

OUR CULTURAL HEART

Existing Precast RC Plank/Slab Investigation Report

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Site Address: Queensgate Market, Princess St, Huddersfield HD1 2RS

Control Sheet

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Executive Summary

The Queensgate Market Hall has undergone a fully considered programme of structural survey, informing the re-use of the building as a Food Hall, with a new library. This has included the survey of the Market Hall and Level 01 structural floor, which is comprised of approximately 2,000 reinforced concrete planks. The Queensgate Market Hall precast plank floor infill was installed in 1969. Concrete planks or slabs made today to existing standards would be expected to have a service life of 50 years before needing repair or replacement. Consequently, the existing concrete planks and slabs need to be reviewed, and irrespective of the Our Cultural Heart proposals, the ongoing structural integrity, use and lifespan of the Listed Building is important. However, the Our Cultural Heart proposals for the Market Hall allow for the concrete planks to be considered as part of the overall development and as part of securing the lifespan of the Listed Building as a whole. It is essential that the works to the Market Hall, as part of its reuse have an appropriate lifespan (which for the purposes of this report is considered to be 50 years), so as to deliver the substantial benefits that the scheme will have.

As per the various heritage assessments undertaken for the planning and Listed Building Consent applications for Our Cultural Heart, it is considered that the planks and slabs are of low significance. It is also important to note that the concrete flooring, whether it comprises these planks or not would ultimately not be visible and would be subject to thermal lining and other finishes as per the architectural proposals and requirements.

This report outlines the recommendations from an extensive investigation of the precast hollow reinforced concrete (RC) planks at Queensgate Market, Huddersfield. These planks form most of the floor plate on the upper ground and first floors. The purpose of the investigation was to determine the existing and potential future structural integrity of the precast RC planks and assess their viability for retention as part of Phase I of the Our Cultural Heart Scheme.

The investigations included:

- Assessing the structural durability
- Examining the existing condition
- Reviewing the existing planks protection against fire

The testing methodologies and findings are presented in the appendices, and Curtins have provided recommendations below based on the investigation results.

The recommendations have been summarised below with more detail found in section 2 of the report.

- Precast planks or slabs with damage or signs of corrosion of steel reinforcement started or well established should be replaced
- Any planks or slabs with significant carbonation to either be replaced or structurally remediated using one of the options suggested
- All retained planks to be fire protected, either by increasing the cover to the bar or using fireboard etc.
- All retained planks to be protected with specialist protection coating for durability.

- All retained planks should have an additional bearing angle fitted at both supports to increase the existing bearing length.

In addition to the precast RC plank works, strengthening of existing foundations to increase bearing capacity and breakout and reinstatement of existing Lower Ground Floor (basement) slabs and existing Upper Ground Floor RC solid slabs are also being carried out to allow installation of proposed below ground services and replacement of slabs with durability issues. The proposed works to these areas has been summarised in section 3 of the report.

1.0 Investigations

The investigations carried out to assess the structural integrity of the precast reinforced concrete (RC) planks and review the viability of retaining them as part of the refurbishment of Queensgate Market include the following:

- Assessment of structural durability for 50yr life.
- Examination of the existing condition
- Review of the existing precast RC planks' fire capacity
- Precast plank end bearing
- Ability to replace individual damaged planks with an alternative structural floor

1.1 Structural Durability

The assessment of the structural durability of the existing precast reinforced concrete (RC) planks involves understanding their ability to withstand various environmental and service conditions throughout their lifespan. The Queensgate Market building, constructed in the late 1960s to early 1970s, has been in service for approximately 55 years. Over this period, the precast RC planks are expected to have experienced some form of deterioration due to environmental exposure. Depending on their location and exposure conditions, different areas of precast RC planks have undergone varying types and extents of deterioration. Inherent differences in the planks, such as size, cover to reinforcement, environment, loading conditions, and batch of concrete mix used, all impact their ability to resist deterioration.

To understand the extent of deterioration in the precast RC planks over the large floor area, Curtins undertook spot intrusive investigations across the upper ground floor and first floor. These investigations provided an understanding of the extent and type of deterioration currently experienced by the precast RC planks. The intrusive investigations included tests to measure the extent of carbonation and the testing of chloride content at varying depths within the precast RC plank concrete.

These investigations and results are discussed in detail in Appendix A, with references to intrusive investigations, visual surveys, and laboratory results.

1.2 Structural Condition

A structural survey of existing precast RC planks has been conducted for the Upper Ground Floor above the mezzanine level and Level One, identifying planks that need replacing or remediating after they have been found to be retainable or repairable following the structural durability investigation.

The condition survey categorised the planks into three types:

1. Acceptable Structural Condition

2. **Structural Remediation Required** - (cementitious mortar to fill historic penetrations or reinstate cover where reinforcement is not exposed)

3. **Replacement Required**

Detailed information on plank investigations carried out can be Appendix C and the results for the condition survey of precast RC planks can be found in Appendix D.

Results from the condition survey found that:

- Of the **98** precast RC planks surveyed on the Upper Ground Floor (above mezzanine floor) **62** require replacement and **14** require remediation.
- Of the **412** precast RC planks surveyed on Level One **75** require replacement and **134** require remediation.

However, the above does not mean that all planks that could be repaired can practically happen. This is particularly apparent when an individual plank, or a limited number of planks exist in an otherwise condemned set of planks. In that instance, it will not always be possible to allow for limited retention and replacement within the same bay. Decisions will need to be made on a plank by plank and bay by bay basis.

1.3 Fire Rating of Existing Precast RC Planks

In reinforced concrete structures, the thickness of concrete covering the steel reinforcement, known as cover level, is vital for fire resistance. BS EN 1992 (Eurocode 2) sets standards for minimum cover thickness based on environmental exposure and fire resistance needs. Thicker covers delay heat transfer, preserving steel strength and preventing spalling. Fire resistance classes (e.g., R30, R60) indicate the duration a structure can withstand fire, with corresponding cover requirements.

The soffits of the upper ground floor and first floor are required to meet a fire rating of minimum 1 hour and 2 hours in some locations. To assess the current fire rating provided by the existing precast RC planks, measurements of the cover levels were necessary. Intrusive and ferro-scanned surveys were conducted in various structural bays (consisting of approximately 14 precast RC planks) across the soffits of the upper ground floor and level one to determine these cover levels., results are available in Appendix E.

Results from intrusive investigations carried out on the precast RC planks found the cover levels ranging between 5mm to 45mm. Based on BS EN1992-1-2 Table 5.8 the following cover levels and thickness are required to achieve each level of fire rating:

- **1-hour fire rating:** 20mm axis distance (15mm cover) to reinforcement and 80mm thickness

- **2-hour fire rating:** 40mm axis distance (35mm cover) to reinforcement and 120mm thickness

Out of a sample size of 336 planks, it was found the cover level to the reinforcement varied significantly. The average cover level found on the upper ground floor was 18.1mm with results ranging from 3mm cover to 67mm. The average cover level found on level one was 18.7mm with results ranging from no cover to 103mm cover. Based on these results, it is clear that there is a large variance in the cover levels and some form of fire protection or increase of cover to the precast RC planks should be adopted assuming they have no inherent consistent fire protection.

The survey of the planks gave a thickness of the flanges of 30mm and 50mm and a screed thickness of 50mm. Based on this, the minimum thickness for both 1 and 2hrs fire rating can be achieved.

1.4 Precast Plank End Bearing

The end bearing of the precast planks was noted on archive drawings to be a minimum of 75mm, to typically sit into a notch (75mm wide) in the insitu concrete beam. Many locations were found on site where the precast planks do not fully cover the notch, resulting in a reduced bearing length of less than 50mm. We must ensure that all planks achieve the 75mm bearing length, and therefore the proposal is to add a steel angle to all support locations of any remaining planks on all floors to achieve this bearing.

1.5 Viability of Precast RC Plank Replacement

Investigations have been carried out to assess if the replacement of precast RC Planks is feasible, and what structural floor alternatives would be suitable. The governing factor when assessing the viability of replacing the precast RC planks was the self-weight and loading limits. Any replacement solution would have to be within loading limits the existing RC structural frame (beams, columns & foundations) has been designed for. Therefore, the replacement option would have to be within the self-weight and loading limit the existing precast RC planks were designed to. Based on historic archive information and on-site intrusive investigations, the self-weight and loading limits for the precast RC planks have been determined and any suggested replacement option has been assessed according to these criteria.

2.0 Recommendations

We recommend the following remedial works for various scenarios as listed below. A flow chart has also been produced to understand the thought process taking place when assessing the retention of precast RC planks:

2.1 Damaged Planks

Any planks that are already damaged or have signs of damage that have been demonstrated to have caused corrosion to the reinforcement bars, need to be removed and replaced. Where planks have physical and visual damage and are repairable may be retained. Results are based on findings outlined in section 1.2.

2.2 Undamaged Planks or Repairable Planks

2.2.1 Low Chloride, Low Carbonation Planks

Where planks have low chloride and low carbonation, and both values are within the code limits then no special remediation works are needed. They will only need a specialist protection coating such as a Renderoc ST05 product or similar to comply with design codes for durability. They do still need a form of fire protection or additional cover applied to achieve the minimum fire rating required.

2.2.2 High Chloride, Low Carbonation Planks

Any planks that have high chloride, but carbonation that has not yet reached the bar can be protected to slow the rate of carbonation. A specialist product such as Renderoc ST05 is recommended to be coated onto the concrete surface to slow the rate of carbonation to acceptable limits. They do still need a form of fire protection or additional cover applied to achieve the minimum fire rating required.

2.2.3 High Carbonation Planks

Planks with High Carbonation, where the carbonation has reached the bar needs significant intervention to protect the bar and ensure durability for the next 50 years. The bar in the plank has no protection from corrosion in its current condition and will therefore deteriorate. These will either require a form of cathodic remediation or replacement.

2.2.4 Replacement options:

In the case of replacement, we have proposed a number of alternative concrete slab options for these planks, as listed below.

1. Replace with propped metal deck, cast insitu concrete slab
2. Replace with unpropped metal deck, cast insitu concrete slab

3. Replace with unpropped metal deck, cast insitu concrete slab, minimising steel beam use
4. Replace with timber
5. Replace with beam and block
6. Replace with Hollowcore slabs

2.3 Fire Protection

2.3.1 Minimum Concrete Thickness

The thickness of the existing precast RC planks are sufficient to achieve 2hrs fire rating.

2.3.2 Minimum Cover to Reinforcement

The result from the survey suggests that a significant number of the bars in the planks do not achieve the minimum cover, and therefore a form of remediation or fire protection is required. This would have to be undertaken on all the planks proposed to be retained.

Options for achieving a certain fire rating would include:

- Increase cover to precast RC plank soffit by 15mm (max. 1hr fire rating achievable)
- Fire boarding,
- Intumescent paint

2.4 Precast Bearing Length

All precast planks to be retained are to have an additional angle support installed to angle at support locations to increase the bearing length to above the minimum required. These steel angles would be post fixed to the face of the existing RC beams the precast RC planks are bearing onto.

2.5 Precast RC Plank Assessment Flow Chart



3.0 Additional Structural Works

In addition to the work required on the precast RC planks, work is also needed on the following structural elements:

- **Existing Foundations**
- **RC Slab at Lower Ground Floor**
- **RC Slab at Upper Ground Floor**
- **Minor Repairs to Existing RC Structure**

3.1 Existing Foundations

Strengthening work is proposed for the existing mass concrete pad foundations to accommodate increased loads. This is particularly necessary in areas where an additional floor is being added (Library Area) and where water tanks are proposed on the lower ground floor. Details and locations of the strengthening work are provided in Curtins' drawings:

- IR430301-CUR-XX-00-DR-S-160001 FOUNDATION - GENERAL ARRANGEMENT
- IR430301-CUR-XX-00-DR-S-160011 FOUNDATION – DETAILS

3.2 RC Slab at Lower Ground Floor

A significant portion of the lower ground floor slab exhibits high chloride content extending more than 75mm into the slab, primarily due to de-icing salts. These areas are proposed to be replaced, both due to the chloride content and to facilitate the installation of new drainage services below the slab. The only sections found to be in good structural condition are beneath the former Superdrug store and the art gallery space. The back-of-house storage area between grid lines L-3 to L-10 and L-E to L-Fa also showed low levels of carbonation and chloride content. The extent of demolition is indicated in Curtins' drawing:

- IR430301-CUR-XX-LG-DR-S-260101 LEVEL 00 LOWER GROUND DEMOLITION - GENERAL ARRANGEMENT

3.3 RC Slab at Upper Ground Floor

The installation of below-ground services beneath the existing upper ground floor RC slab, located beyond the existing retaining wall which currently forms the floor of the existing market hall, necessitates the replacement of a large portion of the slab.

3.4 Minor Repairs to Existing RC Structure

Minor repairs are proposed for issues such as chips, existing penetrations, and localised exposure of reinforcement. These repairs are widespread and not easily quantifiable, so a typical detail has been produced to cover the repair requirements in each case. This detail can be found on the drawing:

- IR430301-CUR-XX-XX-DR-S-210202-P01 DETAILS SHEET 2

Appendix

Appendix A – Precast RC Planks Structural Durability Investigation Details

Chloride Content Investigation

Chloride is an ion commonly found in salts, which increases the corrosion speed in reinforced concrete. They commonly make their way into reinforced concrete structures in the form of de-icing salts, chemicals and when a structure is in a marine environment. The level of Chloride content has been measured within the existing precast RC planks during intrusive investigations.

Samples were taken from precast RC planks at spot investigation locations for the chloride content to be measured. Select results have been displayed on plan found in Appendix B.

Codified limits in BS8500-1 were used to assess whether the content of chloride measured was acceptable or not for a future lifespan of 50 years. Figure 1 shows an extract of BS8500-1, giving a limit for the non-prestressed planks of 0.4.

Table A.8 — Recommended chloride classes for concrete containing carbon reinforcing steel, high tensile steel wire or strand for prestressing

Concrete use	Chloride class	Maximum chloride ion content (% mass of cement or combination)
Pre-tensioned pre-stressed concrete	CI 0,10	0.10
Heat-cured concrete containing steel reinforcement or other embedded metal		
Non heat-cured concrete containing reinforcement or other embedded metal produced with CEM I-SR 0 or CEM I-SR 3 cement	CI 0,20	0.20
Non heat-cured concrete containing reinforcement or other embedded metal that is subjected to significant amounts of external chloride, such as in XS or XD exposure classes	CI 0,30 ^{B)}	0.30
Non heat-cured concrete containing steel reinforcement subject to XC exposure classes	CI 0,40	0.40
Post-tensioned concrete in XC1 exposure class ^{A)} , e.g. internal post-tensioned office construction		
Unreinforced concrete containing no embedded metal other than corrosion-resistant lifting devices	CI 1,00	1.00

^{A)} No guidance is given for post-tensioned pre-stressed concrete in other exposure classes, or for unbounded pre-stressed concrete. The appropriate chloride class depends on the particular exposure, type of structure and construction method.

^{B)} Chloride class CI 0,30 is in addition to the CI 0,10, CI 0,20, CI 0,40 and CI 1,00 classes given in BS EN 206:2013+A2:2021.

The methods for measuring the chloride content of the constituent materials for concrete are specified in BS 8500-2:2023, 5.2 and the method of determining the chloride content of fresh concrete is specified in BS EN 206:2013+A2:2021, 5.2.8.

Figure: Table A.8 - extracted from BS8500-1 2023

The following screenshots taken from the mark up in Appendix B shows relevant chloride results for the Upper Ground Floor and Level One highlighted in yellow.

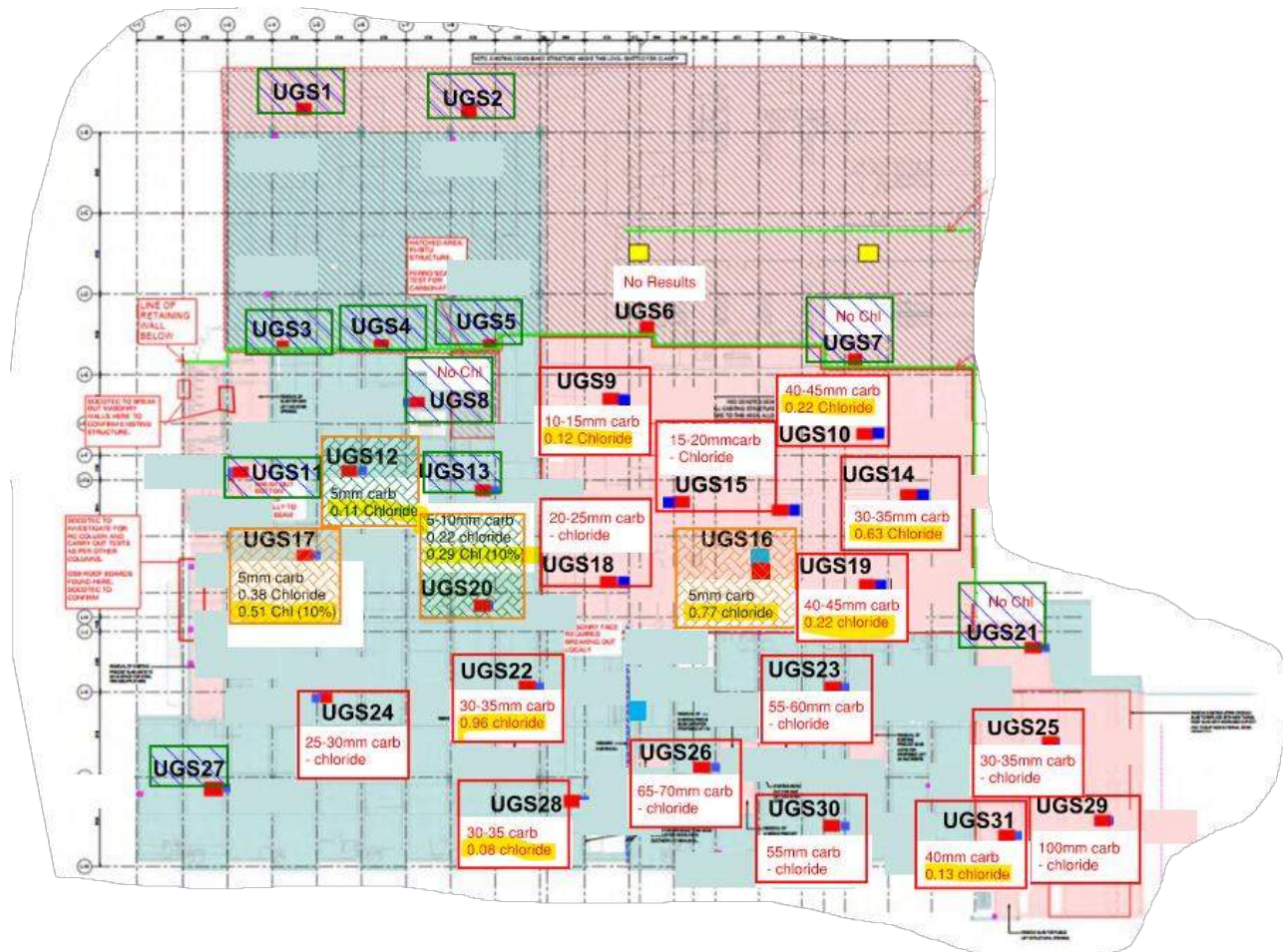


Figure 1: Upper Ground Floor Chloride Results

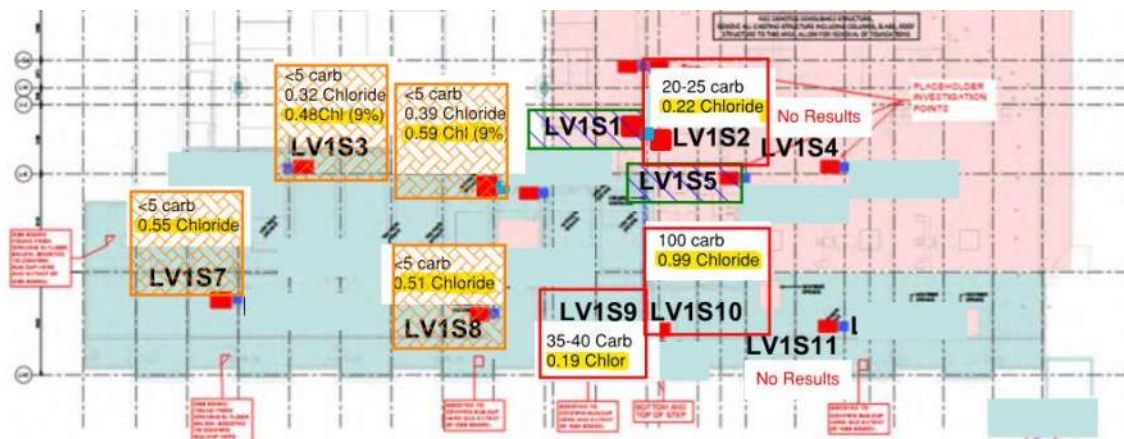


Figure 2: Level 1 Chloride Results

The chloride content results for the Upper Ground Floor and Level One indicate that several locations have chloride levels exceeding the 0.4% limit. These high levels of chloride do not show any clear pattern or correlation with the existing layout or exposure conditions, suggesting that the issue is widespread.

