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SEISMIC STRENGTHENING

3-15 ELMDALE LANE, CHRISTCHURCH

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GENERAL

1. STRUCTURAL AND ARCHITECTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH SPECIFICATION, CIVIL AND ENGINEERING SERVICES DOCUMENTS. ALL DISCREPANCIES SHALL BE REFERRED TO THE DESIGN CONSULTANT.

2. ALL DIMENSIONS SHALL BE VERIFIED ON SITE BY CONTRACTOR PRIOR TO COMMENCEMENT OF FABRICATION OR CONSTRUCTION. THE DRAWINGS SHALL NOT BE SCALED.

3. ALL PROPRIETARY SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

4. MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE NEW ZEALAND BUILDING CODE.

5. DURING CONSTRUCTION THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE STRUCTURE IN A STABLE CONDITION, NO PART SHALL BE OVERSTRESSED UNDER CONSTRUCTION ACTIVITIES. IF DURING CONSTRUCTION ANY PART OF THE WORKS SHOWS SIGNS OF DISTRESS, EXCESSIVE DEFLECTION OR OTHER PROBLEMS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE DESIGN CONSULTANT.

6. ABBREVIATIONS:

GENERAL:

- B = BOTTOM
- BGL = BELOW GROUND LEVEL
- CRS = CENTRES
- DIA = DIAMETER
- DPC = DAMP-PROOF COURSE
- DPM = DAMP-PROOF MEMBRANE
- ES = EACH SIDE
- EW = EACH WAY
- EQ = EQUIVALENT
- FF = FAR FACE
- FFL = FINISHED FLOOR LEVEL
- FWAR = FILLET WELD ALL AROUND
- GFL = GROUND FLOOR LEVEL
- ID = INSIDE DIAMETER
- NF = NEAR FACE
- NTS = NOT TO SCALE
- OD = OUTSIDE DIAMETER
- SG = STRUCTURAL GRADE
- SIM = SIMILAR
- T = TOP
- TYP = TYPICAL
- UNO = UNLESS NOTED OTHERWISE
- U/S = UNDERSIDE
- WP = WELD PLATE

REINFORCING:

- H = GRADE 500 DEFORMED BARS
- D = GRADE 300 DEFORMED BARS
- HR = GRADE 500 PLAIN BARS
- R = GRADE 300 PLAIN BARS
- RB = GRADE 500 REID BARS

STEELWORK:

- FL = FLAT
- UB = UNIVERSAL BEAM
- UC = UNIVERSAL COLUMN
- PFC = PARALLEL FLANGE CHANNEL
- EA = EQUAL ANGLE
- UA = UNEQUAL ANGLE
- MS = MILD STEEL
- SHS = SQUARE HOLLOW SECTION
- RHS = RECTANGULAR HOLLOW SECTION
- CHS = CIRCULAR HOLLOW SECTION
- DHS = DIMOND HI-SPAN PURLIN
- HST = STEEL & TUBE HIGH STRENGTH PURLIN
- MSS = METALCRAFT SUPER SPAN PURLIN
- CHS = CIRCULAR HOLLOW SECTION

STRUCTURAL STEELWORK

1. MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH NZS 3404. WELDING SHALL COMPLY WITH AS/NZS 1554.1.

2. ALL CONNECTIONS, SPLICES AND BASEPLATES SHALL BE TO HERA REPORT R4-100, UNLESS SPECIFICALLY NOTED OR DETAILED.

3. STEEL MEMBERS SHALL BE (UNLESS SHOWN OTHERWISE ON STRUCTURAL DRAWINGS):
   - GRADE 300 - HOT ROLLED OPEN SECTIONS, FLATS;
   - GRADE 350 - HOLLOW SECTIONS;
   - GRADE 250 - HOT ROLLED PLATES

4. BOLTS SHALL GENERALLY BE TIGHTENED SNUGFIT (S) UNLESS STATED OTHERWISE TO AS/NZS 1252.

5. ALL BOLTS SHALL BE M16 PROPERTY CLASS 8.8, UNLESS SHOWN OTHERWISE ON STRUCTURAL DRAWINGS.

6. ALL BOLTS SHALL HAVE AT LEAST 1 FULL THREAD PROJECTING ABOVE THE NUT.

7. ALL BOLT HOLES SHALL BE DRILLED AND SHALL BE OVERSIZED 2 mm FOR BOLTS EQUAL OR LESS THAN M24 AND 3 mm FOR BOLTS > M24, UNLESS SHOWN OTHERWISE ON STRUCTURAL DRAWINGS.

8. ALL BOLT HOLES IN BASE PLATES SHALL BE NOT MORE THAN 6 mm GREATER THAN THE ANCHOR BOLT DIAMETER. A SPECIAL PLATE WASHER WITH MINIMUM THICKNESS OF 4 mm SHALL BE USED UNDER THE NUT IF THE HOLE DIAMETER IS 3 mm OR MORE LARGER THAN THE BOLT DIAMETER.

9. BOLTS PROPERTY CLASS 8.8 AND HIGHER SHALL NOT BE BENT, WELDED, TACK WELDED, OR DAMAGED WITH DIRECT HEAT OR HOT METAL.

10. WASHERS SHALL BE USED UNDER BOLT HEADS AND NUTS.

11. ALL POST-INSTALLED BOLTS SHALL BE INSTALLED USING EPCON C6 EPOXY IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS UNLESS NOTED OTHERWISE.

12. HOLD DOWN BOLTS AND CAST-IN ITEMS SHALL BE SET ACCURATELY USING TEMPLATE FOR POSITIONING.

13. ALL WELDS EXCEPT WELDS IN MEMBERS UNDER SEISMIC LOADING SHALL BE GENERAL PURPOSE CATEGORY (GP) WITH E41XX ELECTRODES, UNLESS SHOWN OR NOTED OTHERWISE ON THE DRAWINGS.

14. ALL WELDS IN MEMBERS UNDER SEISMIC LOADING SHALL BE STRUCTURAL PURPOSE CATEGORY (SP).

15. WELDS SHALL BE CONTINUOUS SINGLE BEVEL, BUTT OR 5 mm CONTINUOUS FILLET WELDS (6 mm FOR MANUAL WELDS) AS APPROPRIATE, UNLESS NOTED OTHERWISE.

16. BASEPLATES SHALL BEAR DIRECTLY ON 10 mm THICK NON-SHRINK GROUT UNLESS NOTED OR DETAILED OTHERWISE.

17. HOLLOW SECTION MEMBERS SHALL BE CAPPED AND ALL JOINTS SEALED.

18. ALLOWANCES SHALL BE MADE FOR TOLERANCE, VENT HOLES ETC FOR HOT DIP GALVANISED ITEMS. VENT HOLES SHALL BE SEALED AFTER GALVANISING.

19. UNLESS OTHERWISE SPECIFIED, ALL STEELWORK INSTALLED IN INTERNAL NON-ATMOSPHERIC ENVIRONMENT SHALL BE PROTECTED WITH ALK3 PAINT COATING SYSTEM IN ACCORDANCE WITH AS/NZS 2312.1:2014 AND THE PAINT SYSTEM MANUFACTURERS RECOMMENDATIONS.

20. UNLESS OTHERWISE SPECIFIED, ALL STEELWORK EXPOSED TO EXTERNAL MOISTURE SHALL BE PROTECTED WITH PUR5 PAINT COATING SYSTEM IN ACCORDANCE WITH AS/NZS 2312.1:2014 AND THE PAINT SYSTEM MANUFACTURERS RECOMMENDATIONS.

21. PREPARATION OF THE STEEL SURFACE FOR PAINTING SHALL BE IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS. DO NOT PAINT STEELWORK TO BE ENCASED IN CONCRETE OR SURFACES FORMING PART OF A TENSIONED BOLTED CONNECTION.

REINFORCED CONCRETE

1. MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH NZS 3109.

2. ALL STRUCTURAL CONCRETE SHALL BE AT LEAST 25 MPa COMPRESSIVE STRENGTH AT 28 DAYS, UNLESS SHOWN OTHERWISE ON THE DRAWINGS.

3. REINFORCEMENT SHALL BE NEW ZEALAND MANUFACTURED TO AS/NZS 4671. ALL REINFORCEMENT SHALL BE DUCTILE CLASS E.

4. ALL GRADE 500 BARS SHALL NOT BE BENT OR STRAIGHTENED ON SITE UNLESS APPROVED AND INSTRUCTED BY ENGINEER.

5. GRADE 300 BARS MAY BE STRAIGHTENED ON SITE BUT SHALL NOT BE RE-BENT UNLESS APPROVED AND INSTRUCTED BY ENGINEER.

6. GRADE 500E QT BARS SHALL NOT BE THREADED OR WELDED.

7. SPLICES IN REINFORCEMENT SHALL BE MADE IN THE POSITION SHOWN ON THE DRAWINGS, OR AS OTHERWISE APPROVED BY THE ENGINEER. UNSPECIFIED BAR LAPS SHALL BE DONE IN A STAGGERED PATTERN.

8. NO HOLES, CHASES OR EMBEDMENT OF PIPES OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT AN APPROVAL OF THE ENGINEER.

9. WHERE CRANKED BARS ARE SHOWN, THE SLOPE SHALL NOT BE GREATER THAN 1 TO 12, UNLESS SHOWN OTHERWISE ON STRUCTURAL DRAWINGS.

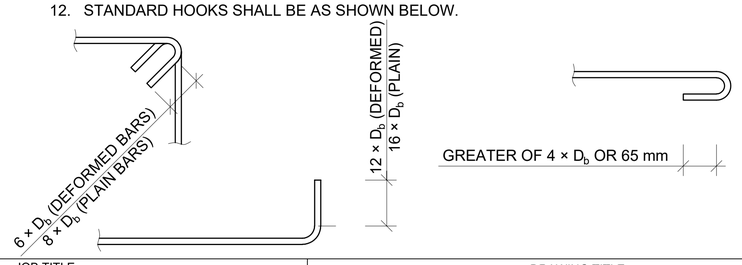
10. MINIMUM DIAMETERS OF BEND FOR REINFORCING STEEL SHALL BE IN ACCORDANCE WITH THE TABLE BELOW. THE DIAMETER OF BEND SHALL BE MEASURED TO THE INSIDE OF THE BAR.

TYPE OF BAR	BAR DIAMETER, D_b (mm)	MINIMUM DIAMETER OF BEND, D_i (mm)
MAIN BARS	6 - 20	$5 \times D_b$
	24 - 40	$6 \times D_b$
STIRRUP OR TIE	6 - 20	$2 \times D_b$ (PLAIN BAR)
		$4 \times D_b$ (DEFORMED BAR)
	24 - 40	$3 \times D_b$ (PLAIN BAR)
		$6 \times D_b$ (DEFORMED BAR)

11. MINIMUM LAP LENGTHS OF REINFORCING BARS IN 25 MPa CONCRETE SHALL BE AS SHOWN IN THE TABLE BELOW, UNLESS SHOWN OTHERWISE ON STRUCTURAL DRAWINGS.

BAR DIAMETER, mm	LAP LENGTH, mm	
	GRADE 500 (H OR RB)	GRADE 300 (D)
10	650	400
12	800	500
16	1050	650
20	1300	800
25	1650	1000
32	2100	1250

12. STANDARD HOOKS SHALL BE AS SHOWN BELOW.



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REVISION HISTORY

JOB TITLE:
SEISMIC STRENGTHENING
3-15 ELMDALE LANE, CHRISTCHURCH

DRAWING TITLE:
GENERAL NOTES

DRAWING ISSUE:

DATE:	19 APRIL 2021	SCALE:	N/A @ A1
DRAWN BY:	DENIS CHERNYSHOV	SHEET No	0.01
CHECKED BY:	PAUL MILKIN		
APPROVED BY:		REVISION:	

ADDRESS:	3 ELMDALE LANE, LINWOOD, CHRISTCHURCH
LEGAL DESCRIPTION:	LOT 2 DP 46567, UNIT A DP 46906 HAVING SHARE IN 1525 m²
ADDRESS:	5 ELMDALE LANE, LINWOOD, CHRISTCHURCH
LEGAL DESCRIPTION:	LOT 2 DP 46567, UNIT B DP 46906 HAVING SHARE IN 1525 m²
ADDRESS:	7 ELMDALE LANE, LINWOOD, CHRISTCHURCH
LEGAL DESCRIPTION:	LOT 2 DP 46567, UNIT C DP 46906 HAVING SHARE IN 1525 m²
ADDRESS:	9 ELMDALE LANE, LINWOOD, CHRISTCHURCH
LEGAL DESCRIPTION:	LOT 2 DP 46567, UNIT D DP 46906 HAVING SHARE IN 1525 m²
ADDRESS:	11 ELMDALE LANE, LINWOOD, CHRISTCHURCH
LEGAL DESCRIPTION:	LOT 2 DP 46567, UNIT E DP 46906 HAVING SHARE IN 1525 m²
ADDRESS:	15 ELMDALE LANE, LINWOOD, CHRISTCHURCH
LEGAL DESCRIPTION:	LOT 2 DP 46567, UNIT F DP 46906 HAVING SHARE IN 1525 m²

SITE PLAN
SCALE 1:200

LOCALITY PLAN
SCALE 1:1000

SEDIMENT AND EROSION CONTROL NOTES

1. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE INSTALLED PRIOR TO COMMENCEMENT OF MAJOR EARTHWORKS.
2. PLACE SEDIMENT CONTROL MEASURES AROUND EXISTING STORMWATER SUMP INLETS TO KEEP SEDIMENT OUT OF THE PUBLIC STORMWATER NETWORK AND RECEIVING ENVIRONMENT.
3. EXCAVATION FACES TO BE COVERED WITH POLYTHENE SHEETING AT THE ONSET OF HEAVY RAIN.
4. TRUCK AND MIXERS WASHING, TOOL AND PAINT WASHING, BRICK, TILE, CONCRETE OR MASONRY CUTTING AND WATER-COOLED CUTTING SHOULD BE DONE WITHIN SITE BOUNDARIES, ON THE PERMEABLE SURFACE (UNDISTURBED VEGETATION), AND ALL PRODUCED WASTE WATER SHOULD BE TRAPPED ON-SITE.
5. ALL LITTER AND BUILDING WASTE SHOULD BE KEPT IN SUITABLE CONTAINERS TO PREVENT ITS LOSS CAUSED BY EITHER WIND OR WATER.
6. ACCIDENTAL SPILLS OF SOIL OR OTHER BUILDING MATERIALS ON ROAD, KERB AND CHANNEL SHOULD BE REMOVED AT THE END OF THE WORKING DAY, OR IMMEDIATELY IF IT IS RAINING OR LIKELY TO RAIN DURING THE DAY.
7. ALL EROSION AND SEDIMENT CONTROL STRUCTURES TO BE INSPECTED EACH WORKING DAY AND MAINTAINED IN GOOD WORKING ORDER.

SITE HAZARD SIGNS TO BE PLACED AT GATE NOTING EXPECTED HAZARDS, SITE LOG REQUIREMENTS AND SAFETY EQUIPMENT

SITE TO BE FENCED WITH MIN 2.0 m HIGH SAFETY FENCES WITH PAD LOCKED GATE TO PREVENT UNAUTHORISED ACCESS DURING CONSTRUCTION.

SAFETY FENCES TO BE CONSTRUCTED WITH GALVANISED CHAINLINK NETTING HAVING A MAXIMUM SIZED GRID OF 50 mm × 50 mm.
SPACING OF POSTS SHALL BE A MAXIMUM OF 2.5 m.
GAP BETWEEN THE BOTTOM OF THE FENCE AND GROUND SHALL BE MAX 100 mm.

DRAWING ISSUE:

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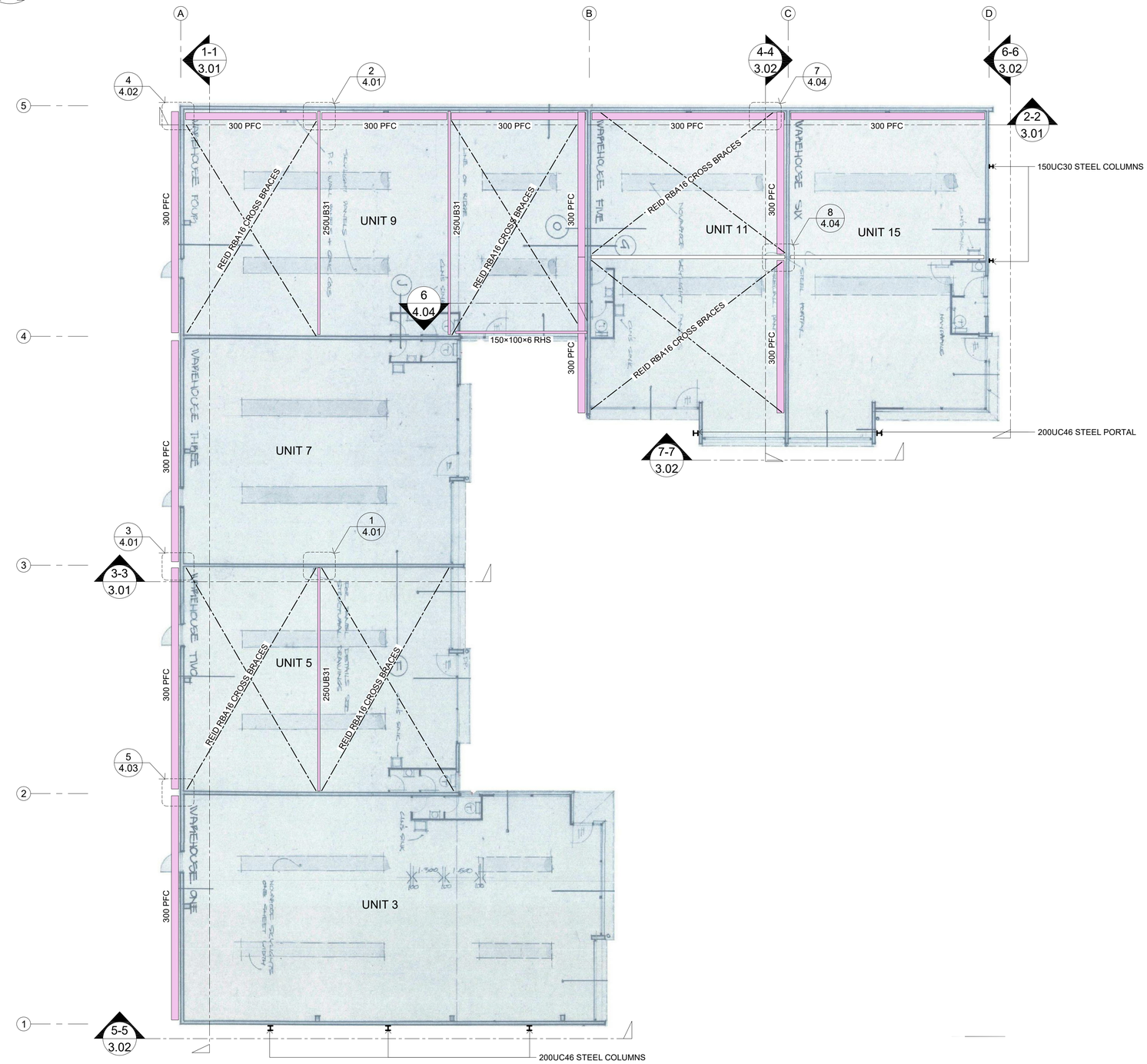
REVISION HISTORY

JOB TITLE:
SEISMIC STRENGTHENING
3-15 ELMDALE LANE, CHRISTCHURCH

DRAWING TITLE:
SITE PLAN, LOCALITY PLAN

DATE:	19 APRIL 2021	SCALE:	1:200 @ A1
DRAWN BY:	DENIS CHERNYSHOV	SHEET No	1.01
CHECKED BY:	PAUL MILKIN		
APPROVED BY:		REVISION:	



SCOPE OF SEISMIC STRENGTHENING TO 67% NBS:

- NEW STEEL WALER BEAMS
- NEW ROOF BRACES AND ROOF BEAMS
- NEW STEEL COLUMNS AND ASSOCIATED POST HOLE FOUNDATIONS

DRAWING ISSUE:

