



Structural Concepts

Detailed Engineering Evaluation Quantitative Report

Kapuatohe Schoolhouse Residence
665 Main North Road, Christchurch

Prepared For:
Christchurch City Council

Ref: 1599-099
20 February 2013

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KAPUATOHE SCHOOLHOUSE RESIDENCE

665 MAIN NORTH ROAD, CHRISTCHURCH

DETAILED ENGINEERING EVALUATION

20 February 2013

FOR:

CHRISTCHURCH CITY COUNCIL

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DETAILED ENGINEERING EVALUATION

20 February 2013

FOR:

KAPUATOHE SCHOOLHOUSE RESIDENCE

AT:

665 MAIN NORTH ROAD, CHRISTCHURCH

1.0 Preamble

This report covers our assessment of the structural condition of the Kapuatohe Schoolhouse Residence at 665 Main North Road, Christchurch, following the magnitude 6.3 earthquake on 22nd February 2011. Our assessment is based on a visual inspection of the inside and outside, which was carried out in May 2011 and again in June 2011.

This report describes the damage observed, and comments on remedial work options for both temporary securing of the building, and long term repair where appropriate. This report does not cover a detailed structural strength assessment or detailed specification of remedial works, which may be required by the client following consideration of this report.

2.0 Scope of Investigation

In May 2011 and June 2011, we visually inspected the building including:

- The exterior from ground level
- The interior

This report is based on our assessment of the building at the time stated. Photos that are attached in Appendix A are indicative of the damage. Any subsequent loading by aftershocks, or high winds, may initiate further damage.

3.0 Building Description

General description:

The Kapuatohe Schoolhouse residence is a two-storey structure consisting of timber framing with weatherboard cladding. There is a single storey addition (ablution block) attached to the West face. The building was first constructed in 1877. The building was being used as a residential accommodation and is currently occupied, although chimneys have been deconstructed to roof level.

Roof construction:

Corrugated steel on timber framing.

External Wall construction:

Weatherboard cladding on timber framed construction to all other exterior walls.

Internal Wall construction:

Generally plaster on lathe on timber framing. Lath and plaster or hardboard on timber framing to interior walls.

Floor construction:

Timber joists and bearers on piles with an unreinforced concrete perimeter foundation wall.

4.0 Structural System

The structural system can be described as plaster on timber lathe on timber framed walls acting in in-plane shear wall action on both levels in both directions with the load then transferring to a timber floor diaphragm that transfers loads to an unreinforced (or low level reinforced) concrete ring foundations and then to the ground. The building is essentially light weight with light weight roof and cladding.

5.0 Strength

The strength of the building has been determined as a % NBS using methodologies provided by NZSEE.

Before September 2010:

The strength of the building before September 2010 is determined as:

Top Floor	E-W	100% NBS
	N-S	100% NBS
Bottom Floor	E-W	100% NBS
	N-S	100% NBS
Chimneys		20% NBS

On day of inspection:

The strength of the building on the day of inspection is determined as:

Top Floor	E-W	100% NBS
	N-S	100% NBS
Bottom Floor	E-W	100% NBS
	N-S	100% NBS
Chimneys		0% NBS

6.0 Damage Description

Damage caused by the February earthquake to the Kapuatohe Schoolhouse residence is described below. Damage described is additional to earlier earthquake damage. Refer to Appendix B for marked-up drawings indicating damaged locations. The damage is typical of lathe and plaster timber framed walls and not unusual.

General Damage:

- i. General damage includes minor cracking of plaster to walls and ceilings.
- ii. Two brick chimneys have been damaged and have been dismantled to roof level. The chimneys have caused significant damage to the ceilings immediately adjacent where they pass through same. There is some cracking to the internal chimney fireplace in the kitchen. The first floor bedroom chimney has dislodged bricks in the arch.

7.0 Immediate Securing of the Building

The following works are required to mitigate immediate hazards, temporarily secure the building, and provide weather tightness:

- Remove loose chimney bricks and remaining chimneys to roof level to remove any fall hazard.
- Due care, safety equipment and precautions must be taken when carrying out the above work. Maintain awareness of fall hazards and escape routes if entering the building.

8.0 Long Term Repair

This section outlines options for repair to restore the building to its pre earthquake condition. Options for repair and/or strengthening will need to be discussed with the owner, and will be subject to revised local authority legislation. All new work has been assessed using a seismic hazard factor of $Z=0.3$.

i. Schoolhouse Chimney Repair:

- Reconstruct chimneys using light weight replicas in the form of brick veneer over plywood on timber framing with steel structures are recommended.
- Deconstruct existing chimneys to ceiling level.
- See attached details in Appendix C.

The repair methods adopted above will bring this building up to 100%NBS.

The costs associated with the repairs would require the appropriate professional to visit the site to view the extent of damage.

9.0 Elements Not Inspected

The following is a list of elements not specifically inspected:

- Roof space

- Soils (Geotechnical report should be sort)

The L2 report makes mention of a wider scale lateral spread report by Tonkin and Taylor including the possibility of perimeter treatment and recommends that work be postponed until those recommendations are known. The owner needs to bear this in mind when making their decisions to proceed with remedial works.

10.0 Limitations

Findings presented in this report are for the sole use of the client. The findings may not contain sufficient information for use by other parties, and as such should not be relied upon unless discussed with Structural Concepts Ltd.

