the full length of the cartridge to break the membrane separating the resin and hardener.
4.4 Pump up and down 30 to 40 times to mix resin and hardener.
4.5 Turn the T-shaped rod anticlockwise to disengage and then remove.
4.6 Do not shake.
4.7 Unscrew the conical nozzle and discard.
4.8 Use the mixed material within the usable life.
4.9 Screw the Sikadur Injectokit-TH hose onto the cartridge.
4.10 Ensure that the rubber 'O' ring is in place on the cartridge.
4.11 Do not over tighten the fitting as this may distort the 'O' ring.
4.12 Place the cartridge into a standard sealant gun.
4.13 Push the free end of the Sikadur Injectokit-TH hose onto the nipple positioned over the widest point of the crack and tighten down the locking cap. Do not over tighten.
4.14 Insert an air release pin into the nipple adjacent to the injection point. (Do not start pumping until the air release pin is inserted to open the non return valve and release trapped air.)
4.15 Commence pumping slowly, do not use excessive pressure.
4.16 When resin appears at the nipple next to the injection point:
(a) stop pumping
(b) release the pressure on the injection gun
(c) remove the air release pin
(d) unscrew the cap and with a twisting movement pull off the Sikadur Injectokit-TH hose.
4.17 Attach the Sikadur Injectokit-TH hose to the next nipple.
4.18 Insert air release pin in nipple beyond and recommence pumping.
4.19 Repeat the process until the entire length of crack has been injected.
4.20 On completion of pumping, the last cartridge can be left connected and pressurised slightly to allow for possible seepage into deep seated cracks.

5 Making good

5.1 After the Sikadur Injectokit-TH injection resin has set, remove the nipples. These can be knocked off with a hammer.
5.2 Make good any holes or voids with the selected surface sealant.
5.3 The existing surface sealant can then be removed by either grinding or heating with a hot air gun and scraping the surface until the original substrate profile is restored.

6 Cleaning

6.1 Tools and application equipment should be cleaned using Sika Colma Cleaner.

Note: This outline procedure details the key components of the work required. For specific details regarding surface preparation, mixing of the products and application, refer to the product data sheet.

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SPECIFICATION FOR CRACK INJECTION USING SIKADUR 52

Specification

PRODUCTS: **Sikadur 31** **(The current data sheet is dated 05/04)**
Sikadur 52 **(The current data sheet is dated 07/01)**

1 General

1.1 This technical specification is to be read in conjunction with the project Contract Documents and Specification.
1.2 All work to be carried out in accordance with the current Sika (NZ) Ltd data sheets.

2 Outline Procedure

2.1 Crack widths between 0.2mm and 5mm may be successfully injected.
2.2 All concrete surfaces must be clean and free from any loosely adhering particles, or contaminants such as dirt, oil, dust, grease, etc.
2.3 The cracks must be blown out with oil-free, dry compressed air.
2.4 Use Sikadur 31 to seal off the crack and fix the Sika Injection Flanges over the cleaned and prepared cracks at 300mm to 500mm intervals.
2.5 Inject epoxy into the cracks in accordance with the procedure on the Sikadur 52 data sheet.

Note: This outline procedure details the key components of the work required. For specific details regarding surface preparation, mixing of the products and application, refer to the product data sheet.

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Version: 07/11

Specification

SPECIFICATION FOR CONCRETE REPAIR USING SIKA MONOTOP STRUCTURAL MORTAR

PRODUCTS:	**Sika MonoTop Primer**	**(The current data sheet is dated 07/07)**
	Sika MonoTop Structural Mortar	**(The current data sheet is dated 07/07)**

1 General

1.1 This technical specification is to be read in conjunction with the project Contract Documents and Specification.
1.2 All work to be carried out in accordance with the current Sika (NZ) Ltd data sheets.

2 Breakout / Preparation

2.1 Sawcut a nominal 10mm cut around the area to be repaired to eliminate over-break and feather edging. (Feather edges to repairs are not permitted.) Smooth saw cut edges should be roughened to improve the bond between the repair and the existing concrete.
2.2 Break out and remove all defective/unsound concrete (as designated by the Supervising Officer) using suitable mechanical means that will avoid unnecessary vibration and damage to the structure.
2.3 Concrete must not be removed from behind reinforcing bars without the permission of the Supervising Officer. When it is necessary to remove concrete from behind reinforcement the extent of breakout should be limited to 15mm or the original bar diameter whichever is the greater unless directed otherwise by the Supervising Officer.
2.4 Any rusting steel reinforcement should be fully exposed to approximately 25mm beyond the corroding length and thoroughly cleaned by abrasive cleaning to standard SA 2.5 of AS1627.9. It is important that rust flakes are removed and corroded pits in the surface of the steel are cleaned out of residue.
2.5 All surfaces (concrete and steel) must be clean and free from loosely adhering particles or any surface contamination such as dirt, dust, grease, oil, etc.
2.6 Where corrosion has resulted in the loss of more than 10% of the original cross sectional areas of the steel the advice of the Engineer should be sought with reference to repair or replacement.