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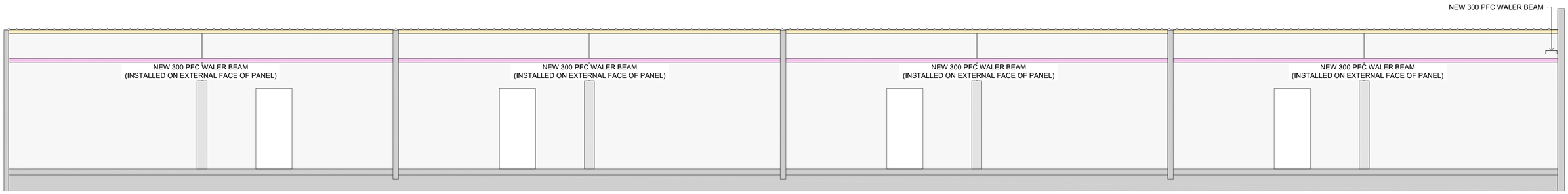
REVISION HISTORY

JOB TITLE:
SEISMIC STRENGTHENING
3-15 ELMDALE LANE, CHRISTCHURCH

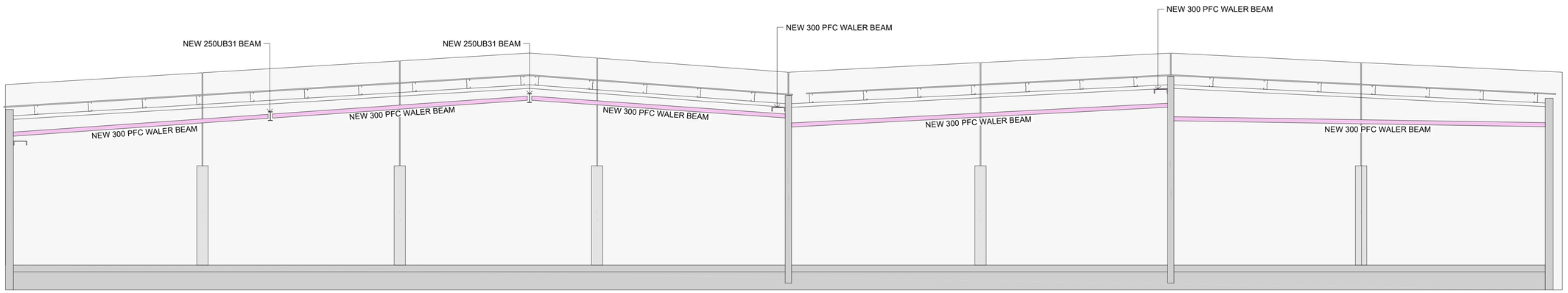
DRAWING TITLE:
PROPOSED STRENGTHENING PLAN
AT ROOF LEVEL

DATE:	19 APRIL 2021
DRAWN BY:	DENIS CHERNYSHOV
CHECKED BY:	PAUL MILKIN
APPROVED BY:	

SCALE:	1:100 @ A1
SHEET No	2.01
REVISION:	



CROSS-SECTION 1-1



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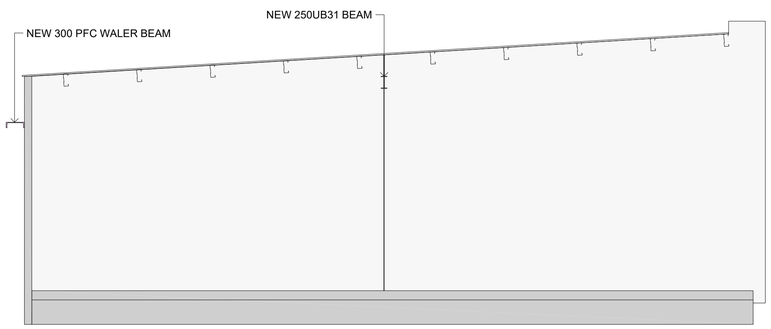

CROSS-SECTION 3-3

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REVISION HISTORY

JOB TITLE:
SEISMIC STRENGTHENING
3-15 ELMDALE LANE, CHRISTCHURCH

DRAWING TITLE:
CROSS-SECTIONS

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DATE:	19 APRIL 2021	SCALE:	1:50 @ A1
DRAWN BY:	DENIS CHERNYSHOV	SHEET No	3.01
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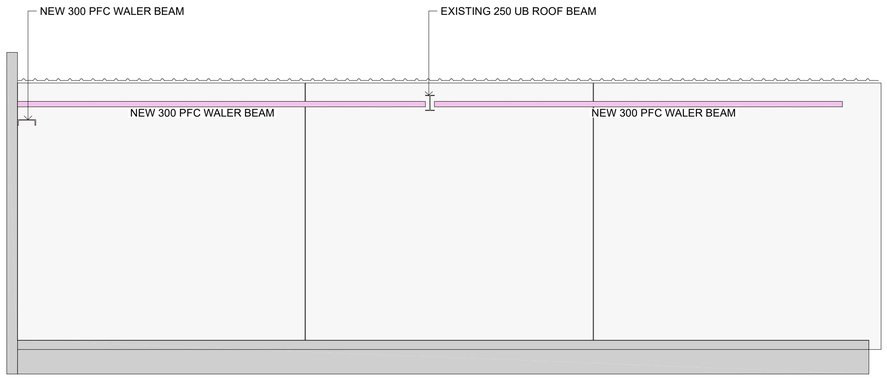

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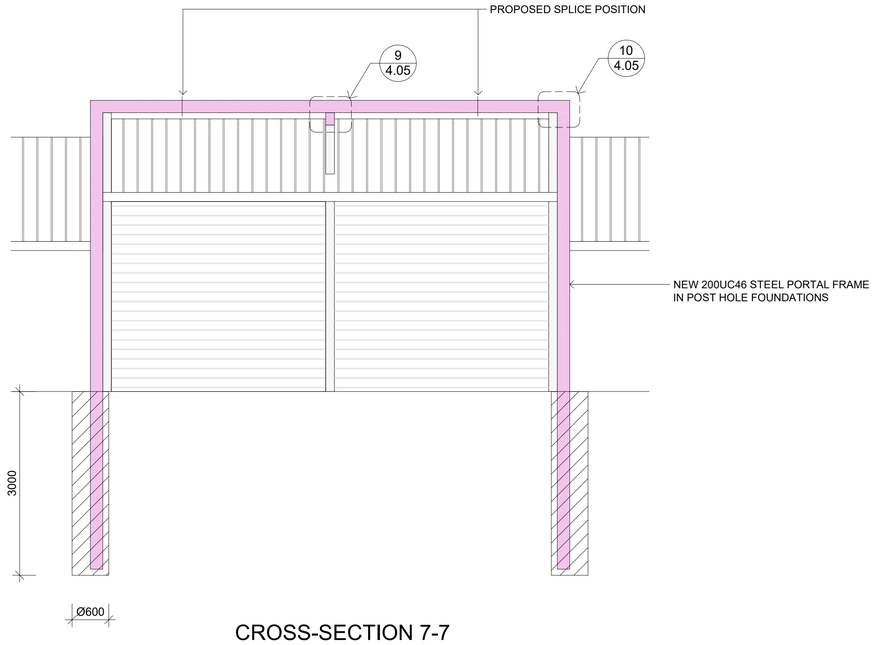
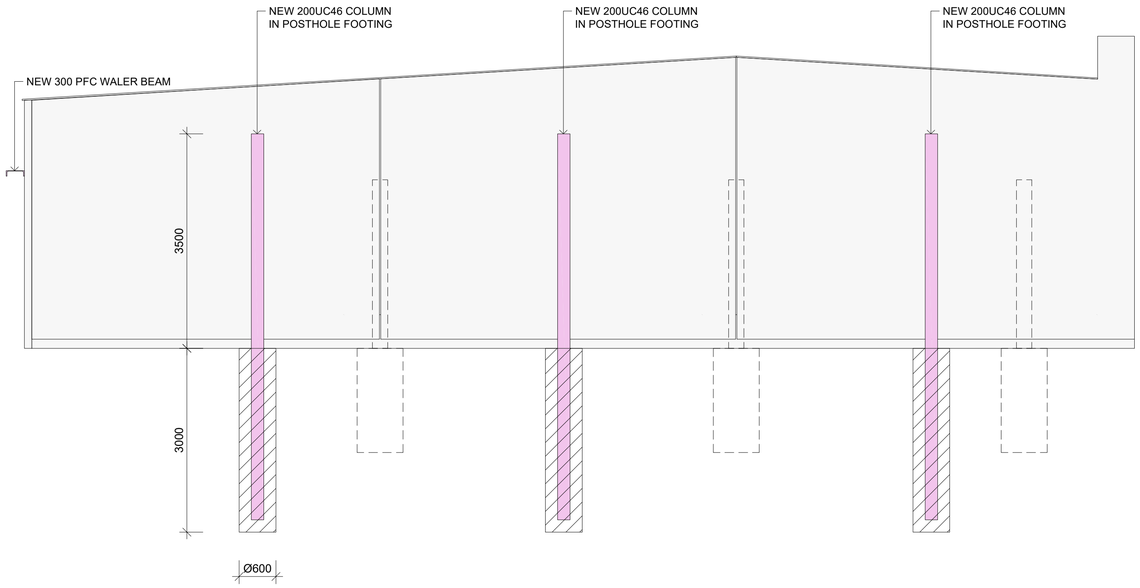


CROSS-SECTION 7-7



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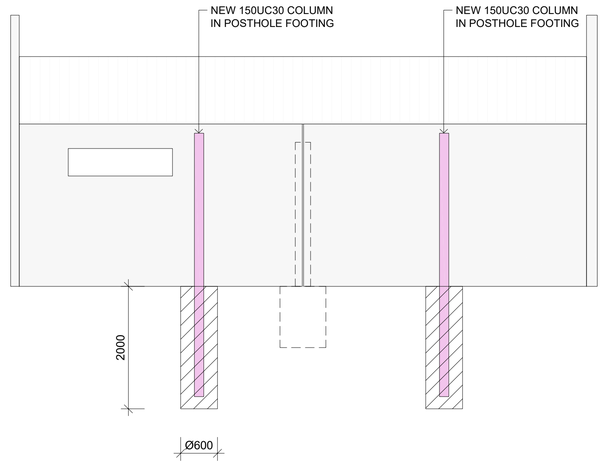

CROSS-SECTION 6-6

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REVISION HISTORY

JOB TITLE:
SEISMIC STRENGTHENING
3-15 ELMDALE LANE, CHRISTCHURCH

DRAWING TITLE:
CROSS-SECTIONS

DRAWING ISSUE:

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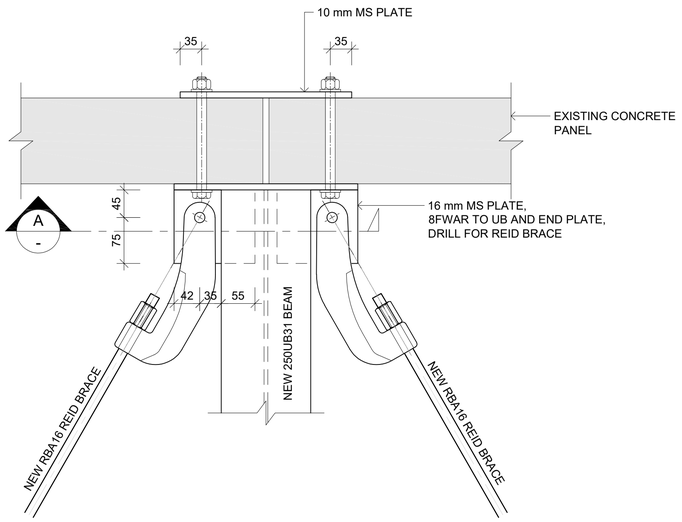
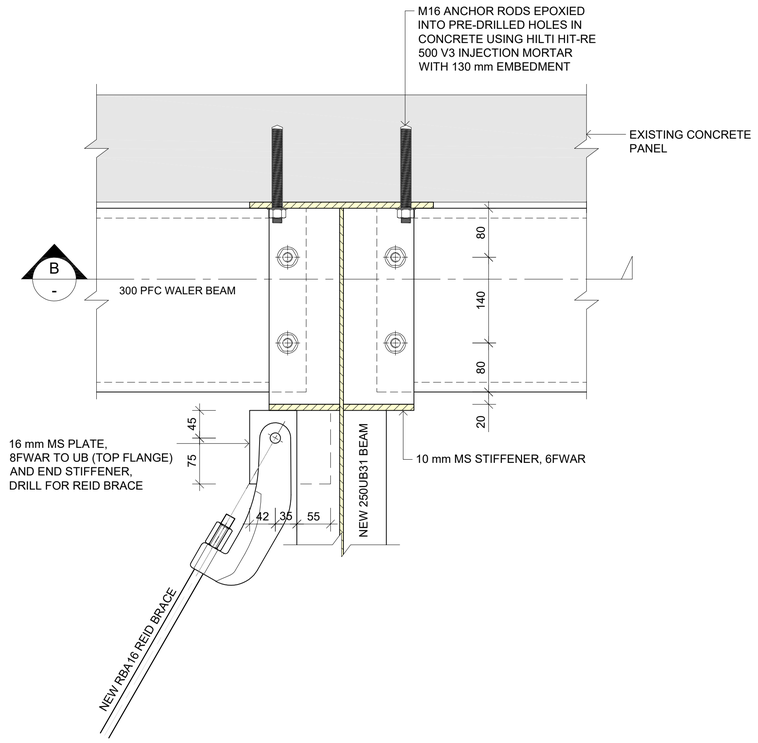


1 / 2.01 UB TO CONCRETE PANEL FIXING DETAIL

SCALE 1:5



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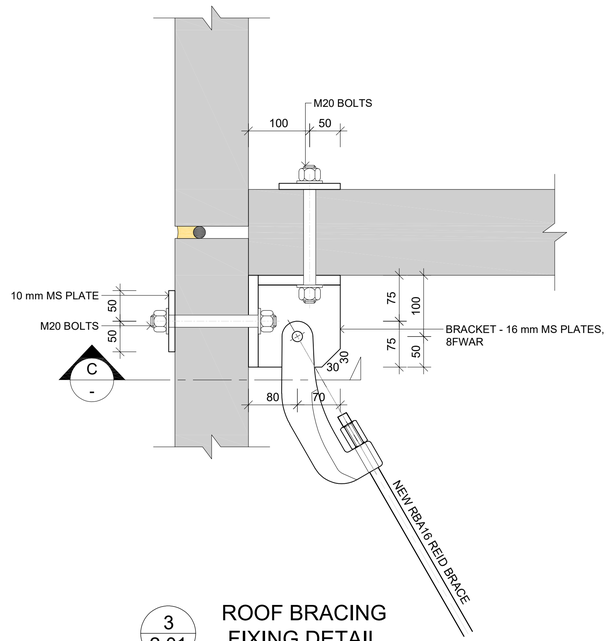
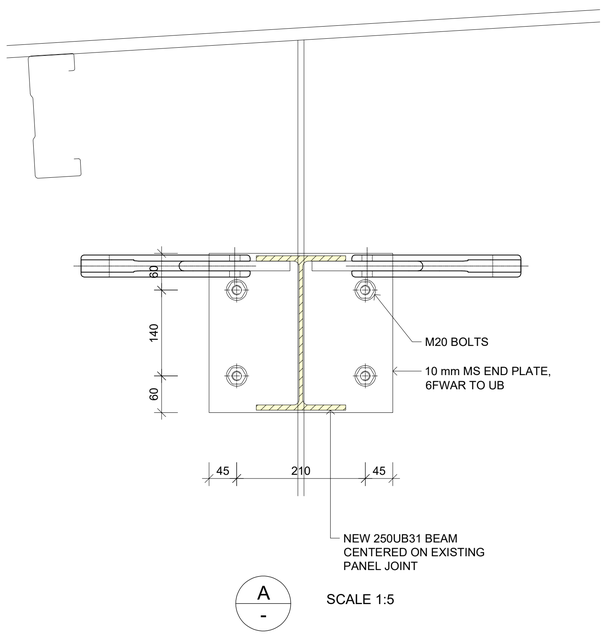


3 / 2.01 ROOF BRACING FIXING DETAIL

SCALE 1:5



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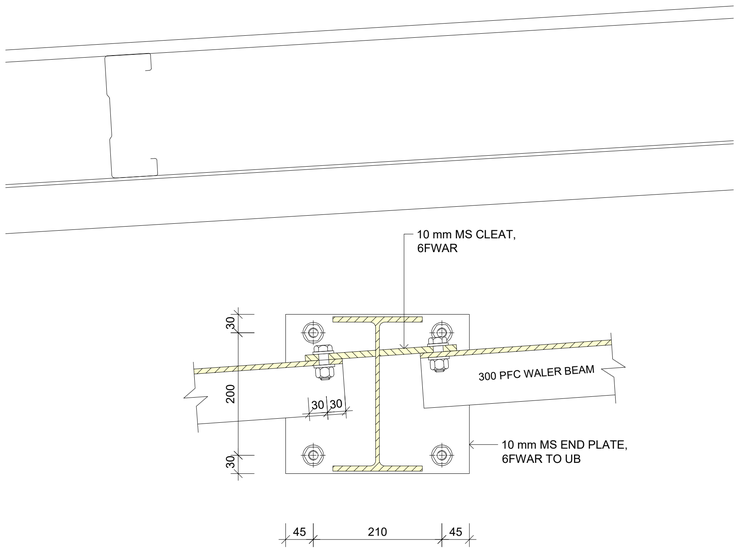

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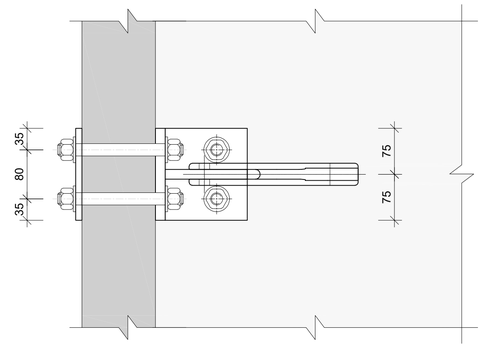

C / - SCALE 1:5

CONTRACTOR TO VERIFY ALL DIMENSIONS ON SITE PRIOR TO ORDERING STEELWORK.

ALL BOLTS TO BE PROPERTY CLASS 8.8

ALL STEELWORK (INCLUDED FIXINGS) EXPOSED TO EXTERNAL MOISTURE TO BE PROTECTED WITH PUR5 EXTERNAL COATING SYSTEM - INTERSPEC BY AKZONOBEL (REFER TO AKZONOBEL SPECIFICATIONS).

SURFACE PREPARATION SHALL BE DONE AS PER MANUFACTURER'S SPECIFICATIONS.