We have exercised our services in a professional manner using a degree of care and skill normally, under similar circumstances, by reputable consultants practicing in this field at this time. No other warranty, expressed or implied, is made as to the professional advice presented in this report.

Prepared By:



Garry Newton

BE (Civil), MIPENZ, CPEng, IntPE, APEC Engineer

Managing Director

On behalf of Structural Concepts Ltd

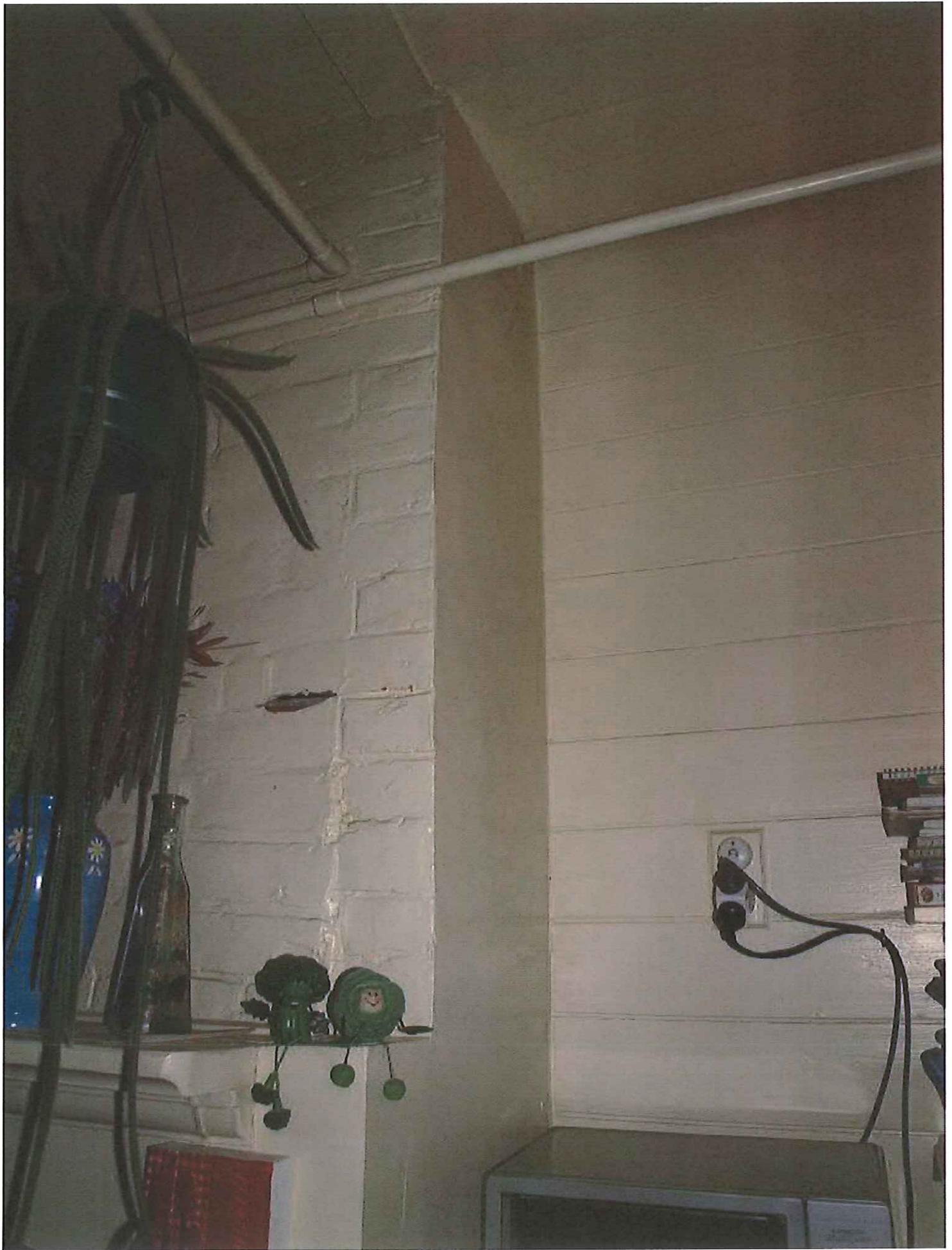
APPENDIX A

KAPUATOHE SCHOOLHOUSE RESIDENCE CHRISTCHURCH

PHOTOGRAPHS

Please note that the photographs provided in this report are not high quality and are for providing information that shows the indicative damage found around the building for structural engineering assessment only.