During site visual surveys many precast RC planks were found to show signs of water ingress. This suggests that during the service life of the structure, the floor build up above the precast

RC planks had failed causing the precast RC planks to be exposed to liquids applied to the floor finish. Cleaning products and chemicals containing chlorides are believed to have seeped through the floor finish in damaged/failed zones causing the high levels of chloride in certain areas.

Carbonation Extent Investigation

Carbonation in reinforced concrete is the process where CO₂ from the atmosphere reacts with calcium hydroxide in the concrete, forming calcium carbonate and lowering the concrete's pH. This reduced pH can lead to the corrosion of embedded steel reinforcement by removing the alkaline environment.

When both carbonation and chlorides are present, the corrosion potential increases.

Carbonation extent testing was carried out in-situ during intrusive investigation works. The Carbonation extent was measured at varying depths to understand the extent up to which the carbonation had reached within the concrete elements. The minimum non-carbonated cover levels to protect the bar from corrosion is as per the limits set in BS 8500-1, Table A.4. Archive drawings and site results were used to obtain concrete cover levels, this has been assessed against the carbonation extent to determine if the remaining cover is sufficient or not.

The nominal non-carbonated cover requirements for resistance to carbonation for the precast RC planks are **15mm** based on an exposure class XC1 for internal environments, and **20mm** cover for areas within trafficked parts of the lower ground floor based on an XC3/4 exposure class.

The following screenshots taken from the mark up in Appendix B shows the carbonation extents for the Upper Ground Floor and Level One highlighted in yellow.

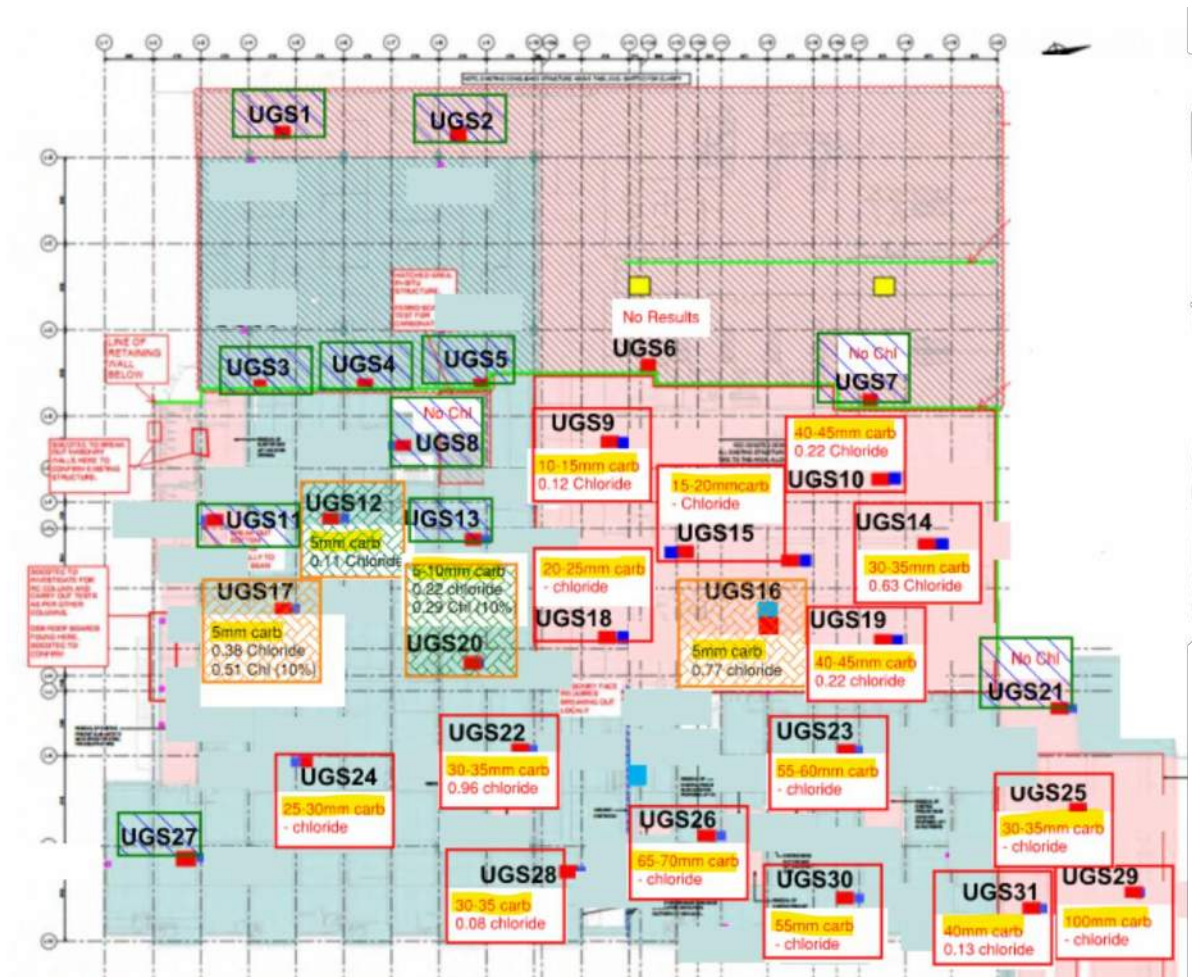


Figure 3: Upper Ground Floor Precast RC Planks Carbonation Results

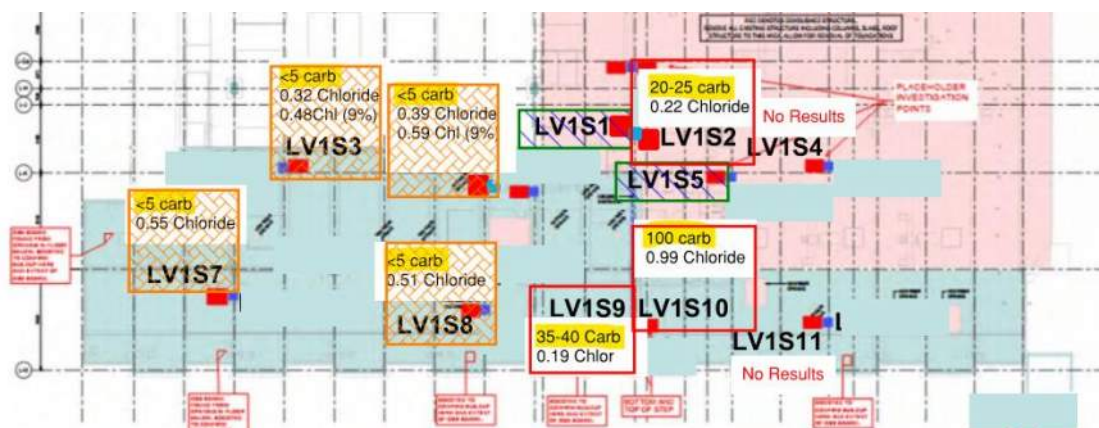


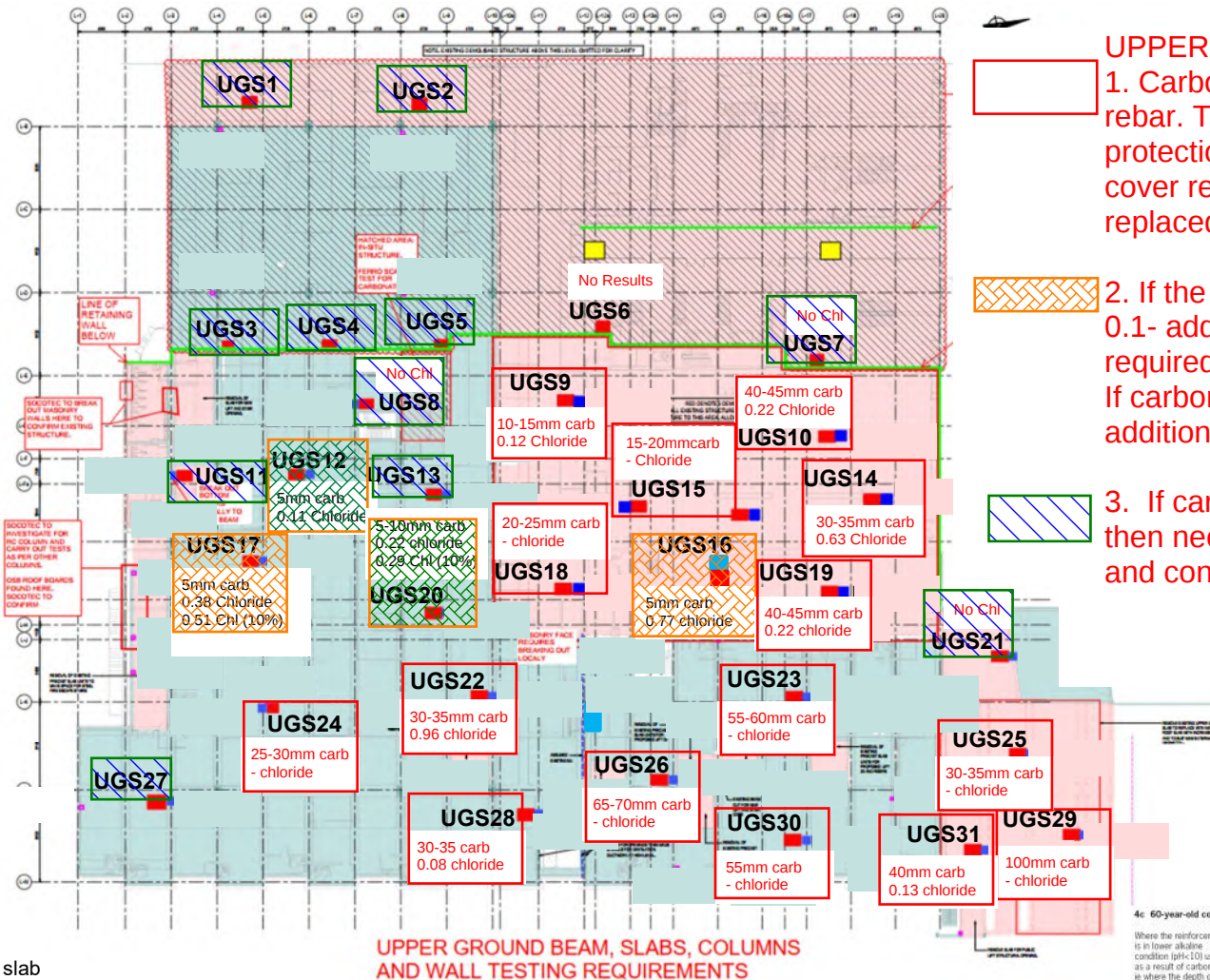
Figure 4: Level One Precast RC Planks Carbonation Results

The upper ground floor carbonation extent results indicate that in locations of vehicle access, where the exposed precast RC planks have been subjected to carbon fumes, carbonation has penetrated beyond cover levels. Results from the precast RC planks located over the proposed event space, currently the Piazza Shopping Centre, indicate high levels of carbonation. In contrast, precast RC planks located internally in the Queensgate Market space, north-west on the upper ground floor plan, show low levels of carbonation.

On Level One, the carbonation extent results indicate low levels of carbonation for the precast RC planks west of the existing movement joint. However, planks adjacent to and east of the movement joint show high levels of carbonation, surpassing cover levels.

Appendix B – Socotec Chloride and Carbonation Results GA

Indicative intrusive locations



Notes:

UGS# = Upper ground slab
UGB# = Upper ground floor beam
UGC# = Upper ground floor column/wall

4c: 60-year-old concrete structures (extrapolated data)

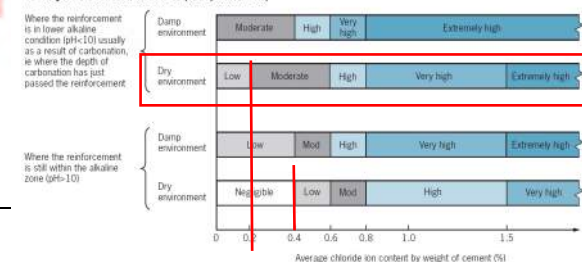
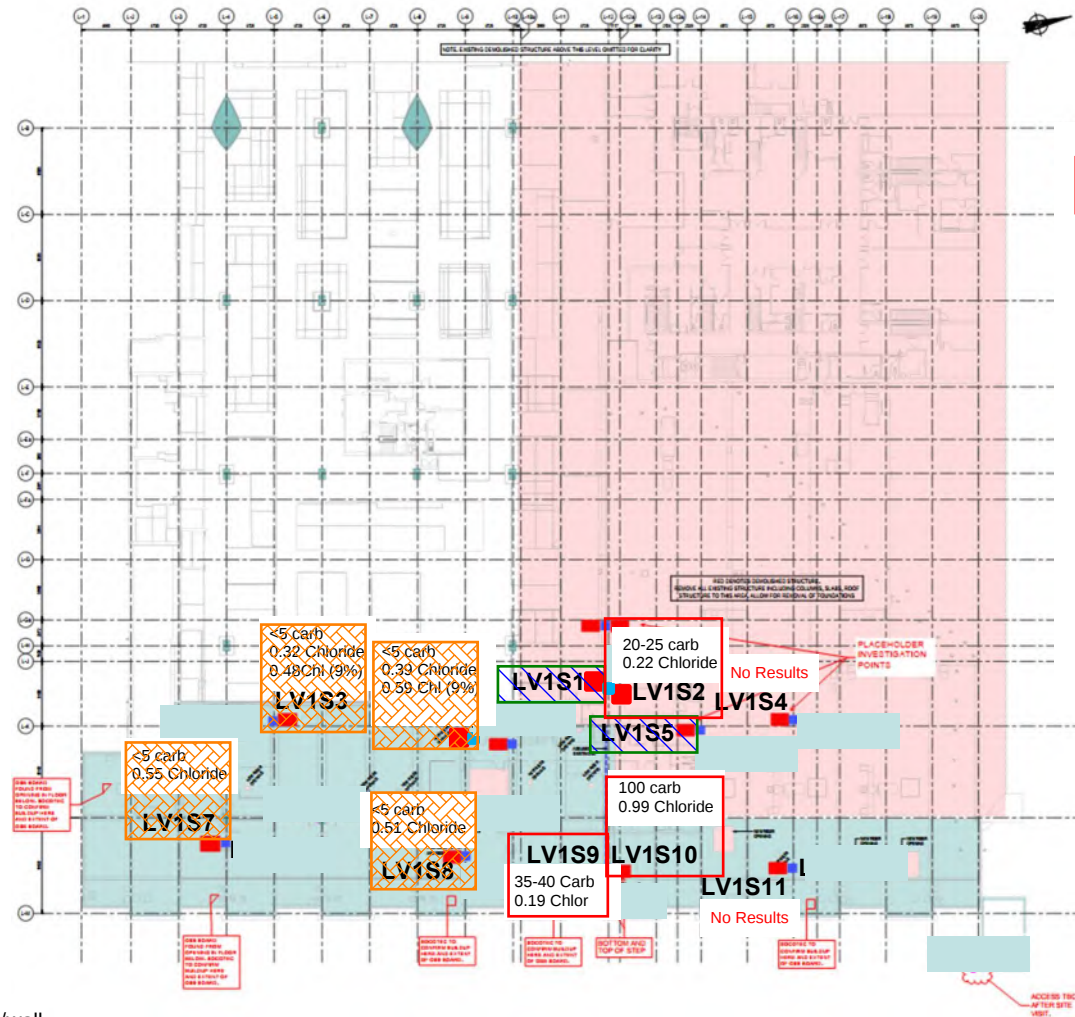


Figure 4: Estimated risk of steel reinforcement corrosion associated with carbonation, cast-in chloride content and environmental conditions

Indicative intrusive locations



Notes:

LV1S# = Level 1 slab
LV1B# = Level 1 beam
LV1C# = Level 1 column/wall

FIRST FLOOR SLABS:

1. Carbonation front is at the rebar. Therefore the rebar has no protection and requires the to be cover replaced or the plank replaced.

2. If the chloride is greater than 0.4- additional cover render required.
If carbonation greater than 5mm - additional cover render required

3. If carbonation and chloride ok, then need to prove cover for fire, and condition of existing plank.

Appendix C – Precast RC Planks Condition Investigation

Plank Type Investigations

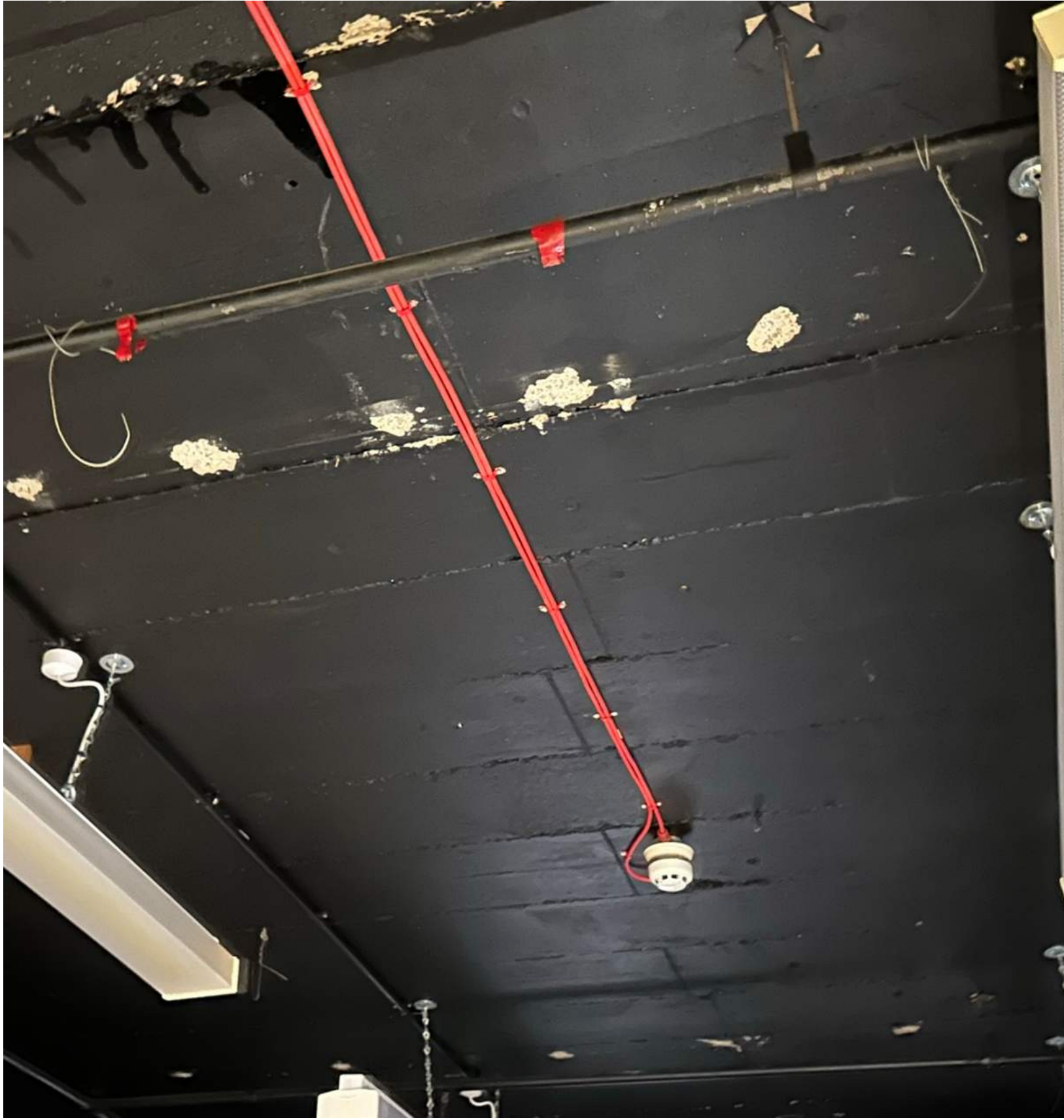
To define each of the condition categories outlined in section 1.2, intrusive investigations have been conducted to understand the relationship between visual condition and internal reinforcement condition. The following was found for the tested precast RC planks with no significant penetrations or visual damage:

- **Type 1:** Transverse cracks with no water ingress– No substantial reinforcement corrosion.
- **Type 2:** Transverse cracks with water ingress with– Corrosion present.
- **Type 3:** Significant transverse cracks with water ingress or longitudinal cracks – Corrosion present.

An example of each condition type of the above precast RC planks can be found below.

The above intrusive investigation assisted in being able to categorise the precast RC planks and determine if they are in an acceptable structural condition to be retained, or if a structural remediation is required, or if they must be replaced.