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REVISION HISTORY

JOB TITLE:
SEISMIC STRENGTHENING
3-15 ELMDALE LANE, CHRISTCHURCH

DRAWING TITLE:
DETAILS

DRAWING ISSUE:

DATE:	19 APRIL 2021	SCALE:	1:5 @ A1
DRAWN BY:	DENIS CHERNYSHOV	SHEET No	4.01
CHECKED BY:	PAUL MILKIN		
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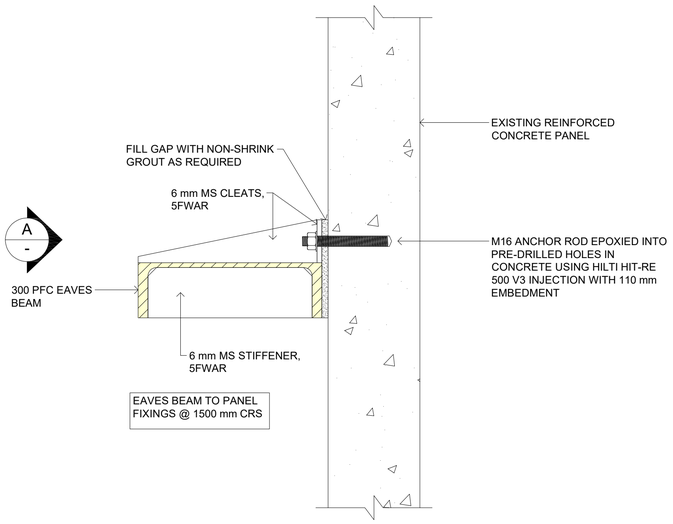
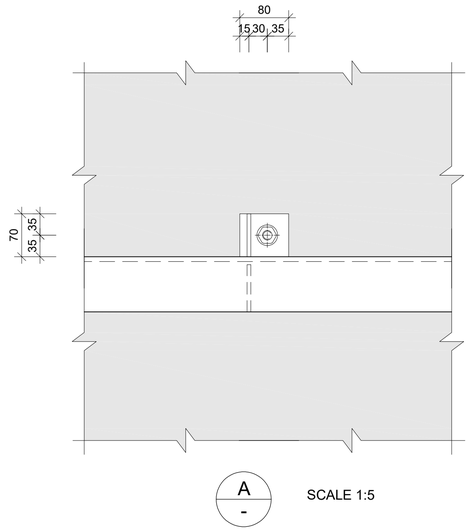
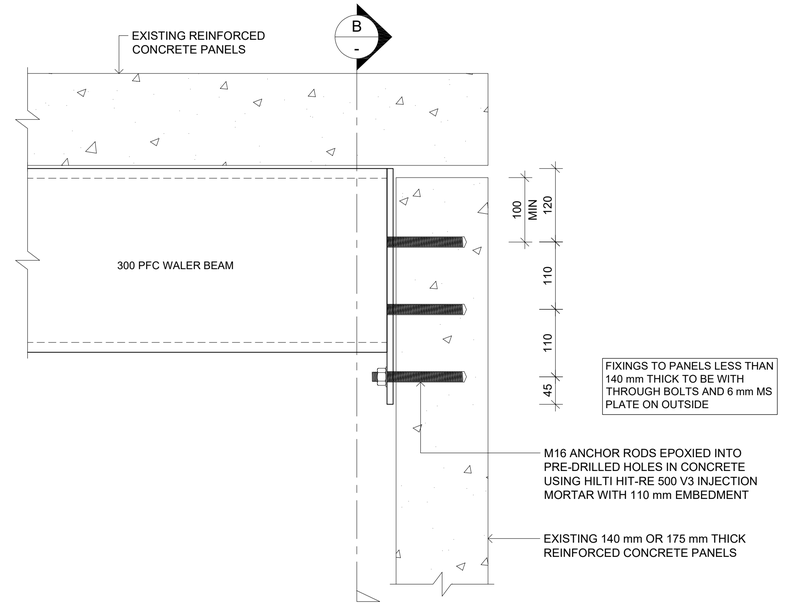


WALER BEAM TO PANEL INTERMEDIATE CONNECTIONS (ELEVATION - GRID LINES 5, B, C)

SCALE 1:5

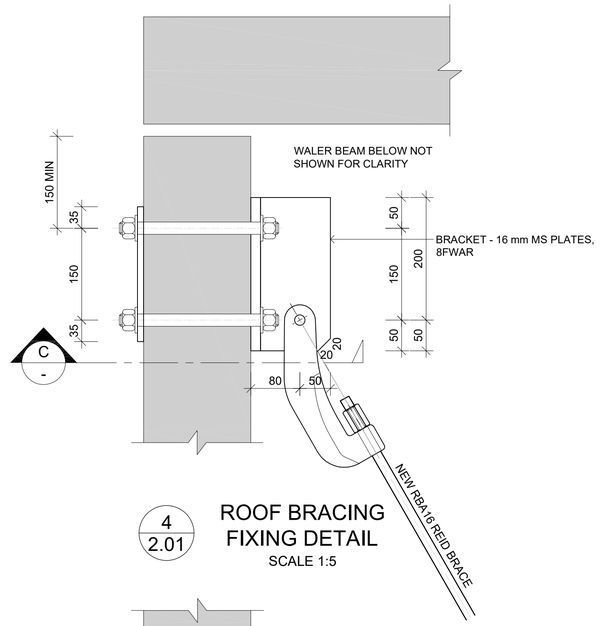


SCALE 1:5



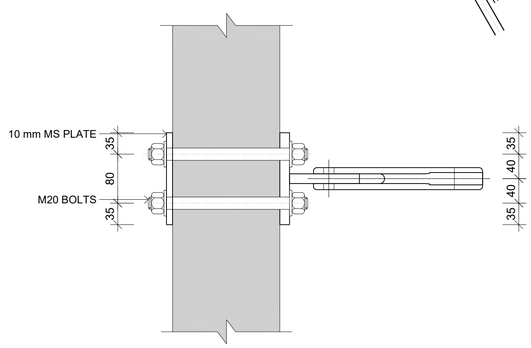
WALER BEAM END CONNECTION DETAIL (PLAN INTERNAL BEAMS)

SCALE 1:5

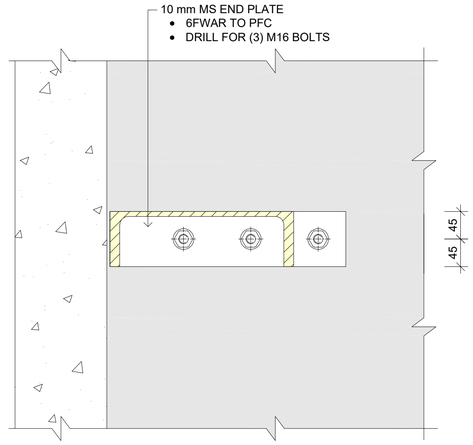


4 / 2.01 ROOF BRACING FIXING DETAIL

SCALE 1:5



C / - SCALE 1:5



B / - SCALE 1:5

CONTRACTOR TO VERIFY ALL DIMENSIONS ON SITE PRIOR TO ORDERING STEELWORK.

ALL BOLTS TO BE PROPERTY CLASS 8.8

ALL STEELWORK (INCLUDED FIXINGS) EXPOSED TO EXTERNAL MOISTURE TO BE PROTECTED WITH PUR5 EXTERNAL COATING SYSTEM - INTERSPEC BY AKZONOBEL (REFER TO AKZONOBEL SPECIFICATIONS).

SURFACE PREPARATION SHALL BE DONE AS PER MANUFACTURER'S SPECIFICATIONS.

DRAWING ISSUE:

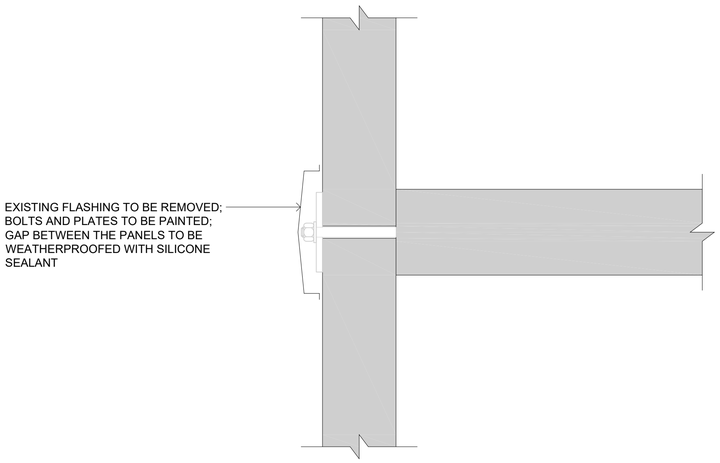
SMC DESIGN STUDIO
ENGINEERS & ARCHITECTURE
7/77 Gloucester Street, Christchurch p. 03 377 7898
info@smcdesign.co.nz
www.smcdesign.co.nz

REVISION HISTORY

JOB TITLE: SEISMIC STRENGTHENING 3-15 ELMDALE LANE, CHRISTCHURCH

DRAWING TITLE: DETAILS

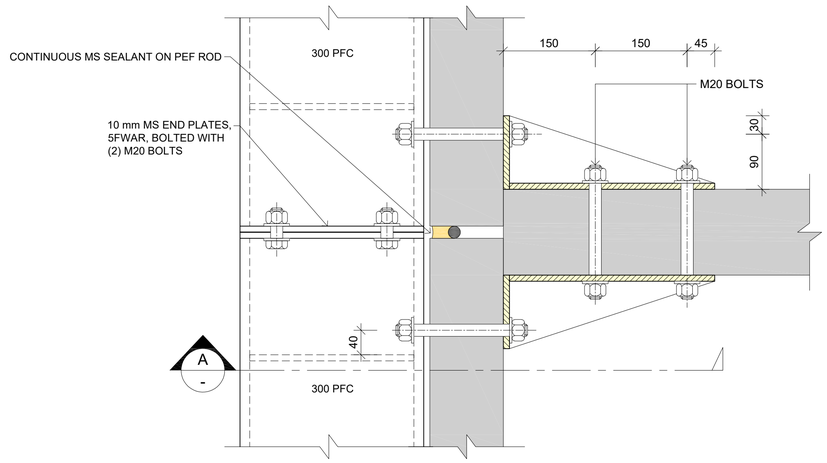
DATE:	19 APRIL 2021	SCALE:	1:5 @ A1
DRAWN BY:	DENIS CHERNYSHOV	SHEET No	4.02
CHECKED BY:	PAUL MILKIN		
APPROVED BY:		REVISION:	



5 / 2.01

EXISTING PANEL CONNECTION DETAIL (GRID LINE A)

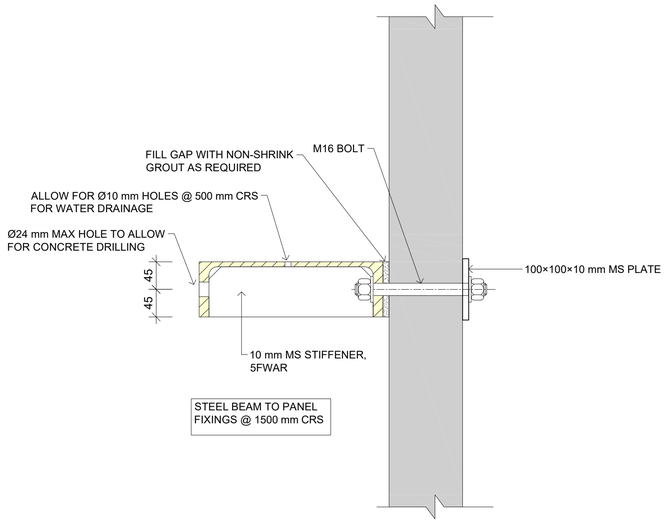
SCALE 1:5



5 / 2.01

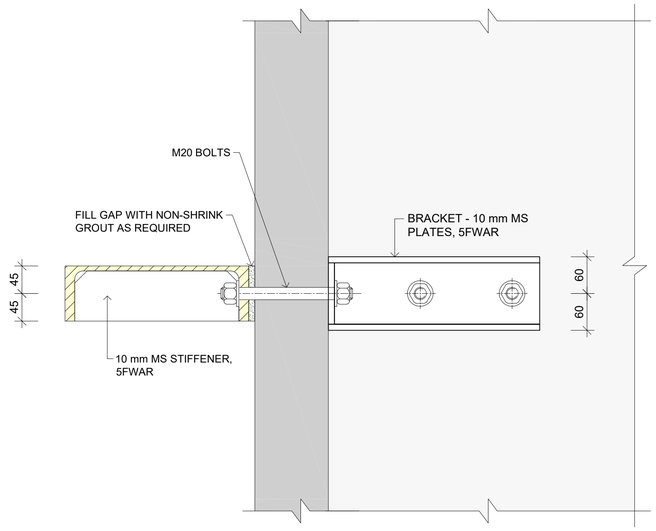
PROPOSED PANEL CONNECTION DETAIL (PLAN - GRID LINE A)

SCALE 1:5



WALER BEAM TO PANEL INTERMEDIATE CONNECTIONS (ELEVATION - GRID LINE A)

SCALE 1:5



A / -

SCALE 1:5

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REVISION HISTORY

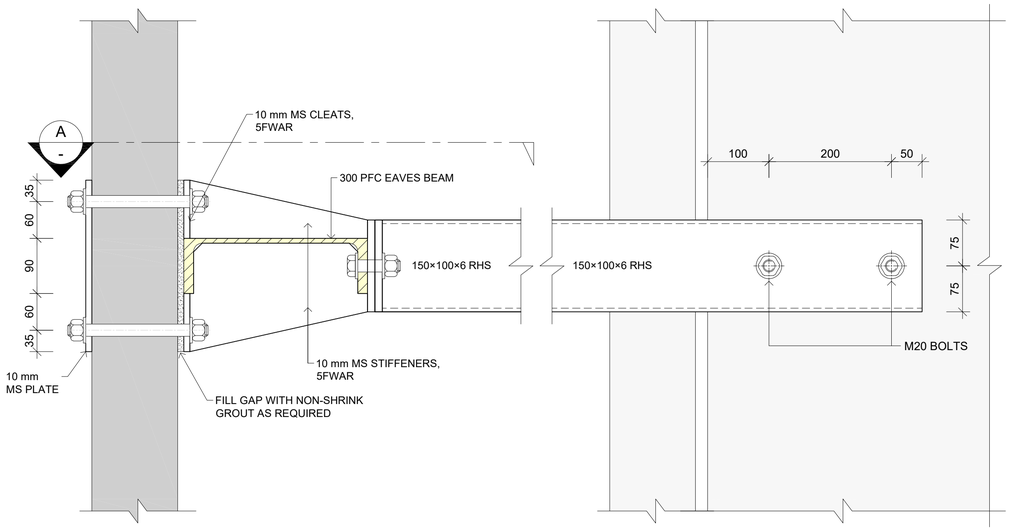
JOB TITLE:

SEISMIC STRENGTHENING
3-15 ELMDALE LANE, CHRISTCHURCH

DRAWING TITLE:

DETAILS

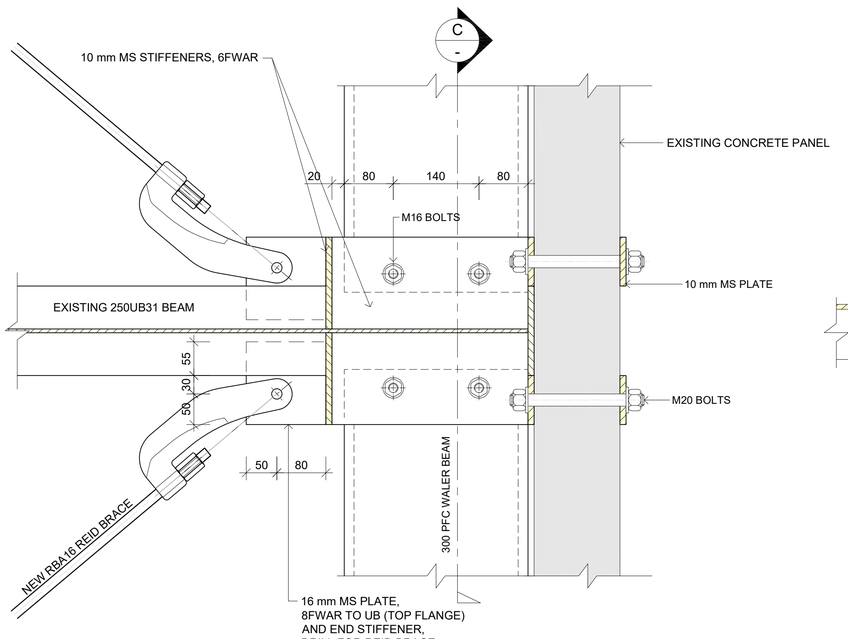
DATE:	19 APRIL 2021	SCALE:	1:5 @ A1
DRAWN BY:	DENIS CHERNYSHOV	SHEET No	4.03
CHECKED BY:	PAUL MILKIN		
APPROVED BY:		REVISION:	

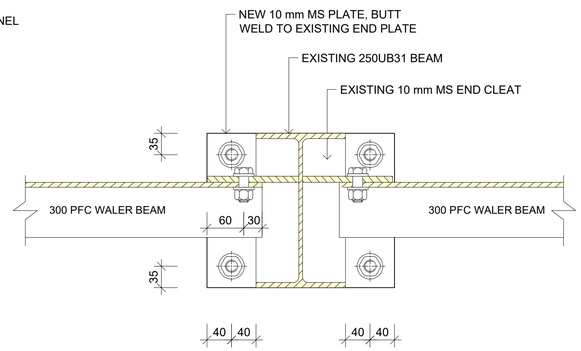


6
2.01

RHS STRUT FIXING DETAIL

SCALE 1:5





C
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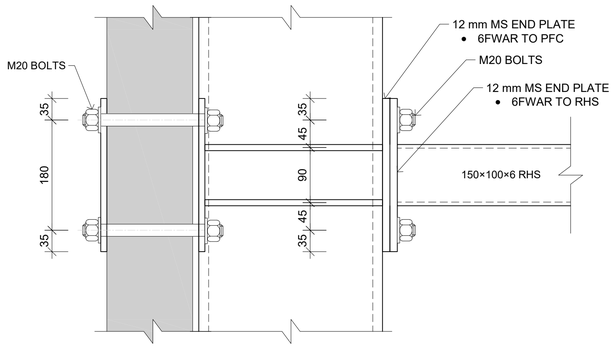
SCALE 1:5



A
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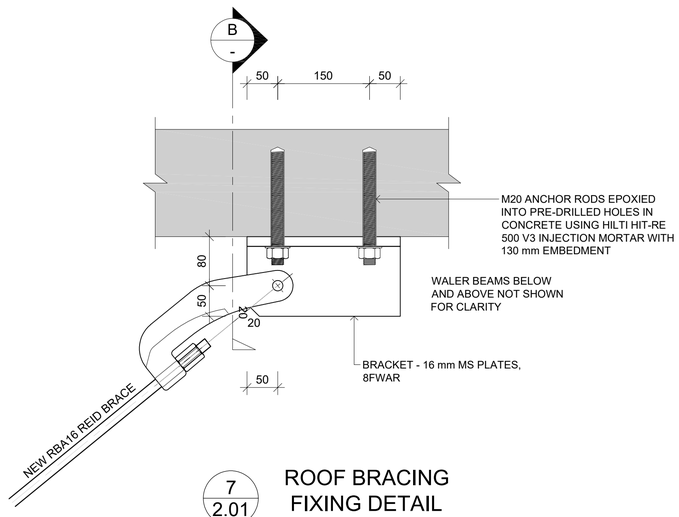
SCALE 1:5

8
2.01

UB TO CONCRETE PANEL FIXING DETAIL

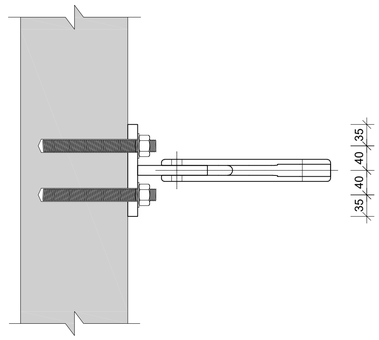
SCALE 1:5



7
2.01

ROOF BRACING FIXING DETAIL

SCALE 1:5



B
-

SCALE 1:5

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REVISION HISTORY

JOB TITLE:

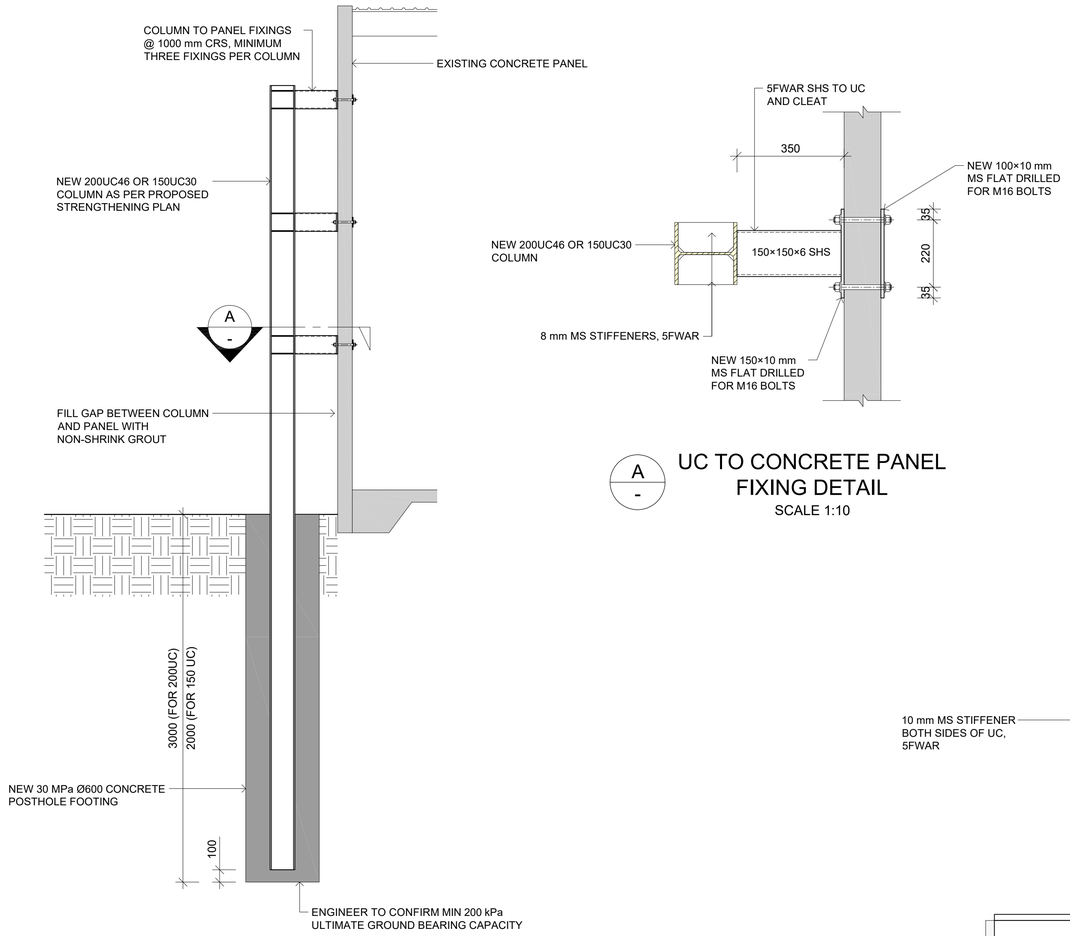
SEISMIC STRENGTHENING
3-15 ELMDALE LANE, CHRISTCHURCH

DRAWING TITLE:

DETAILS

DATE: 19 APRIL 2021
DRAWN BY: DENIS CHERNYSHOV
CHECKED BY: PAUL MILKIN
APPROVED BY:

SCALE: 1:5 @ A1
SHEET No 4.04
REVISION:



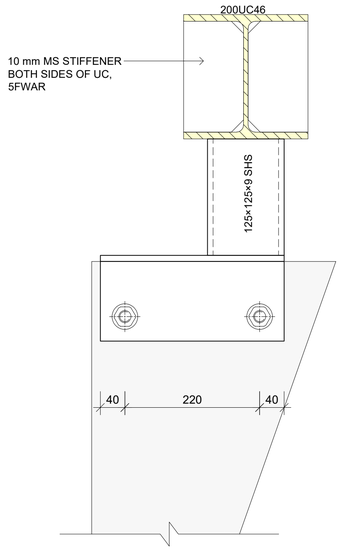
TYPICAL STEEL COLUMN

SCALE 1:25

A
-

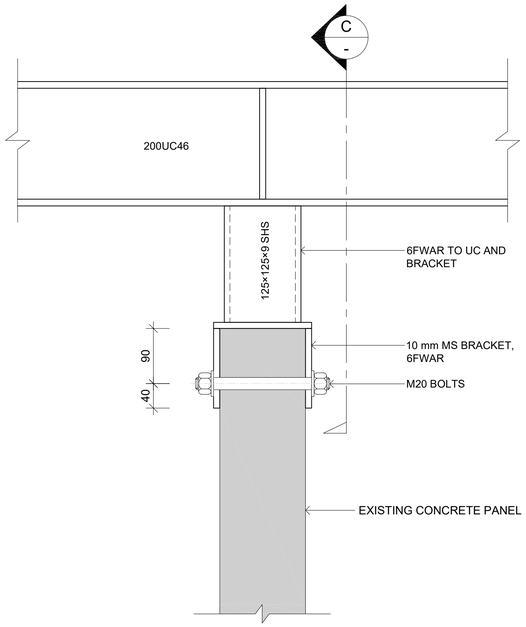
UC TO CONCRETE PANEL
FIXING DETAIL

SCALE 1:10



B
-

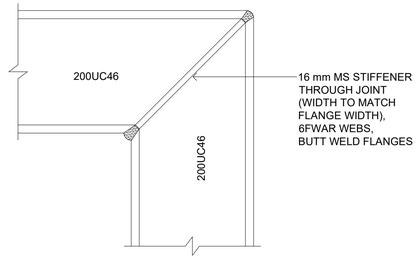
SCALE 1:5



9
3.02

PORTAL TO PANEL
FIXING DETAIL

SCALE 1:5



10
3.02

UC KNEE JOINT DETAIL

SCALE 1:5

CONTRACTOR TO VERIFY ALL DIMENSIONS ON SITE PRIOR TO ORDERING STEELWORK.

ALL BOLTS TO BE PROPERTY CLASS 8.8

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REVISION HISTORY

JOB TITLE:

SEISMIC STRENGTHENING
3-15 ELMDALE LANE, CHRISTCHURCH

DRAWING TITLE:

DETAILS

DATE:	19 APRIL 2021	SCALE:	1:5, 1:10, 1:20 @ A1
DRAWN BY:	DENIS CHERNYSHOV	SHEET No	4.05
CHECKED BY:	PAUL MILKIN		
APPROVED BY:		REVISION:	

Engineering Assessment Summary Report Template

Version 1.1 – 14 August 2017

Overview

The following table provides a template for an *Assessment Summary Report* for seismic assessments undertaken using *The Technical Guidelines for Engineering Assessments* – as referred to in Section A8.5 of the Guidelines.

For engineering assessments being undertaken for potentially earthquake-prone buildings, this summary template meets the requirements of Section 2.5 of the EPB methodology. For engineering assessments being undertaken for other purposes, it is strongly recommended this summary template is used.

This template, which can be downloaded from www.EQ-Assess.org.nz , contains a summary of the following information:

1. **Building information**
   - Address etc., No. of storeys, year of design, structural system, previous retrofit
2. **Assessment information**
   - Person responsible for the assessment, when inspected, what information reviewed, geotech info, previous reports referred to
3. **Summary of engineering methodology and key parameters**
   - Assessment methodology used, and how these Guidelines were applied
4. **Assessment outcomes**
   - *%NBS* rating, seismic grade and qualitative risk classification, governing Critical Structural Weakness; mode of failure and physical consequence statement

This template may be used for both Initial Seismic Assessments (ISA) and Detailed Seismic Assessments (DSA) using Part B or Part C of the Guidelines respectively.

Additional comments may be added if required.

Version 1.1 involves a minor update to footnote 1 to Section 2, plus formatting adjustments in Section 4.

1. Building Information	
Building Name/ Description	The subject building is a single storey multi-unit precast concrete panel building. The building approximate plan dimensions are 34.6 m × 39.0 m.
Street Address	3-15 Elmdale Lane, Linwood, Christchurch
Territorial Authority	CCC
No. of Storeys	1
Area of Typical Floor (approx.)	810 m² (approx., all units)
Year of Design (approx.)	1983
NZ Standards designed to	NZS 4203:1976
Structural System including Foundations	The lightweight roof comprises longrun steel roofing sheets on steel channel purlins supported on concrete panels and, in some units, on steel roof beams. The lateral force resisting system of the building consists of a combination of reinforced concrete panels and cantilevered reinforced concrete columns. The concrete panels are supported on foundation pads at each end. The cantilevered reinforced concrete columns are supported on concrete post holes.
Does the building comprise a shared structural form or shares structural elements with any other adjacent titles?	The building comprises six units. The units have shared intertenancy precast concrete panels.
Key features of ground profile and identified geohazards	No geotechnical investigation has been carried out as a part of this assessment. The site is level. Christchurch liquefaction maps indicate that minor level of damage is expected due to liquefaction during future seismic events.
Previous strengthening and/ or significant alteration	No information about previous strengthening of the units is available. Several panels to panel fixings were installed after the earthquakes as an immediate repair measure
Heritage Issues/ Status	N/A
Other Relevant Information	

2. Assessment Information	
Consulting Practice	SMC Design Studio Ltd
CPEng Responsible, including: • Name • CPEng number • A statement of suitable skills and experience in the seismic assessment of existing buildings[1]	Denis Chernyshov Structural engineer, CPEng 1025549, CMEngNZ, 8 years of relevant experience – seismic assessments of commercial buildings.
Documentation reviewed, including: • date/ version of drawings/ calculations[2] • previous seismic assessments	The original design drawings of the units designed in 1983 by Jon Aldridge (Architect) and Holmes, Wood, Poole & Johnstone (Structural Engineer). No information regarding previous assessments of the units is available.
Geotechnical Report(s)	No geotechnical investigation has been carried out as a part of this assessment. The site is level. Christchurch liquefaction maps indicate that minor level of damage is expected due to liquefaction during future seismic events.
Date(s) Building Inspected and extent of inspection	15/06/2020, visual inspection of the exterior and interior of the units.
Description of any structural testing undertaken and results summary	No structural testing was undertaken as a part of this assessment.
Previous Assessment Reports	No information is available regarding previous assessment reports of the units
Other Relevant Information	

[1] This should include reference to the engineer's Practice Field being in Structural Engineering, and commentary on experience in seismic assessment and recent relevant training
[2] Or justification of assumptions if no drawings were able to be obtained

3. Summary of Engineering Assessment Methodology and Key Parameters Used	
Occupancy Type(s) and Importance Level	Industrial warehouses and manufacture. Importance level 2
Site Subsoil Class	Class D assumed
For an ISA:	
Summary of how Part B was applied, including: • Key parameters such as μ, S_p and F factors • Any supplementary specific calculations	Adopted displacement ductility = 2 Structural performance factor = 0.7 F factors are taken = 0.7 in both directions to allow for limited supports at the top of precast concrete panels (typical for this type of construction)
For a DSA:	
Summary of how Part C was applied, including: • the analysis methodology(s) used from C2 • other sections of Part C applied	
Other Relevant Information	

4. Assessment Outcomes		
Assessment Status (Draft or Final)	Final	
Assessed *%NBS* Rating	IEP assessed as 40% NBS	
Seismic Grade and Relative Risk (from Table A3.1)	Grade C , medium risk	
For an ISA:		
Describe the Potential Critical Structural Weaknesses	Panel fixings is a potential CSW	
Does the result reflect the building's expected behaviour, or is more information/ analysis required?	Yes – the ISA is sufficient	
If the results of this ISA are being used for earthquake prone decision purposes, and elements rating <34*%NBS* have been identified:	**Engineering Statement of Structural Weaknesses and Location** N/A	***Mode of Failure and Physical Consequence* Statement(s)** N/A
For a DSA:		
Comment on the nature of Secondary Structural and Non-structural elements/ parts identified and assessed		
Describe the Governing Critical Structural Weakness		
If the results of this DSA are being used for earthquake prone decision purposes, and elements rating <34*%NBS* have been identified (including Parts)[3]:	**Engineering Statement of Structural Weaknesses and Location**	***Mode of Failure and Physical Consequence* Statement(s)**
Recommendations (*optional for EPB purposes*)		

[3] If a building comprises a shared structural form or shares structural elements with other adjacent titles, information about the extent to which the low scoring elements affect, or do not affect the structure.

Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA} Page 1

WARNING!! *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedure set out in the "The Seismic Assessment of Existing Buildings" Technical Guidelines for Engineering Assessments, July 2017. This spreadsheet must be read in conjunction with the limitations set out in the accompanying report, and should not be relied on by any party for any other purpose. Detailed inspections and engineering calculations, o r engineering judgements based on them, have not been undertaken, and these may lead to a different result or seismic grade.*

Street Number & Name:	**3-15 Elmdale Ln**	**Job No.:**	
AKA:		**By:**	**Denis Chernyshov**
Name of building:		**Date:**	**15/06/2020**
City:	**Christchurch**	**Revision No.:**	**1**

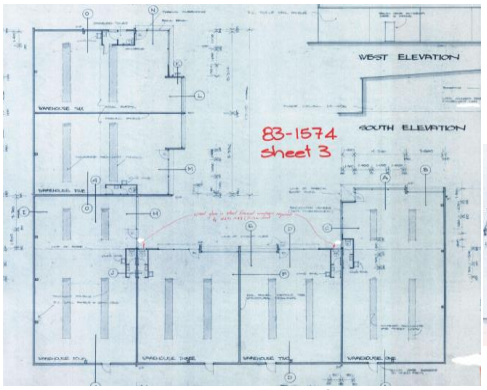
Table IEP-1 Initial Evaluation Procedure Step 1

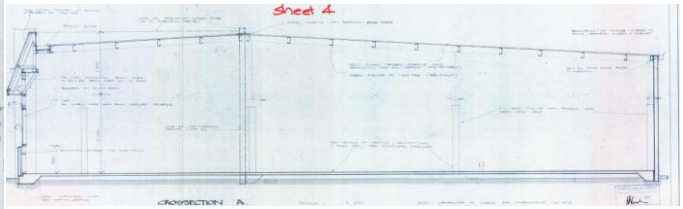
Step 1 - General Information

1.1 Photos (attach sufficient to describe building)

NOTE: THERE ARE MORE PHOTOS ON PAGE 1a ATTACHED

1.2 Sketches (plans etc, show items of interest)





NOTE: THERE ARE MORE SKETCHES ON PAGE 1a ATTACHED

1.3 List relevant features (Note: only 10 lines of text will print in this box. If further text required use Page 1a)

The subject building is a single storey multi-unit precast concrete panel building. The building approximate plan dimensions are 34.6 m × 39.0 m.
The building importance level 2 is assumed.
The building consists of six workshop units designed in 1983 by Jon Aldridge (Architect) and Holmes, Wood, Poole & Johnstone (Structural Engineer).
Architectural and structural drawings are available.

1.4 Note information sources Tick as appropriate

Visual Inspection of Exterior	☑	**Specifications**	☐
Visual Inspection of Interior	☑	**Geotechnical Reports**	☐
Drawings (note type)	☑	**Other (list)**	☐

Original architectural and structural drawings are available.

Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA}

Street Number & Name:	**3-15 Elmdale Ln**	**Job No.:**	
AKA:		**By:**	**Denis Chernyshov**
Name of building:		**Date:**	**15/06/2020**
City:	**Christchurch**	**Revision No.:**	**1**

Table IEP-2 Initial Evaluation Procedure Step 2

Step 2 - Determination of *(%NBS)* $_b$

(Baseline *(%NBS)* for particular building - refer Section B5)

2.1 Determine nominal *(%NBS)* = *(%NBS)* $_{nom}$

	Longitudinal	Transverse
a) Building Strengthening Data		
Tick if building is known to have been strengthened in this direction	☐	☐
If strengthened, enter percentage of code the building has been strengthened to	N/A	N/A
b) Year of Design/Strengthening, Building Type and Seismic Zone		
Pre 1935	○	○
1935-1965	○	○
1965-1976	○	○
1976-1984	◉	◉
1984-1992	○	○
1992-2004	○	○
2004-2011	○	○
Post Aug 2011	○	○
Building Type:	RC Building 1976-84	RC Building 1976-84
Seismic Zone:	Zone B	Zone B
c) Soil Type		
From NZS1170.5:2004, Cl 3.1.3 :	D Soft Soil	D Soft Soil
From NZS4203:1992, Cl 4.6.2.2 : (for 1992 to 2004 and only if known)	**Not applicable**	**Not applicable**
d) Estimate Period, *T*		
Comment:		
h_n =	25	25 m
A_c =	1.81	1.59 m^2
Moment Resisting Concrete Frames: T = max{0.09$h_n^{0.75}$, 0.4}	○	○
Moment Resisting Steel Frames: T = max{0.14$h_n^{0.75}$, 0.4}	○	○
Eccentrically Braced Steel Frames: T = max{0.08$h_n^{0.75}$, 0.4}	○	○
All Other Frame Structures: T = max{0.06$h_n^{0.75}$, 0.4}	○	○
Concrete Shear Walls T = max{0.09$h_n^{0.75}$/ $A_c^{0.5}$, 0.4}	◉	◉
Masonry Shear Walls: $T \leq 0.4$sec	○	○
User Defined (input Period):	○	○
Where h_n = height in metres from the base of the structure to the uppermost seismic weight or mass.	**T:** 0.75	0.80
e) Factor A: Strengthening factor determined using result from (a) above (set to 1.0 if not strengthened)	**Factor A:** 1.00	1.00
f) Factor B: Determined from NZSEE Guidelines Figure 3A.1 using results (a) to (e) above	**Factor B:** 0.20	0.20
g) Factor C: For reinforced concrete buildings designed between 1976-84 Factor C = 1.2, otherwise take as 1.0.	**Factor C:** 1.00	1.00
h) Factor D: For buildings designed prior to 1935 Factor D = 0.8 except for Wellington and Napier (1931-1935) where Factor D may be taken as 1.0, otherwise take as 1.0.	**Factor D:** 1.00	1.00
***(%NBS)* $_{nom}$ = AxBxCxD**	***(%NBS)* $_{nom}$** 20%	20%

WARNING!! *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedureset out in "The Seismic Assessment of Existing Buildings" Technical Guidelines for Engineering Assessments, July 2017. This spreadsheet must be read in conjunction with the limitations set out in the accompanying report, and should not be relied on by any party for any other purpose. Detailed inspections and engineering calculations, or engineering judgements based on them, have not been undertaken, and these may lead to a different result or seismic grade.*

Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA} Page 3

Street Number & Name:	3-15 Elmdale Ln	Job No.:	
AKA:		By:	Denis Chernyshov
Name of building:		Date:	15/06/2020
City:	Christchurch	Revision No.:	1

Table IEP-2 Initial Evaluation Procedure Step 2 continued

2.2 Near Fault Scaling Factor, Factor E

If $T \leq 1.5$sec, Factor E = 1

		Longitudinal	Transverse
a) Near Fault Factor, *N(T,D)* (from NZS1170.5:2004, Cl 3.1.6)	N(T,D):	1	1
b) Factor E = 1/N(T,D)	**Factor E:**	1.00	1.00

2.3 Hazard Scaling Factor, Factor F

a) Hazard Factor, *Z*, for site

Location: Christchurch — **Refer right for user-defined locations**

Z =	0.3	(from NZS1170.5:2004, Table 3.3)
Z_{1992} =	0.8	(NZS4203:1992 Zone Factor from accompanying Figure 3.5(b))
Z_{2004} =	0.22	(from NZS1170.5:2004, Table 3.3)

b) Factor F

For pre 1992	=	$1/Z$
For 1992-2011	=	Z_{1992}/Z
For post 2011	=	Z_{2004}/Z

	Longitudinal	Transverse
Factor F:	3.33	3.33

2.4 Return Period Scaling Factor, Factor G

a) Design Importance Level, I

(Set to 1 if not known. For buildings designed prior to 1965 and known to be designed as a public building set to 1.25. For buildings designed 1965-1976 and known to be designed as a public building set to 1.33 for Zone A or 1.2 for Zone B. For 1976-1984 set I value.)

	Longitudinal	Transverse
	Class 2	Class 2
I =	1.3	1.3

b) Design Risk Factor, R_o (set to 1.0 if other than 1976-2004, or not known)

	Longitudinal	Transverse
	Item 1	Item 1
R_o =	1	1

c) Return Period Factor, R (from NZS1170.0:2004 Building Importance Level)

Choose Importance Level ○ 1 ◉ 2 ○ 3 ○ 4

	Longitudinal	Transverse
R =	1.0	1.0

d) Factor G = IR_o/R

	Longitudinal	Transverse
Factor G:	1.30	1.30

2.5 Ductility Scaling Factor, Factor H

a) Available Displacement Ductility Within Existing Structure

Comment:

	Longitudinal	Transverse
μ =	2.00	2.00

b) Factor H

		k_μ Longitudinal	k_μ Transverse
For pre 1976 (maximum of 2)	=	2.00	2.00
For 1976 onwards	=	1	1
Factor H:		1.00	1.00

(where k_μ is NZS1170.5:2004 Inelastic Spectrum Scaling Factor, from accompanying Table 3.3)

2.6 Structural Performance Scaling Factor, Factor I

a) Structural Performance Factor, S_p (from accompanying Figure 3.4)

Tick if light timber-framed construction in this direction ☐ ☐

	Longitudinal	Transverse
S_p =	0.70	0.70

b) Structural Performance Scaling Factor = $1/S_p$

	Longitudinal	Transverse
Factor I:	1.43	1.43

Note Factor B values for 1992 to 2004 have been multiplied by 0.67 to account for Sp in this period

2.7 Baseline *%NBS* for Building, *(%NBS)*$_b$ (equals **$(\%NBS)_{nom}$ x E x F x G x H x I**)

Longitudinal	Transverse
123%	**124%**

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Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA} Page 4

Street Number & Name:	3-15 Elmdale Ln	Job No.:	
AKA:		By:	Denis Chernyshov
Name of building:		Date:	15/06/2020
City:	Christchurch	Revision No.:	1

Table IEP-3 Initial Evaluation Procedure Step 3

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

a) Longitudinal Direction

potential CSWs	Effect on Structural Performance (Choose a value - Do not interpolate)			Factors
3.1 Plan Irregularity				
Effect on Structural Performance	○ *Severe*	◉ *Significant*	○ *Insignificant*	**Factor A** 0.7
L-shaped building plan				
3.2 Vertical Irregularity				
Effect on Structural Performance	○ *Severe*	○ *Significant*	◉ *Insignificant*	**Factor B** 1.0
No vertical irregularity				
3.3 Short Columns				
Effect on Structural Performance	○ *Severe*	○ *Significant*	◉ *Insignificant*	**Factor C** 1.0
No short columns				

3.4 Pounding Potential
(Estimate D1 and D2 and set D = the lower of the two, or 1.0 if no potential for pounding, or consequences are considered to be minimal)

a) Factor D1: - Pounding Effect

Note:
Values given assume the building has a frame structure. For stiff buildings (eg shear walls), the effect of pounding may be reduced by taking the coefficient to the right of the value applicable to frame buildings.