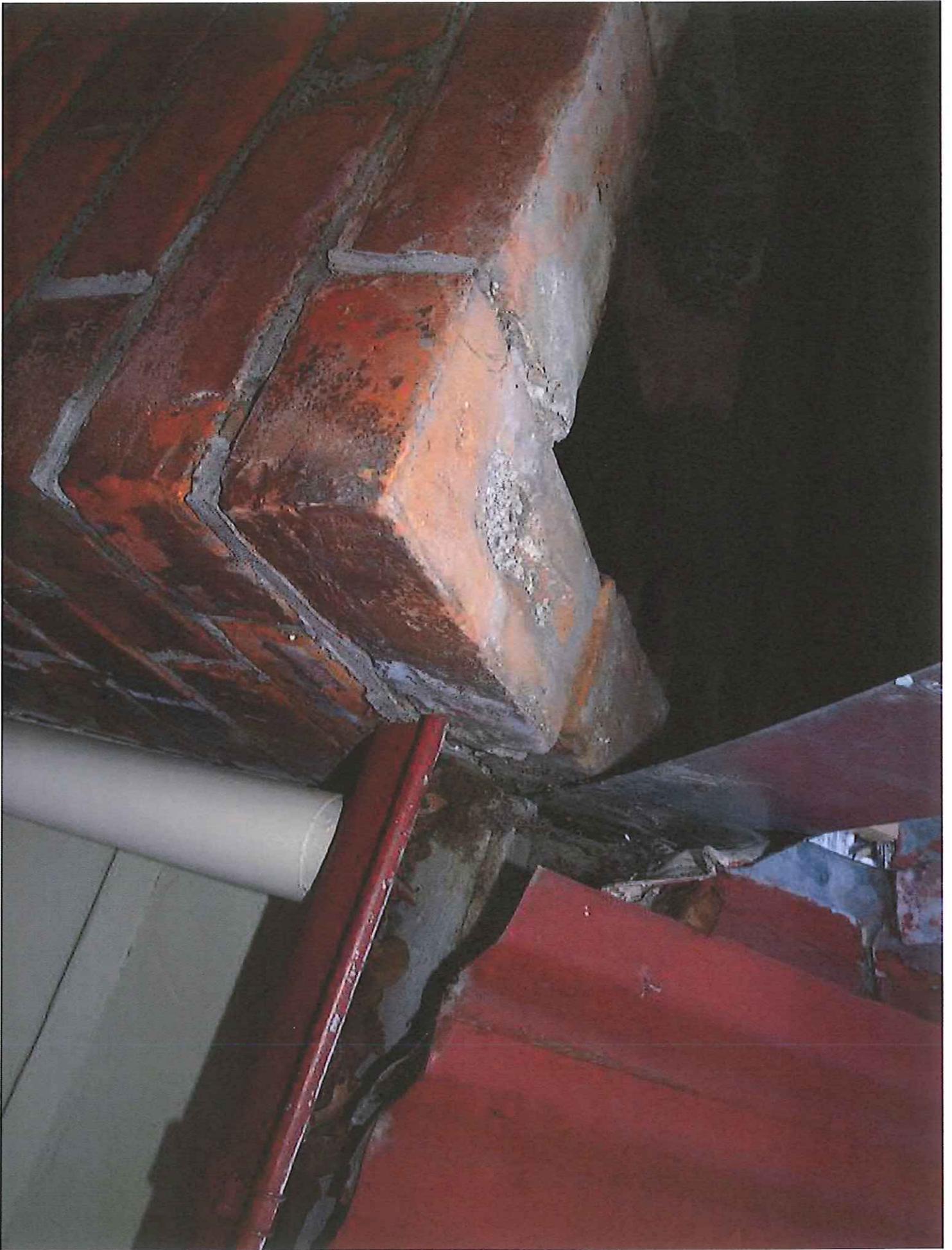












APPENDIX B

KAPUATOHE SCHOOLHOUSE RESIDENCE CHRISTCHURCH

MARKED-UP DRAWING INDICATING DAMAGED LOCATIONS

APPENDIX C

KAPUATOHE SCHOOLHOUSE RESIDENCE CHRISTCHURCH

NEW WORKS

Part Section A-A Through Chimney Scale 1:50 @ A3

North Elevation Scale 1:100 @ A3

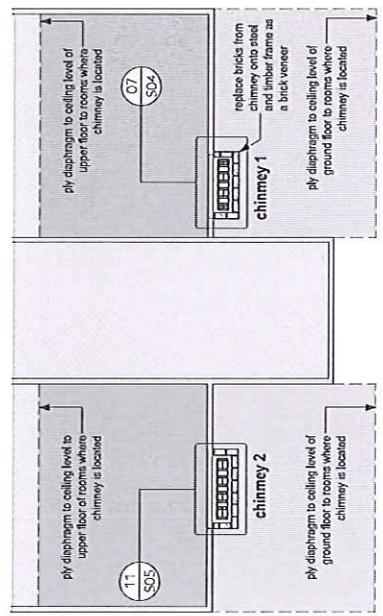
SEISMIC STRENGTHENING OF CHIMNEYS TO
KAPUATOHE SCHOOL HOUSE, CHRISTCHURCH
Elevation, Part Section and Part Plan

CLIENT
Christchurch city council
PROJECT ADDRESS
665 Main Road North, Christchurch