3 Steel Reinforcement Protection

3.1 Within 24 hours of abrasive cleaning, apply a uniform layer of Sika MonoTop Primer approximately 1mm thick to all de-rusted and cleaned reinforcement.
3.2 Allow to dry (for 4 – 5 hours at 20°C) prior to application of the bonding bridge or to other works proceeding.
3.3 All exposed steel surfaces must be uniformly coated, including behind bars where applicable. Where reinforcement remains firmly embedded in sound alkaline concrete lap the Sika MonoTop Primer on to the adjacent concrete by approximately 10mm.

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Specification

4 Bonding Bridge

4.1 Wet down the prepared substrate until the concrete is fully saturated with water.
4.2 Once the surface has returned to a matt damp appearance (saturated surface dry condition) apply a second 1mm thick coat of Sika MonoTop Primer to the reinforcement, and apply one (1) coat of Sika MonoTop Primer nominally 1 mm thick to the repair interface. Work the MonoTop Primer well into the surface using a brush or broom.
4.3 The subsequent repair mortar must be applied whilst the Sika MonoTop Primer bonding bridge is still wet. If the bond coat does dry before application of the repair mortar, then Sika MonoTop Primer must be reapplied.

5 Repair Mortar

5.1 While the bonding coat is still tacky, pack the Sika MonoTop Structural Mortar repair mortar into the cavity to restore line and level. Use a placing rather than a rendering technique to fill all voids and ensure that thorough compaction is achieved. Start by forcing the Sika MonoTop Structural Mortar against the edge of the repair and progressively work towards the centre.
5.2 Sika MonoTop Structural Mortar should not be used when the rebuild thickness is less than 5mm and should not be applied in a single layer thicker than 30mm. For repairs in excess of 30mm deep, apply the repair mortar in layers, ensuring each previous layer is sufficiently hardened before proceeding. If the previous layer has been in place for 48 hours or more before placing the subsequent layer, scabble the surface of the mortar, dampen with water and apply a Sika MonoTop Primer bonding coat in accordance with Section 4 above before proceeding.
5.3 Steel trowel the final layer if a smooth tight finish is required.
5.4 An adequate curing method must be employed to keep the rebuild damp for at least seven (7) days.

Note: This outline procedure details the key components of the work required. For specific details regarding surface preparation, mixing of the products and application, refer to the product data sheet.

Sika®

Version: 07/11

Specification

SPECIFICATION FOR CONCRETE REPAIR USING SIKA MONOTOP HIGH BUILD MORTAR

PRODUCTS:	**Sika MonoTop Primer**	**(The current data sheet is dated 07/07)**
	Sika MonoTop High Build Mortar	**(The current data sheet is dated 07/07)**

1 General

1.1 This technical specification is to be read in conjunction with the project Contract Documents and Specification.
1.2 All work to be carried out in accordance with the current Sika (NZ) Ltd data sheets.

2 Breakout / Preparation

2.1 Sawcut a nominal 10mm cut around the area to be repaired to eliminate over-break and feather edging. (Feather edges to repairs are not permitted.) Smooth saw cut edges should be roughened to improve the bond between the repair and the existing concrete.
2.2 Break out and remove all defective/unsound concrete (as designated by the Supervising Officer) using suitable mechanical means that will avoid unnecessary vibration and damage to the structure.
2.3 Concrete must not be removed from behind reinforcing bars without the permission of the Supervising Officer. When it is necessary to remove concrete from behind reinforcement the extent of breakout should be limited to 15mm or the original bar diameter whichever is the greater unless directed otherwise by the Supervising Officer.
2.4 Any rusting steel reinforcement should be fully exposed to approximately 25mm beyond the corroding length and thoroughly cleaned by abrasive cleaning to standard SA 2.5 of AS1627.9. It is important that rust flakes are removed and corroded pits in the surface of the steel are cleaned out of residue.
2.5 All surfaces (concrete and steel) must be clean and free from loosely adhering particles or any surface contamination such as dirt, dust, grease, oil, etc.
2.6 Where corrosion has resulted in the loss of more than 10% of the original cross sectional areas of the steel the advice of the Engineer should be sought with reference to repair or replacement.