Factor D1 For Longitudinal Direction: 1.0

Table for Selection of Factor D1	Severe 0<Sep<.005H	Significant .005<Sep<.01H	Insignificant Sep>.01H
Separation			
Alignment of Floors within 20% of Storey Height	○ 1	○ 1	◉ 1
Alignment of Floors not within 20% of Storey Height	○ 0.4	○ 0.7	○ 0.8

Comment

b) Factor D2: - Height Difference Effect

Factor D2 For Longitudinal Direction: 1.0

Table for Selection of Factor D2	Severe 0<Sep<.005H	Significant .005<Sep<.01H	Insignificant 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

Comment

Factor D 1.0

3.5 Site Characteristics - *Stability, landslide threat, liquefaction etc as it affects the structural performance from a life-safety perspective*

Effect on Structural Performance	○ *Severe*	◉ *Significant*	○ *Insignificant*	**Factor E** 0.7
Liquefaction potential				

3.6 Other Factors - *for allowance of all other relevant characterstics of the building*

For ≤ 3 storeys - Maximum value 2.5
otherwise - Maximum value 1.5.
No minimum.

Factor F 0.7

Record rationale for choice of Factor F:

Several precast panels have limited supports at the top

3.7 Performance Achievement Ratio (PAR)
(equals **A x B x C x D x E x F**)

PAR
Longitudinal **0.34**

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Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA} Page 5

Street Number & Name:	3-15 Elmdale Ln	Job No.:	
AKA:		By:	Denis Chernyshov
Name of building:		Date:	15/06/2020
City:	Christchurch	Revision No.:	1

Table IEP-3 Initial Evaluation Procedure Step 3

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

b) Transverse Direction

potential CSWs	Effect on Structural Performance (Choose a value - Do not interpolate)			Factors
3.1 Plan Irregularity				
Effect on Structural Performance	○ *Severe*	◉ *Significant*	○ *Insignificant*	**Factor A** 0.7
L-shaped building plan				
3.2 Vertical Irregularity				
Effect on Structural Performance	○ *Severe*	○ *Significant*	◉ *Insignificant*	**Factor B** 1.0
No vertical irregularity				
3.3 Short Columns				
Effect on Structural Performance	○ *Severe*	○ *Significant*	◉ *Insignificant*	**Factor C** 1.0
No short columns				

3.4 Pounding Potential
(Estimate D1 and D2 and set D = the lower of the two, or 1.0 if no potential for pounding, or consequences are considered to be minimal)

a) Factor D1: - Pounding Effect

Note:
Values given assume the building has a frame structure. For stiff buildings (eg shear walls), the effect of pounding may be reduced by taking the coefficient to the right of the value applicable to frame buildings.

Factor D1 For Transverse Direction: 1.0

Table for Selection of Factor D1	Severe 0<Sep<.005H	Significant .005<Sep<.01H	Insignificant Sep>.01H
Separation			
Alignment of Floors within 20% of Storey Height	○ 1	○ 1	◉ 1
Alignment of Floors not within 20% of Storey Height	○ 0.4	○ 0.7	○ 0.8

Comment

b) Factor D2: - Height Difference Effect

Factor D2 For Transverse Direction: 1.0

Table for Selection of Factor D2	Severe 0<Sep<.005H	Significant .005<Sep<.01H	Insignificant 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

Comment

Factor D 1.0

3.5 Site Characteristics - *Stability, landslide threat, liquefaction etc as it affects the structural performance from a life-safety perspective*

Effect on Structural Performance	○ *Severe*	◉ *Significant*	○ *Insignificant*	**Factor E** 0.7
Liquefaction potential				

3.6 Other Factors - *for allowance of all other relevant characterstics of the building*

Record rationale for choice of Factor F:

For ≤ 3 storeys - Maximum value 2.5
otherwise - Maximum value 1.5.
No minimum.

Factor F 0.70

Several precast panels have limited supports at the top.

3.7 Performance Achievement Ratio (PAR)
(equals **A x B x C x D x E x F**)

PAR
Transverse **0.34**

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Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA}

Street Number & Name:	3-15 Elmdale Ln	Job No.:	
AKA:		By:	Denis Chernyshov
Name of building:		Date:	15/06/2020
City:	Christchurch	Revision No.:	1

Table IEP-4 Initial Evaluation Procedure Steps 4, 5, 6 and 7

Step 4 - Percentage of New Building Standard *(%NBS)*

		Longitudinal	Transverse
4.1	**Assessed Baseline *%NBS* *(%NBS)*$_b$** (from Table IEP - 1)	123%	124%
4.2	**Performance Achievement Ratio (PAR)** (from Table IEP - 2)	0.34	0.34
4.3	**PAR x Baseline *(%NBS)*$_b$**	40%	40%
4.4	**Percentage New Building Standard *(%NBS)* - Seismic Rating** (Use lower of two values from Step 4.3)		40%

Step 5 - Is *%NBS* < 34? NO

Step 6 - Potentially Earthquake Risk (is *%NBS* < 67)? YES

Step 7 - Provisional Grading for Seismic Risk based on IEP

Seismic Grade C

Additional Comments (items of note affecting IEP based seismic rating)

The building has been penalised due to limited fixings of the precast panels.

Relationship between Grade and *%NBS*:

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Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA} **Page 7**

Street Number & Name:	**3-15 Elmdale Ln**	**Job No.:**	
AKA:		**By:**	**Denis Chernyshov**
Name of building:		**Date:**	**15/06/2020**
City:	**Christchurch**	**Revision No.:**	**1**

Table IEP-5 Initial Evaluation Procedure Step 8

Step 8 - Identification of potential Severe Structural Weaknesses (SSWs) that could result in significant risk to a significant number of occupants

8.1	**Number of storeys above ground level**	1
8.2	**Presence of heavy concrete floors and/or concrete roof? (Y/N)**	N

Potential Severe Structural Weaknesses (SSWs):

Note: Options that are greyed out are not applicable and need not be considered.

Occupancy not considered to be significant - no further consideration required

Risk not considered to be significant - no further consideration required

The following potential Severe Structural Weaknesses (SSWs) have been identified in the building that could result in significant risk to a significant number of occupants:

1. None identified

2. Weak or soft storey (except top storey)

3. Brittle columns and/or beam-column joints the deformations of which are not constrained by other structural elements

4. Flat slab buildings with lateral capacity reliant on low ductility slab-to-column connections

5. No identifiable connection between primary structure and diaphragms

6. Ledge and gap stairs

IEP Assessment Confirmed by **Signature**

Denis Chernyshov **Name**

1025549 **CPEng. No**

WARNING!! *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedure set out in "The Seismic Assessment of Existing Buildings" Technical Guidelines for Engineering Assessments, July 2017. This spreadsheet must be read in conjunction with the limitations set out in the accompanying report, and should not be relied on by any party for any other purpose. Detailed inspections and engineering calculations, or engineering judgements based on them, have not been undertaken, and these may lead to a different result or seismic grade.*

Initial Evaluation Procedure (IEP) Assessment - Completed for {Client/TA} Page 1a

Street Number & Name:	3-15 Elmdale Ln	Job No.:	
AKA:		By:	Denis Chernyshov
Name of building:		Date:	15/06/2020
City:	Christchurch	Revision No.:	1

Table IEP-1a Additional Photos and Sketches

Add any additional photographs, notes or sketches required below:

Note: print this page separately

WARNING!! *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedure set out "The Seismic Assessment of Existing Buildings" Technical Guidelines for Engineering Assessments, July 2017. This spreadsheet must be read in conjunction with the limitations set out in the accompanying report, and should not be relied on by any party for any other purpose. Detailed inspections and engineering calculations, or engineering judgements based on them, have not been undertaken, and these may lead to a different result or seismic grade.*

PRODUCER STATEMENT – DESIGN (PS1)

(ISSUE B)

ISSUED BY:	**SMC DESIGN STUDIO LTD**
DESIGN ENGINEER:	**DENIS CHERNYSHOV**
TO:	**FITZ CONSULTING LTD**
TO BE SUPPLIED TO:	**CHRISTCHURCH CITY COUNCIL**
IN RESPECT OF:	**SEISMIC STRENGTHENING TO 67% NBS (STEEL WALER BEAMS, ROOF BRACES, ROOF BEAMS, STEEL COLUMNS AND FOUNDATIONS)**
AT:	**3-15 ELMDALE LANE, LINWOOD, CHRISTCHURCH**
LEGAL DESCRIPTION:	**LOT 2 DP 46567, UNITS A-F DP 46906 HAVING SHARE IN 1525 m²**

SMC DESIGN STUDIO LIMITED has been engaged by **FITZ CONSULTING LTD** to provide **Structural Engineering** services in respect of the requirements of Clause **B1** of the Building Code 2004 for:

- ☐ All
- ☑ Part only as specified above

of the proposed building work. The design carried out by us has been prepared in accordance with

- ☑ Compliance Documents issued by MBIE **B1/VM1 and B1/VM4** of the approved documents
- ☐ Alternative solution as per the attached schedule

The proposed building work covered by this Producer Statement is described on **SMC Design Studio Ltd's** drawings titled **Seismic strengthening – 3-15 Elmdale Lane, Christchurch**, dated **19/04/2021** and numbered **0.01-4.05** together with the specification.

On behalf of SMC Design Studio Ltd, and subject to:

i. Site verification of the following design assumptions – ultimate bearing pressure of 200 kPa or better.
ii. All proprietary products meeting their performance specification requirements.

I believe on reasonable grounds that a) the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the building code and that b), the persons who have undertaken the design have the necessary competency to do so. I also recommend the following level of construction monitoring/observation:

☐ CM1 ☐ CM2 ☑ CM3 ☐ CM4 ☐ CM5

This Producer Statement - Design is valid for 1 year only from the date of issue.

I, **Denis Chernyshov** am CPEng **1025549.** I am a Member of Engineering New Zealand and hold the following qualifications **BE (Civil), CMEngNZ (Structural), CPEng.**

The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.

SIGNED BY  **ON BEHALF OF SMC DESIGN STUDIO LTD** **DATE: 20 April 2021**

SMC Design Studio Ltd in issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000.
Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to SMC Design Studio Ltd only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.

Construction monitoring site visits required are shown on the reverse.

RE: CONSTRUCTION MONITORING

Construction Monitoring site visits relating to compliance with the building consent documentation and for verification of design assumptions are required as follows:

	TIME	NO. OF VISITS
1	Excavation to check exposed ground conditions	1
2	Foundations, prior to pouring concrete	1 per pour
3	Steelwork, when installed	1

We confirm that records of our site visits will be left on site.

A Producer Statement, Construction Review, could be issued once the above construction monitoring site visits have been completed.

It is the owner's responsibility to notify the Engineer to enable the above site visits to be completed.

Please direct any queries back to SMC Design Studio Limited and Denis Chernyshov (denis@smcdesign.co.nz)

Design Features Report

3-15 Elmdale Lane, Linwood, Christchurch

20 April 2021

Change tracking:

Issue	Description	Date	Prep. by	Checked by
1		20/04/2021	DC	PM

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1 GENERAL 3
2 STRUCTURE 4
3 SOIL CONDITIONS 4
4 DESIGN LOADS 5
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6 PROPRIETARY SYSTEMS ..... **Error! Bookmark not defined.**
7 CONSTRUCTION MONITORING 7

1 GENERAL

1.1 Objective

The Design Features Report (DFR) is a detailed document defining the structure's design criteria and recording key decisions or outcomes. It outlines design loading, structural modelling assumptions, material properties, foundation requirements and design standards. The DFR also defines the calculation procedure and checking principles to be followed, providing a clear explanation of the full design.

1.2 Scope

The scope of work is as follows:

Seismic strengthening design of existing building.

1.3 Means of Compliance

The design of the structure is in compliance with the New Zealand Building Code (NZBC), section B1.

The following standards have been used:

- AS/NZS1170:2001
- NZS3101:2006
- NZS3404:1997

1.4 Alternative Solutions

No alternative solutions have been adopted in the design of the structure.

2 STRUCTURE

2.1 General

The subject building is a single storey multi-unit precast concrete panel building. The building approximate plan dimensions are 34.6 m × 39.0 m.

The building importance level 2 is assumed.

The building consists of six workshop units designed in 1983 by Jon Aldridge (Architect) and Holmes, Wood, Poole & Johnstone (Structural Engineer). Architectural and structural drawings are available.

The design life of the structure is 50 years.

2.2 Gravity Structure

The lightweight roof comprises longrun steel roofing sheets on steel channel purlins supported on concrete panels and, in some units, on steel roof beams.

2.3 Lateral Load Resisting Structure

The lateral force resisting system of the building consists of a combination of reinforced concrete panels and cantilevered reinforced concrete columns.

3 SOIL CONDITIONS

3.1 Description of Site Soil Conditions

No geotechnical assessment of the soil was completed as a part of this strengthening design. The Christchurch liquefaction maps show a minor risk of liquefaction damage.

3.2 Soil Design Values

3.2.1 Ultimate soil strengths

An ultimate geotechnical bearing capacity of 200 kPa was adopted for the design. This is to be confirmed on site, once excavation works are completed.

3.2.2 Strength reduction factors

Ultimate limit state strength reduction factors: $\varphi = 0.5$

$\varphi = 0.7$ (seismic)

4 DESIGN LOADS

4.1 General

For the purposes of consideration of loading, this structure Importance Level 2 in accordance with AS/NZS 1170.0:2002.

4.2 Imposed Loads

The table below summarizes all vertical loads including both superimposed dead and live loads.

Table 1: Imposed gravity loads

Level / Area	Use	Live Load	Superimposed Dead Load
Ground Floor	Light manufacturing	3 kPa	
Roof		0.25 kPa	

4.3 Barriers and Handrails

The building has no barriers.

4.4 Wind Loads

Wind loads are not considered.

4.5 Snow and Ice Loads

Snow and ice loads are not considered.

4.6 Seismic Loads

4.6.1 Site parameters

Site subsoil class: D

4.6.2 Analysis methodology

The seismic analysis has been completed in accordance with NZS 1170.5:2004, using the equivalent static method.

Design Spectra are for site subsoil class D.

For the purposes of the analysis, the project x and y directions are considered to be across and along the building respectively.

4.6.3 Seismic load coefficient

Z = 0.3

T_x = 0.4 s

T_y = 0.4 s

$C(T_1)$ = 0.401 (X-direction)

$C(T_1)$ = 0.401 (Y-direction)

4.7 Construction loads

No construction loads were allowed for in the design.

4.8 Special Loads Cases

No special load cases were considered in the design.

5 SERVICEABILITY CRITERIA

Serviceability limit state criteria are not considered.

6 CONSTRUCTION MONITORING

The design is based on the verification of specific design aspects of the construction by a suitably qualified Chartered Professional Engineer in accordance with ACENZ/IPENZ level CM3.

CONSTRUCTION MONITORING SERVICE		
LEVEL	REVIEW	COMMENT
CM1	Monitor the outputs from another party's quality assurance programme against the requirements of the plans and specifications. Visit the works at a frequency agreed with the client to review important materials of construction critical work procedures and/or completed plant or components. Be available to advise the constructor on the technical interpretation of the plans and specifications	This level is only a secondary service. It may be appropriate where: - For the design consultant when another party is engaged to provide a higher level of construction monitoring or review during the period of construction or - When the project works are the subject of a performance based specification and performance testing is undertaken and monitored by others.
CM2	Review, preferable at the earliest opportunity, a sample of each important work procedure, material of construction and component for compliance with the requirements of the plans and specifications and review a representative sample of each important completed work prior to enclosure or completion as appropriate. Be available to provide the constructor with technical interpretation of the plans and specification.	This level of service is appropriate for smaller projects of a routine nature being undertaken by an experienced and competent constructor and where a higher than normal risk of non-compliance is acceptable. It provides for the review of a representative sample of work procedures and materials of construction. The assurance of compliance of the finished work is dependent upon the constructor completing the work to at least the same standard as the representative sample reviewed.
CM3	**Review, to an extent agreed with the client, random samples of important work procedures, for compliance with the requirements of the plans and specifications and review important completed work prior to enclosure or on completion as appropriate. Be available to provide the constructor with technical interpretation of the plans and specifications.**	**This level of service is appropriate for medium sized projects of a routine nature being undertaken by an experienced constructor when a normal risk of non-compliance is acceptable.**
CM4	Review, at a frequency agreed with the client, regular samples of work procedures, materials of construction and components for compliance with the requirements of the plans and specifications and review the majority of completed work prior to the enclosure or on completion as appropriate.	This level of services is appropriate for projects where a lower than normal risk of non-compliance is required.
CM5	Maintain personnel on site to constantly review work procedures, materials of construction and components for compliance with the requirements of the plans and specifications and review completed work prior to enclosure or on completion as appropriate.	This level of service is appropriate for major projects - Projects where the consequences of failure are critical. Projects involving innovative or complex construction procedures. The level of service provides the client with the greatest assurance that the completed work complies with the requirements of the plans and specifications.

6.1 Soil Testing and Verification

Visual inspection of excavation as work proceeds. This may include the removal and filling of softspots with compacted hardfill as required by the Specification.

6.2 Inspection Requirements

Refer to the producer statement PS1 for schedule of inspections is to be met in order to meet the required level of Construction Monitoring, and to ensure the intent of the design is met.

Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: 0-01

Seismic Strengthening Calculations

3-15 Elmdale Lane

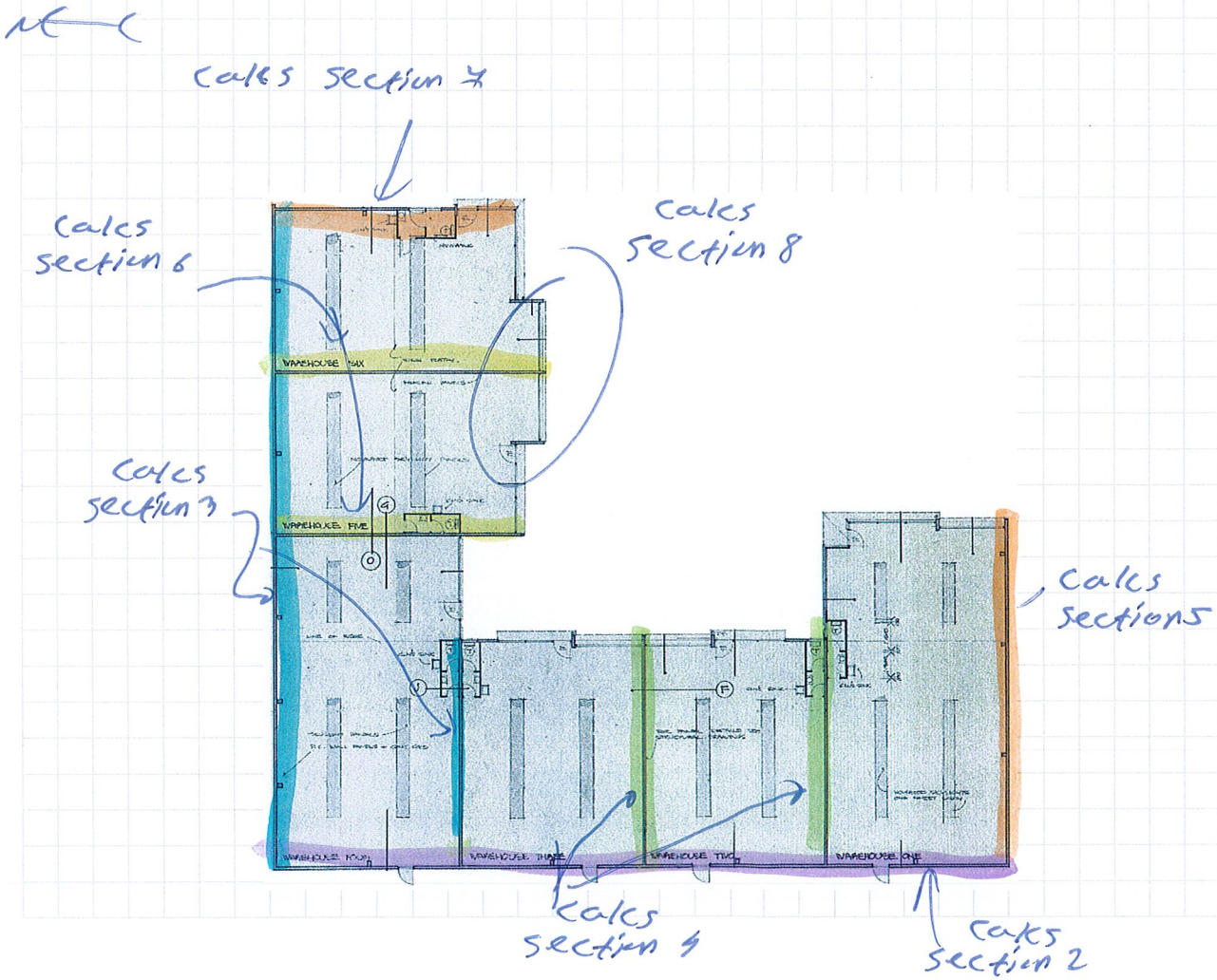
Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: 0-02

1 - DSA results and strengthening plan
2 - West wall OOP
3 - North wall OOP and grid line 4 wall OOP
4 - Walls at grid lines 2, 3 OOP
5 - South wall OOP
6 - Walls at grid lines B, C OOP
7 - East wall OOP
8 - South wall at units 11, 15 - in-plane

Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: 1-01



Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations
Date: March 2021 Designer: DC Sheet No: 2-01

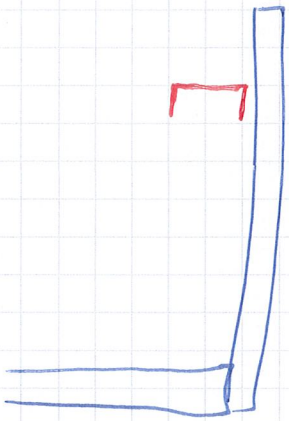
West wall OOP

Walls to span vertically between foundation and new water beam

$w = 2.29\,kPa$ (120mm panels, $F_{ib} = 0.79$)

$LD = 1.8\,m$

$w = 2.29\,kPa \times 1.8\,m = 4.1\,kN/m$

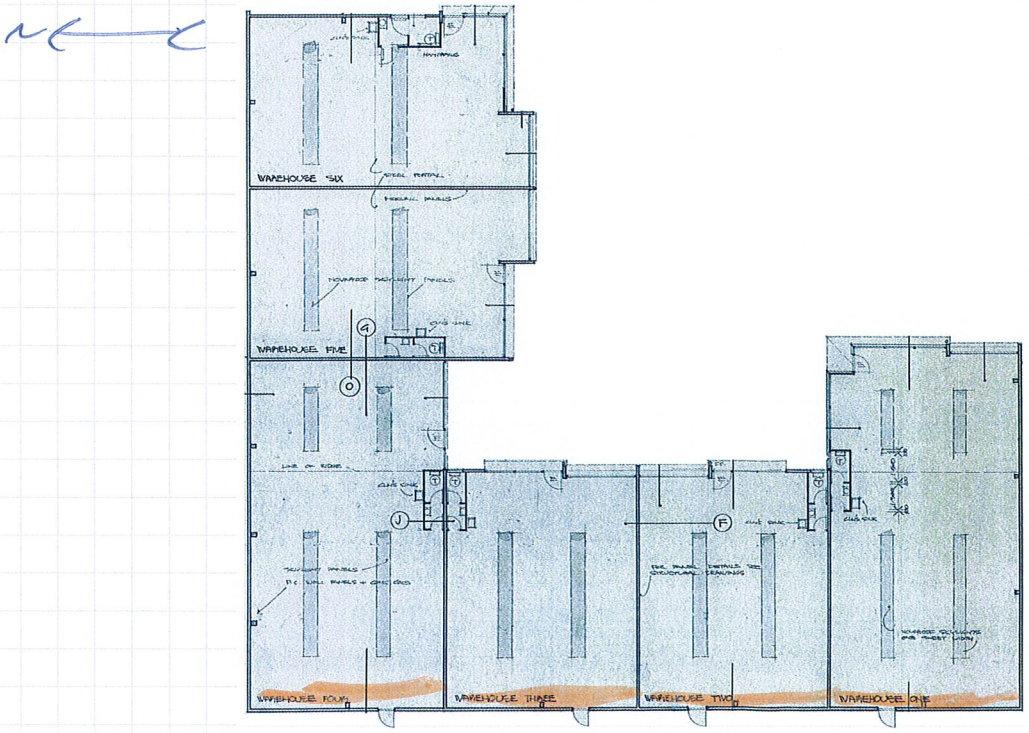


Try 300PFC

$M^* = 4.1\,kN/m \times (9.6m)^2/8 = 47\,kNm$

$\phi M_{bx} = 118\,kNm > 47\,kNm \rightarrow OK$

$\delta = \frac{5 \times 4.1\,kN/m \times (9.6m)^4}{384 \times 200GPa \times 72.5 \times 10^6\,mm^4} = 31\,mm \rightarrow OK$



Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: 3-01

North wall OOP and grid line 4 wall OOP

Walls to span vertically between slab and new roof beam.

$W = 3.32\,kPa$ (175mm panels, $F_{ph} = 0.7g$)

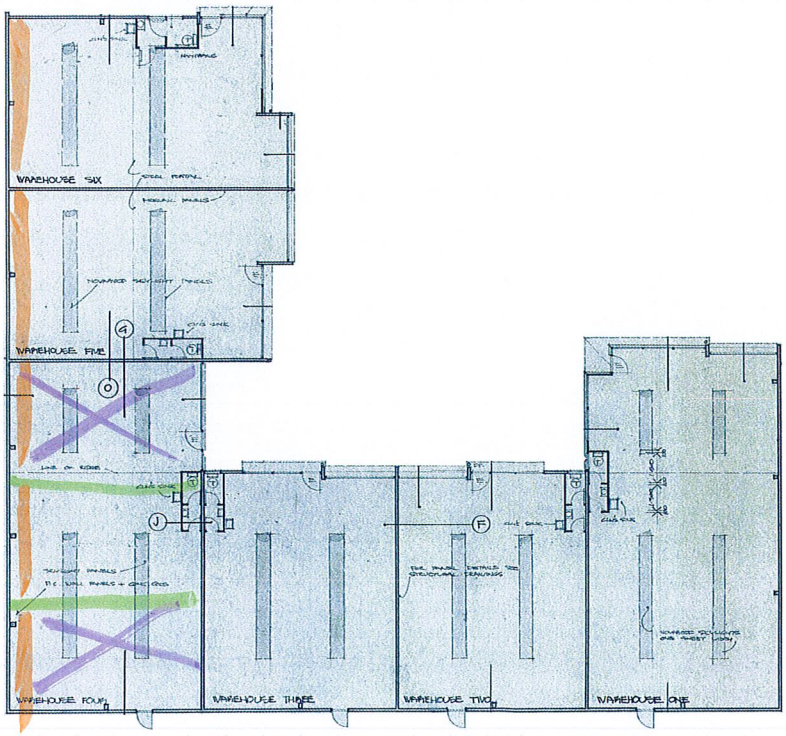
$L_D = 2.3\,m$

$w = 3.32\,kPa \times 2.3\,m = 7.6\,kN/m$

Try 300PFC

$M^* = 7.6\,kN/m \times (8.3\,m)^2 / 8 = 65\,kNm < 118\,kNm \rightarrow OK$

$\delta = \frac{5 \times 7.6\,kN/m \times (8.3\,m)^4}{384 \times 200GPa \times 72.5 \times 10^6\,mm^4} = 32\,mm \rightarrow OK$



Strut

$N_c^* = 7.6\,kN/m \times 5.8m = 44\,kN$

Try 200UB25

$\phi N_{nc_y} = 52kN > 44kN \rightarrow OK$

Brace

$N_t^* = 44kN / \cos 45^\circ = 62kN$

Try RB416 $\rightarrow \phi N_t = 113kN > 62kN \rightarrow OK$

Allow for OOP action of concrete panel on grid line 4.

$N_t^* = 62kN + 2.69\,kPa \times 6m \times 1.6m = 62kN + 26kN =$
(140mm panels, $F_{ph} = 0.7g$)

$= 88kN < 113kN \rightarrow OK$

Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: 4-01

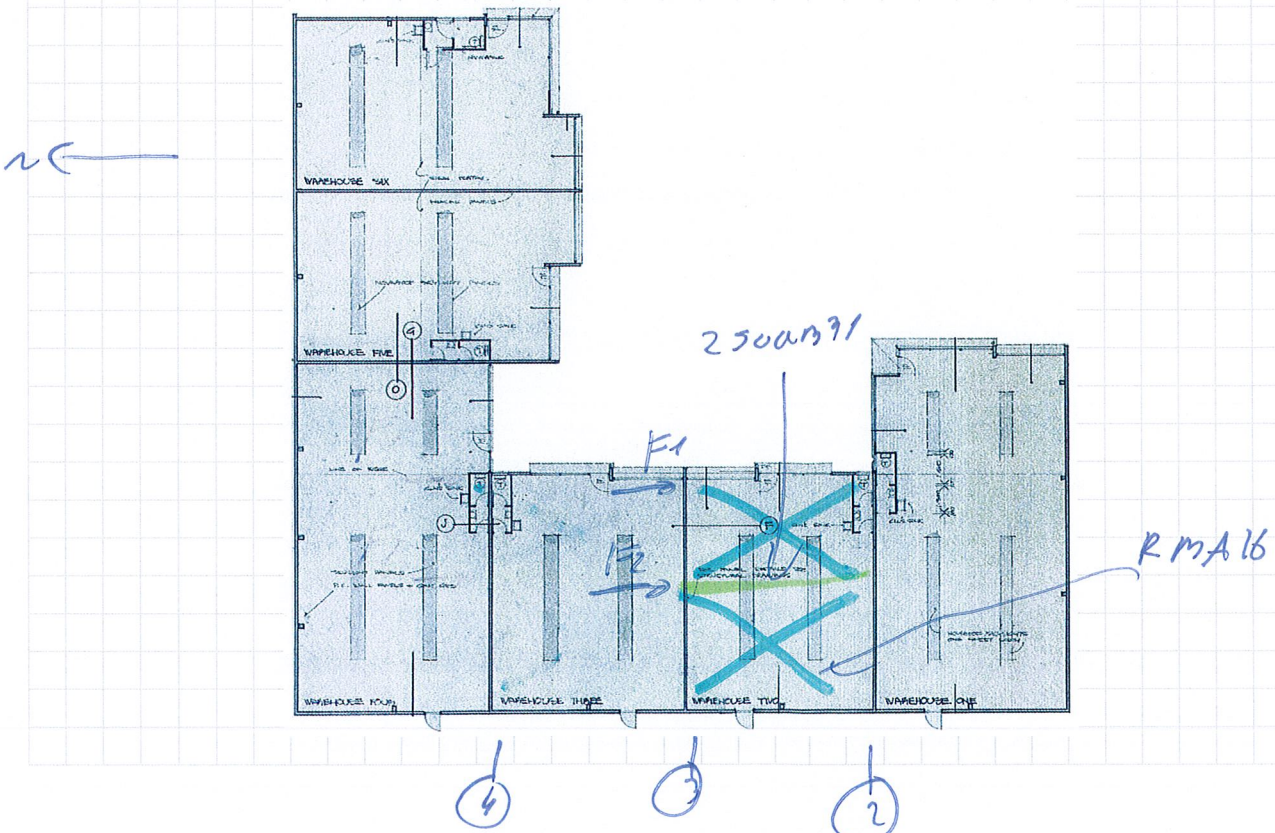
Walls at grid lines 2, 3, COD

Assume the walls span vertically between floor slab and purlins.

Design roof bracing system to transfer the forces at the top of the panels back to west wall

F_1 = 2.69 kPa × 3.1 m × 2 m × 2 panels = 33 kN
(140 mm panels, F_{ph} = 0.79)

F_2 = 2.69 kPa × 6 m × 1.6 m × 2 panels = 52 kN



Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: 4-02

Strut

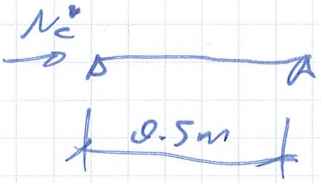
$N_c^*(max) = 33\,kN + 52\,kN = 85\,kN$

Try 250uc31

$\phi N_{scy} = 84\,kN$

$85\,kN / 85\,kN = 99\%$ NG

→ OK



Braces

$N_t^* = 85\,kN / \cos 35^\circ = 104\,kN$

Use RR416 → $\phi N_t = 113\,kN > 104\,kN$ ok

Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: 5-01

South wall OOP

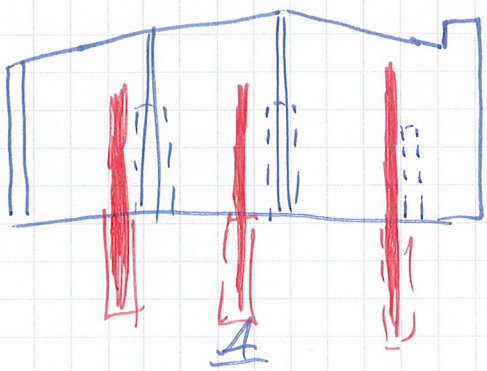
Support the wall with vertical steel columns in post hole footings.

$u = 2.29\ kPa$ (120mm panel, $F_{ph} = 0.79$)

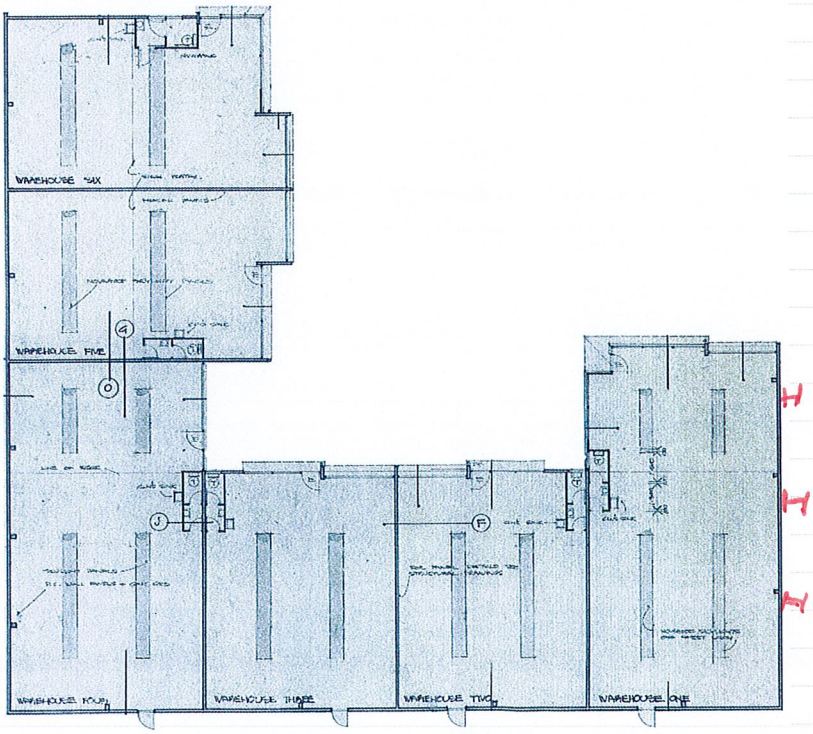
$u = 2.29\ kPa \times 5m = 11.5\ kN/m$

$M^* = 92\ kNm$

$V^* = 46\ kN$



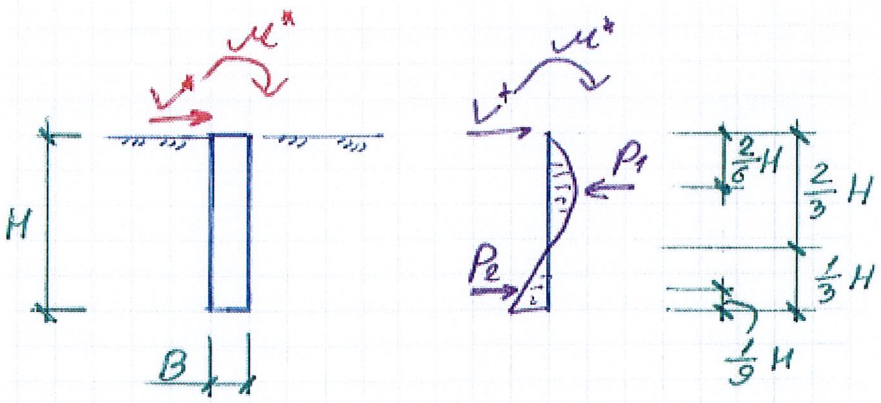
Try 200 UC 46 → $\phi M_{sx} = 133\ kNm > 92\ kNm$ → OK



5-02

Post hole

M* = 92 kNm
V* = 46 kN



H = 3 m
B = 0.6 m (post hole diameter)

+ 200 mc 4/6

Moment about P_2:

$M^* + V^* \times (H - \frac{1}{3} \times \frac{1}{3} \times H) - P_1 \times (\frac{1}{2} \times \frac{2}{3} \times H + \frac{2}{3} \times \frac{1}{3} \times H) = 0$

$$P_1 = \frac{M^* + V \times 8 \times H / 9}{5 \times H / 9} = 128.8 \text{ kN}$$

$P_2 = P_1 - V^* = 82.8$ kN

Area P_1: $\frac{2}{3} \times H \times B = \frac{2}{3} \times 3\text{ m} \times 0.6\text{ m} = 1.2\text{ m}^2$
Area P_2: $\frac{1}{3} \times H \times B = \frac{1}{3} \times 3\text{ m} \times 0.6\text{ m} = 0.6\text{ m}^2$

$q_d = 128.8\text{ kN} / 1.2\text{ m}^2 = 107$ kPa
$q_d = 82.8\text{ kN} / 0.6\text{ m}^2 = 138$ kPa

q_u = 200 kPa (available ultimate ground bearing strength)
ϕ_{bc} = 0.7 (bearing strength reduction factor)
q_{dbs} = 200 kPa × 0.7 = 140 kPa (design ground bearing strength)

138 kPa < 140 kPa → OK

Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: G-01

Walls at grid lines B, C -OOP

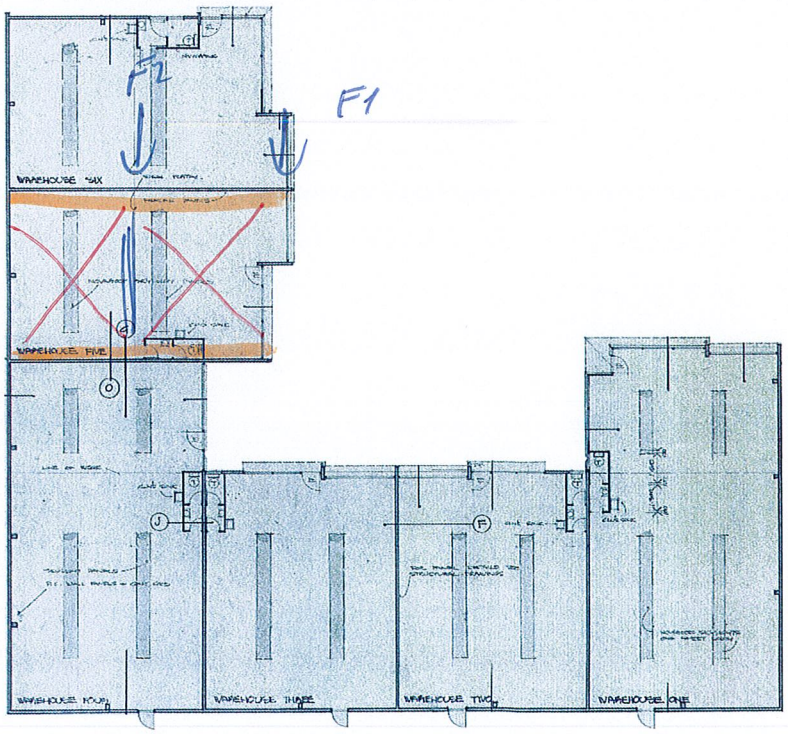
Walls to span vertically between floor slab and new PFC wall beam.