TYPE 1: VISUALLY
IN GOOD
CONDITION
(SMALL BENDING
CRACKS MAY BE
PRESENT) -
EXAMPLE:



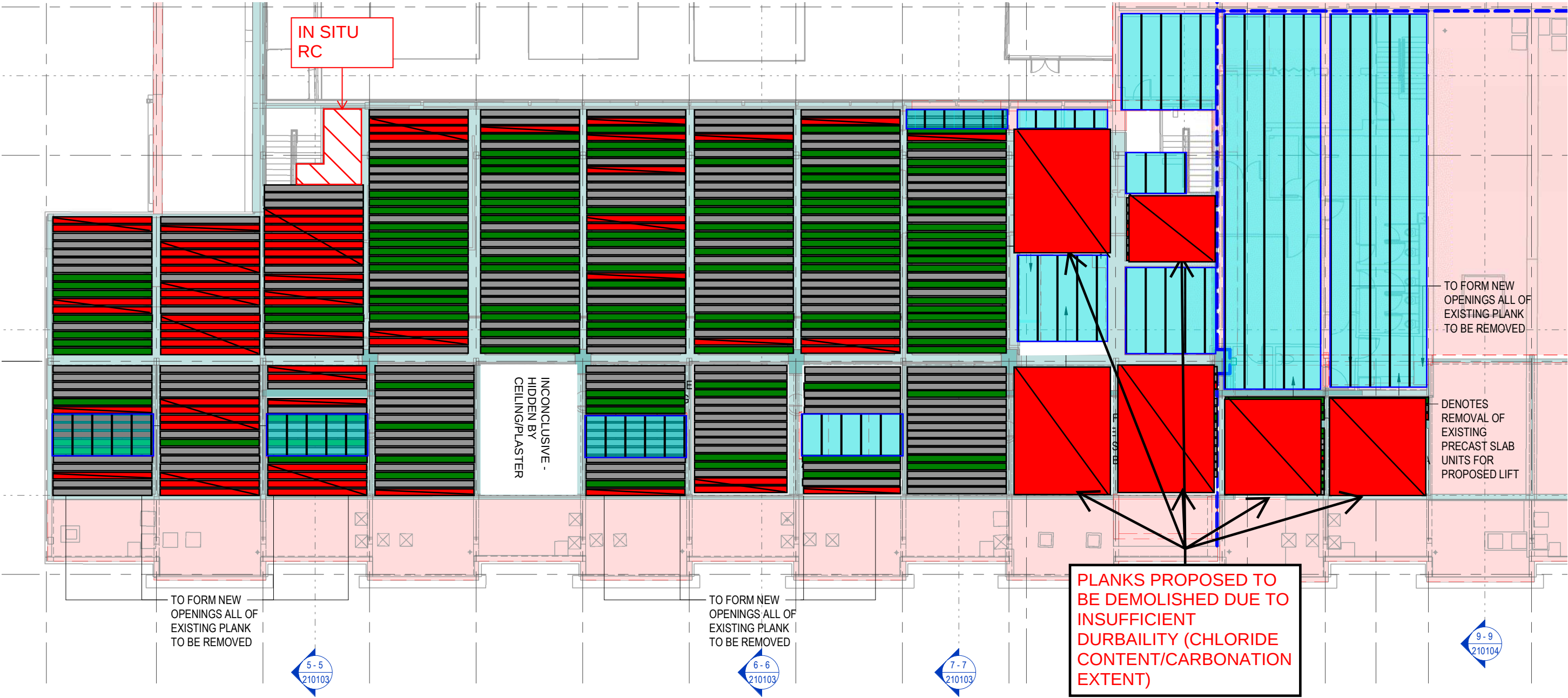
TYPE 2: MANY
VISIBLE BENDING
CRACKS (SIGNS OF
WATER SEAPAGE
MAY ALSO BE
PRESENT AND/OR
LARGE BENDING
CRACKS) - EXAMPLE:



TYPE 3: VISUALLY IN
BAD CONDITION
(LONGITUDINAL
CRACKS PRESENT
AND/OR LARGE
AMOUNTS OF
SEAPAGE THROUGH
BENDING CRACKS)
PLANKS EXAMPLE:



Appendix D - Condition Survey Results of precast RC planks & Typical Sections



KEY:

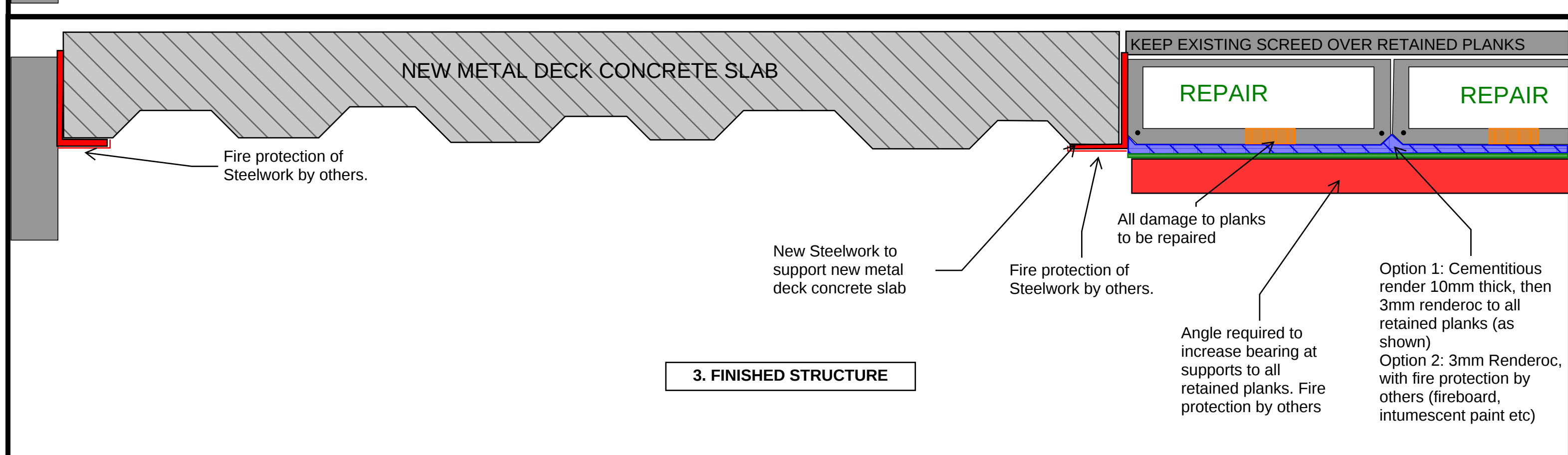
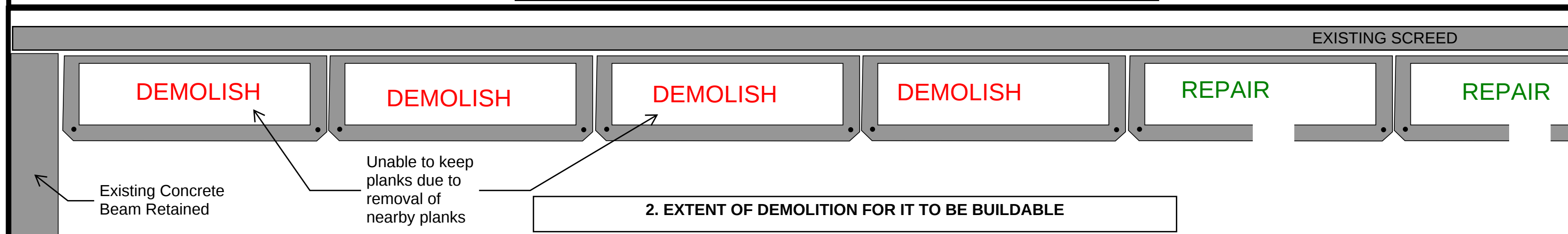
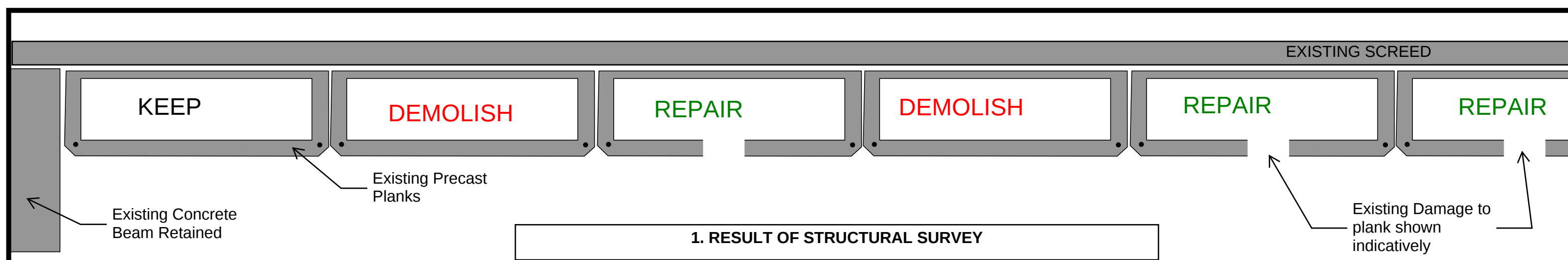
- RECAST RC PLANK REQUIRES REPLACEMENT
- REPAIR (CEMENTICIOUS SURFACE REPAIR OR INFILL EXISTING PENETRATION)
- PRECAST RC PLANK STRUCTURALLY RETAINABLE
- AREA PROPOSED TO BE DEMOLISHED AS A PART OF SCHEME DESIGN