3 Steel Reinforcement Protection

3.1 Within 24 hours of abrasive cleaning, apply a uniform layer of Sika MonoTop Primer approximately 1mm thick to all de-rusted and cleaned reinforcement.
3.2 Allow to dry (for 4 – 5 hours at 20°C) prior to application of the bonding bridge or to other works proceeding.
3.3 All exposed steel surfaces must be uniformly coated, including behind bars where applicable. Where reinforcement remains firmly embedded in sound alkaline concrete lap the Sika MonoTop Primer on to the adjacent concrete by approximately 10mm.

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4 Bonding Bridge

4.1 Wet down the prepared substrate until the concrete is fully saturated with water.
4.2 Once the surface has returned to a matt damp appearance (saturated surface dry condition) apply a second 1mm thick coat of Sika MonoTop Primer to the reinforcement, and apply one (1) coat of Sika MonoTop Primer nominally 1 mm thick to the repair interface. Work the material well into the surface using a brush or broom.
4.3 The subsequent repair mortar must be applied whilst the Sika MonoTop Primer bonding bridge is still wet. If the bond coat does dry before application of the repair mortar, then Sika MonoTop Primer must be reapplied.

5 Repair Mortar

5.1 While the bonding coat is still tacky, pack the Sika MonoTop High Build Mortar repair mortar into the cavity to restore line and level. Use a placing rather than a rendering technique to fill all voids and ensure that thorough compaction is achieved. Start by forcing the Sika MonoTop High Build Mortar against the edge of the repair and progressively work towards the centre.
5.2 Sika MonoTop High Build Mortar should not be used when the rebuild thickness is less than 5mm and should not be applied in a single layer thicker than 80mm. For repairs in excess of 80mm deep, apply the repair mortar in layers, ensuring each previous layer is sufficiently hardened before proceeding. If the previous layer has been in place for 48 hours or more before placing the subsequent layer, scabble the surface of the mortar, dampen with water and apply a Sika MonoTop Primer bonding coat in accordance with Section 4 above before proceeding.
5.3 Steel trowel the final layer if a smooth tight finish is required.
5.4 An adequate curing method must be employed to keep the rebuild damp for at least seven (7) days.

Note: This outline procedure details the key components of the work required. For specific details regarding surface preparation, mixing of the products and application, refer to the product data sheet.

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SPECIFICATION FOR CONCRETE REPAIR USING MICRO-CONCRETE

Specification

PRODUCTS:	**Sika MonoTop Primer**	**(The current data sheet is dated 07/07)**
	Sika MonoTop Micro Concrete	**(The current data sheet is dated 07/07)**
	Sika Formol	**(The current data sheet is dated 09/07)**

1 General

1.1 This technical specification is to be read in conjunction with the project Contract Documents and Specification.

1.2 All work to be carried out in accordance with the current Sika (NZ) Ltd data sheets.

2 Breakout / Preparation

2.1 Sawcut a nominal 10mm deep cut around the area to be repaired to eliminate over-break and feather edging. (Feather edges to repairs are not permitted.) Smooth saw cut edges should be roughened to improve the bond between the repair and the existing concrete.

2.2 Break out and remove all defective/unsound concrete (as designated by the Supervising Officer) using suitable mechanical means that will avoid unnecessary vibration and damage to the structure.

2.3 Concrete must not be removed from behind reinforcing bars without the permission of the Supervising Officer. When it is necessary to remove concrete from behind reinforcement the extent of breakout should be limited to 15mm or the original bar diameter whichever is the greater unless directed otherwise by the Supervising Officer.

2.4 Any rusting steel reinforcement should be fully exposed to approximately 25mm beyond the corroding length and thoroughly cleaned by abrasive cleaning to standard SA 2.5 of AS1627.9. It is important that rust flakes are removed and corroded pits in the surface of the steel are cleaned out of residue.

2.5 All surfaces (concrete and steel) must be clean and free from loosely adhering particles or any surface contamination such as dirt, dust, grease, oil, etc.

2.6 Where corrosion has resulted in the loss of more than 10% of the original cross sectional areas of the steel the advice of the Engineer should be sought with reference to repair or replacement.

3 Steel Reinforcement Protection

3.1 Within 24 hours of abrasive cleaning, apply a uniform layer of Sika MonoTop Primer approximately 1mm thick to all de-rusted and cleaned reinforcement.