The top restraint is to be provided by a system of braces and existing URM acting as compression struts.

u = 2.69 kPa (110mm panels, F_{ph} = 0.79)

F_1 = 2.69 kPa x 3.7m x 2m x 2 panels = 36 kN

F_2 = 2.69 kPa x 6.6m x 2m x 2 panels = 71 kN



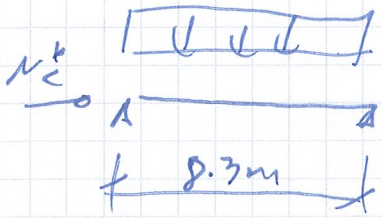
Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: G-02

Strut

Check exist beam.

$N_c^* = 108\ kN$



250UB 31

$\phi N_{ncy} = 990\ kN$
(restrained compressed flange by purlins @ 1.2m crs)

$M^* = 0.3 \times Pa \times 6m \times (8.3m)^2 / 8 = 16\ kNm$

$\phi M_{bx} = 103\ kNm > 16\ kNm$

Brace

$N_t^* = 108\ kN / \cos 40° = 141\ kN$

Try RHA16 brace

$\phi N_t = 113\ kN$

$113\ kN / 141\ kN = 80\%$ NBS → OK

Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: 7-01

East wall OOP

Support the panels with cantilevered steel columns.

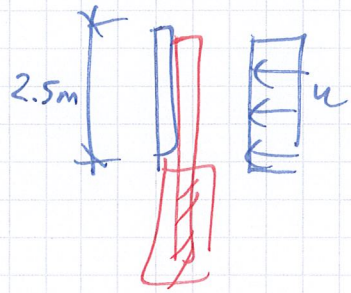
$w = 3.32\,kPa$ (175mm panels, $\phi_{ph} = 0.79$)

$u = 3.32\,kPa \times 3.2m = 10.6\,kN/m$

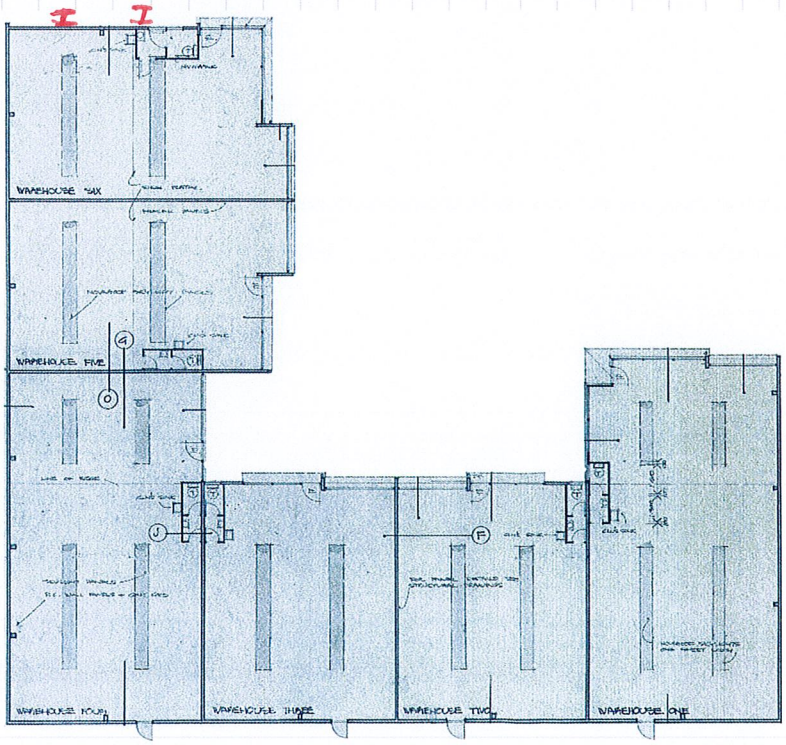
$M^* = 10.6\,kN/m \times (2.5m)^2/2 =$

$= 33\,kNm$

$V^* = 27\,kN$



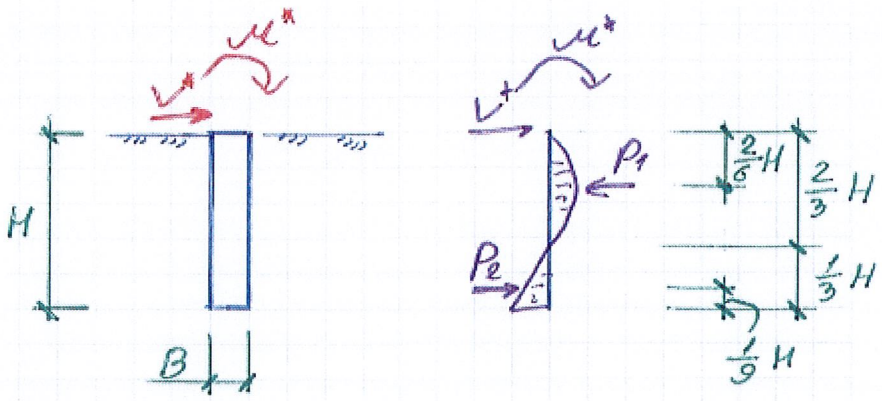
Try 150uc30 → $\phi M_{sx} = 72\,kNm > 33\,kNm \rightarrow OK$



7-02

Post hole

M* = 33 kNm
V* = 27 kN



H = 2 m
B = 0.6 m (post hole diameter)

Moment about P_2:

$M^* + V^* \times (H - ⅓ \times ⅓ \times H) - P_1 \times (½ \times ⅔ \times H + ⅔ \times ⅓ \times H) = 0$

$$P_1 = \frac{M^* + V \times 8 \times H / 9}{5 \times H / 9} = 72.9 \text{ kN}$$

$P_2 = P_1 - V^* = 45.9$ kN

Area P_1: ⅔ × H × B = ⅔ × 2 m × 0.6 m = 0.8 m²
Area P_2: ⅓ × H × B = ⅓ × 2 m × 0.6 m = 0.4 m²

q_d = 72.9 kN / 0.8 m² = 91 kPa
q_d = 45.9 kN / 0.4 m² = 115 kPa

q_u = 200 kPa (available ultimate ground bearing strength)
ϕ_{bc} = 0.7 (bearing strength reduction factor)
q_{dbs} = 200 kPa × 0.7 = 140 kPa (design ground bearing strength)

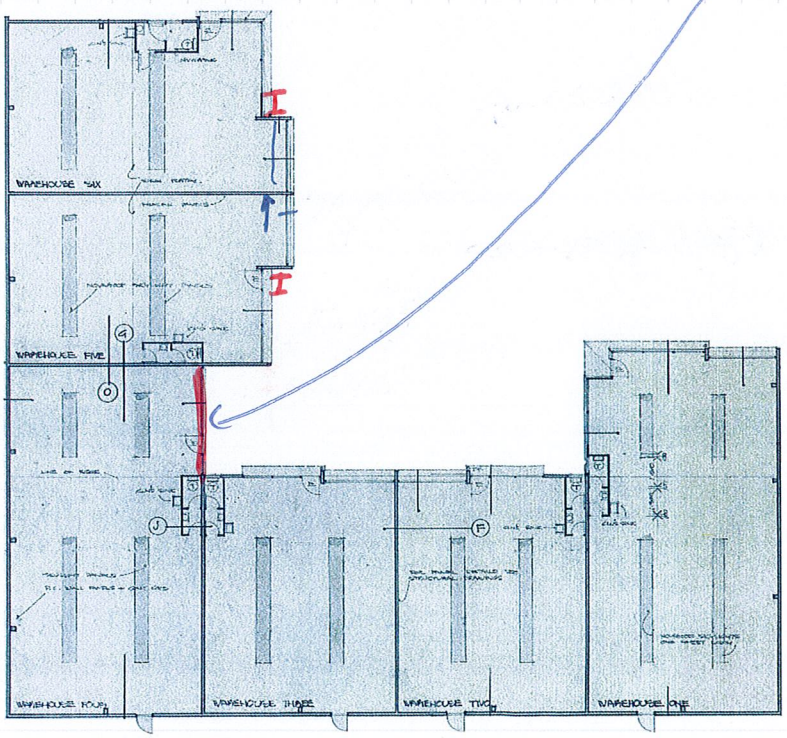
115 kPa < 140 kPa → OK

Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: S-01

South wall at units 11, 15 - in-plane

Design a strut to transfer seismic forces to wall at grid 4



4

Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: S-02

Cantilevered columns

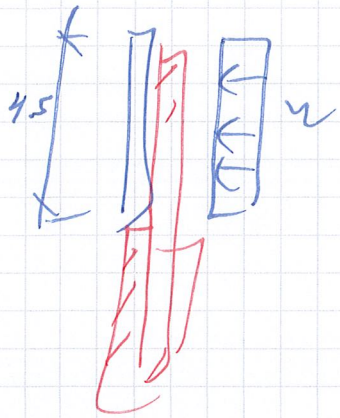
$w = 2.69\ kPa$

$u = 2.69\ kPa \times 1.9m = 5.1\ kN/m$

$M^* = 5.1\ kN/m \times (4.5m)^2/2 =$

$= 52\ kNm$

$V^* = 23\ kN$



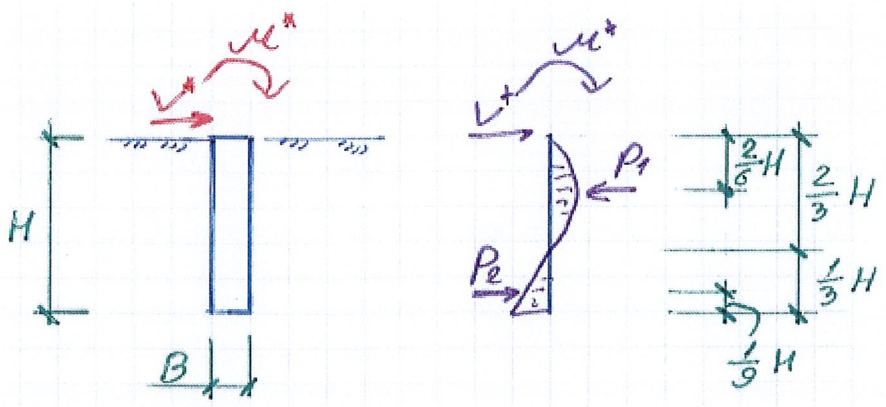
Try 150UC30

$\phi M_{sx} = 72\ kNm > 52\ kNm \rightarrow OK$

8-03

Post hole

M*	=	52 kNm	
V*	=	23 kN	
H	=	2 m	
B	=	0.6 m	(post hole diameter)



Moment about P_2:

$M^* + V^* \times (H - ⅓ \times ⅓ \times H) - P_1 \times (½ \times ⅔ \times H + ⅔ \times ⅓ \times H) = 0$

$$P_1 = \frac{M^* + V \times 8 \times H / 9}{5 \times H / 9} = 83.6 \text{ kN}$$

$P_2 = P_1 - V^* = 60.6$ kN

Area P_1 :	⅔ × H × B	=	⅔ × 2 m × 0.6 m	= 0.8 m²
Area P_2 :	⅓ × H × B	=	⅓ × 2 m × 0.6 m	= 0.4 m²

q_d	=	83.6 kN / 0.8 m²	= 105 kPa
q_d	=	60.6 kN / 0.4 m²	= 152 kPa

q_u	=	200 kPa	(available ultimate ground bearing strength)
ϕ_{bc}	=	0.7	(bearing strength reduction factor)
q_{dbs}	=	200 kPa × 0.7 = 140 kPa	(design ground bearing strength)

152 kPa !140 kPa !!!!!!!!!!!!!!!!!!!!

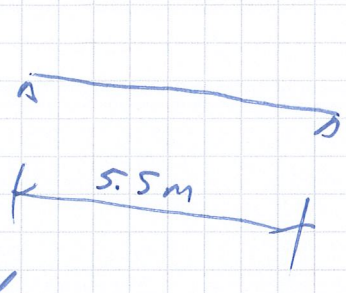
140 kPa / 152 kPa = 92% NMS → OK

Project: 3-15 Elmdale Lane, Linwood, Christchurch – Seismic Strengthening Calculations

Date: March 2021 Designer: DC Sheet No: 8-04

Strut

$N_c^* = 62\,kN$ (see DSA calcs)



Try 150×100×5 RHS

$\phi N_{neg} = 172\,kN > 62\,kN$ ~OK

SMC Design Studio
Engineers & Architecture

CONSTRUCTION SPECIFICATION

3-15 Elmdale Ln, Christchurch

Seismic strengthening

2021

p. 03 377 7898 7/77 Gloucester Street, Christchurch www.smcdesign.co.nz info@smcdesign.co.nz

PRELIMINARY AND GENERAL

PG 01 CONDITIONS OF CONTRACT

The Specification and drawings shall be read together, and anything contained in one and not the other shall be equally binding as though in both, and everything shall be done to complete the works together with all preparatory work, expressed or implied.

Generally, the drawings show the extent of the work while the Specification defines the Standard. As this Specification is written to cover nearly all situations, only those clauses that are relevant to work shown on the drawings shall apply.

Where any discrepancies exist in the documents, the drawings shall take precedence to the Specification, the Specification shall take precedence to the Special Conditions of Contract, and the Special Conditions of Contract shall take precedence to the General Conditions of Contract.

PG 02 SCOPE

This contract consists of the supply of all labour, materials, plant, temporary works and equipment for the construction and finish of the works shown on the drawings and described in this Specification, complete in every respect, tested and passed by local or other relevant authorities and functioning perfectly.

PG 03 TEMPORARY WORKS

Sheds

The Contractor shall set up on site such temporary sheds and storage facilities as may be required. All sheds shall be placed so that they take up a minimum of space and are sited to minimize the adverse effects they may have on site use by others.

Lavatories

Allow to provide own temporary toilet.

Power, Water, Etc

The Contractor shall make water and electricity supplies available to the site for their own use and pay for service consumption. The Contractor shall provide and pay for temporary connections to such supplies.

Barricades

The Contractor shall provide and maintain all protection for the public including barricades, lights and the like, as required by the Local Authority and the Law. The sufficiency of such temporary works shall at all times be the entire responsibility of the Contractor.

The construction area shall be fenced off with wire mesh fencing to prevent public access including a lockable gate to the site access. The “Site Access” signs shall be provided where required.

Costs Of Temporary Works

The Tenderer shall be deemed to have allowed for all costs arising from the provision of all temporary work, and for the removal thereof and restitution of the site on completion of the works.

PG 04 BUILDING CONSENT

Any delays in obtaining a building consent after receiving possession of the site shall only result in a claim for an extension of time if the Contractor can prove that such delay affected their progress. Work requiring a Building Consent shall not be carried out until the consent has been uplifted. The Contractor shall make themselves familiar with the Building Consent documents prior to starting any work.

PG 05 WORK SHOWN AND INCLUDED

The tender documents show the extent of the work, but there is no warranty expressed or implied that it shows each and every minor detail or item required to be included by the Tenderer. Should any material or work appear to be inadequately described, yet necessary for the neat and satisfactory completion of the whole, the Tenderer shall include and allow for this in their tender price. Unless otherwise indicated on the drawings or in the Specifications, the drawings shall be considered complete.

The Contractor shall allow for all measurements, shop drawings, etc that they consider necessary for completion of the work.

PG 06 SECTIONS OF SPECIFICATION

This Specification is divided into various sections for convenience and reference only. Whilst reasonable care has been taken to classify by trades, no claims will be admitted in respect of work not specifically mentioned in a particular section, but which is provided for, expressed or implied elsewhere in the Specification or drawings. It shall not be construed that each section is a separate contract.

PG 07 STANDARDS

All materials shall comply with the relevant New Zealand Standard (NZS), Australian Standard (AS) or British Standards (BS) where appropriate NZS do not exist, or other Standards called for in the Specification.

Wherever a Standard Specification is called for in the Specification, it shall be deemed that all other Standard Specifications called up in that Standard Specification shall be incorporated by cascade and in the case of NZS shall include any current amendments or superseding NZS declared or endorsed in terms of the Standards Act 1965.

PG 08 ALTERNATIVES

Where any item is mentioned by a trade name or by any other specific reference, it shall be deemed to mean the type of article or material so mentioned, or any other equivalent thereto in quality, finish, durability and serviceability for the purpose intended. The quoting of a trade name shall not be construed as any desire to restrict the use of competitor's articles or materials, and the Contractor is at liberty to offer any equivalent article or material for the Engineers approval. No warranty is expressed or implied that articles or materials specified are regularly stocked by merchants.

PG 09 ALTERATIONS OR DELETIONS

The Builder or Contractor is hereby advised that it is dangerous to change or delete structural elements without the specific written approval of the Structural Engineer.

PG 10 EXISTING SERVICES

The Contractors attention is drawn to the fact that there will be services underground which are adjacent to and across the site of the works, the existence of which is to be ascertained by checking with all service authorities before starting work.

The Contractor is entirely responsible for accurately locating these services on the site and for ensuring that the serviceability of them is in no way impaired.

In the event of the works of this contract giving rise to any damage to any of these services, the Contractor shall at once repair such damage to the approval of the relevant Authority and at no cost to the Owner.

PG 11 FINISHING WORK

Should any tradesperson consider that the work of other trades or the condition of any surface is not suitable for ensuring a proper finish for their own work thereon, they shall so notify the Contractor before any work is done, and shall not proceed until the necessary alteration or improvement has been made.

Failing such notice, the trade concerned will not be relieved of responsibility for a poor result due to such unsatisfactory conditions.

PG 12 AMBIGUITIES

The Specification and the drawings shall be read and construed as one document and any item appearing in one but not appearing in the other shall be deemed to appear in both.

Should any ambiguity or contradiction be found in the tender documents which would affect the tender price, the Tenderer shall notify the Engineer as soon as possible, so that all Tenderers may be advised of the Engineer's decision. If, after this has been complied with, there is still a doubt as to the meaning of the tender documents or as to any other matter, the Tenderer shall set out such doubt in writing and submit this with their tender, together with a clear indication as to what is provided for in the tender.

Unless the Tenderer acts in this manner, it will be deemed that they have allowed in their tender for carrying out the works in accordance with that reading of the documents which will involve the greater cost.

PG 13 SITE MEASUREMENTS

The Contractor is entirely responsible for verifying all dimensions by checking against actual site measurements, particularly where grid lines or floor levels are to match those already existing.

This responsibility includes the notification to their Subcontractors of as-built dimensions to enable them to fabricate accurately.

Should any boundary pegs require reinstatement to enable the set-out to proceed, the Contractor shall arrange for the reinstatement of the pegs as a variation to the contract.

PG 14 PROTECTION OF PROPERTY

The Contractor shall take precautions to protect all property, including those adjoining, and shall make good, at no extra cost, any damage caused by and during their operations.

Where any property has been disturbed by the works, the Contractor shall make this good to the satisfaction of the Local Authority or the Owner, as the case may be.

Where any roadway, driveway and footpath have been disturbed by the works and which roadway, driveway and footpath are not detailed to be affected by the works, the Contractor shall make these good to the satisfaction of the Engineer.

The Contractor shall be responsible for the security of the Principal's property where this may be affected by their operations and shall take all necessary steps to this end.

Where access to neighbouring property is required or preferred, the neighbours shall be notified, and their permission sought to carry out the work.

Should the Contractor fail to take whatever steps may be necessary to ensure the security of the Principal's property, then the Principal shall be entitled to deduct from money due or becoming due to the Contractor the value of all such losses they may sustain which are attributable to such failure on the Contractors part.

The Principal reserves the right to employ others to make good security and weathertightness, where these have been adversely affected by the contract, and where the Contractor has failed to take immediately effective remedial works to the Principal's approval, in which case costs arising from the Principal employing others to carry out this work shall be recovered by the Principal from money due or becoming due to the Contractor.

PG 15 SAFETY OF THE WORKS

Where work is vitally necessary for the saving of life or property or for assuring the safety of the works, such work shall be carried out by the Contractor, immediately, by day or by night. The Contractor immediately shall advise the Engineer in writing of the full circumstances.

Should the Contractor not be in a position to undertake immediately such vital work, the Principal reserves the right to carry out such work by their own or other agencies, and to deduct the costs arising therefrom monies which may become due to the Contractor under the contract.

All operations must be suspended during weather which would affect the quality of the work in progress, and suitable precautions taken to protect the works.