Curtins

081801-CUR-XX-XX-SK-S-00030

LEVEL 01 EXISTING PRECAST
RC PLANKS CONDITION
SURVEY RESULTS P01

12/06/2024



Curtins

081801-CUR-XX-XX-SK-S-00032 V01

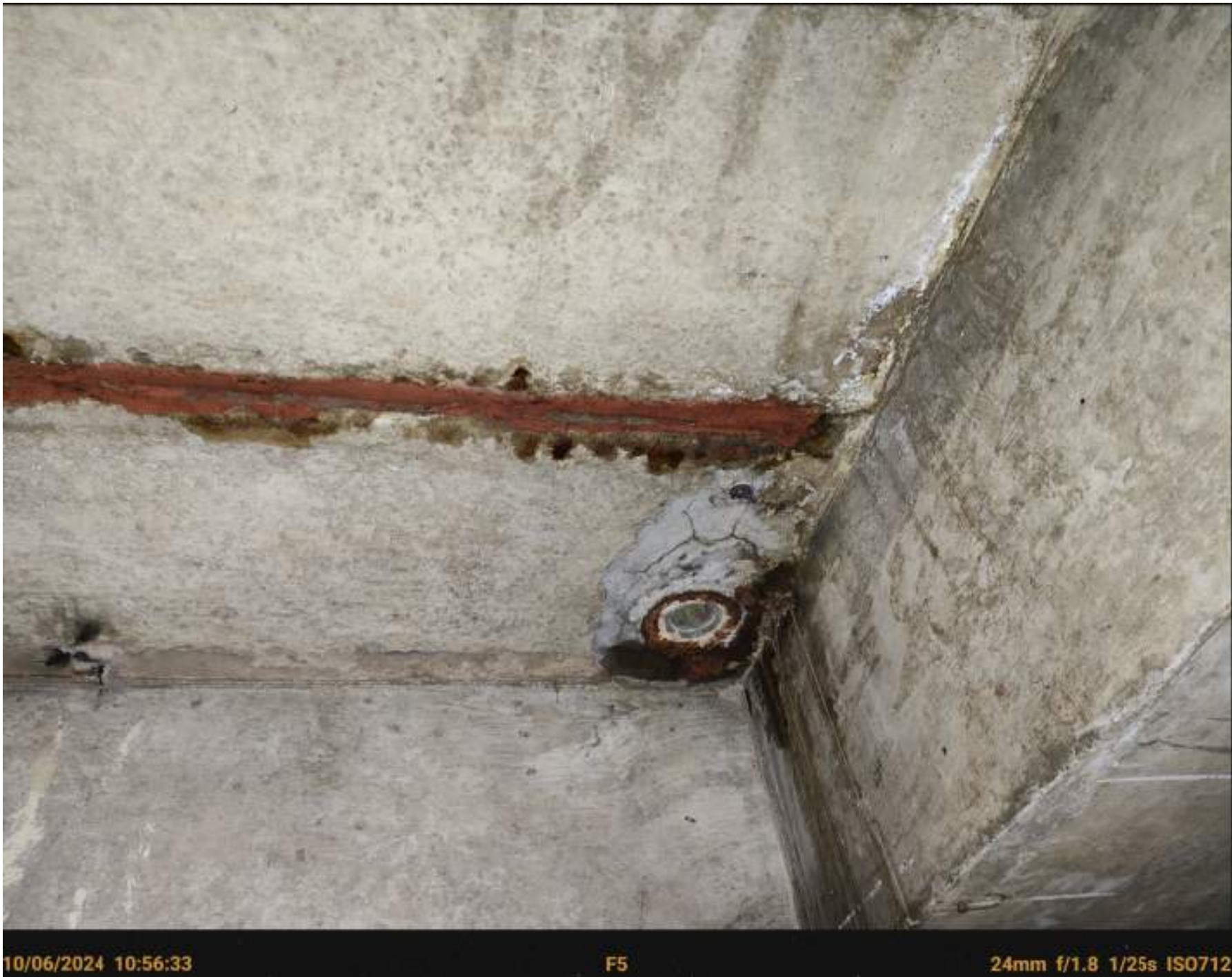
TYPICAL SECTIONS THROUGH PLANKS

13/06/2024

CONDITION SURVEY EXAMPLE IMAGES - PROPOSED REPLACED PRECAST RC PLANKS



CONDITION SURVEY EXAMPLE IMAGES - PROPOSED REPLACED PRECAST RC PLANKS



10/06/2024 10:56:33 F5 24mm f/1.8 1/25s ISO712



10/06/2024 11:12:36 F5 24mm f/1.8 1/33s ISO374

CONDITION SURVEY EXAMPLE IMAGES - PROPOSED REPLACED PRECAST RC PLANKS

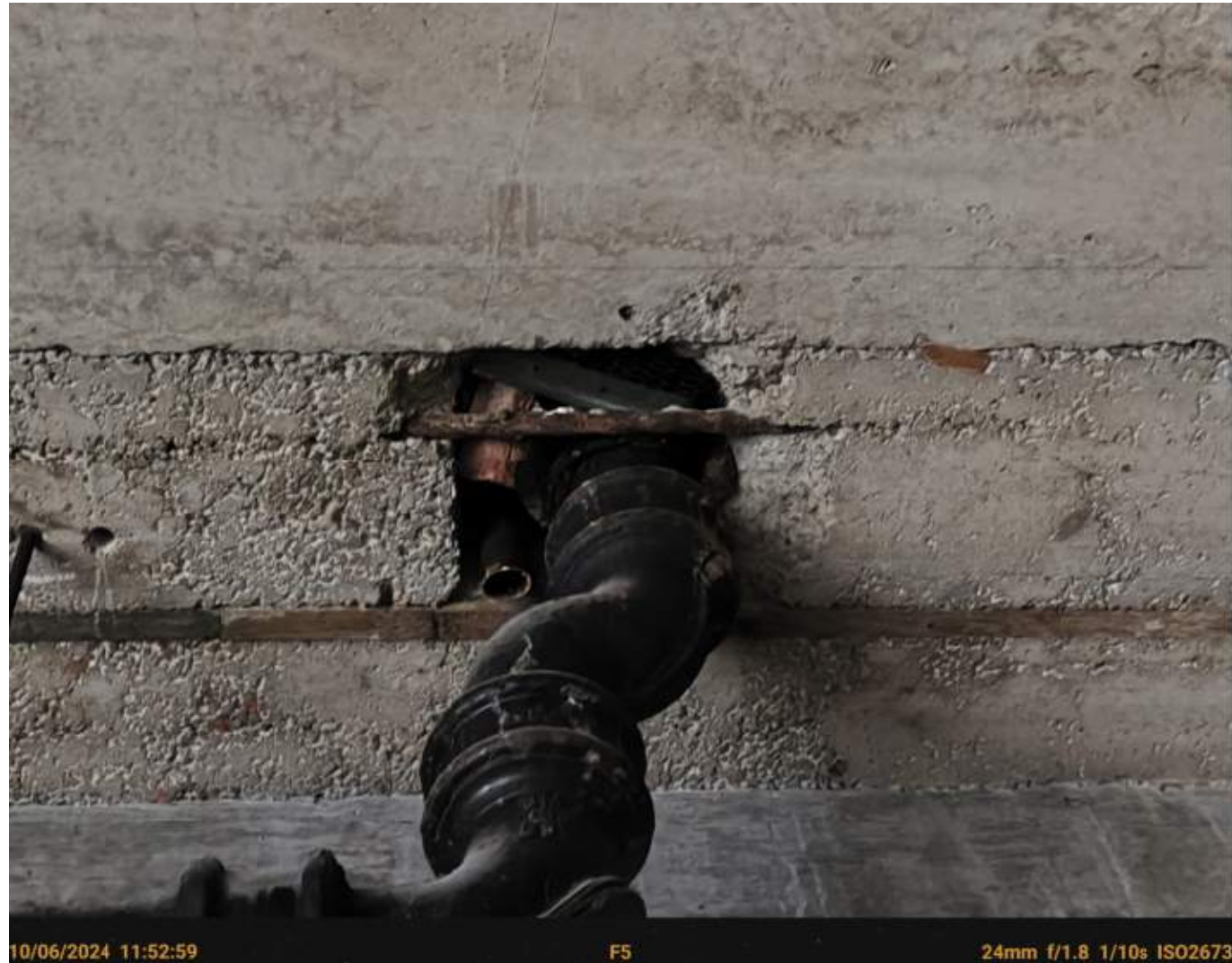


10/06/2024 11:24:01 F5 24mm f/1.8 1/50s ISO339



10/06/2024 11:38:09 F5 24mm f/1.8 1/33s ISO749

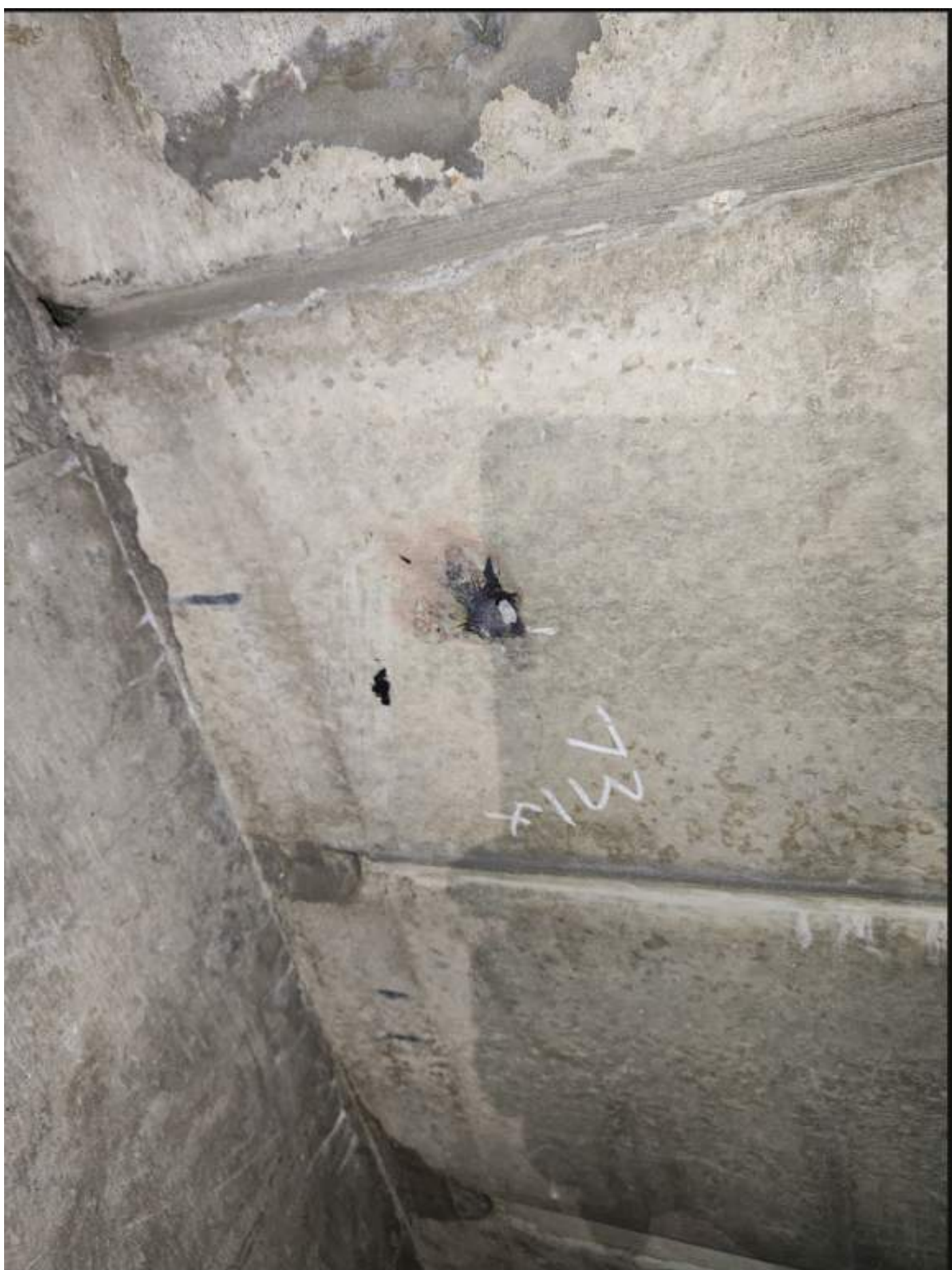
CONDITION SURVEY EXAMPLE IMAGES - PROPOSED REPLACED PRECAST RC PLANKS



CONDITION SURVEY EXAMPLE IMAGES - PROPOSED REPAIR PRECAST RC PLANKS



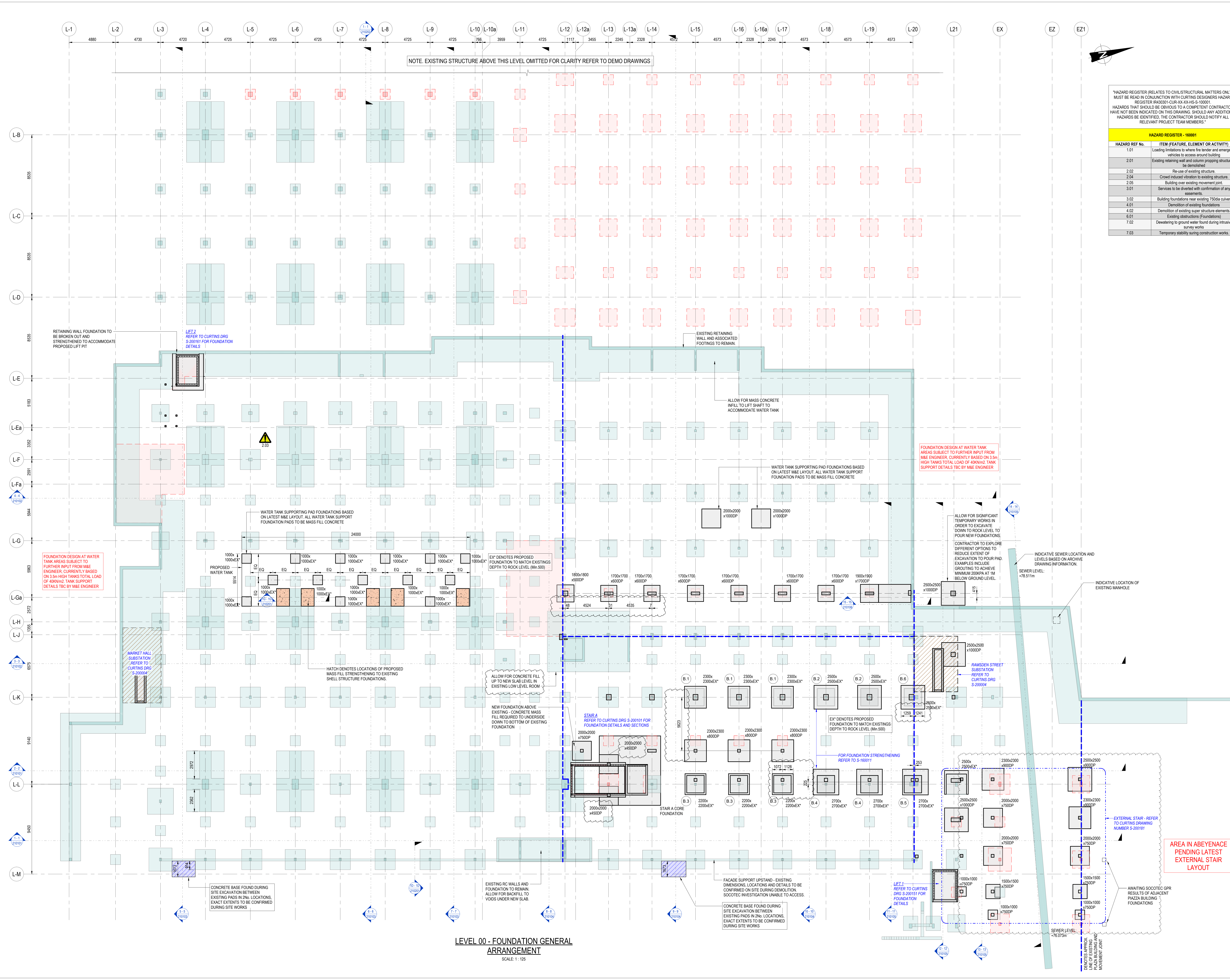
CONDITION SURVEY EXAMPLE IMAGES - PROPOSED REPAIR PRECAST RC PLANKS



Appendix E – Socotec Draft Report & Measured Cover Results of Precast RC Planks

Large File. Available Upon Request.

Appendix F – Additional Structural Works Curtins Drawings and Details



LEVEL 00 - FOUNDATION GENERAL
ARRANGEMENT
SCALE: 1:125

GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
- DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

EXISTING INFORMATION LEGEND
(NOTE: THIS DRAWING MUST BE PRINTED IN COLOUR)

— DENOTES EXISTING STRUCTURE TO REMAIN

- - - DENOTES DEMOLISHED EXISTING STRUCTURE. REFER TO DEMOLITION GENERAL ARRANGEMENTS

STRUCTURAL DESIGN CHECKS OF ALL EXISTING STRUCTURE PROPOSED TO BE RETAINED ONLY TO BE FINALISED UPON COMPLETION AND ISSUING OF SOOCTED FINAL INVESTIGATION REPORT.

WHERE SLAB LEVEL IS PROPOSED TO BE DROPPED ALLOW FOR BREAKOUT OF TOP OF FOUNDATION.

ALL WATERPROOFING TO SPECIALIST DESIGN AND DETAILS BY OTHERS.

ALL NEW FOUNDATION TO BE CAST MINIMUM 28 DAYS BEFORE NEW CONSTRUCTION ABOVE

TOP OF ALL NEW FOUNDATIONS TO BE UNDERSIDE OF LOWER GROUND FLOOR SLAB

ALL NEW FOUNDATIONS TO BE FORMED INTO THE SANDSTONE LAYER BY AT LEAST 200mm. WITH 370KNM2 CAPACITY. ALL FOUNDATION STRENGTHENING TO GO AT LEAST AS DEEP AS THE EXISTING FOUNDATION

DO NOT UNDERMINE EXISTING FOUNDATIONS WITHOUT THE INPUT FROM A TEMPORARY WORKS ENGINEER.

ALLOW FOR APPLICATION OF NITOPRIME ZINC RICH PLUS OR EQUIVALENT APPROVED TO ALL EXISTING EXPOSED REBAR TO MANUFACTURER'S SPECIFICATION.

MEASURED SURVEY IS REQUIRED ONCE ALL DEMOLITION HAS BEEN COMPLETE TO CONFIRM EXACT DIMENSIONS AND SETTING OUT OF EXISTING STRUCTURE.

THESE DRAWINGS ARE NOT COORDINATED AND DO NOT HAVE ANY SUBCONTRACTOR INPUT.

HAZARD REGISTER - 100001

HAZARD REF No.	ITEM (FEATURE, ELEMENT OR ACTIVITY)
1.01	Loading limitations to where fire tender and emergency vehicles to access around building
2.01	Existing retaining wall and column propping structure to be demolished
2.02	Re-use of existing structure
2.04	Crowd induced vibration to existing structure
2.05	Building over existing movement joint
3.01	Services to be diverted with confirmation of any easements
3.02	Building foundations near existing 750dia culvert
4.01	Demolition of existing foundations
4.02	Demolition of existing super structure elements
5.01	Existing obstructions (Foundations)
7.02	Dewatering to ground water found during intrusive survey works
7.03	Temporary stability during construction works

Revised By: [Signature] Date: 02.08.23

Project: IR430301 - CUR - XX - 00 - DR - S - 160001

Page: P09

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

EXISTING INFORMATION LEGEND

(NOTE: THIS DRAWING MUST BE PRINTED IN COLOUR)

-  DENOTES EXISTING STRUCTURE TO REMAIN
-  DENOTES DEMOLISHED EXISTING STRUCTURE. REFER TO DEMOLITION GENERAL ARRANGEMENTS

STRUCTURAL DESIGN CHECKS OF ALL EXISTING STRUCTURE PROPOSED TO BE RETAINED ONLY TO BE FINALISED UPON COMPLETION AND ISSUING OF SOCOTEC FINAL INVESTIGATION REPORT.

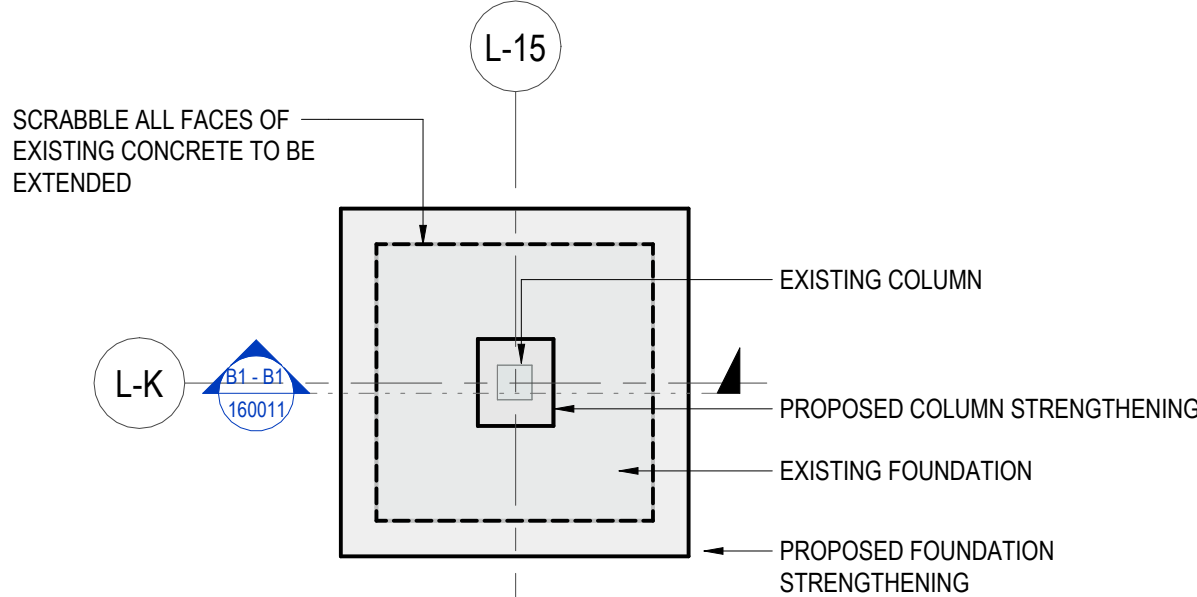
EXACT DIMENSIONS OF ALL EXISTING FOUNDATIONS TO BE CONFIRMED ON SITE - CURRENT ASSUMPTIONS BASED ON ARCHIVE INFORMATION AND SPOT INTRUSIVE INVESTIGATION CHECKS

RC QUANTS

FOUNDATION STRENGTHENING = 100g/m3

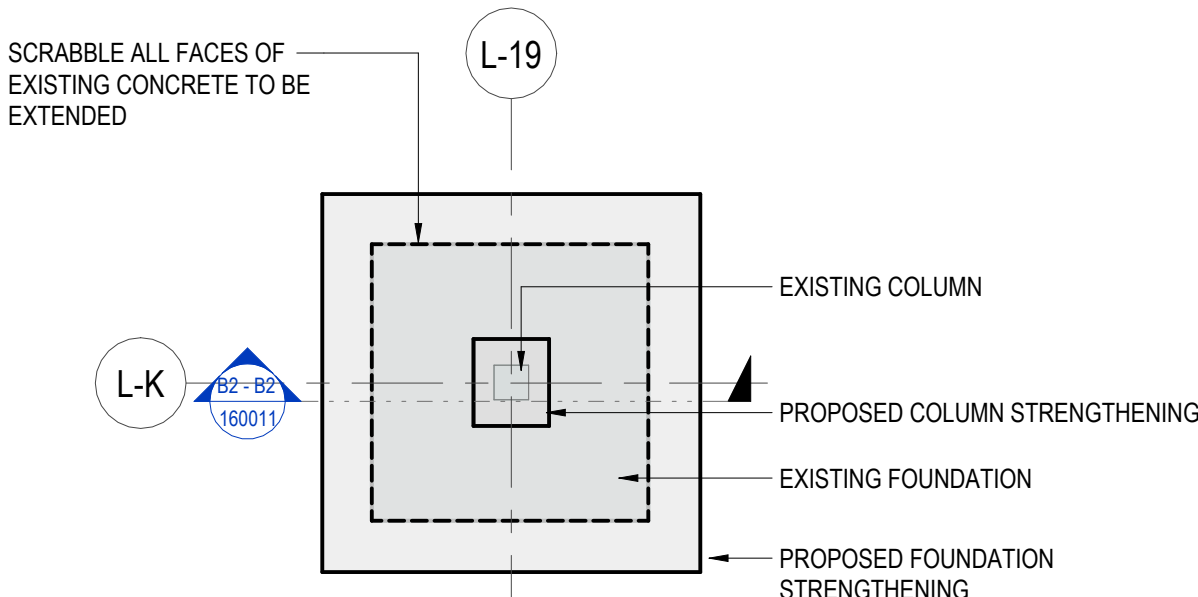
EXISTING SLAB REBAR TO BE RETAINED FOR 1000mm MINIMUM U.N.O BEYOND EACH COLUMN FACE. THE DESIGN ASSUMES THAT THIS IS BASED ON 16mm DIA AT 200 C/C IN ONE DIRECTION, AND 32mm DIA AT 200 C/C IN THE OTHER AS FOUND IN INTRUSIVE INVESTIGATIONS. WHERE THIS IS NOT THE CASE ALLOW FOR ADDITIONAL WORKS, SUCH AS POSTFIXED REBAR.

WHERE NEW CONCRETE IS TO BE POURED AGAINST EXISTING CONCRETE, THE EXISTING CONCRETE SURFACE IS TO BE ROUGHENED TO EXPOSE THE AGGREGATE.