3.2 Allow to dry for 4 – 5 hours (at 20°C), prior to other works proceeding.

3.3 All exposed steel surfaces must be uniformly coated, including behind bars where applicable. Where reinforcement remains firmly embedded in sound alkaline concrete lap the Sika MonoTop Primer on to the adjacent concrete by approximately 10mm.

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4 Micro-concreting

4.1 Construct watertight formwork to produce the required line and level of the concrete element. The formwork must be able to rigidly confine the Sika MonoTop Micro Concrete during its expansion phase. The formwork should be treated with Sika Formol before installation to prevent the concrete sticking to the formwork.

4.2 Flush out all formwork and thoroughly saturate the substrate with fresh clean water prior to placement of Sika MonoTop Micro Concrete. Ensure the substrate is in a saturated surface dry condition prior to proceeding with micro-concreting.

4.3 Formwork should be filled with Sika MonoTop Micro Concrete in such a manner as to avoid air entrapment. In many cases it may be necessary to install filling pipes and breather tubes to enable the cavity to be filled from bottom to top to prevent this occurrence.

4.4 An adequate curing method must be employed for at least seven (7) days.

Note: This outline procedure details the key components of the work required. For specific details regarding surface preparation, mixing of the products and application, refer to the product data sheet.

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SPECIFICATION FOR SPRAYED CONCRETE REPAIR

Specification

PRODUCTS:	**Sika MonoTop Primer**	**(The current data sheet is dated 07/07)**
	Sikacrete-Gunite 103	**(The current data sheet is dated 11/99)**
	Sikcem-Gunite 133	**(The current data sheet is dated 04/99)**

1 General

1.1 This technical specification is to be read in conjunction with the project Contract Documents and Specification.

1.2 All work to be carried out in accordance with the current Sika (NZ) Ltd data sheets.

2 Breakout / Preparation

2.1 Sawcut a nominal 10mm deep cut around the area to be repaired to eliminate over-break and feather edging. (Feather edges to repairs are not permitted.) Smooth saw cut edges should be roughened to improve the bond between the repair and the existing concrete.

2.2 Break out and remove all defective/unsound concrete (as designated by the Supervising Officer) using suitable mechanical means that will avoid unnecessary vibration and damage to the structure.

2.3 Concrete must not be removed from behind reinforcing bars without the permission of the Supervising Officer. When it is necessary to remove concrete from behind reinforcement the extent of breakout should be limited to 15mm or the original bar diameter whichever is the greater unless directed otherwise by the Supervising Officer.

2.4 Any rusting steel reinforcement should be fully exposed to approximately 25mm beyond the corroding length and thoroughly cleaned by abrasive cleaning to standard SA 2.5 of AS1627.9. It is important that rust flakes are removed and corroded pits in the surface of the steel are cleaned out of residue.

2.5 All surfaces (concrete and steel) must be clean and free from loosely adhering particles or any surface contamination such as dirt, dust, grease, oil, etc.

2.6 Where corrosion has resulted in the loss of more than 10% of the original cross sectional areas of the steel the advice of the Engineer should be sought with reference to repair or replacement.

3 Steel Reinforcement Protection

3.1 Within 24 hours of abrasive cleaning, apply a uniform layer of Sika MonoTop Primer approximately 1mm thick to all de-rusted and cleaned reinforcement.

3.2 Allow to dry for 4 – 5 hours (at 20°C), prior to other works proceeding.

3.3 All exposed steel surfaces must be uniformly coated, including behind bars where applicable. Where reinforcement remains firmly embedded in sound alkaline concrete lap the Sika MonoTop Primer on to the adjacent concrete by approximately 10mm.

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4 Spray repairs with Sikacrete-Gunite 103 or Sikacem-Gunite 133

4.1 Sikacrete-Gunite 103 and Sikacem-Gunite 133 shall only be applied by an experienced nozzleman using a conventional dry powder spray machine.

4.2 Wet down the prepared substrate until the concrete is fully saturated with water. Only proceed with application of Sikacrete-Gunite 103 and Sikacem-Gunite 133 once the surface has returned to a matt damp appearance (saturated surface dry condition).

4.3 The rate of addition of water at the nozzle is adjusted to give the required mortar consistency. Trials should be done to determine the right consistency and finish.

4.4 Immediately after application of the mortar it shall be screeded and trowelled to the desired finish.

4.5 Any rebound materials shall not be re-used.

4.6 As with all concrete and mortars it is essential that Sikacrete-Gunite 103 and Sikacem-Gunite 133 are protected from water evaporation during the crucial early age curing period. We recommend the use of Antisol curing membranes for this purpose.

