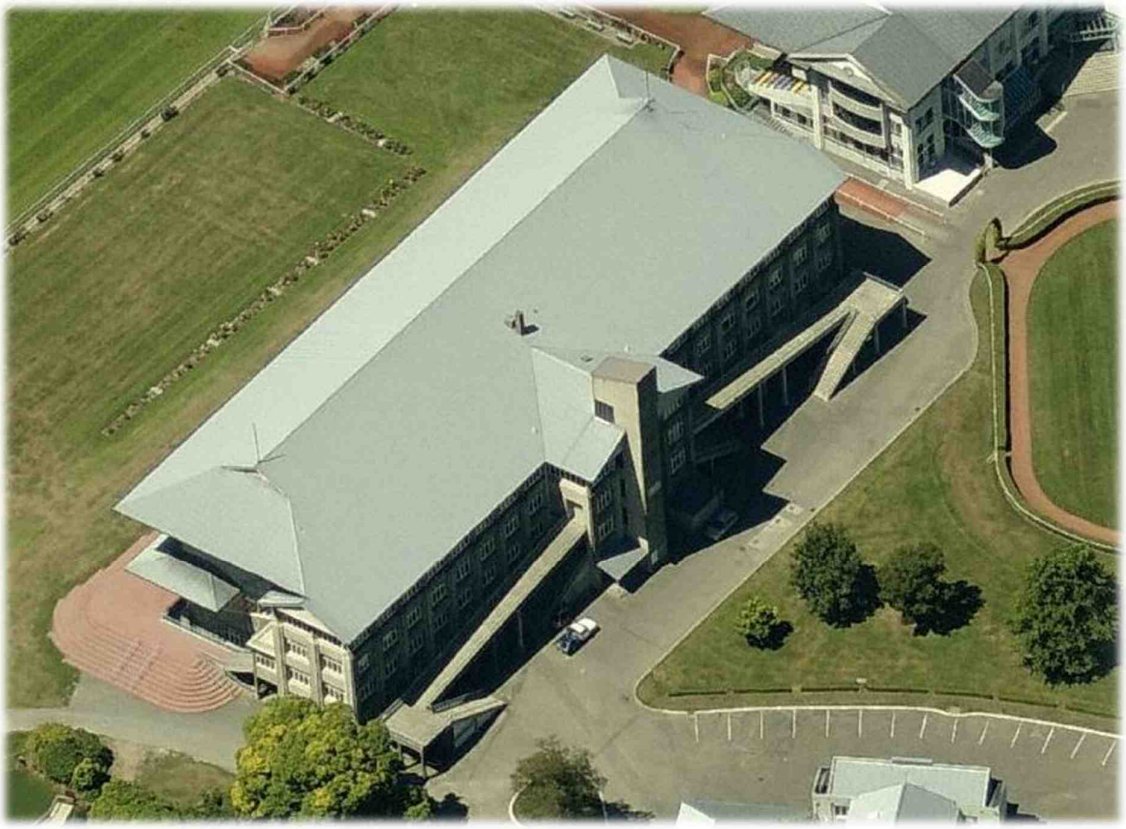
Intrusive Investigation Report

Grand National (Public) Stand



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Prepared for – Canterbury Jockey Club – ABN: N/A

Intrusive Investigation Report

Grand National (Public) Stand

Client: Canterbury Jockey Club

ABN: N/A

Prepared by

AECOM New Zealand Limited
Level 2, 2 Hazeldean Road, Addington, Christchurch 8024, P O Box 710, Christchurch MC, Christchurch 8140, New Zealand
T +64 3 966 6000 F +64 3 966 6001 www.aecom.com

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Prepared by Nik Richter, Matt Clifford

Reviewed by Mark Ferfolja

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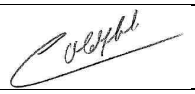
			Name/Position	Signature
0	20-Mar-2015	Draft – For commentary	Craig Oldfield Associate Director	-
1	14-Apr-2015	For Issue	Craig Oldfield Associate Director	

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1.0 Introduction

1.1 Overview

AECOM New Zealand Ltd has been engaged by Canterbury Jockey Club Inc. Soc. to undertake a seismic damage assessment of the Grand National (Public) Stand at the Canterbury Jockey Club, Riccarton Park Raceway, 165 Racecourse Road, Sockburn, Christchurch.

The initial phase of AECOM's assessment has involved a review of existing drawings of the building structure and an inspection of the structure to the identify areas within the building where earthquake damage may potentially be present.

AECOM structural engineers, Nik Richter and Matt Clifford, visited the Riccarton Racecourse site on Friday 6th March 2015 to conduct an initial site walkover, in the presence of representatives from Thornton Tomasetti.

An Initial inspection of the Grand National Stand was carried by AECOM structural engineers, Nik Richter and Matt Clifford, on Tuesday 11th March 2015, Wednesday 12th March 2015, and Friday 13th March 2015. These initial inspections were non-intrusive visual inspections only, the main purpose of which was to identify areas for intrusive works and to understand the structural systems.