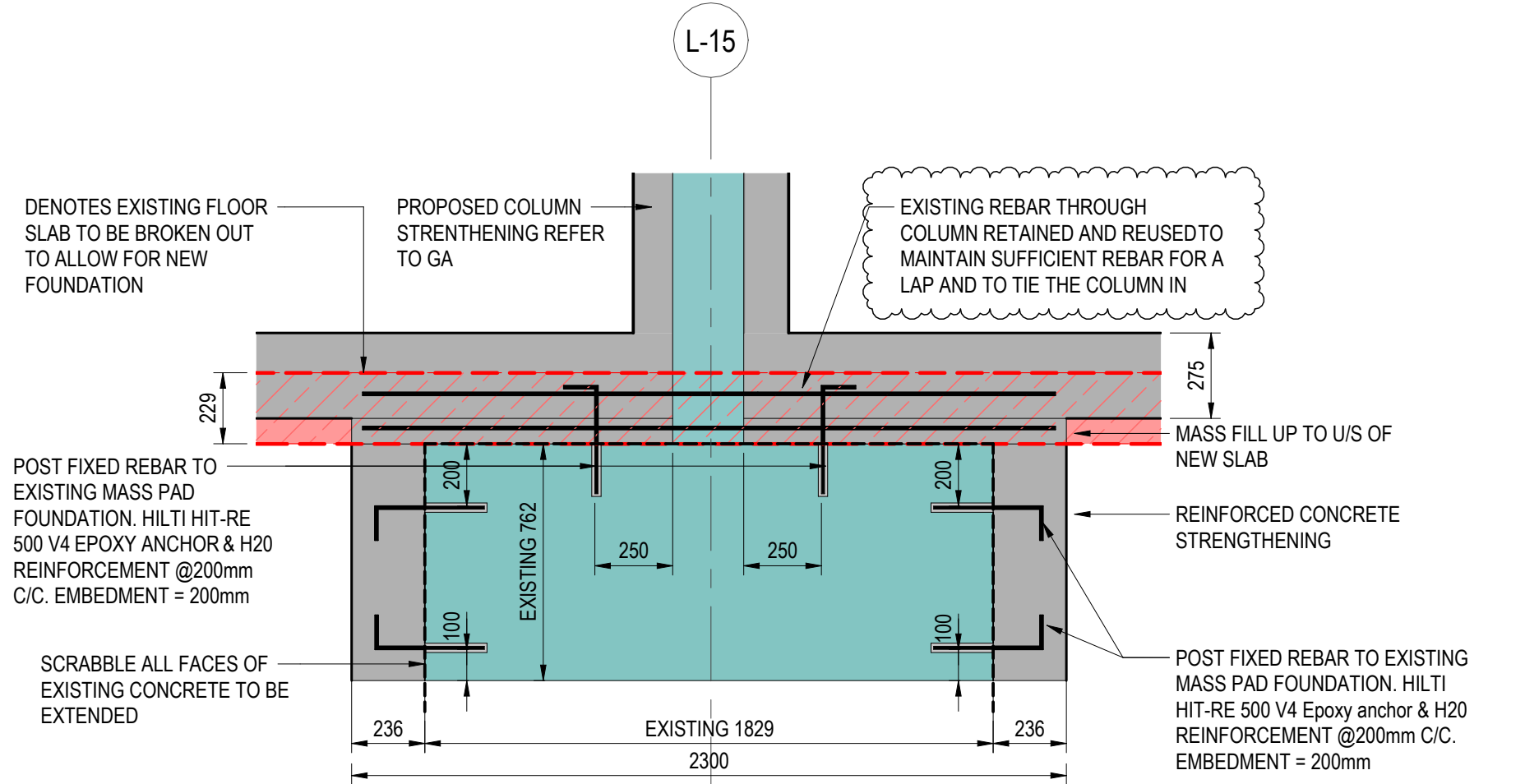
FOUNDATION TYPE B.1

SCALE: 1: 50



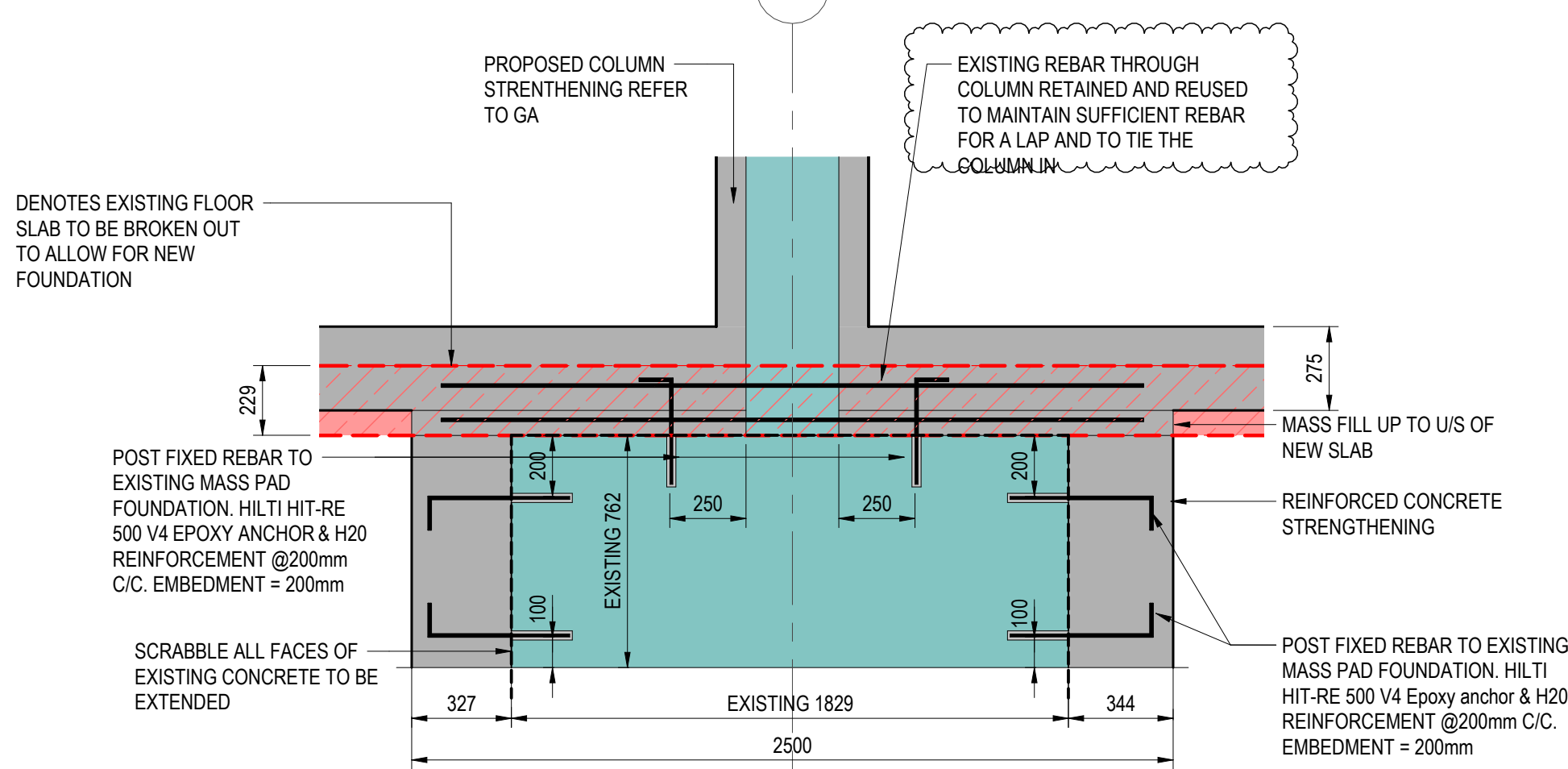
FOUNDATION TYPE B.2

SCALE: 1: 50



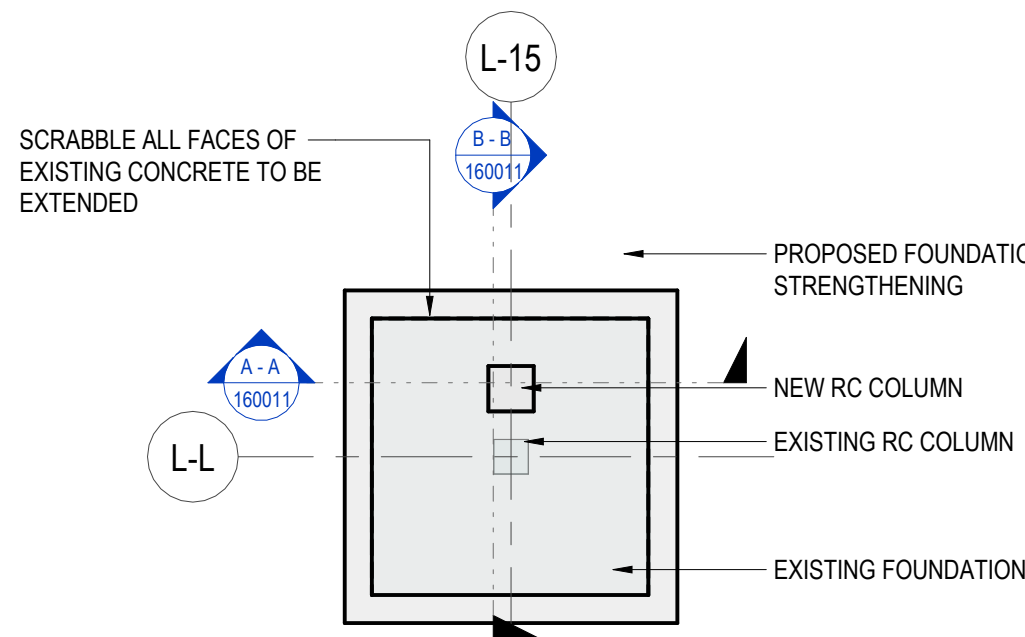
TYPE B.1 SECTION

SCALE: 1: 20



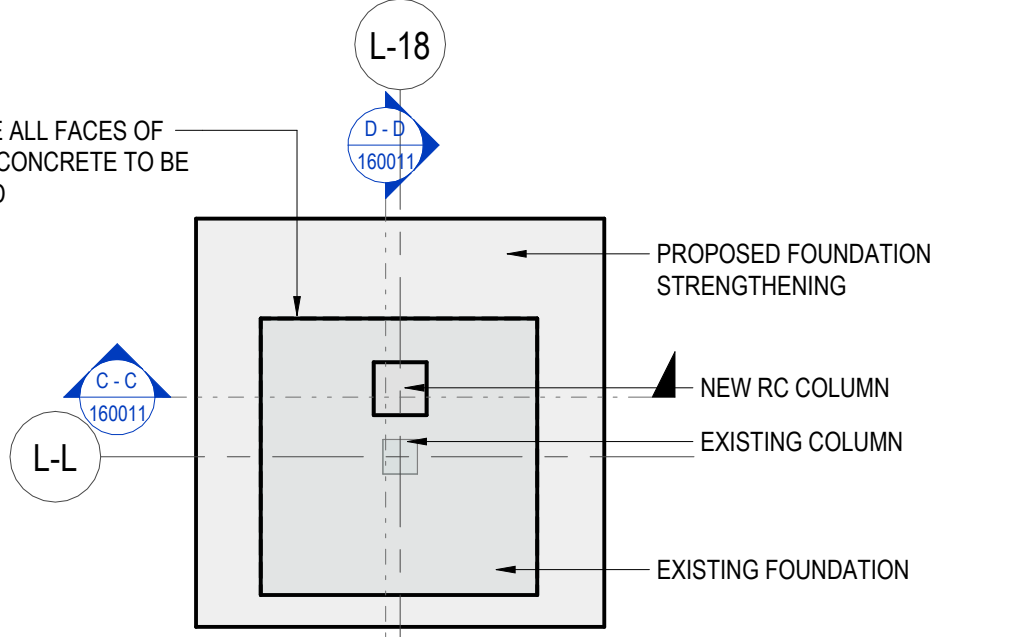
TYPE B.2 SECTION

SCALE: 1: 20



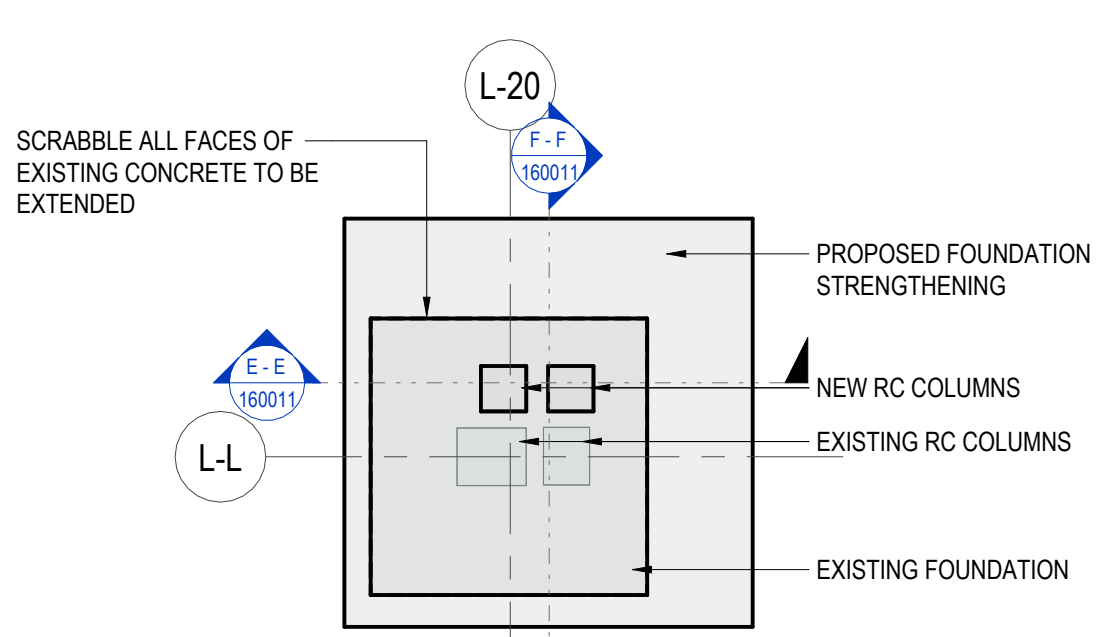
FOUNDATION TYPE B.3

SCALE: 1: 50



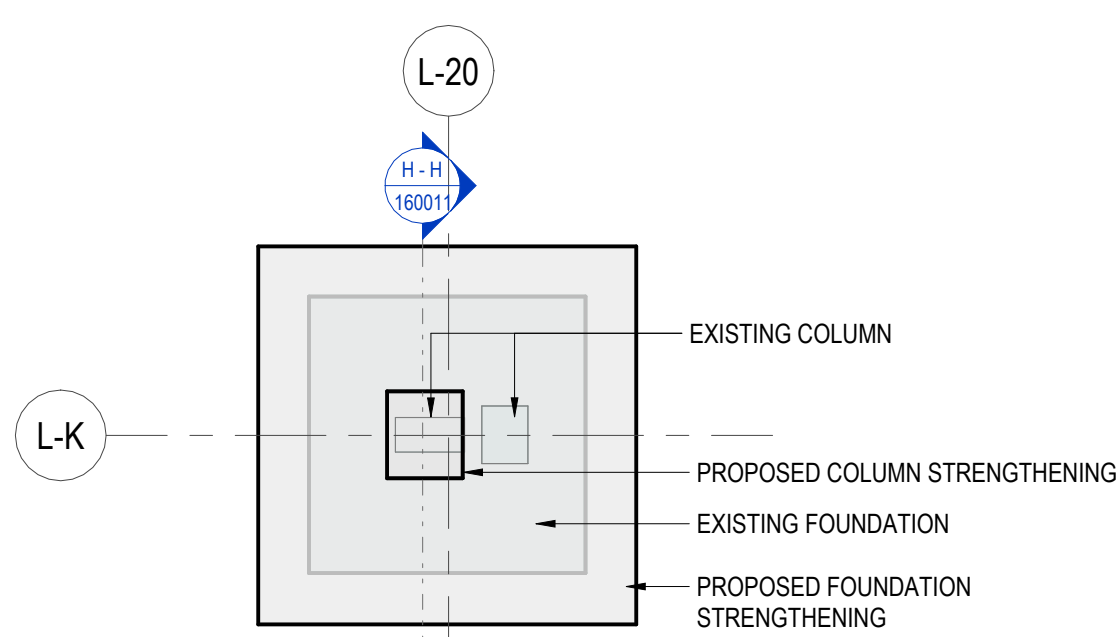
FOUNDATION TYPE B.4

SCALE: 1: 50



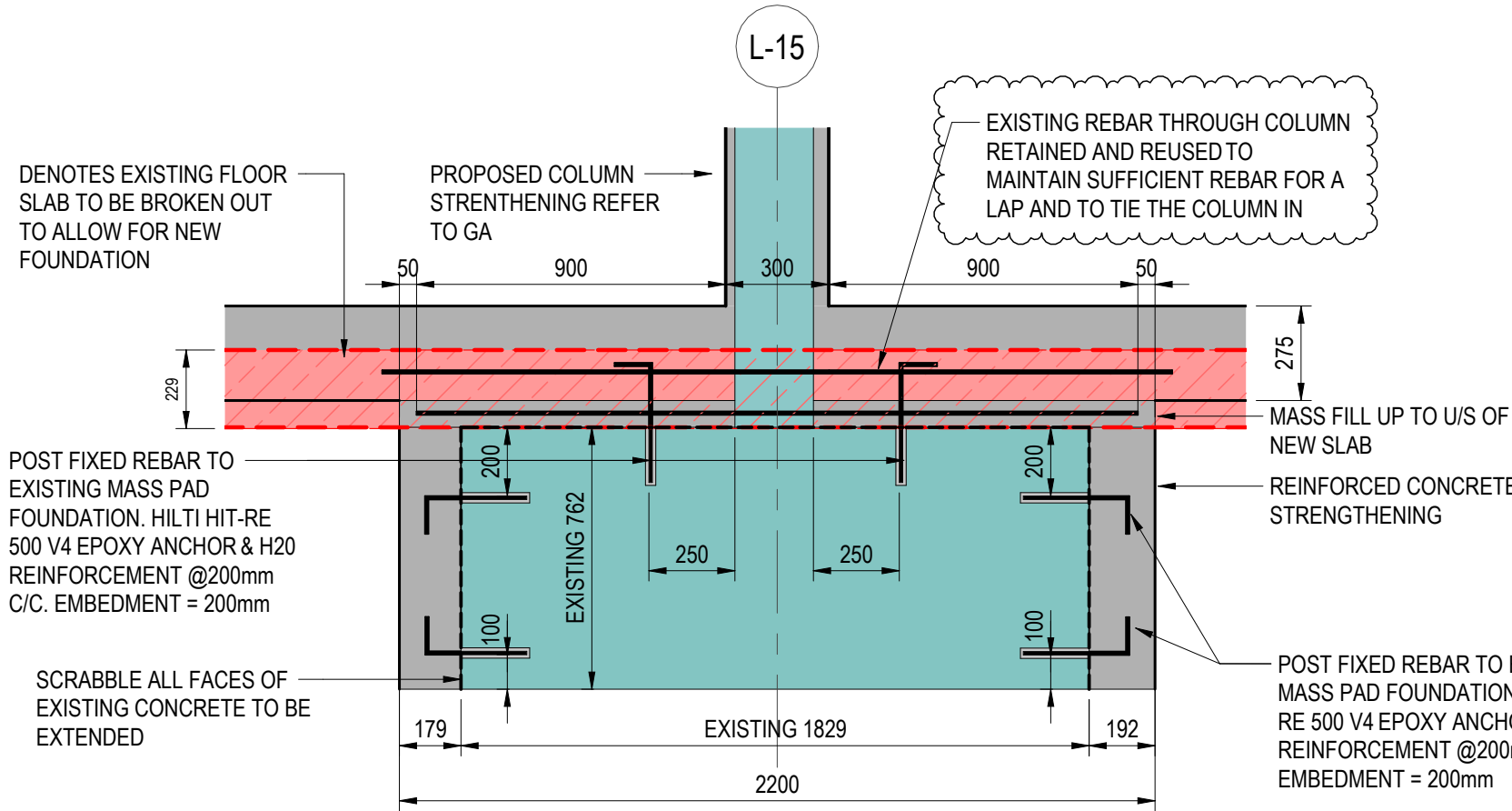
FOUNDATION TYPE B.5

SCALE: 1: 50



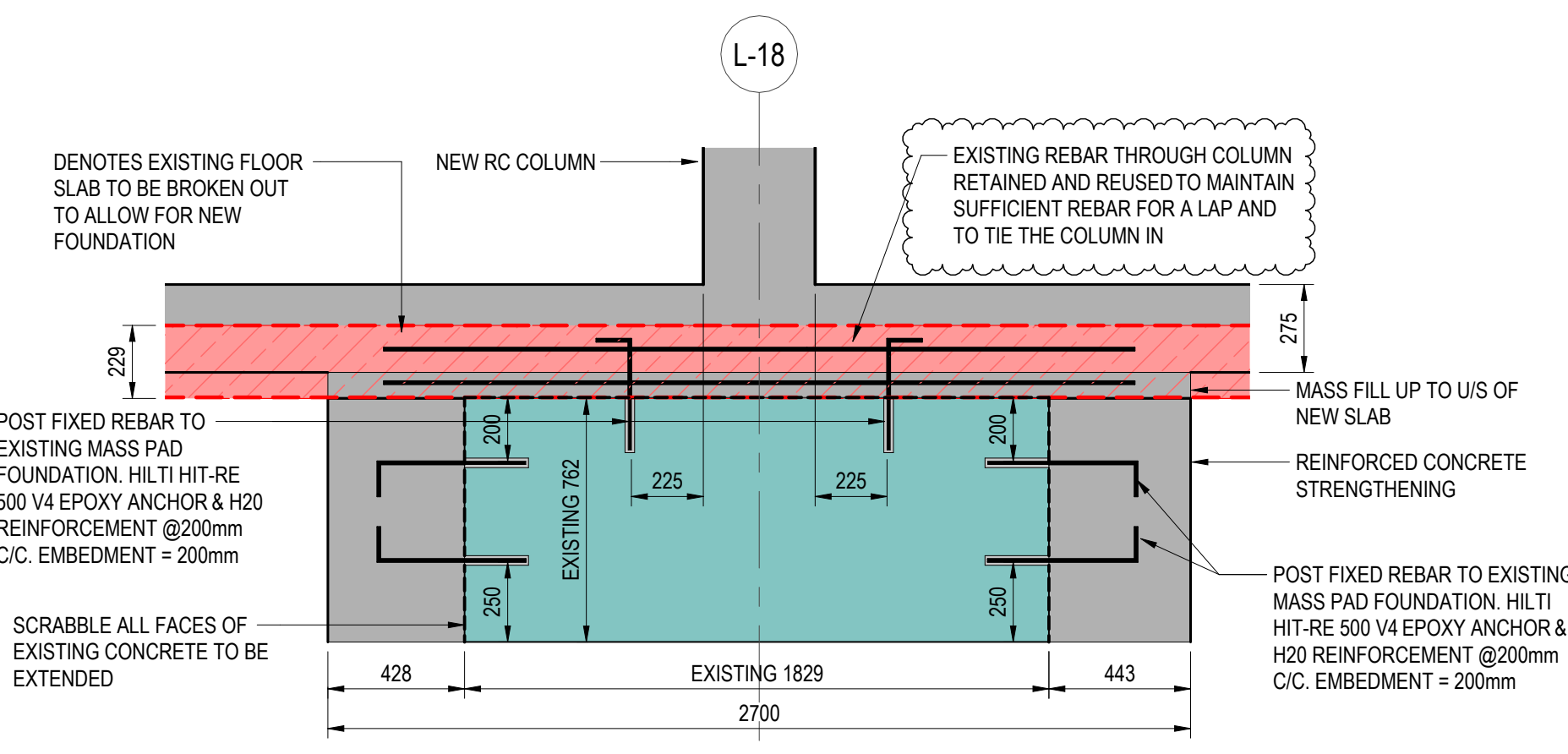
FOUNDATION TYPE B.6

SCALE: 1: 50



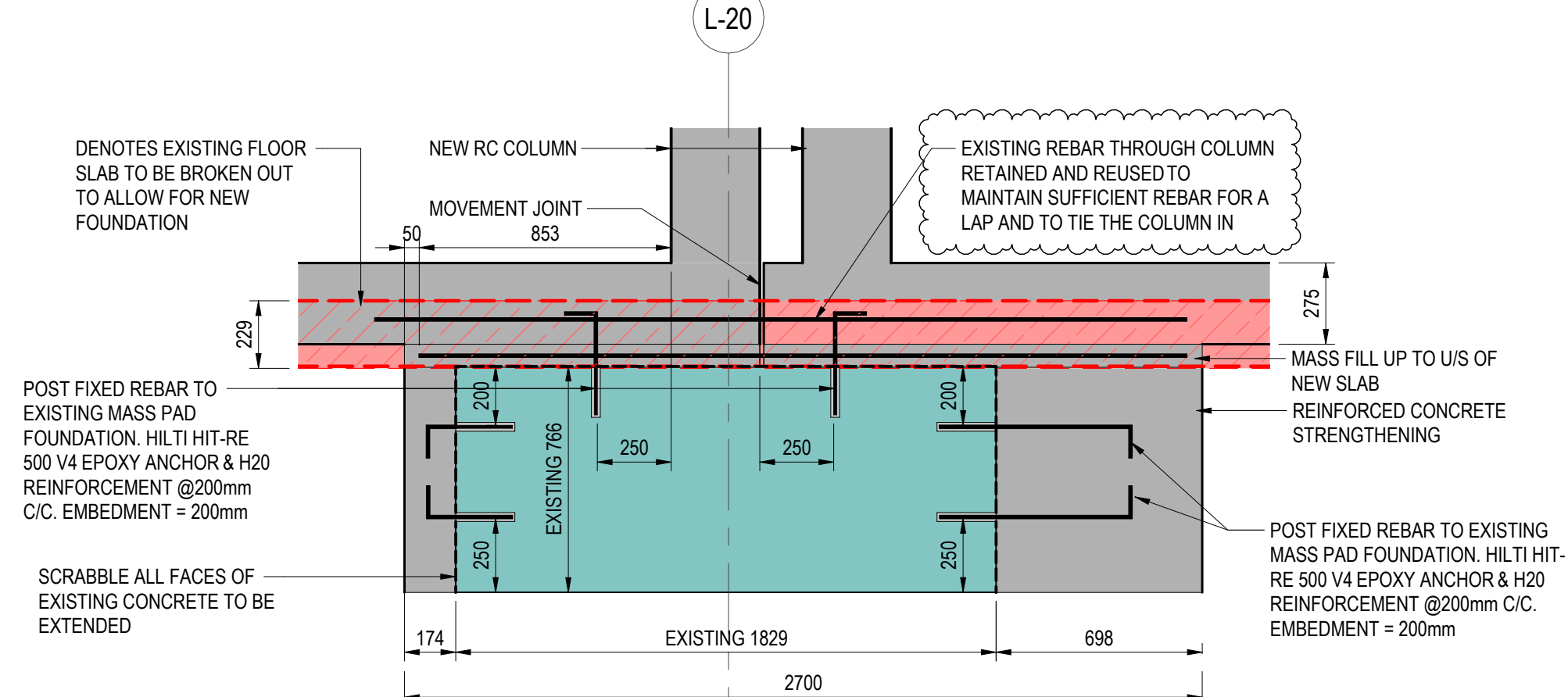
TYPE B.3 SECTION A-A

SCALE: 1: 20



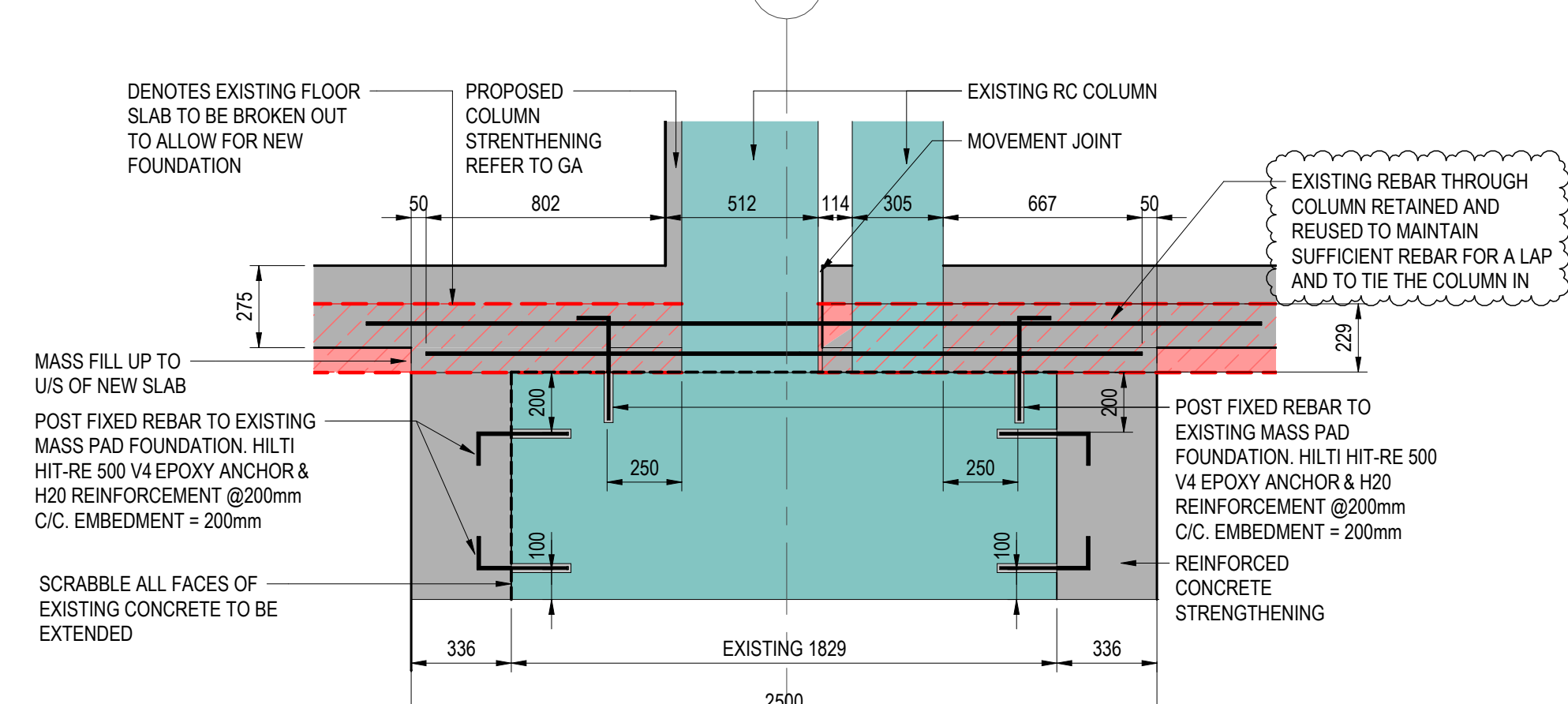
TYPE B.4 SECTION C-C

SCALE: 1: 20



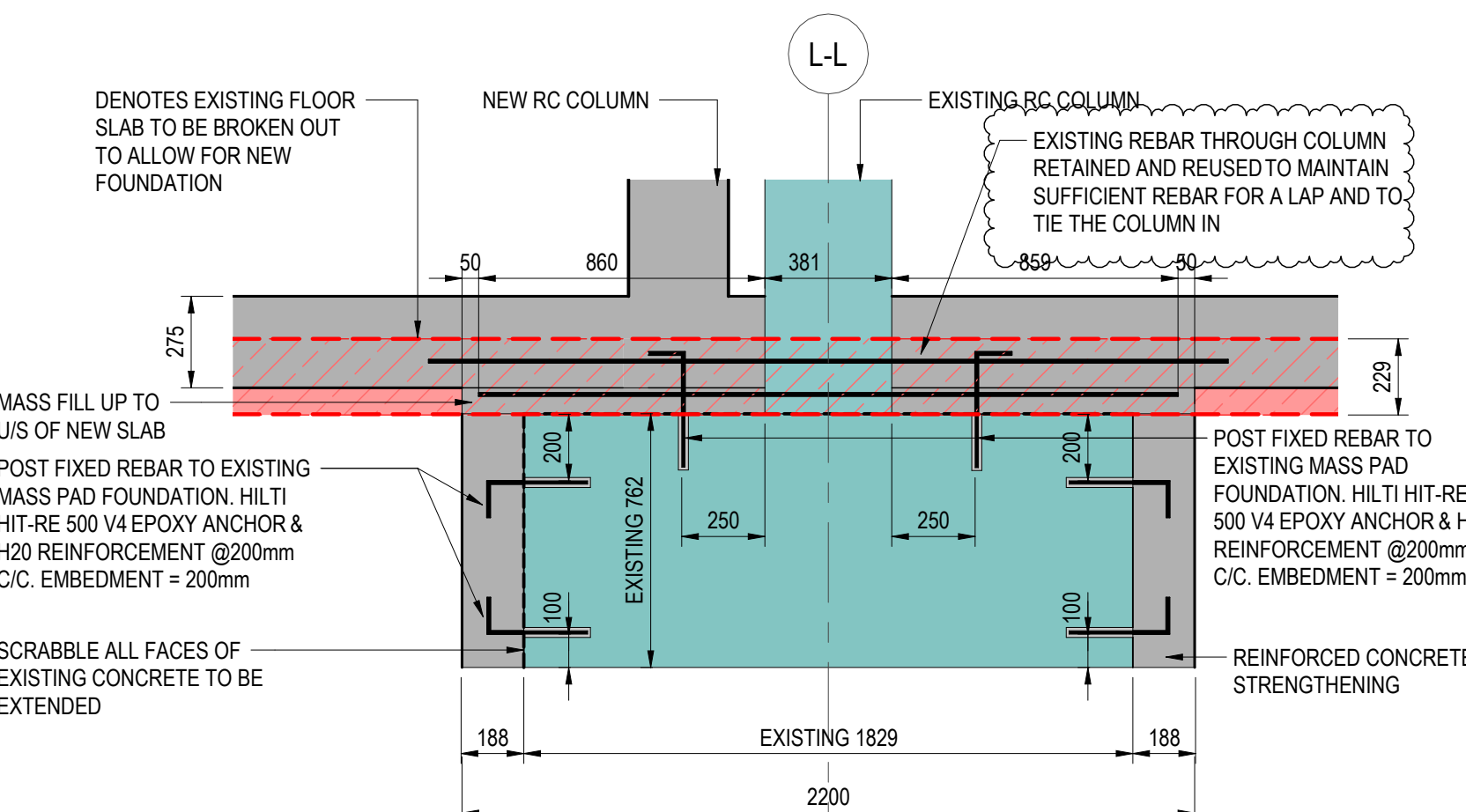
TYPE B.5 SECTION E-E

SCALE: 1: 20



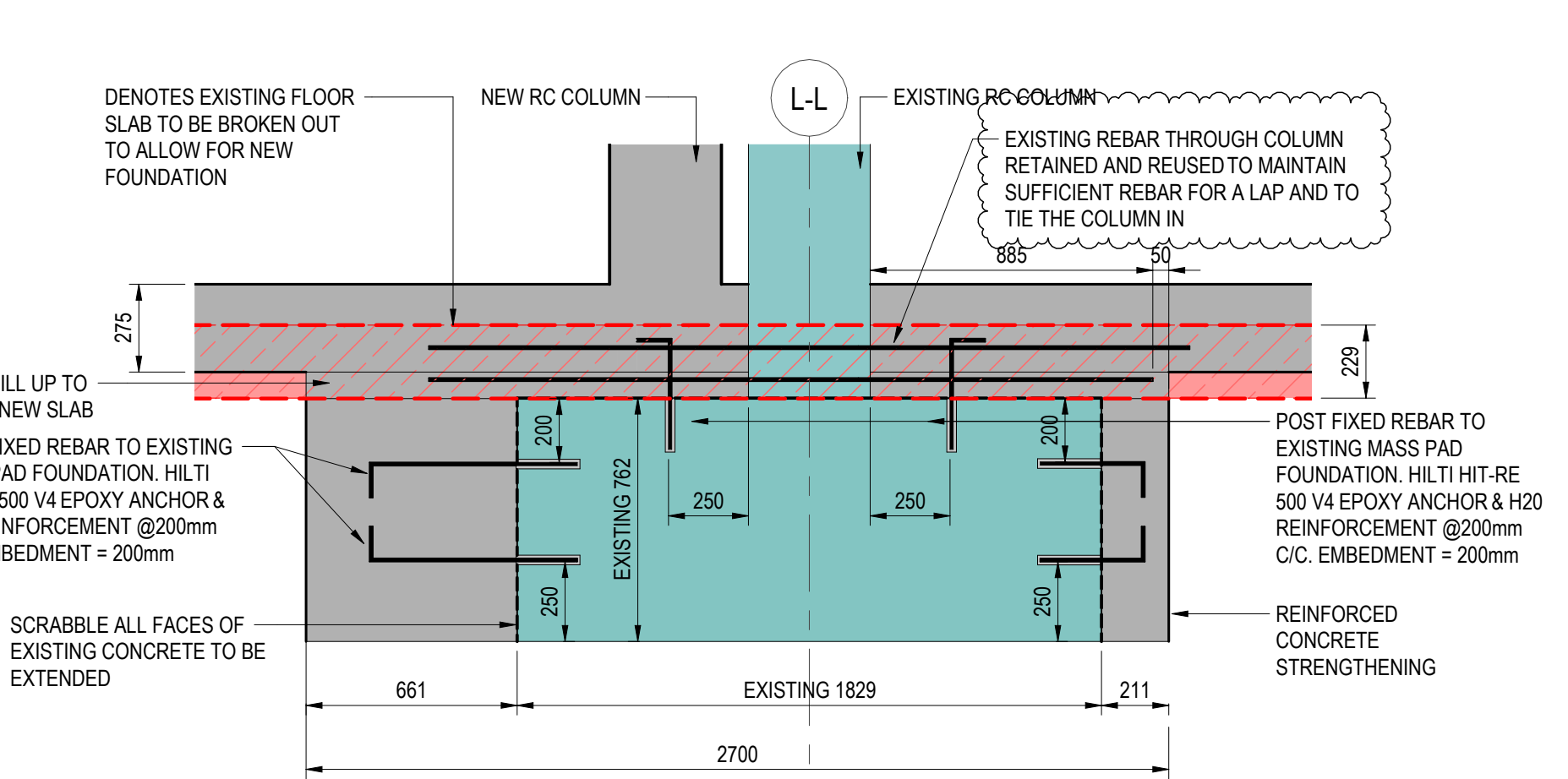
TYPE B.6 SECTION G-G

SCALE: 1: 20