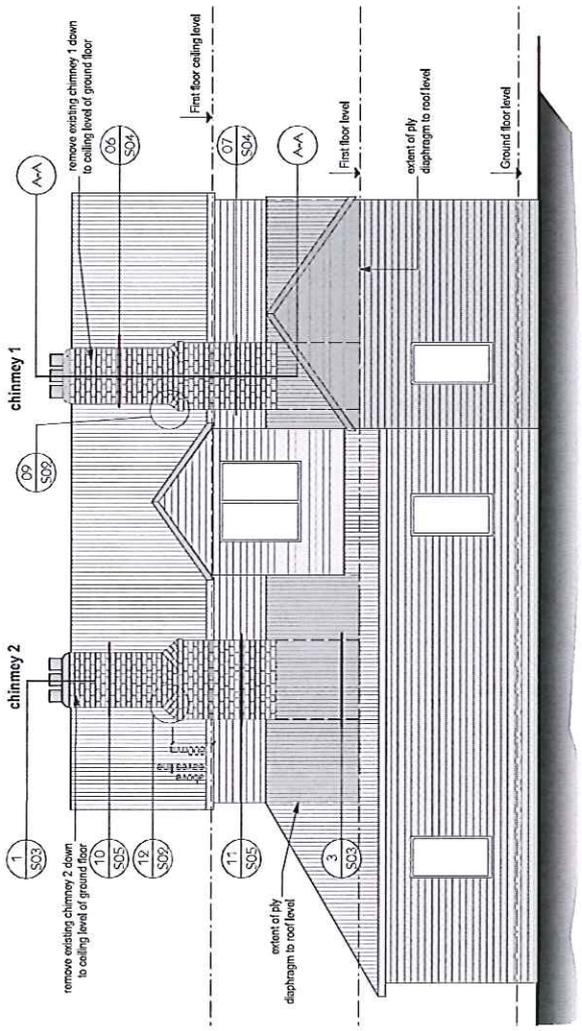
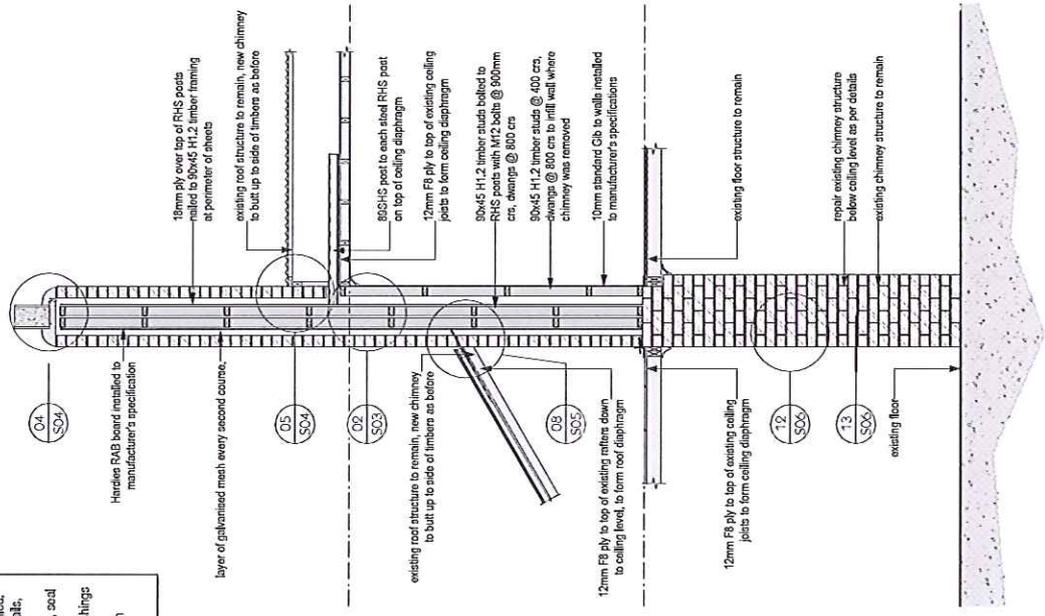
REV DATE DESCRIPTION

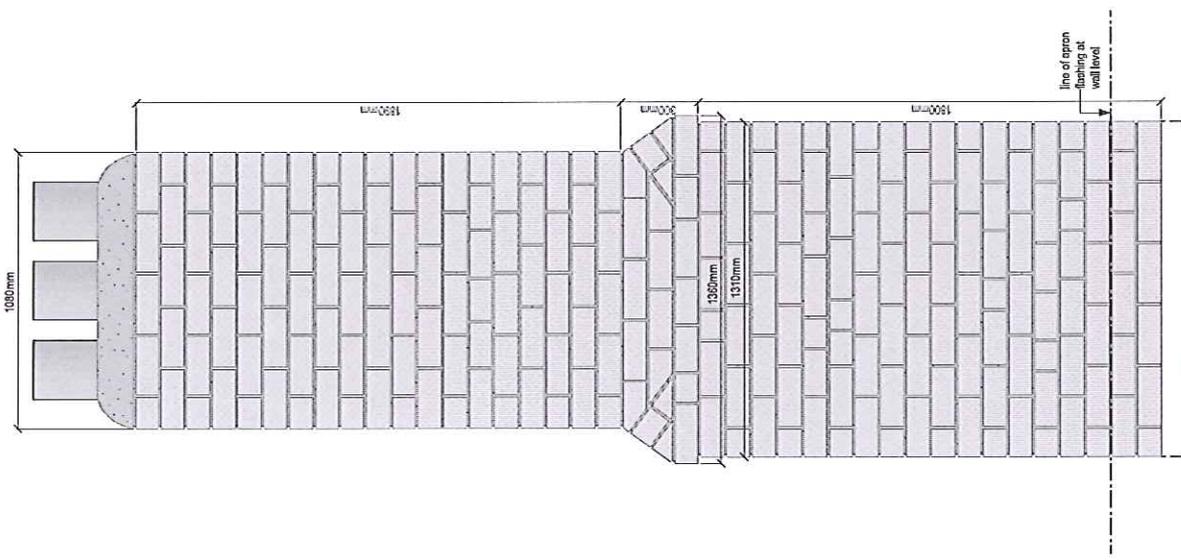
GENERAL SCOPE OF WORKS:

- remove existing chimneys to level of ground floor ceiling as shown in details, salvages bricks for re-use
- install ceiling diaphragm to top of existing ground floor ceiling joists to rooms that contain the chimneys
- install ceiling diaphragm to first floor ceiling as detailed, along with all structural timbers and all structural steel as per details
- install ply bracing and Heralde RAB board cladding, seal as per manufacturer's specification
- install brick veneer as per details, along with all flashings and shelf angles as shown on plans
- make good all exterior and interior finishes to match existing

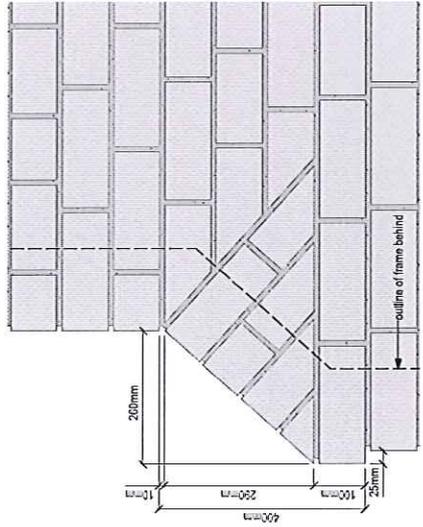


Part First Floor Plan Scale 1:100 @ A3