This report documents the investigations undertaken by AECOM thus far and catalogues the intrusive works that AECOM recommend to be undertaken prior to conducting a detailed damage assessment of the building.

1.2 Purpose of this report

The purpose of the report is to identify locations where intrusive investigation or provision of access is required to further assess the condition of the structure.

1.3 Sources of information

- Architectural modification drawings. Not dated, but assumed to be circa 1981, by Gleeson Architects.
- Structural, mechanical services, electrical services, and fire services alteration drawings dated 27 July 1981, by Powell Fenwick and Partners Consulting Engineers.

All drawings were received as scanned images only and AECOM did not view originals. As such these documents served as reference sketches only as dimensions and details were not legible.

- Detailed Engineering Evaluation carried out by Airey Consultants, dated 20 August 2012.
- Initial report carried out by Thornton Tomasetti (TT), dated 18 December, 2012.

Airey and TT reports were used as sources of information and as aids to AECOM's initial inspections. These reports were not peer reviewed or critiqued in any way by AECOM.

- Geotechnical desk top study for the Tote Building dated 15 October 2014 by AECOM.

2.0 Grand National Stand description

2.1 Site description

The building is located on the grounds of the Riccarton Park Raceway, which is located at 165 Racecourse Road, Sockburn, approximately 7 km west of the Christchurch CBD, as shown in Figure 1.

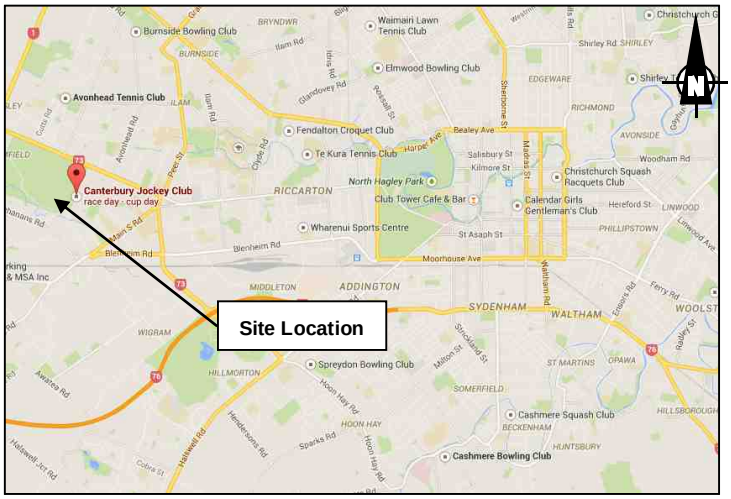


Figure 1: Site Location Plan (Google Maps, 2015)

This site is generally flat and at the same level as the immediate surrounding area. The building, which will be referred to as the "Grand National Stand", is located on the southern side of the Racecourse, adjacent to and west of the property's other remaining grandstand, the Club (or Administration) Stand. There are several other racecourse buildings in the southwest vicinity of the building as shown in Figure 2. The ground directly to the south of the building is paved in asphalt and the ground directly to the north of the stand is finished with a salmon-coloured concrete plinth, with an integral concrete retaining wall retaining up to 1.8m of ground. The Grand National stand itself sits on level ground.

Figure 2: Site Layout Plan (Bing Maps, 2015)

2.2 Building description

2.2.1 General

The Grand-National Stand is a reinforced concrete (RC) structure with timber grandstands, built circa 1920. The structure measures approximately 70m long, measured parallel to the racetrack (east-west) and 22m deep, measured perpendicular to the racetrack (north-south). The structure consists of five above ground stories and two grandstand seating levels. The main RC structure measures approximately 70m x 8m. The stands are of timber construction, sitting on a steel support structure (trusses and bracing). The stands measure approximately 70m x 15m. AECOM did not conduct a detail measure up of the building.

The ground floor consists of a bar at the eastern end of the structure and a storage and workshop area at the western end of the structure. The first, second, and third floors, consist of tote offices, bar and food facilities, and general public assembly areas. Access to these upper floors is via several ramps and concrete steps or via an elevator; all located on the south elevation. The fourth floor is a maintenance level with no public access. Access to the fourth floor is via a service door on the upper stand or via the elevator. The lower stand can be accessed directly from trackside on the northern side and from the first and second stories on the south side. Access to the upper stand is via four sets of stairs on the third floor. A brief building summary is provided in Table 1.