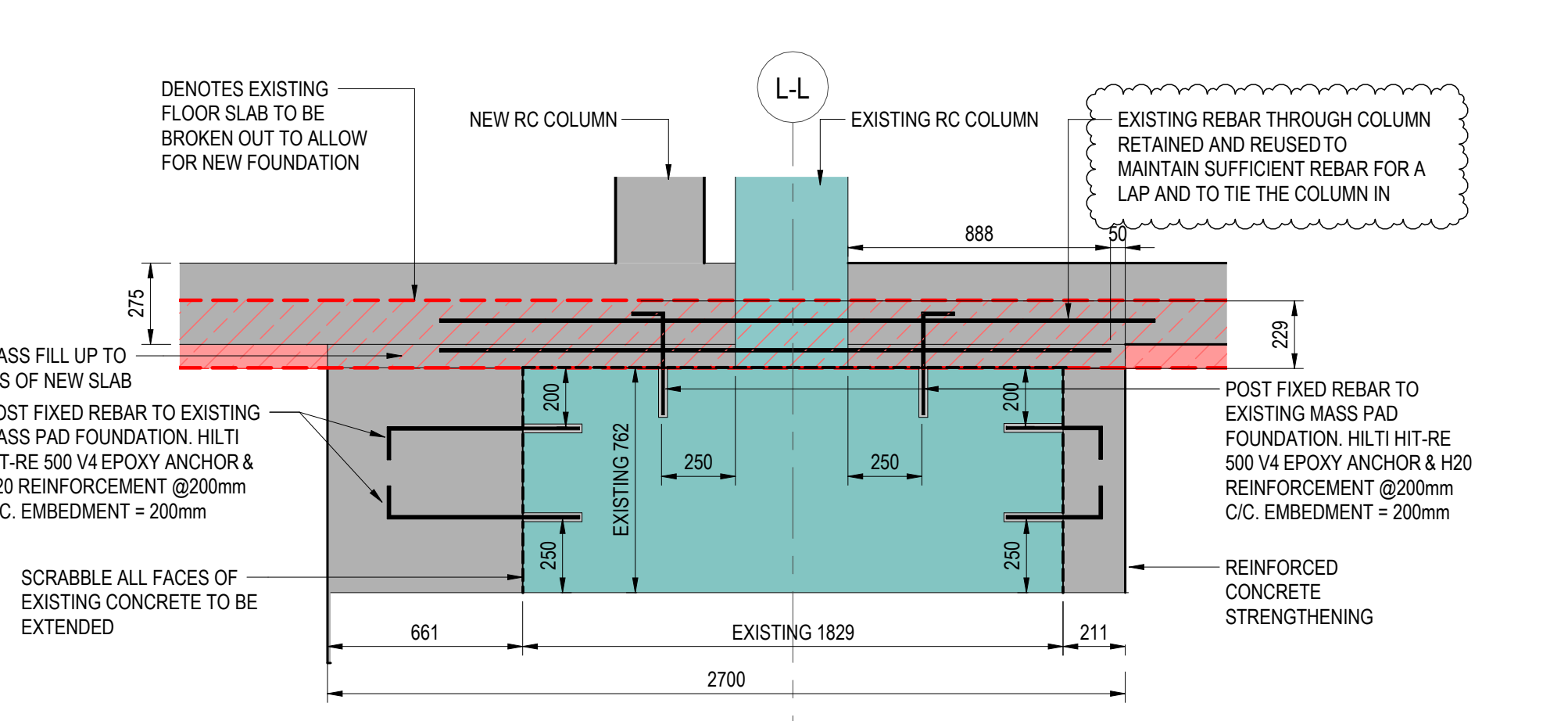
TYPE B.3 SECTION B-B

SCALE: 1: 20



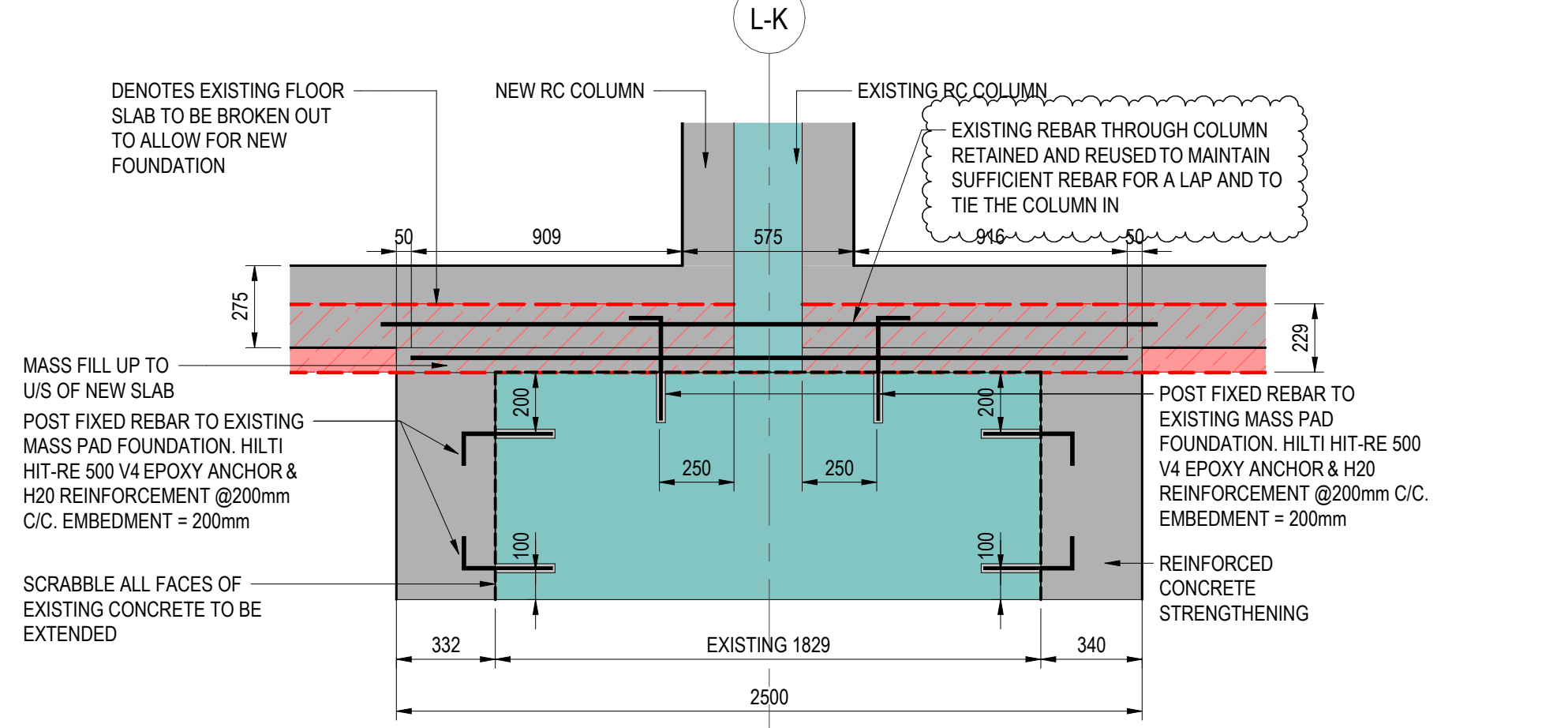
TYPE B.4 SECTION D-D

SCALE: 1: 20



TYPE B.5 SECTION F-F

SCALE: 1: 20



TYPE B.6 SECTION H-H

SCALE: 1: 20

P05: NYI STAGE 4 COMMENTS AND SETTING OUT	NYI	CS	HK
P06: STAKE & ISSUE	08.05.24	AP	HK
P03: PRELIMINARY ISSUE	05.04.24	AP	HK
P02: PRELIMINARY ISSUE	01.03.24	AP	HK
P01: PRELIMINARY ISSUE	16.02.24	AP	HK

Rev: Description: Date: By: Chd

Curtins

Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS2 8EE

0113 274 6559

leeds@curtins.com

www.curtins.com

Currys is a registered company. Registered in England. Registered Office: 78-80 East Street, Leeds, LS2 8EE. Registered Number: 0113 274 6559. Registered Address: 78-80 East Street, Leeds, LS2 8EE. Registered Office: 78-80 East Street, Leeds, LS2 8EE. Registered Number: 0113 274 6559. Registered Address: 78-80 East Street, Leeds, LS2 8EE.