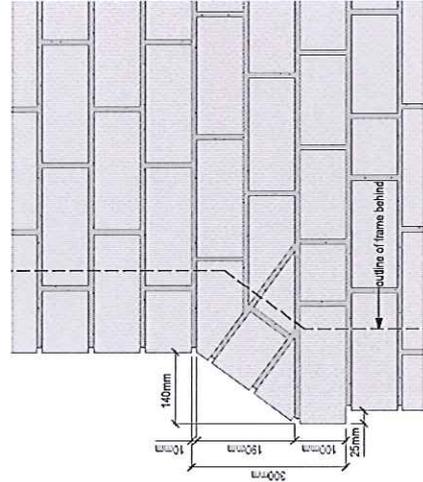




Chimney 1 Elevation Scale 1:20 @ A3

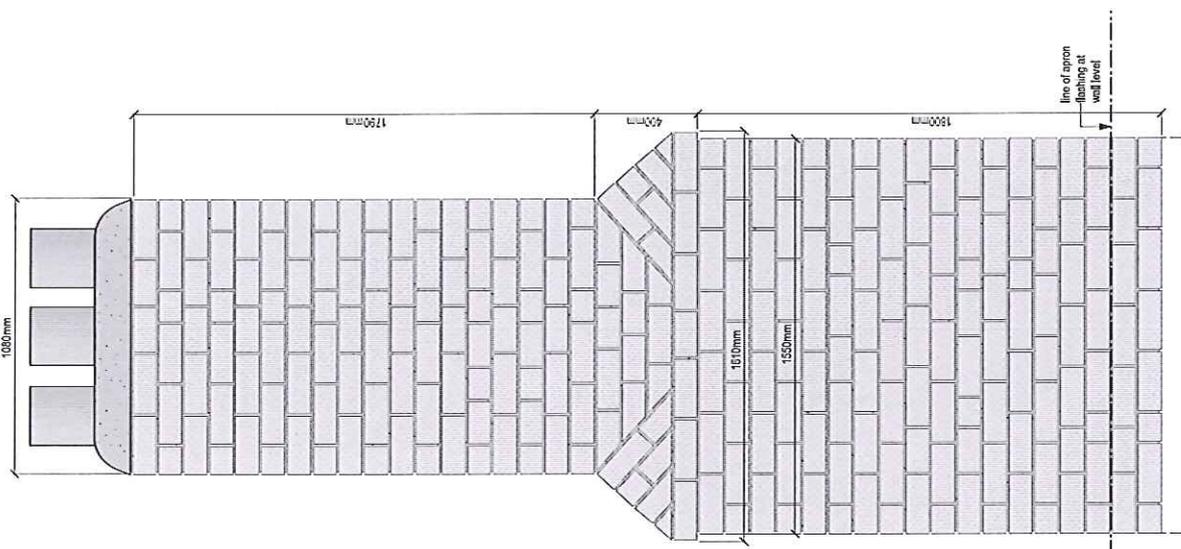


12
S01 Change of Thickness in Chimney 2 Scale 1:10 @ A3

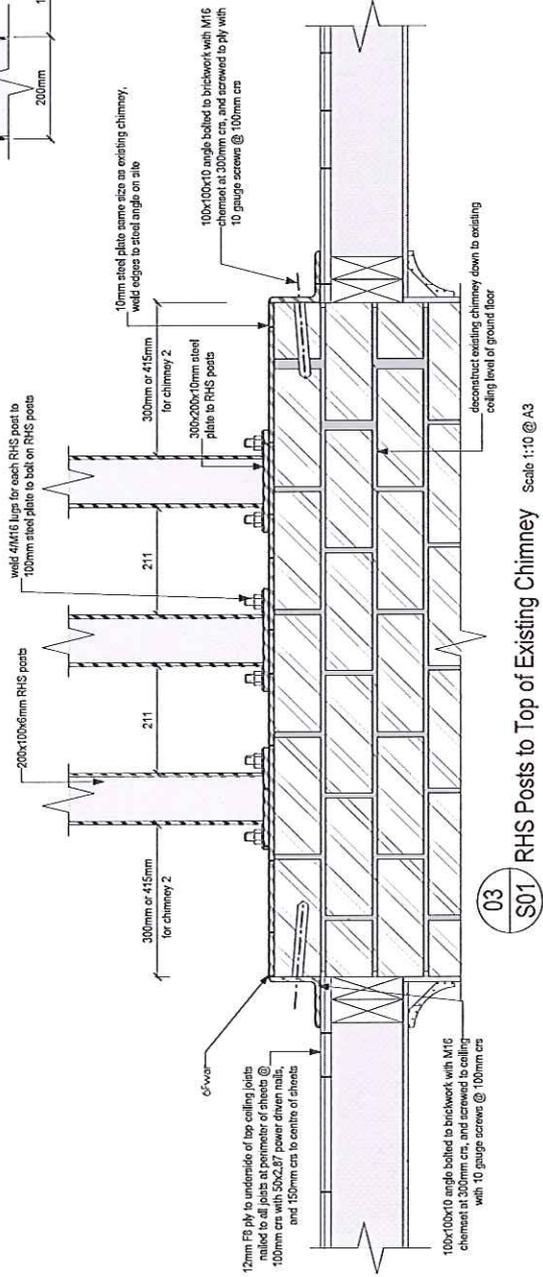
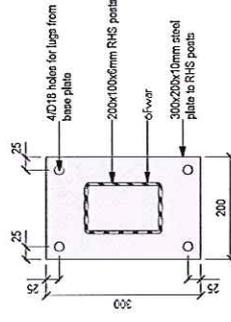
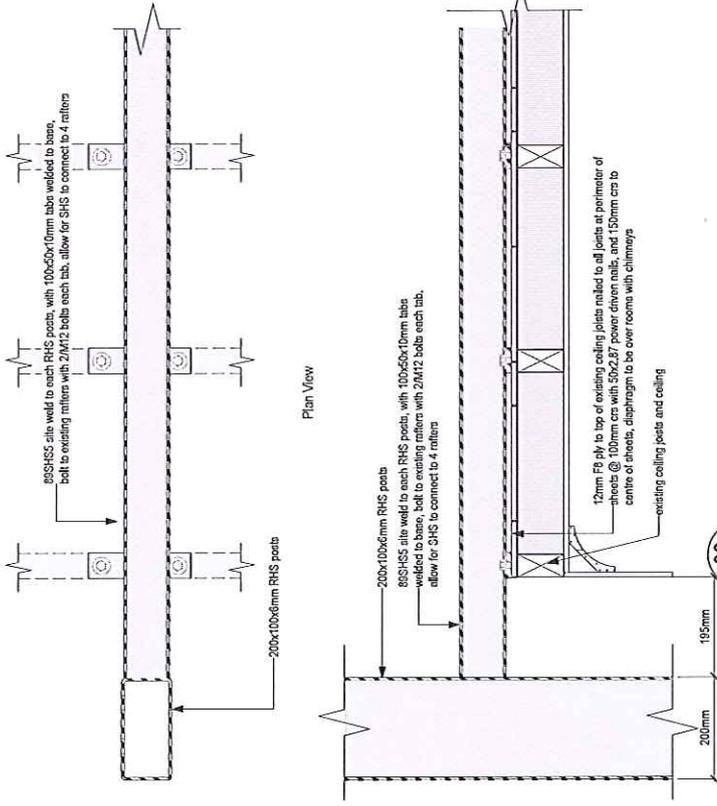
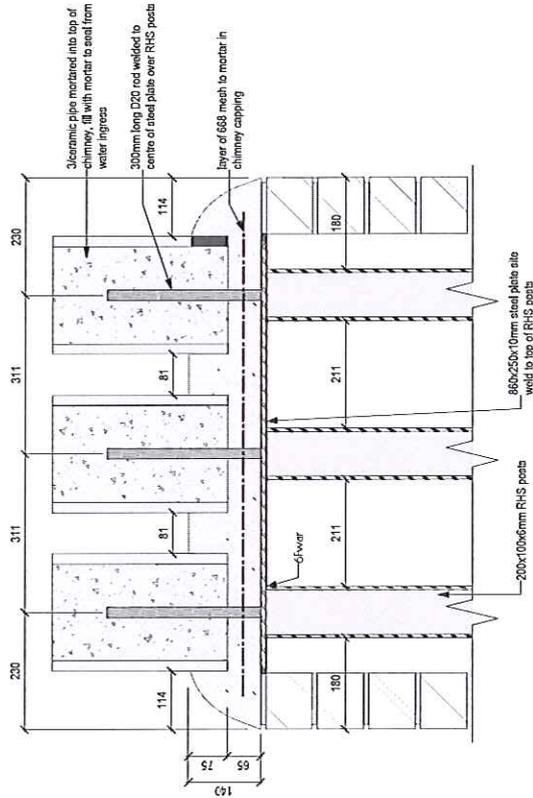


09
S01 Change of Thickness in Chimney 1 Scale 1:10 @ A3

Notes:
 - bricks to be installed as close as possible to the existing layout, as shown on these elevations.
 - the roof side of the chimney layout is unknown, so replicate layout of these elevations.
 - the sides of the chimney are a standard half stretcher bond