PG 16 PROPRIETARY PRODUCTS

Where a proprietary product of any sort is specified, the associated manufacturer's instructions and specifications shall form part of this Specification.

In all cases, the manufacturer's instructions and/or specification shall be strictly adhered to, unless otherwise instructed by the Engineer.

PG 17 WORKMANSHIP AND MATERIALS

All work shall be carried out to a high standard using good quality materials. The standard of work, and materials, shall be at least as good as that set out in any relevant NZ Standard, any relevant BRANZ publication, or any other relevant document. Manufacturers' instructions shall be complied with where there are not more stringent requirements.

PG 18 NOTIFICATIONS TO THE ENGINEER

The Engineer shall be notified 24 hours before the commencement of each of the following phases of work, so that the Engineer has the opportunity to inspect the work to ensure that the work is carried out with the intent of the design:

(a) All excavations
(b) All concrete pours
(c) Erection of structural frames
(d) Closing in or encasement of any structure
(e) Sealing or paving work

PG 19 CLEANING

Each Subcontractor shall from time to time remove all rubbish, debris, and builders spoil caused by their work as it accumulates so that their work and the work of other trades is not impaired in any way.

On completion of the work, the Contractor shall remove all rubbish from the site. All materials in the building shall be clean, free of paint or other splashes, free of stains and other marks.

PG 20 FIRESTOPPING

Any penetrations in fire rated walls or fire rated floors shall be firestopped with products having producer information approved by the Engineer.

Any pipes or conduits penetrating fire rated walls or floors shall be protected by a fire collar approved by the Engineer. Any switch boxes in firewalls shall be fire rated in accordance with the wallboard manufacturers approved system. Recessed lights in fire rated ceilings or walls shall be fire rated in accordance with the wallboard manufacturers approved system.

PG 21 QUALITY CONTROL

The Contractor shall advise how they intend to check that the building is built in accordance with the plans and specifications.

As a minimum the Contractor shall nominate one person on site who shall check and record the checks for the following.

1. That all notifications have been given and that all reinforcement and cast in items are correctly in place, that all dimensions are correct, and that all holes, chases, recesses, etc are correctly in place before each concrete pour.
2. That all concrete has been ordered correctly, batched in accordance with the order and delivered within the required time.
3. That all concrete has been properly vibrated.
4. That all concrete has been properly cured.
5. That the Steelworker has been advised of the checks and certification required and to check that the Steelworker is doing these.
6. That all materials have been checked as soon as they arrive on site for compliance.
7. That checks are carried out on each Subcontractors work at each stage.

These checks shall be carried out on properly printed check forms and shall be dated and signed when completed. These sheets shall be kept on site and available for the Engineer to audit at any time. A copy of all these shall be provided to the Engineer on completion of the contract.

PG 22 PRODUCER STATEMENTS

The Contractor shall provide the Engineer with a Producer Statement certifying that all the building work has been completed to the extent required by the Building Consent. Producer Statements from the Contractor shall be of the form of the Sixth Schedule of NZS 3910:2013.

PG 23 SAFETY OF STAFF AND OTHER PERSONNEL

S1 Known Hazards

1. People occupying space under the work area.
2. Buried electrical cables.
3. The height of the work.

S2 Project Health and Safety Information

The Contractor shall outline how they intend to deal with the risks and hazards of this job.

Please provide the following information with your tender.

1. What Company Health and Safety documents you have.
2. What is your past health and safety record over the last 5 years.
3. What training the Staff working on this project have undertaken.
4. Has the Company had any warnings or action taken against it by OSH in the last 5 years.
5. How are project review and monitoring of Health and Safety practices documented.
6. State the name and qualifications (including formal safety qualifications) and experience of the person who will be in charge of your work for this project.
7. State the names, qualifications and experience of other persons who will be working on this project.

PG 24 SITE ACCESS

Traffic management plan shall be provided and approved by the relevant authorities if the traffic to the site is likely to affect the traffic on the access road or any other streets in the vicinity of the construction site.

PG 25 CAR PARKING

Parking shall be provided and organised on the site.

PG 26 HOURS OF WORK

The Contractor shall carry out the work with general consideration to the neighbours and not carry out noisy work before 7.30 am and after 7.00 pm. If disruptive work or work outside this time is necessary, the Contractor shall allow to inform the neighbours and cease work if a reasonable request to do so is received.

All work hours, noise control etc shall be carried out in compliance to all local by-laws and statutory requirements.

EXCAVATION

EX 01 PRELIMINARY

Refer to the Conditions of Contract and Preliminary and General clauses which shall apply to this section of the works.

EX 02 SCOPE

This section of the contract includes the supply of all plant, materials, labour, and other ancillary materials and services necessary for:

1. The stripping of soil and other material.
2. Excavating for the foundations.
3. The taking possession of all surplus fill and excavated material and removing same from the site.
4. All other excavation work shown on the drawings.

EX 03 INSPECTION

No reinforcement or site concrete shall be placed until excavations have been approved by the Engineer. Backfilling against foundations walls shall not be done until the foundation walls have been approved by the Engineer.

EX 04 OVER EXCAVATION

Should the Contractor excavate to a greater depth than detailed, specified, or approved by the Engineer in writing, they shall, at their own expense, fill to a proper level with hardfill, or with site concrete as specified in the concrete section of the Specification.

EX 05 MAINTAINING EXCAVATIONS

Secure and maintain all excavations and keep them free from slips, water and mud, etc and provide and maintain all necessary shoring, sheet piling, plumbing or other plant as required. Ensure the safety of the work at all times and ensure that the Construction Act and all other legal obligations are fully met.

EX 06 BACKFILLING

Backfilling around foundations shall be with hardfill as specified below. All rubbish shall be removed before backfilling.

EX 07 HARDFILL

Hardfill shall be crushed AP 65, or local equivalent, shingle laid in 150 mm maximum depth layers and thoroughly consolidated with approved vibrating rollers. Any sand or shingle excavated from the site that is to be reused as backfill must be approved by the Engineer and shall be kept clean and shall not be contaminated with soil or clay.

Compaction of hardfill shall ensure that a dry density of 2200 kg/m^3 average and a minimum point result of 2050 kg/m^3 is achieved. The Contractor shall prove this density has been obtained by having troxler testing carried out by a recognised testing company. The results shall be emailed to the Engineer for written approval which shall be received before the damp-proof membrane or any other construction is placed over the hardfill.

EX 08 WORKMANSHIP

All work shall be carried out to a high standard, to accurate forms and set-out. Work in the opinion of the Engineer that is substandard shall be redone. Should the compaction of any hardfill be suspect then the Contractor shall pay for any testing required.

CONCRETE

CO 01 PRELIMINARY

Refer to the Conditions of Contract and Preliminary and General clauses which shall apply to this section of the works.

CO 02 SCOPE

This section of the contract includes the supply of all labour, materials, plant and equipment in connection with the supply, mixing and placing of all concrete, together with supply and fixing of all reinforcement and finishing of all surfaces and shall include

1. All in-situ concrete work.
2. All fillings of pockets and other openings. Column encasement and other steel concrete protection as detailed on the drawings.

CO 03 CONCRETE GRADES AND STRENGTHS

All concrete shall be supplied from an approved ready mix concrete plant and shall comply with NZS 3104:2003. All cement shall be type GP to NZS 3122. The nominated concrete supplier must not be changed without the Engineers prior approval. Reworked concrete must not be incorporated as part of any truck load.

Concrete grades and strengths as defined in NZS 3104 shall be as follows:

Site Concrete

Normal grade concrete with a minimum compressive strength of 10 MPa at 28 days having a slump of 50 mm.

Foundations

Normal grade concrete with a minimum compressive strength of 25 MPa at 28 days, having a slump of 75 mm and using nominal 20 mm aggregate.

CO 04 MATERIALS AND WORKMANSHIP

All materials shall comply with the relevant NZ Standards.

The whole of the concrete work shall comply with appropriate sections of NZS 3109:1997 unless specifically instructed otherwise by the Engineer.

A copy of NZS 3109:1997 "Concrete Construction" shall be kept on site.

Any defective work and any work which in the opinion of the Engineer does not comply with the Specification or drawings shall be removed and replaced at the expense of the Contractor.

CO 05 FORMWORK

All formwork shall comply with the relevant clauses of NZS 3109:1997.

A high standard of fairface concrete is required above finished ground level. Formwork shall be constructed to achieve this. Except for the upper 300 mm, sides of posthole footings shall not be boxed- they shall be poured against the natural ground.

All forms shall be coated with an approved non-staining release agent. See Clause “Concrete surface finishes” for more information.

Formwork ties shall be a fibreglass formtie system or other non-corrodible ties. Ties shall be a concrete grey colour and shall be ground off flush with the concrete surface after the formwork is removed.

CO 06 ADMIXTURES

Normal approved water reducing agents and superplasticisers may be used provided the Engineer is notified of their use.

No additional admixtures other than those stated in each mix above, shall be used without the approval of the Engineer. Calcium Chloride will not be approved for any concrete that is reinforced.

CO 07 TESTS AND RECORDS

The delivery dockets or other certified record for plant mixed concrete shall be forwarded to the Engineer at fortnightly intervals. The Contractor shall keep an accurate record of the in-place location of all batches. Tests on site shall be carried out as per Section 9 of NZS 3109:1997. Other tests shall be carried out as per NZS 3112 Parts 1 to 4.

CO 08 CHASES, HOLES

Any chases or holes required for services or for any other reasons shall be formed to the neat size required. They shall be accurately positioned and cast. Set concrete shall not be hacked or cut unless specific approval is obtained from the Engineer.

CO 09 BUILD-IN

Provide and/or build in as work proceeds all pipes, ducts, brackets, seatings, bolts, fixings, etc, as detailed and as required to ensure a complete and workmanlike job.

CO 10 REINFORCEMENT

All reinforcement must be manufactured in New Zealand by Pacific Steel and have passed the rebend test specified by Clause 7.2.3 of AS/NZS 4671:2001.

Bar reinforcement denoted on the drawings with the prefix H shall be deformed bars of grade 500E, complying with AS/NZS 4671:2001 "Steel Reinforcing Materials".

Bar reinforcement denoted on the drawings with the prefix D shall be deformed bars of grade 300E complying with AS/NZS 4671:2001 "Steel Reinforcing Materials".

Bar reinforcement denoted on the drawings with the prefix R shall be plain bars of grade 300E complying with AS/NZS 4671:2001 "Steel Reinforcing Materials".

Mesh reinforcement shall be deformed rib mesh of Grade 500E complying with AS/NZS 4671:2001 "Steel Reinforcing Materials" i.e. 500SE.

CO 11 BENDING AND PLACING OF REINFORCEMENT

Reinforcement shall be cut, bent and placed as indicated on the drawings and in conformity with the appropriate sections of NZS 3109:1997. Reinforcement shall be secured with wire ties and the cover maintained with plastic or concrete spacers.

Bars shall be lapped only where detailed, except that bars in foundation and slab edge beams may be lapped to suit stock lengths with the provision that laps shall be kept to a minimum and staggered where possible.

Before pouring begins the Engineer is to be notified and reasonable opportunity given for them to inspect the reinforcing as fixed. All reinforcing steel shall be bent to return to all wall, beam, slab or column junctions, where not otherwise shown. When placing reinforcement for ground floor slabs care shall be taken to ensure that the sand blinding is not disturbed below the DPM.

CO 12 CONCRETE SURFACE FINISHES

The surface finish of concrete surfaces shall comply with the provisions of NZS 3114:1987 applicable to the class of surface.

The final finish of all concrete, where not otherwise specified, shall be at least as good as the finish for typical uses as Table 1 and at least as good as the finish specified for the examples given in Table 2.

CO 13 CONCRETE COVER

Cover shall be positively maintained to within 3 mm.

The reinforcing steel in precast tilt up panels shall be placed centrally unless specified otherwise in the drawings.

Where not otherwise specified concrete cover shall be provided as set out in the table below.

	Specified Compressive Strength (MPa)				
Exposure	20	25	30	40	50
	Minimum Required Cover (mm)				
Interior or protected by DPM	25	25	20	20	20
Exterior Inland. Check With Engineer	40	35	30	25	25
Exterior otherwise	50	40	35	30	30
Exterior if within 500 m of coast			45	40	35

CO 14 SPLICES

Where splices are shown on the drawings, splices of reinforcement shall not be made at positions other than those shown without the approval of the Engineer. Where splices are not shown on the drawings they shall be of the following length.

Grade 300 bars 44 bar diameters

Grade 500 bars 73 bar diameter

STRUCTURAL STEELWORK

ST 01 PRELIMINARY

Refer to the Conditions of Contract and Preliminary and General clauses which shall apply to this section of the works.

ST 02 SCOPE

This section of the contract includes the supply, fabrication, erection, and treatment of the whole of the structural steelwork including all cleats, connections, intumescent paint application etc and the fabrication and supply to other trades of all bolts, weld plates and other connection items for building in. All other steel metalwork items required for this contract as shown on the drawings shall be supplied and fixed by this trade.

ST 03 MATERIALS

All steelwork items not otherwise specified or shown differently on the plans shall be of the following grades.

Welded Beams, Welded Columns	(Grade 300)	AS/NZS 3679.2:2016
Universal Beams, Universal Columns, Parallel Flange Channels, Equal Angles, Unequal Angles, Taper Flange Beams, Taper Flange Channels	(Grade 300)	AS/NZS 3679.1:2016
CHS RHS SHS	(Grade 300L0)	AS/NZS 1163:2016

On completion of the works the Engineer shall be provided with a certificate from the Steelwork Contractor stating that all structural steel used complies with the Specification.

ST 04 HOLES

All holes shall be punched or drilled to the sizes shown on the drawings. Holes for bolts shall be drilled not more than 2 mm greater than the nominal bolt size unless otherwise shown. Holes shall not be gas cut without the Engineers approval.

ST 05 WELDING

All welding shall be by an electric arc process in accordance with AS/NZS 1554.1, AS/NZS.1554.3, AS/NZS 1554.5 or AS/NZS 1554.6 as appropriate. Butt welding of lengths not specifically shown on the drawings shall only be permitted with the written approval of the Engineer.

All weld surfaces shall be brought up proud of the parent metal. Butt welds shall be ground smooth. Welds exposed in the finished building shall be neatly finished.

Welding shall be carried out only by qualified Welders who have been engaged in welding for a period of six months immediately prior to the date which welding work is to begin. All weld splatters, etc shall be ground smooth before painting.

Where a hollow section such as an RHS or SHS is to be welded, a backing plate not thinner than the wall thickness of the hollow section being welded shall be fixed securely behind the root of the butt weld.

The two weld categories are designated as:

(a) GP (General Purpose Welds). These welds may be used in non-structural applications or where welds have not otherwise required to be SP welds.
(b) SP (Structural Purpose). These welds shall be used for all portal joints, truss joints, bracing fixings, for all butt welds, for all welds of areas that the in service temperature is below 0°C, and for high cycle dynamic loading.

Where any steel is bent, and then required to be welded at a distance within ten times the steel thickness or diameter, the bend must be made with the steel at red heat.

As much fabrication as possible shall be carried out in the workshop.

ST 06 WELDING INSPECTION

The Structural Steelwork Contractor shall be responsible for the visual inspection of all welds in accordance with AS/NZS 1554.

All welds shall be inspected by a Welding Inspector who shall have had suitable training and experience in the fabrication and inspection of welded structures for the scope of work involved.

Welding Inspectors should hold welding inspection certification from the Certification Board of Inspection Personnel (CBIP) or an equivalent qualification acceptable to the CBIP.

Prior to welding commencing the Inspector should inspect the set-up of the work.

During welding, all welds shall receive full visual inspection in accordance with Section 7 and Table 6.2.2 of AS/NZS 1554.1:2014.

The Inspector shall make a careful and systematic check to ensure that no welds called for in the drawings and specifications are omitted.

On completion of all welding, the Engineer shall be provided with a certificate from the Steelwork Contractor prepared by the Welding Inspector that the welding has been inspected in accordance with the above requirements and that the welding was in accordance with AS/NZS 1554.1 or AS/NZS 1554.2 or AS/NZS 1554.5 as appropriate.

ST 07 WELDING DEFECTS

Any welding defects shown up by Radiography or other testing shall be cut out and remade as directed by the Engineer. Should welding defects be disclosed, then further welds may be subject to Radiographic testing at the Contractor's expense if directed by the Engineer.

ST 08 TOLERANCES AND CLEARANCES

All dimensions shall be verified by actual measurements on the job by the Contractor before commencing any work or preparing shop drawings.

Tolerances and clearances shown on the drawings have precedence over tolerances and clearances specified in the Standard Specification.

All lengths shall be generally accurate to within 1 mm, but this tolerance shall not be in addition to tolerances or clearances given on the drawings or in the Standard Specification.

ST 09 ERECTION

Truth Of Line, Level And Plumb

It is the Contractor's responsibility to ensure that all members after erection and after application of all dead loads are level or plumb and are straight, unless expressly shown otherwise on the drawings.

Handling

Unless approved by the Engineer to the contrary, padded slings shall be used to handle all treated steelwork. The Contractor shall be at all times wholly responsible for the efficiency and the safety of all erection operations and procedures.

During erection, members shall be adequately supported to prevent over stressing or failure occurring. All welds shall be complete before any loads (other than the self-weight of the steelwork) are applied.

Welding

Field welding shall be of the same standard as shop welding and shall not be done in rain, wet or other harmful conditions.

Erection Bolts

Provision of bolts and seatings for erection is not necessarily made in the drawings. The Contractor shall on request give the Engineer particulars of their proposals for erection bolts and seatings.

Erection bolts which, if they work loose, could become a potential threat to safety, shall be removed.

Mortar

Mortar shall be used for filling all spaces between concrete or masonry and steel bearing plates, etc. Materials shall comply with concrete work of the Specification.

The mix shall consist of one part cement to 1 and a half parts dry sand by weight, with a water/cement ratio not exceeding 0.38, but with sufficient water to ensure the mixed mortar is in a plastic condition. The procedure shall be – the mix shall be towelled on to the moistened concrete just before the steelwork is lowered into place in a layer of approximately 10 mm. The holding down bolts shall then be tightened to secure the steelwork and all mortar squeezed out removed.

Attachments For Services, Etc

No attachments unless shown otherwise may be made to the structural steelwork for the support of services, etc without the expressed approval of the Engineer.

ST 10 BOLTS

Supply all bolts as detailed. Bolts shall be of such length that a minimum of 4 mm and a maximum of 20 mm of the threaded end protrudes beyond the nut face after fixing. Bolts shall comply with AS/NZS 1252.

Nuts shall comply with AS/NZS 1252. A thick washer with flat faces shall be provided under each nut. Where necessitated by bevel flanges or otherwise, washers to match shall be used so that the head and nut bearing shall be parallel.

All nuts, washers and bolts shall be zinc plated where visible inside or galvanised where visible and exposed to weather.

ST 11 PRIMING

All steelwork except those portions cast in concrete shall be prepared and primed with Grey Resene Amourcoat 210. Degrease according to SSPC-SP1 Solvent Cleaning. Remove all weld spatter, and grind sharp edges and weld seams. Blast clean to SSPC- SP10. Apply in accordance with the manufacturer's recommendations to provide a finished dry film thickness of 70 microns.

After erection, touch up all surfaces damaged by erection or fixings so as to ensure that complete coverage of exposed structural steel surfaces is obtained. Liberally coat bolt heads, weld plates, welds, nuts and random pinholes. Paint evenly without spills and runs. All on-site welds to be given two coats of primer after thorough preparation.

ST 12 APPLICATION OF HOT DIP GALVANISING

All steelwork to be hot dip galvanised shall be in compliance with AS/NZS 4680. The Contractor shall demonstrate that they have achieved the required build up.

All steelwork shall be checked before the galvanising processing for completeness of fabrication.

ST 13 BRACING

After bracing is fixed, the Engineer shall be notified to carry out an inspection to ensure that the bracing is tight.

ST 14 STEELWORK CAST INTO CONCRETE

All structural steelwork cast into concrete shall be free from loose flakey rust, mud, oil, paint, concrete, or other mortar splatter or any other coating that will reduce or destroy the bond.

ST 15 COLUMN WIRE WRAPPING

Wrap each column shown to be concrete encased with 5mm wire spiral at 150 mm pitch. This spiral shall be held in position by spot welding as required. The spiral shall be such as to be an average of 20 mm away from the face of the structural steelwork.

ST 16 STAINLESS STEEL

Stainless steel shall be 304 or 316 grade.