STAGE 4

Project: OUR CULTURAL HEART, HUDDERSFIELD

Orig Title:

FOUNDATION - DETAILS

Drawn By: AP

Designed By: HK

Checked By: TL

Project No: IR430301

Date: 02.08.23

As Indicated

Project Code - Originator - Function - Spatial - Form - Discipline - Number

IR430301 - CUR - XX - 00 - DR - S - 160011

P05

08/08/23 09:27:22 AM 22/08/2023



OUTSTANDING INFORMATION REQUIRED			
ITEM	REQUIRED FROM	ASSUMPTION TO DATE	COMMENTS
FINALISED LANDSCAPE LEVELS	GILLESPIES	PROPOSED LEVELS AS SHOWN ON DRAWING IR430301-GIL-ZZ-00-DR-L-000102	POTENTIAL CHANGES TO ALLOW FOR BUILD UP DEPTH ABOVE EXISTING BASEMENT SLAB
RECEIPT OF TECHNICAL NOTE DRAINAGE DISCHARGE DRI1 RESPONSE AS STATED WITHIN PLANNING CONDITION DISCHARGE 25	PEGASUS PLANNING +BAM	DISCHARGE RATES AS SHOWN ON PREVIOUS ARUP DRAINAGE DRAWINGS ASSUMED TO BE ACCEPTABLE TO ULFA	INFORMATION REQUIRED TO VALIDATE DESIGN THERE MAY BE OPPORTUNITIES TO RATIONALISE STRAGE AND DISCHARGE RATES
COORDINATION AND CONFIRMATION OF PROPOSED WATER FOUNTAIN PROPOSALS (DRAINAGE REQUIREMENTS)	+BAM +WATER FOUNTAIN SPECIALIST	AREA ASSUMED TO REQUIRE A DRAINAGE OUTLET	INFORMATION REQUIRED TO VALIDATE DESIGN LOCATION OF PUMP AND TANK TO BE COORDINATED WITH BELOW GROUND SERVICES
ULFA AND YORKSHIRE WATER CONFIRMATION OF PROPOSED DISCHARGE RATES	+ULFA +YORKSHIRE WATER	DISCHARGE RATES AS PREVIOUSLY AGREED BY ARUP ASSUMED TO BE ACCEPTABLE	TO BE CONFIRMED THROUGH PRE-PLANNING DISCUSSIONS AND THE PLANNING PROCESS
SURVEY OF EXISTING RAIN WATER PIPES FROM PARABOLIC ROOFS	+BAM	ASSUMED DIRECTION BASED UPON BEST GUESS OF EXISTING SURVEY INFORMATION	TO BE SURVEYED AND DRAINAGE LAYOUT TO CHANGE FOLLOWING RECEIPT OF INFORMATION

- Key
- ACC WC
 - Changing / Shower
 - Children's Library
 - Circulation
 - Comms
 - Customer Facing
 - Cycle Storage
 - Entrance Lobby
 - Events
 - Faith Room
 - Food Hall
 - Food Stalls
 - Foyer
 - General Lending Library
 - Library Storage
 - Markspace
 - Meeting Room
 - Office & Admin
 - Office & Admin - SW
 - Reception
 - Services & Risers
 - Spare Plant
 - Storage
 - Transcriptions
 - WC
 - WYAS Storage

COORDINATION NOTES	
KEY	NOTE
1	EXISTING RWPS ASSOCIATED WITH PARABOLIC ROOFS - EXISTING BELOW GROUND PIPE EXPECTED TO BE CAST INTO EXISTING FOUNDATION. DIRECTION AS EXITS FOUNDATION UNKNOWN AND THEREFORE PLACEMENT OF CHAMBERS HAVE BEEN SHOWN INDICATIVELY AND ARE SUBJECT TO CHANGE FOLLOWING CONFIRMATION. SURVEY REQUIRED TO CONFIRM.
1.1	EXISTING RWP PLACEMENT BASED ON HISTORIC AS-BUILT INFORMATION
2	SW PIPE AS PASSES THROUGH RETAINING WALL - DETAIL TO BE COORDINATED WITH M&E. PIPE SIZE = 225mmØ IL = 85.049m
3	FW PIPE AS PASSES THROUGH RETAINING WALL - DETAIL TO BE COORDINATED WITH M&E. PIPE SIZE = 150mmØ IL = 85.354m
4	PROPOSED POP UPS LOCATED ON TOP OF EXISTING FOUNDATION. TO BE RELOCATED OR DETAIL DEVELOPED TO ACCOMMODATE
5	NO GRADE INTERCEPTION FROM SW/PS ALLOWED FOR GREASE INTERCEPTION FROM FOOD WASTE TO BE PRE-PLANNING SENSITIVE ENQUIRY DATED 22/02/22 REF: Y002357
6	SVP TO BE MOVED OUTSIDE OF EXISTING FOUNDATION
7	COULD RWP BE DROPPED BELOW BASEMENT LEVEL AND RE-DIRECTED CLOSER TO I-S12.17 THIS WILL AVOID RUNNING RWP AREA THROUGH ATTENUATION (SUBJECT TO YORKSHIRE WATER / PLANNING APPROVAL OF DISCHARGE RATES)
8	COULD GULLIES BE RELOCATED OUTSIDE OF EXISTING AND PROPOSED FOUNDATION EXTENTS AS SHOWN
9	COULD PROPOSED RWP BE MOVED OUTSIDE OF PROPOSED FOUNDATION, AND AS FAR TOWARDS OUTFALL AS POSSIBLE?
10	COULD PROPOSED RWP BE MOVED OUTSIDE OF EXISTING FOUNDATION, AND TOWARDS CHAMBER I-S1.8?
11	POTENTIAL CHAMBERS REQUIRED WITHIN LIBRARY STORAGE DEPENDANT ON EXISTING PARABOLIC ROOF RWP SURVEYS
12	AGREEMENT REQUIRED FROM YORKSHIRE WATER PRIOR FOR CONNECTION AND THROUGH PLANNING PROCESS. DISCHARGE RATES AND DRAINAGE STRATEGY TO BE AGREED WITH ULFA AND YORKSHIRE WATER. CONTRACTOR RESPONSIBLE FOR OBTAINING S106 APPROVAL.

- GENERAL NOTES:
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 - ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
 - FOR GENERAL NOTES REFER TO DRAWING.
 - DRAINAGE PROPOSALS BASED UPON FOLLOWING DESIGN TEAM DRAWINGS:
 - IR430301-CTA-ZZ-00-DR-A-201100 P04 - UPPER GROUND FLOOR
 - IR430301-CTA-ZZ-00-DR-A-201099 P09 - LOWER GROUND FLOOR
 - IR430301-GIL-ZZ-00-DR-L-000102 P01 - SITE MASTERPLAN
 - IR430301-GIL-ZZ-00-SK-L-000002 P01 - SOIL STRUCTURED DETAIL SKETCH
 - IR430301-BMD-ZZ-00-DR-P-501000 P02 - FOUL AND SURFACE WATER DRAIN POINTS LOWER GROUND FLOOR
 - IR430301-BMD-ZZ-00-DR-P-501001 P02 - FOUL AND SURFACE WATER DRAIN POINTS UPPER GROUND FLOOR
 - DRAINAGE PROPOSALS BASED UPON FOLLOWING SURVEY INFORMATION:
 - GR48948-DR REV 8 (SUBSCAN CCTV SURVEY)
 - 21/05/2020 REV 8 (MALTBY SURVEYS TOPOGRAPHICAL SURVEY)
 - 21/05/2020 REV 8 (MALTBY SURVEYS QUEENSGATE MARKET GROUND FLOOR BUILDING SURVEY)
 - 21/05/2020/P28 (MALTBY SURVEYS PLAZA BASEMENT FLOOR PLAN)
- DESIGN NOTES:
- ASSUMED THAT ALLOWABLE DISCHARGE RATES AS LISTED ON ARUP DRAWINGS IS ACCEPTABLE TO BOTH PLANNING AUTHORITY AND STRATEGY SUBJECT TO CHANGE DEPENDANT ON CONFIRMATION.
 - EXISTING PRIVATE DRAINAGE WITHIN PLANNING BOUNDARY ASSUMED TO BE REMOVED AS PART OF DEMOLITION AND RE-CONSTRUCTION.
 - ATTENTION VOLUME AND STORAGE SHOWN INDICATIVELY AT THIS STAGE AND SUBJECT TO CHANGE FOLLOWING ALLOWABLE DISCHARGE RATE CONFIRMATIONS.

- KEY
- RED LINE BOUNDARY
 - EXISTING YORKSHIRE WATER COMBINED SEWER NETWORK (ALIGNMENT BASED ON SUBSCAN CCTV SURVEY DRAWING)
 - EASEMENTS ASSOCIATED WITH EXISTING YORKSHIRE WATER NETWORK
 - YELLOW = NO OBSTRUCTIONS
 - GREEN = NO TREE PLANTING
 - EASEMENTS BASED ON YORKSHIRE WATER PRE-PLANNING SENSITIVE ENQUIRY DATED 22/02/22 REF: Y002357
 - PROPOSED SURFACE WATER NETWORK
 - PROPOSED BACKDROP CONNECTION
 - PROPOSED FOUL WATER NETWORK
 - EXISTING TUNNEL RETAINING WALL LINE EXTENTS
 - EXISTING YORKSHIRE WATER SEWER TO BE ABANDONED - SEWER TO BE GRUBBED OUT / REMOVED
 - EXISTING RWP CONNECTION
 - PROPOSED RWP CONNECTION
 - PROPOSED SVP CONNECTION
 - PROPOSED FLOOR GULLY
 - PROPOSED FOUNDATIONS
 - EXISTING FOUNDATIONS
 - EXISTING FOUNDATIONS TO BE REMOVED
- BASED UPON M&E DRAWINGS AS LISTED WITHIN DRAWING NOTES
- REFER TO STRUCTURAL DRAWINGS FOR ALL DESIGN NOTES

CCTV SURVEY OF YWS SEWER IN ROAD DOES NOT SHOW CONNECTION TO YWS SEWER TO BE ABANDONED

P09	UPDATED TO SHOW LATEST ARCHITECTS LAYOUT	03/06/24	JC	JS
P08	EXISTING YORKSHIRE WATER SEWER TO BE ABANDONED ADDED	23/02/24	JC	JS
P07	FOUL NETWORK ANNOTATIONS ADDED	17/04/24	JC	JS
P06	VIEWPORT ROTATED TO SHOW	16/04/24	JC	JS
P05	REVISED FOLLOWING COORDINATION WITH PROPOSED STRUCTURAL WORKS	12/04/24	JC	JS
P04	WORK IN PROGRESS ISSUE	03/04/24	JC	JS
P03	UPGRADED WITH LATEST M&E LAYOUT	22/02/24	JC	JS
P02	UPDATED FOLLOWING RECEIPT OF POP UP LOCATIONS	11/12/23	RR	DT
P01	INITIAL ISSUE	30/08/23	RR	LB

Rev: Description: Date: By: Chkd:

Chris Stables - Project Manager - Environmental - Infrastructure - Commercial - Heritage - Precast - Designer
Benjamin - Senior - Cambridge - Cardiff - Chester - Dublin - Edinburgh - Glasgow - London - Leeds - Liverpool - Manchester - Nottingham

Project: **OUR CULTURAL HEART, HUDDERSFIELD**

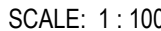
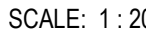
Dwg Title: **PROPOSED DRAINAGE STRATEGY INTERNAL AREAS**

Drawn By: RR Designed By: RR Checked By: LB

Project No: **081801** Date: **30/08/23** Scales @ A0: **1:200**

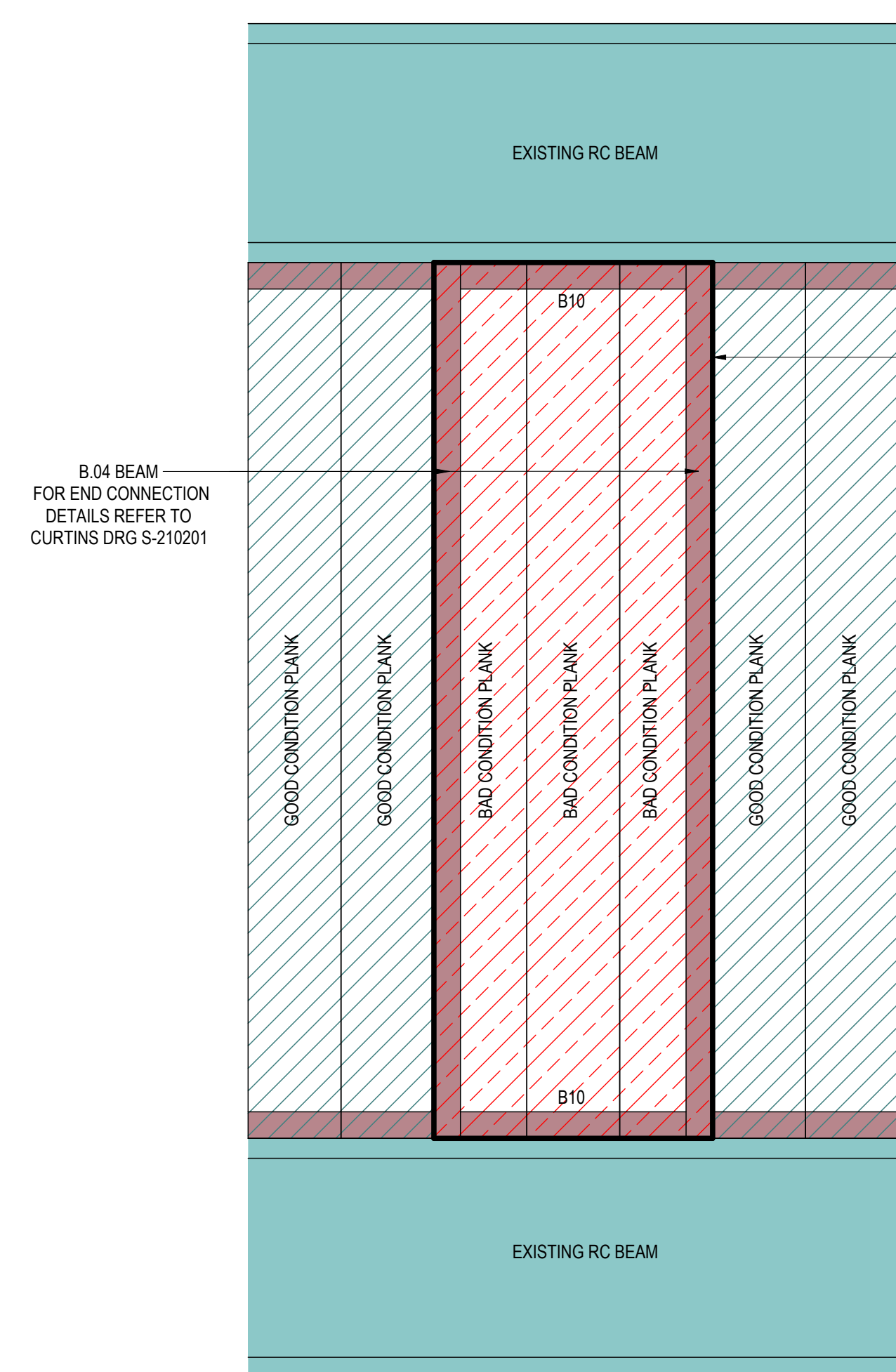
Project Code - Originator - Function - Spatial - Form - Discipline - Number - Revision

IR430301 - CUR - XX - XX - DR - C-921002 P09

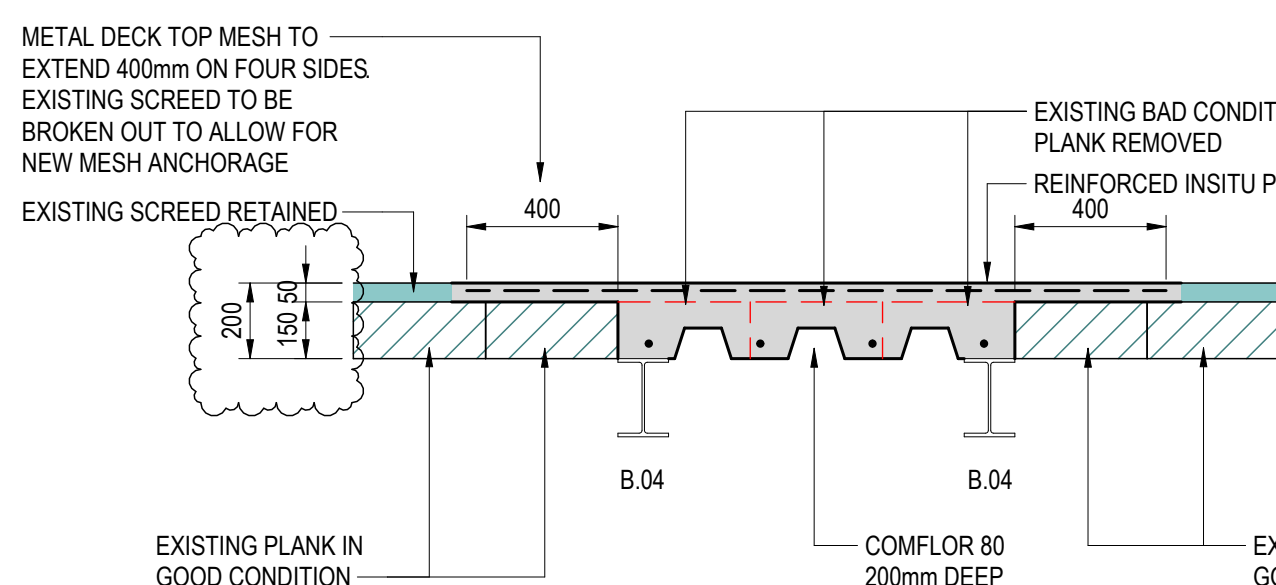


BEAM	
B-01	1P100x100x12
B-02	LCF180x50x20
B-03	SHS140x140x12.5
B-04	UB203x133x30
B-05	UB356x171x67
B-06	UB457x219x67
B-07	UB533x215x109
B-08	UB610x305x149
B-09	UB406x146x46
B-10	1P100x100x10
B-11	FL140x90
B-12	RHS150x100x10.0
B-13	RHS160x80x10.0
B-14	RHS250x100x10.0
B-15	RHS150x150x10.0
B-16	SHS100x100x10.0
B-21	1F50x150x12
B-22	L200x150x12
B-23	L300x30x16
B-24	UB254x146x37
B-26	RHS200x100x12.5
B-27	FL100x50
COLUMN	
C-01	RHS150x100x8.0
C-02	UC203x203x46
C-03	UC203x203x52
C-04	SHS180x180x10.0
C-05	SHS140x140x12.5
C-06	UC152x152x30
C-07	RHS250x150x6.3
C-08	SHS150x150x12.5
C-09	SHS100x100x10.0
C-10	SHS80x80x8.0

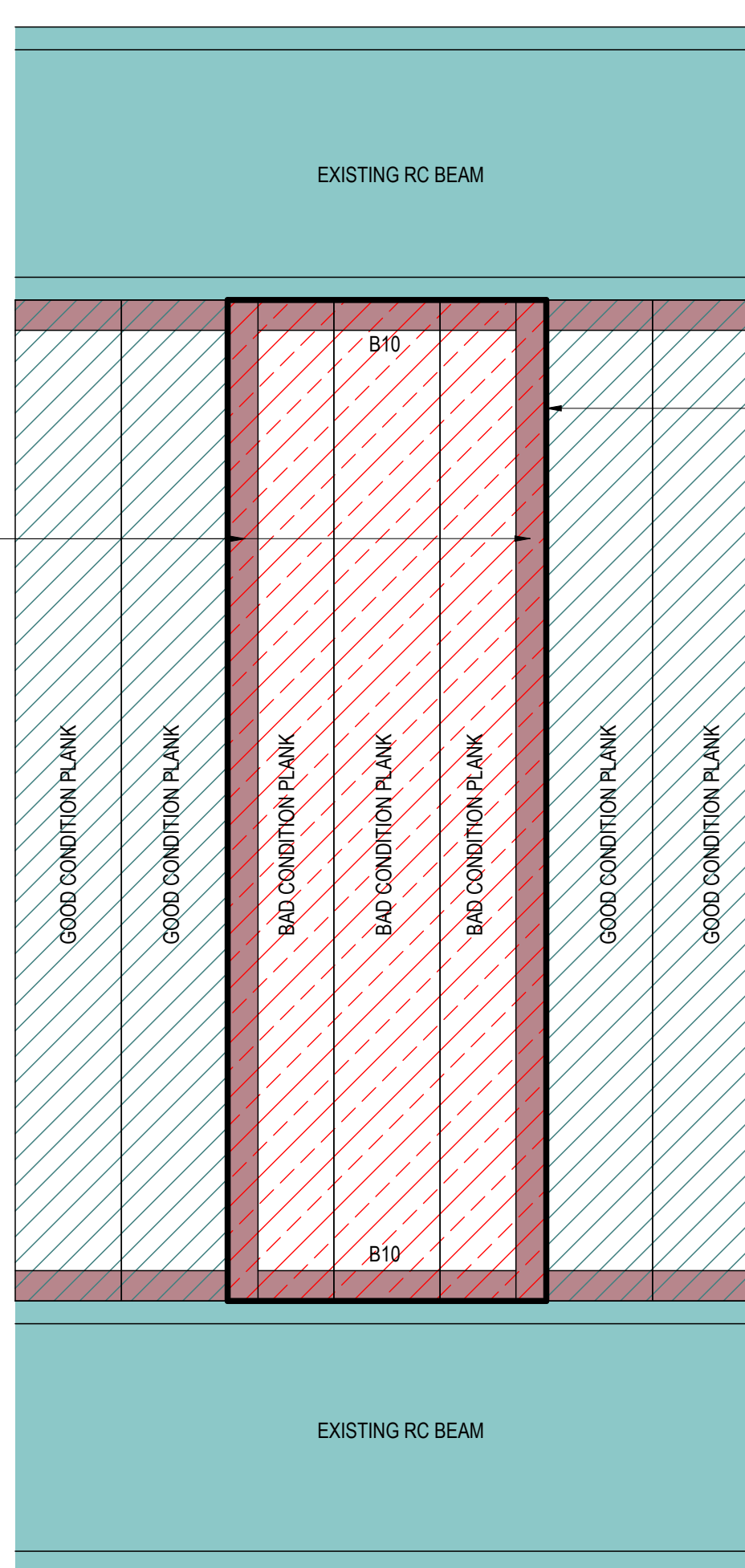
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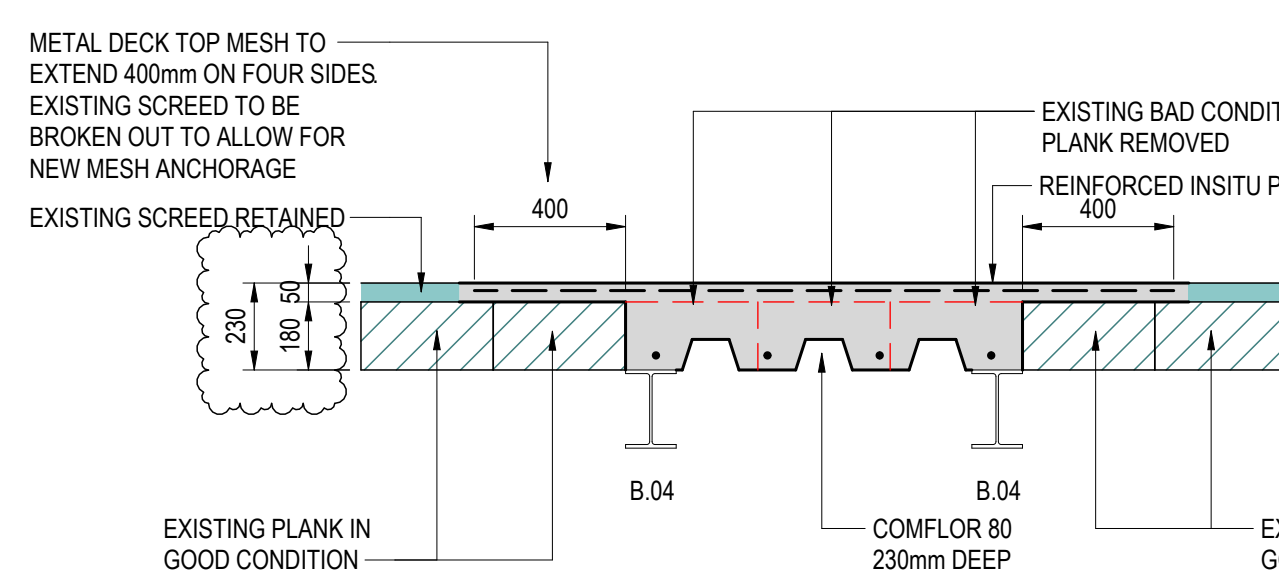
INTERNAL PLANK REPLACEMENT PLAN