4.7 In vertical and overhead applications, layer thicknesses of Sikacrete-Gunite 103 are only limited by heat of hydration and subsequent thermal contraction. Areas and layer thickness should follow good concrete practice in this respect.

4.8 As per the Product Data sheet, Sikacem-Gunite 133 is recommended for use in harsh marine environments.

Note: This outline procedure details the key components of the work required. For specific details regarding surface preparation, mixing of the products and application, refer to the product data sheet.

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SPECIFICATION FOR CONCRETE REPAIR USING SIKA FASTFIX-125 (WITH MONOTOP PRIMER)

PRODUCTS:	**Sika FastFix-125**	**(The current data sheet is dated 03/09)**
	MonoTop Primer	**(The current data sheet is dated 07/07)**

1 General

1.1 This technical specification is to be read in conjunction with the project Contract Documents and Specification.
1.2 All work to be carried out in accordance with the current Sika (NZ) Ltd data sheets.
1.3 Sika FastFix-125 has been formulated for the emergency reinstatement of horizontal localised patches in concrete pavements, airport aprons, access ramps, roadways and many other industrial situations. It can be applied to small localised areas requiring not more than 12 litres of patching material.

2 Breakout / Preparation

2.1 Sawcut a nominal 15mm deep cut around the area to be repaired to eliminate over-break and feather edging. (Feather edges to repairs are not permitted.) Smooth saw cut edges should be roughened to improve the bond between the repair and the existing concrete.
2.2 Areas to be repaired must be scabbled to remove all defective/unsound concrete (as designated by the Supervising Officer), and to provide a good mechanical key. Avoid unnecessary vibration and damage to the structure.
2.3 Concrete must not be removed from behind reinforcing bars without the permission of the Supervising Officer. When it is necessary to remove concrete from behind reinforcement the extent of breakout should be limited to 15mm or the original bar diameter whichever is the greater unless directed otherwise by the Supervising Officer.
2.4 Any rusting steel reinforcement should be fully exposed to approximately 25mm beyond the corroding length and thoroughly cleaned by abrasive cleaning to standard SA 2.5 of AS1627.9. It is important that rust flakes are removed and corroded pits in the surface of the steel are cleaned out of residue.
2.5 All surfaces (concrete and steel) must be clean and free from loosely adhering particles or any surface contamination such as dirt, dust, grease, oil, etc.
2.6 Where corrosion has resulted in the loss of more than 10% of the original cross sectional areas of the steel the advice of the Engineer should be sought with reference to repair or replacement.
2.7 Dampen the prepared surface by mist spraying with clean potable water.

3 Priming

3.1 Immediately before priming, surface water should be removed by brushing off or blowing away with clean compressed air. The surface is ready to prime when the surface is damp but all free water has been removed. Redampen any area of substrate that dries out during the application sequence.
3.2 Thoroughly scrub MonoTop Primer into the dampened surface taking care to ensure complete coverage, particularly around the edges.
3.3 Sika FastFix-125 must be applied whilst the MonoTop Primer is still tacky. The priming operation must be repeated if the initial coat has dried out.

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4 Repair Mortar

4.1 While the primer coat is still tacky, apply the Sika FastFix-125 repair mortar firmly and evenly over the primed surface and tamp with a wood float to achieve complete compaction.

4.2 Minimum depth of Sika FastFix-125 shall be 15mm. The thickness of a single application should not exceed 160mm. For filling of pockets of greater depth, individual layers should be scratch-keyed and allowed to set for at least 3 hours before priming and application of the next layer.

4.3 Strike off the surface to the correct level and finish with a steel trowel to ensure that a fully closed surface is obtained.

4.4 An adequate curing method must be employed to keep the rebuild damp for at least seven (7) days.

Note: This outline procedure details the key components of the work required. For specific details regarding surface preparation, mixing of the products and application, refer to the product data sheet.

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Sika Approved Contractors
Concrete Repair and Protection Systems

Christchurch Based (Alphabetical order only)

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Contact Justin Ashwell
Mob 021 082-71490
Email absolutechch@gmail.com

Adhesion Sealing Ltd
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Contact Steve Moodie
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Email Steve@adhesionsealing.co.nz

Application Specialists Ltd
Ph 03 384-3200
Fax 03 384-3200
Contact Sam Webster
Mob 022 042-8870
Email sam@appspecs.co.nz

Concrete Protection & Repair Ltd
Ph 03 349-0334
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Contact Graeme Smith
Mob 021 337-095
Email cpr@actrix.gen.nz

Construction Techniques Ltd
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Contact Peter Higgins
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Memos

Christchurch City Council

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