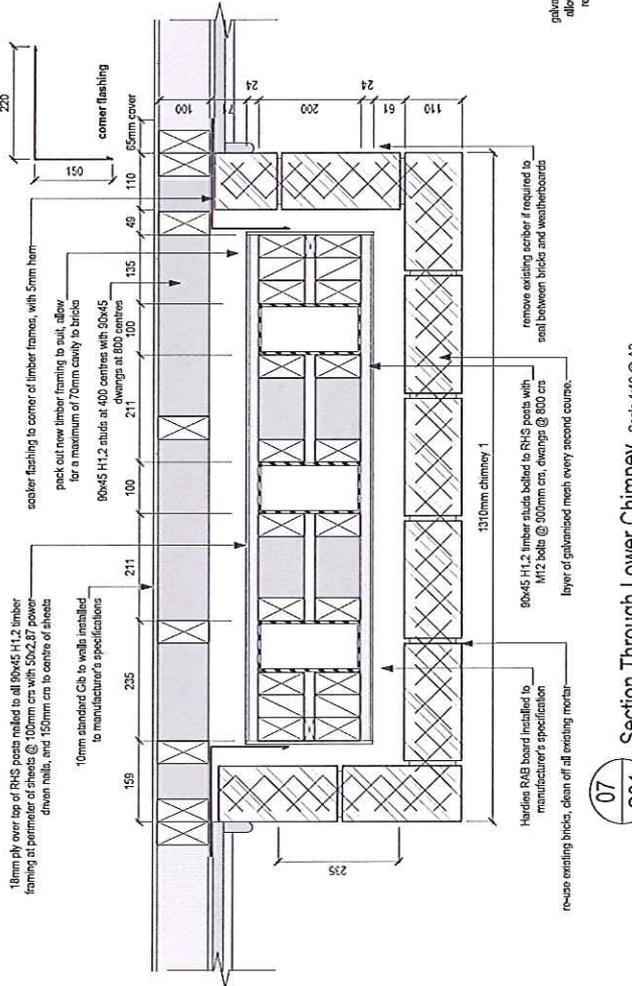


Chimney 2 Elevation Scale 1:20 @ A3

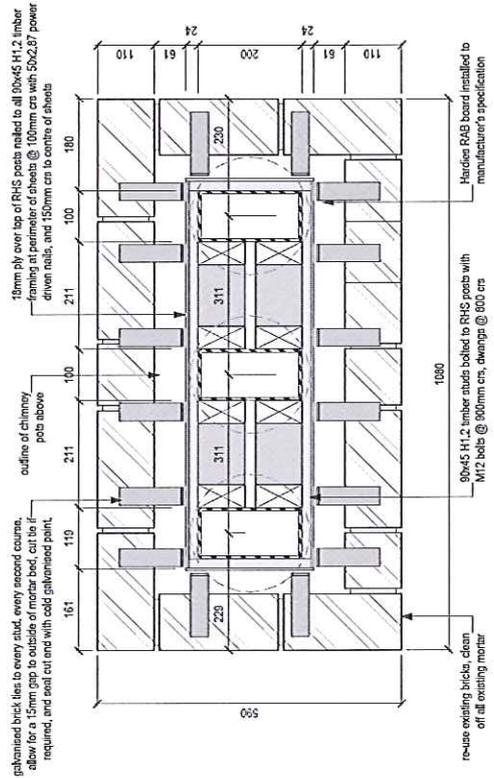


RHS Posts Baseplate Scale 1:10 @ A3

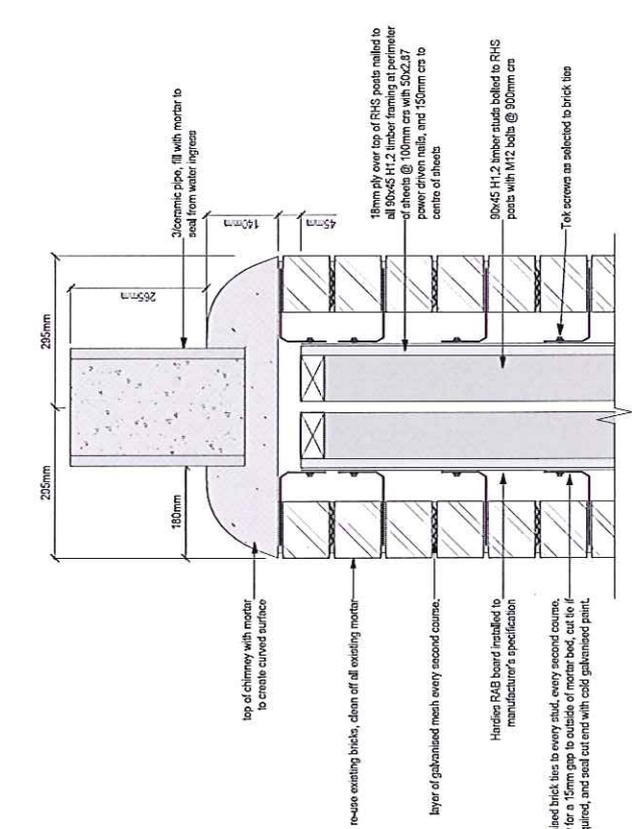
RHS Posts to Top of Existing Chimney Scale 1:10 @ A3