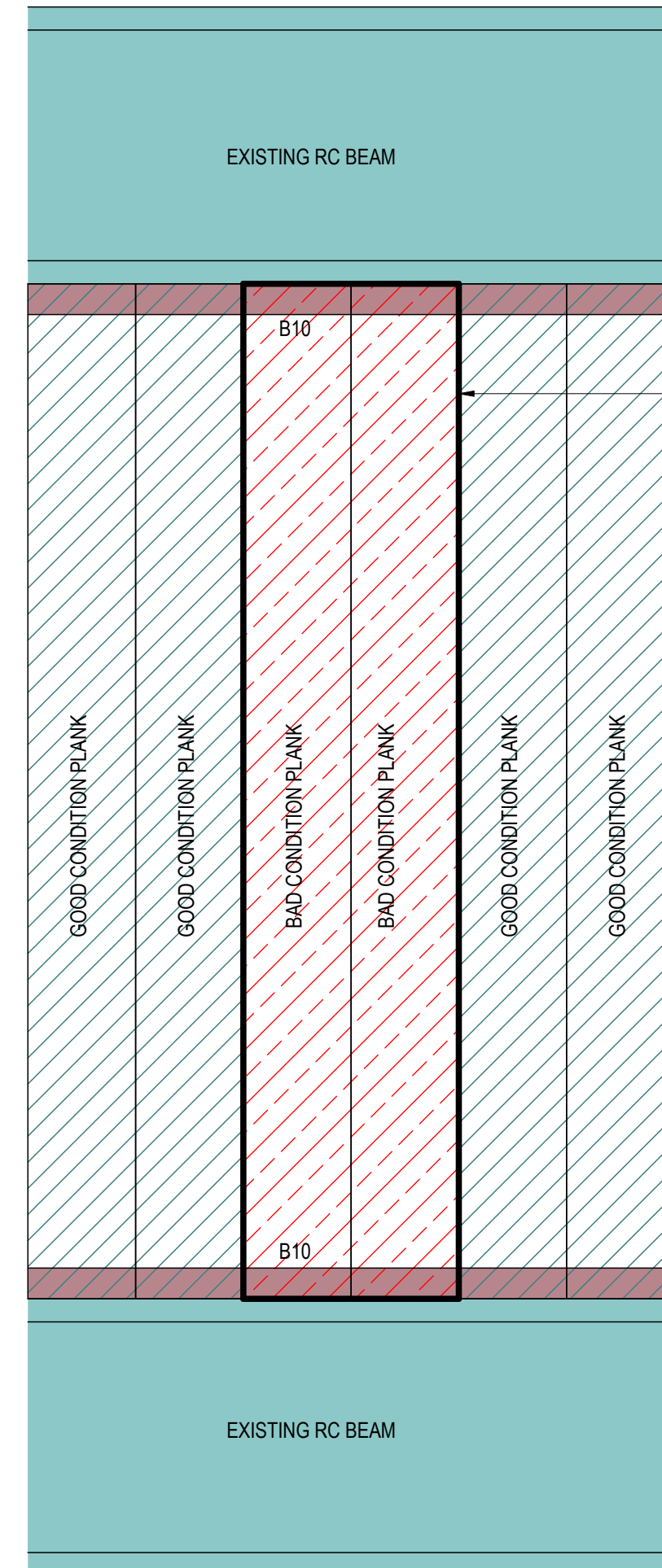
INTERNAL PLANK REPLACEMENT SECTION



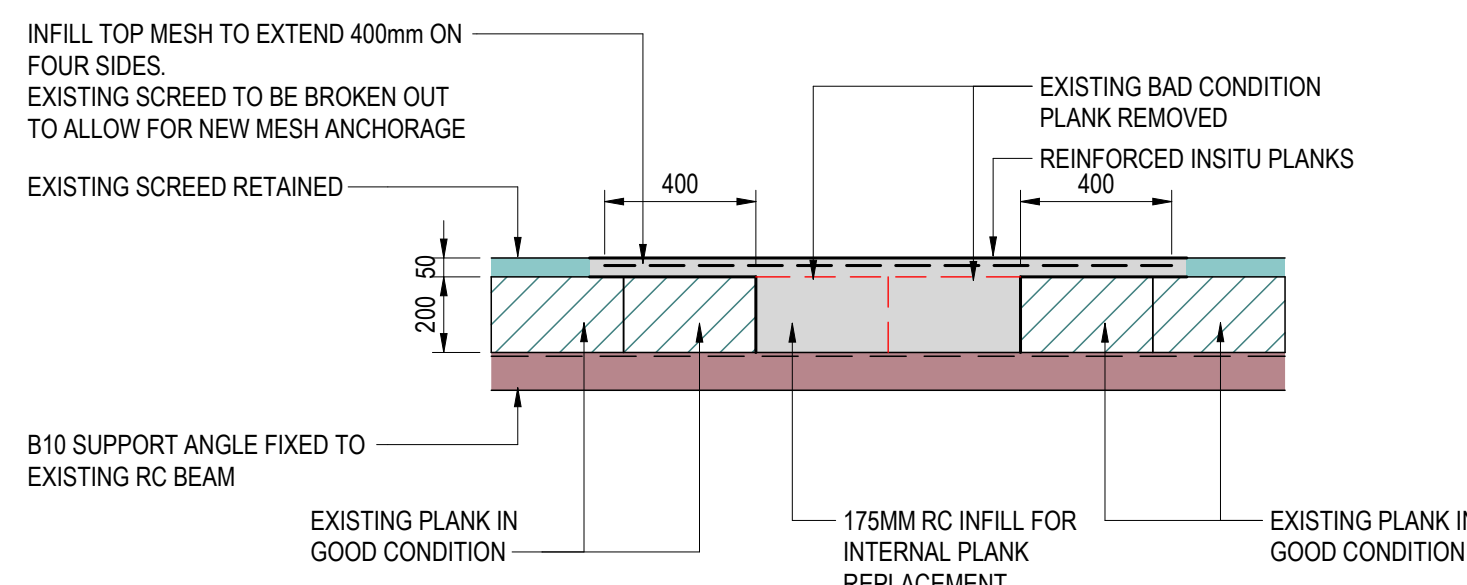
EXTERNAL PLANK REPLACEMENT PLAN



EXTERNAL PLANK REPLACEMENT SECTION



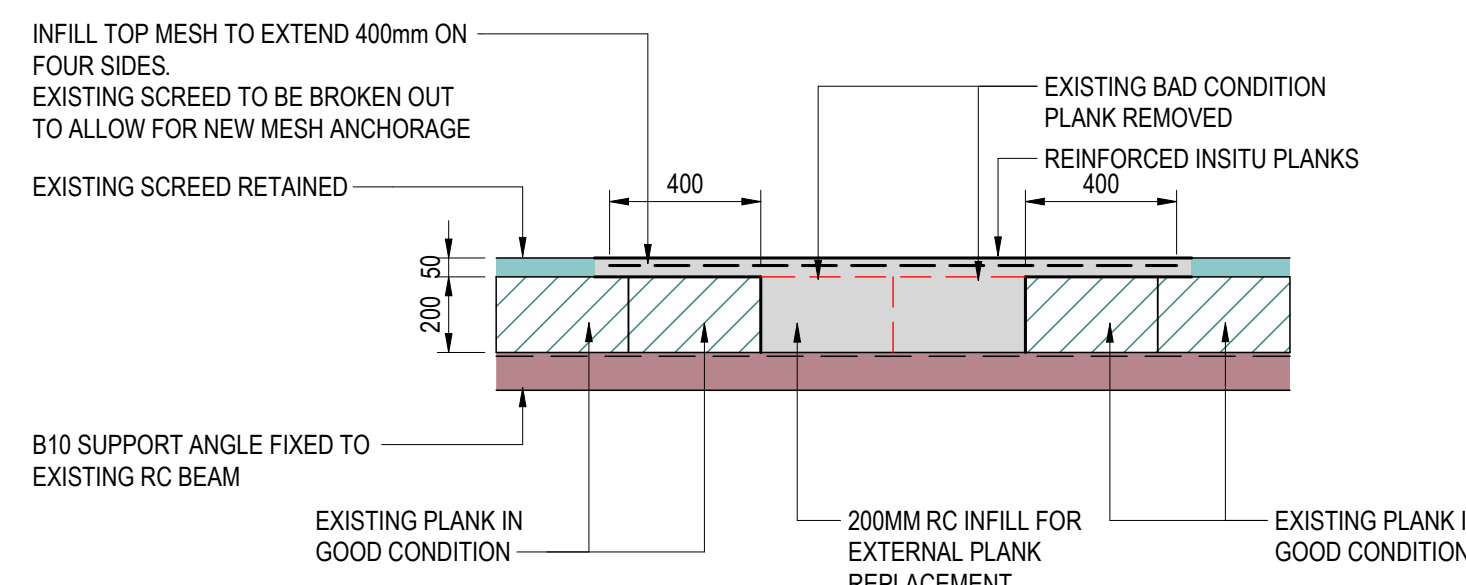
INTERNAL PLANK REPLACEMENT PLAN



INTERNAL PLANK REPLACEMENT SECTION



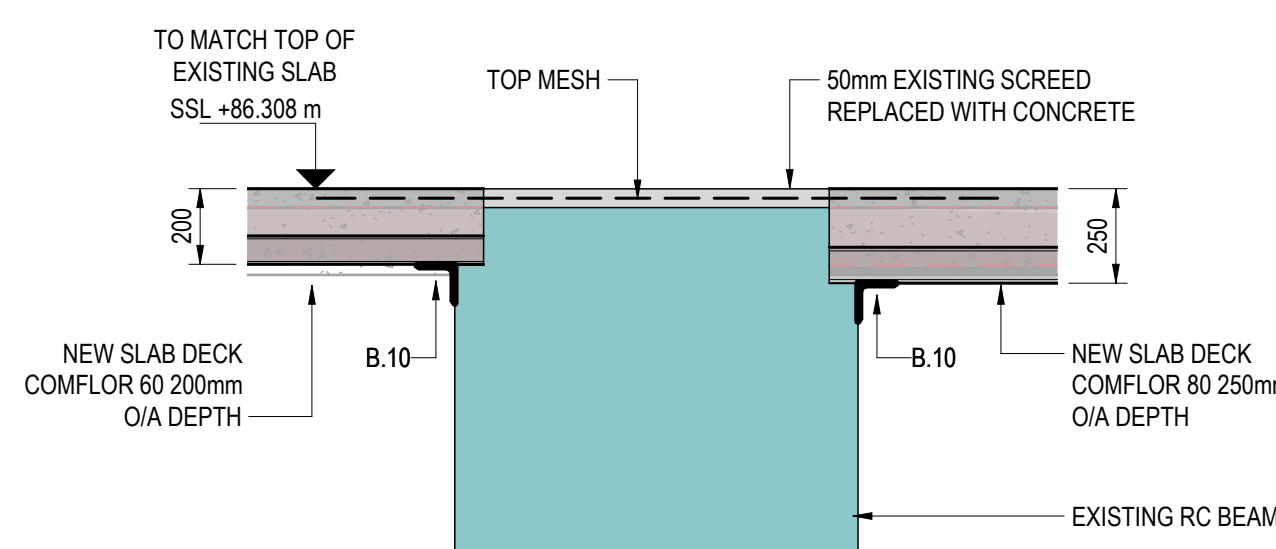
EXTERNAL PLANK REPLACEMENT PLAN



EXTERNAL PLANK REPLACEMENT SECTION

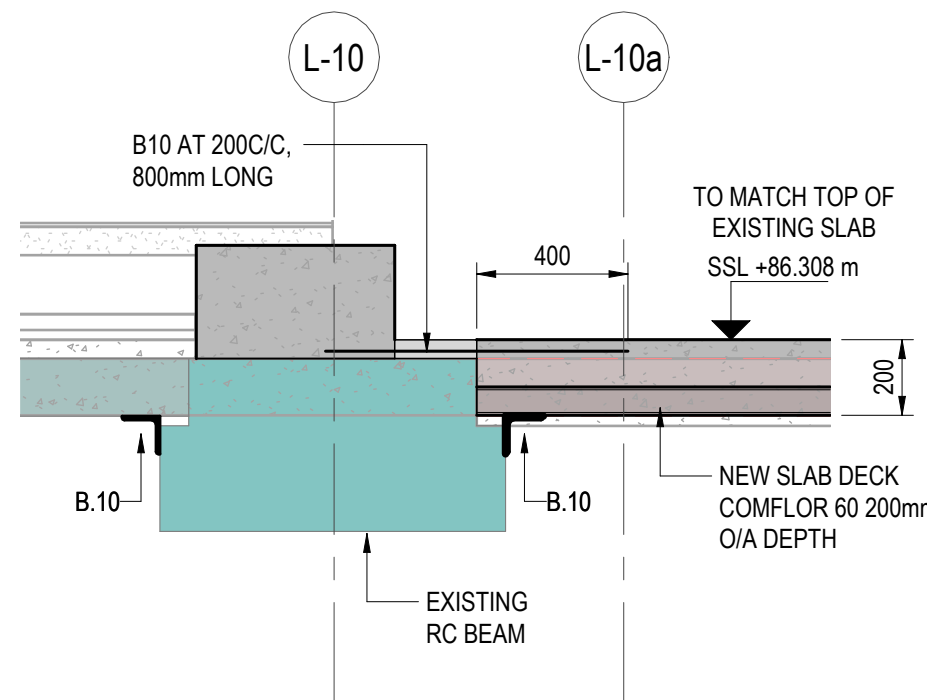
DAMAGED PLANK METAL DECK REPLACEMENT DETAILS (3 OR MORE DAMAGED PLANKS)

SCALE: 1 : 20



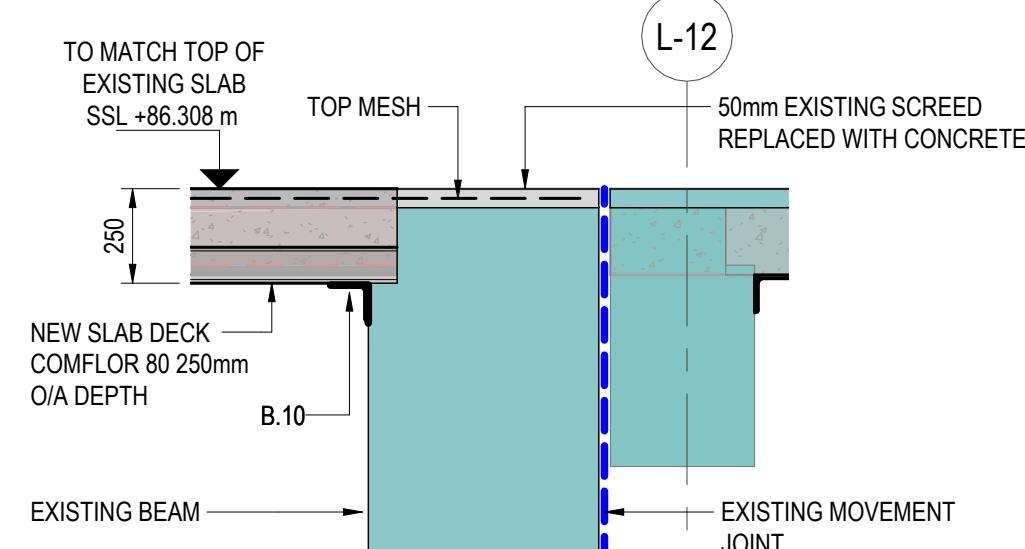
PLANK REPLACEMENT - SECTION A-A

SCALE: 1:20



PLANK REPLACEMENT - SECTION B-B

SCALE: 1 : 20



PLANK REPLACEMENT - SECTION C-C

SCALE: 1 : 20

DAMAGED PLANK RC INFILL REPLACEMENT
DETAILS (2 OR LESS DAMAGED PLANKS)

SCALE: 1 : 20

GENERAL NOTES:	
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	DENOTES DEMOLISHED EXISTING STRUCTURE REFER TO DEMOLITION GENERAL ARRANGEMENTS
STRUCTURAL DESIGN CHECKS OF ALL EXISTING STRUCTURE PROPOSED TO BE RETAINED ONLY TO BE FINALISED UPON COMPLETION AND ISSUING OF SCOOTEC FINAL INVESTIGATION REPORT.	
STEEL SCHEDULE	
TYPE REF.	SECTION NAME
BEAM	
B.01	L100x100x12
B.02	RFC100x60x20
B.03	SHS140x140x12.5
B.04	UB203x133x30
B.05	UB386x171x67
B.06	UB457x151x67
B.07	UB352x103x109
B.08	UB61x305x149
B.09	UB406x140x46
B.10	L100x100x10
B.11	FL140x20
B.12	RHS150x100x10.0
B.13	RHS160x80x10.0
B.14	RHS250x100x10.0
B.15	SHS150x150x10.0
B.16	SHS100x100x10.0
B.21	L150x150x12
B.22	L200x150x12
B.23	L300x200x16
B.24	UB254x146x37
B.25	RHS200x100x12.5
V801	FLT100x5
COLUMN	
C.01	RHS150x100x8.0
C.02	UC203x203x46
C.03	UC203x203x52
C.04	RHS180x180x10.0
C.05	SHS140x140x12.5
C.06	LS152x152x30
C.07	RHS250x150x3.3
C.08	RHS150x150x12.5
C.09	SHS100x100x10.0
C.10	SHS80x80x8.0

ALL B.10 ANGLE FIXED TO EXISTING RC BEAM USING M12 BOLT + HILTI HIT-

MEASURED SURVEY IS REQUIRED ONCE ALL DEMOLITION HAS BEEN COMPLETE TO CONFIRM EXACT DIMENSIONS AND SETTING OUT OF EXISTING STRUCTURE.
THESE DRAWINGS ARE NOT COORDINATED AND DO NOT HAVE ANY SUBCONTRACTOR INPUT.

P02	NY1 STAGE 4 COMMENTS AND SETTING OUT	NY1	CS	HK
P01	STAGE 4 ISSUE	08.05.24	AP	HK
Rev:	Description:	Date:	By:	Chkd:

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STAGE 4

Project:

OUR CULTURAL HEART, HUDDERSFIELD

Drug Title

LEVEL 00 UPPER GROUND - PLANK REPLACEMENT SECTIONS AND DETAILS

Drawn By AP	Designed By HK	Checked By TL
Project No IR430301	Date 02.08.23	Scales @ A0 As indicated
Project Code - Originator - Function - Spatial - Form - Discipline - Number IR430301 - CUR - XX - 00 - DR - S - 200605		Revision: P02

1901	CIIB	77	77	112	522	00001
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