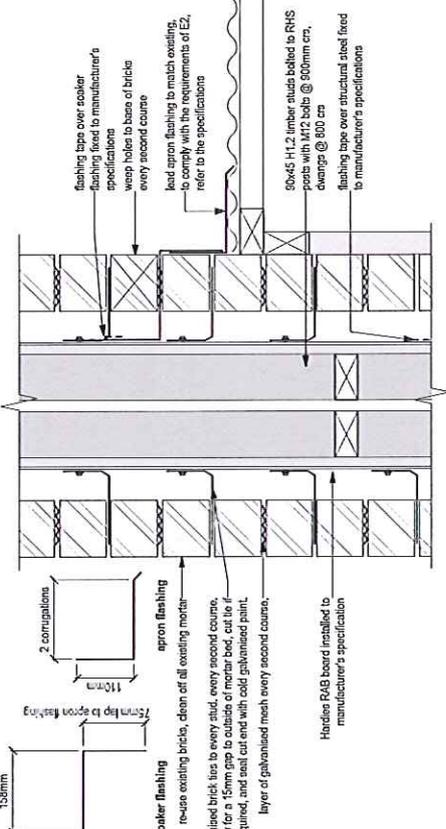
07 S01 Section Through Lower Chimney Scale 1:10 @ A3



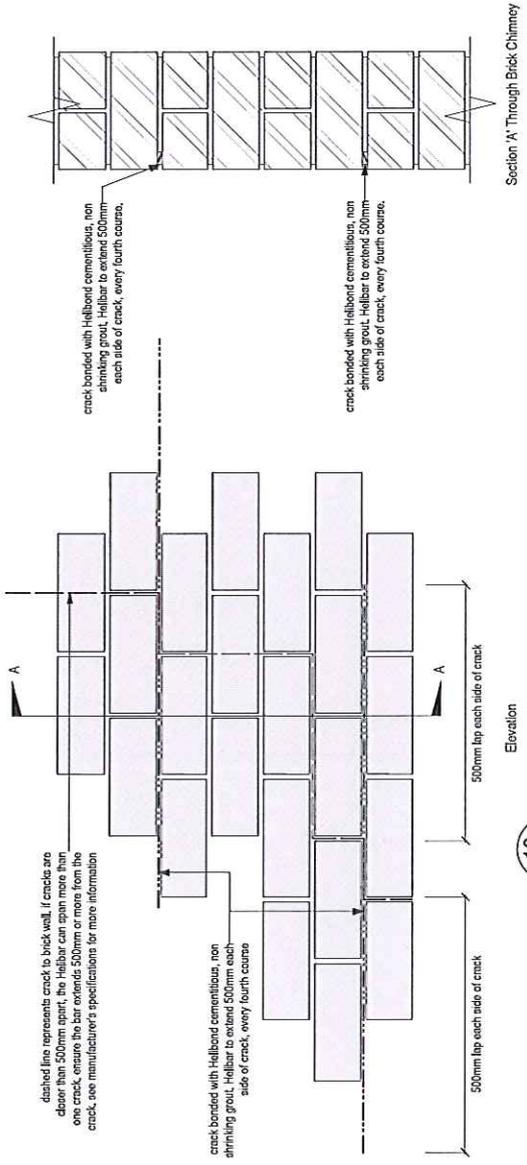
06 S01 Section Through Upper Chimney Scale 1:10 @ A3



04 S01 Typical Top to Chimney Scale 1:10 @ A3

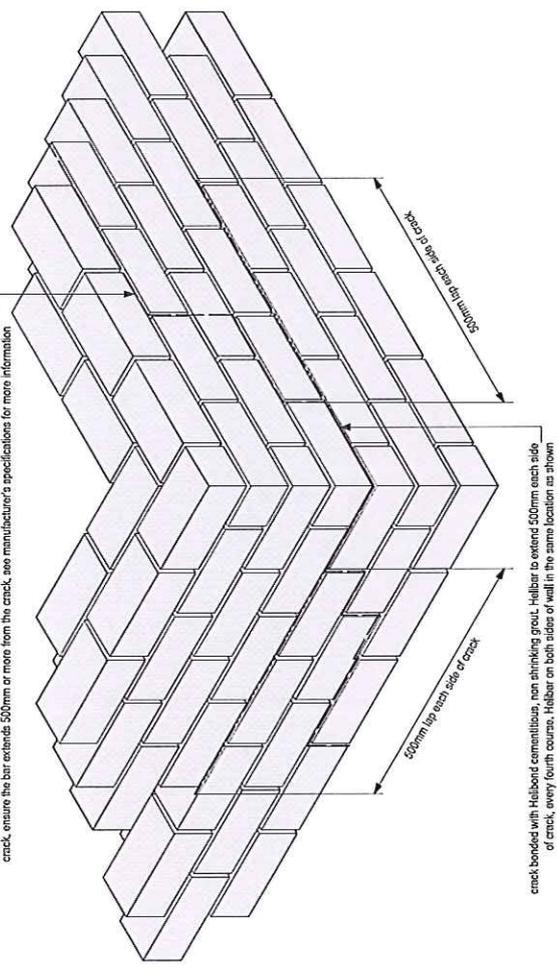


05 S01 Typical Apron Flashing to Chimney Scale 1:10 @ A3



12
S01 Typical Crack Stitch Detail Scale 1:10 @ A3

dashed line represents crack to brick wall. If cracks are closer than 500mm apart, the Halibar can span more than one crack, ensure the bar extends 500mm or more from the crack, see manufacturer's specifications for more information



13
S01 Crack Stitch Detail at Corners Scale 1:10 @ A3