Table 1 – Building Summary

Element	
Total Building Length	~70 m
Total Building Width	~22 m
Total Plan Area Approx.	4340 m^2
Importance Level (IL)	3
Number of Stories	5 floor levels 2 stands
Occupancy	
Ground:	Workshop / Public Access
First:	Public Access
Lower Stand:	Public Access
Second:	Public Access
Third:	Public Access
Upper Stand:	Public Access
Fourth:	Maintenance Access Only

2.2.2 Structural systems

At the time of writing, no original structural drawings or legible structural alteration drawings were available to AECOM and thus the superstructure reinforcing steel and substructure foundation details are unknown. The main RC structure consists entirely of cast-in-situ elements. The gravity system in the main structure consists of RC floor slabs, supported by RC beams, which in turn are supported on RC columns. There are several 180mm thick RC shear walls on the upper storeys of the structure. The grandstands are timber framed structures. The upper stand and lightweight roof are supported by steel trusses sitting on main RC structure and on four concrete-filled 200mm metal tubes (suspected to be cast iron). The lower stand is supported by rolled steel joists (RSJ's) sitting directly on the concrete frame of the ground floor.

The lateral resistance system consists of RC moment frames and the elevator core in the north-south direction and a mix of RC moment frames, shear walls and the elevator core in east-west direction. The RC elevator is not part of the original structure and at the time of writing there were no structural drawings available. The elevator core connection details, superstructure reinforcing steel, and substructure foundation details are unknown.

Given the age of the structure and the assumed 'good' ground conditions (refer AECOM geotechnical desk top study, dated 15 October 2014), it is likely that shallow mass concrete pad footings were used under the main RC columns and the ground floor is a slab-on-grade construction. Local slab thickenings may be present under red brick infill walls. In the absence of structural drawings, only intrusive works could determine the foundation type.

Reference drawings show that the main RC structure was modified in the 1980's. At that time, the shear walls on the first, second and third floors were modified and many panels removed. On the third floor, timber-framed NZS3604-style rooms approximately 4m deep were constructed between the grandstand-supporting trusses. The infill shear walls were removed between the columns and beams approximately 200mm deep were cast in as lintel beams at these new openings. It is likely that the RC elevator core was constructed at this time.

3.0 Initial observations

The investigations on the Grand National Stand were conducted in a top-down fashion, beginning on the fourth floor and finishing on the ground floor.

As the existing drawings were illegible or non-existent AECOM surveyed and reproduced some of the details observed.

3.1 Level 4 observations

Contrary to historic drawings, which show three entrances to level 4 from the upper stand, there is only one access doorway to this level. There is a step down from the upper stand to level 4, of approximately 800mm. This step occurs at the threshold of the doorway and thus precautions should be taken surrounding this trip/ falling hazard. Whilst the elevator has a button for access to level 4, it does not appear to work. AECOM were unable to use the elevator to access level 4, but the elevator does work descending from level 4 to lower floors.

There are full depth diagonal cracks around the doorway from the upper stand to level 4.

When viewed from the upper stand, the shear wall panels on level 4 show signs of full height vertical cracks at regular spacing along the 70m length of the wall. These vertical cracks vary in width ranging from greater than 1mm to approximately 5mm. These vertical cracks coincide with the location of cast-in double angle column members which support the roof of the upper stand. No cracks are visible at these locations on the level 4 side of the wall. It is thought that under north-south directional seismic excitation these panels acted like simply supported members hinging at their weakest point, at the vertical column support, and as a result these flexural cracks opened up. These steel members do not appear damaged, although they are showing signs of their age, with much surface rust visible.

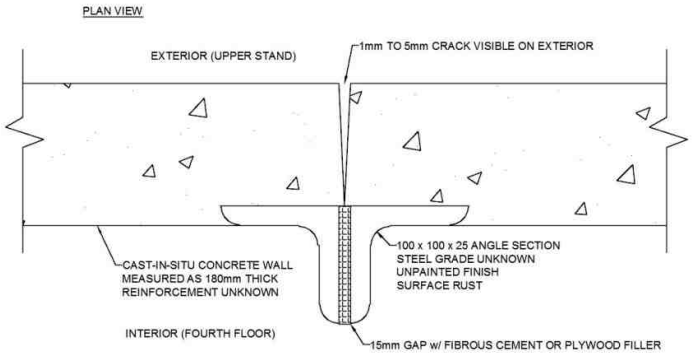


Figure 3: Cracking in concrete wall on Level 4

There is no crack damage apparent in the RC floor slab on level 4. There are multiple 2000L water tanks on the fourth floor. These tanks feed either the sanitary system, potable system or the sprinkler system. The tanks are leaking, possibly at the connections, and there is evidence of significant water ponding under these tanks.

There was no crack damage visible to the RC elevator shaft at fourth floor level. There was no evidence of splitting of the roof sheeting in this area or of separation of the elevator shaft away from the main structure.

The roof at the north western end of level 4 shows signs of distress with water penetration and ponding visible in this area. This leaking appears to be caused by separation of the roof sheeting.

There is a discontinuity at the centre of the shear wall on level 4. At this point there is a concrete column which houses a ventilation shaft. There is evidence of flexural failure of this column. There is severe damage to this column with cracks up to 30mm in width visible on the south face of the column, these cracks taper to approximately 3mm wide at their smallest, on the edge of the north face. The north face is obscured by the RC walls and this face of the column is clad on the exterior (upper stand level). There is evidence of crushing of the concrete in this region on the north, east, and west faces and there are multiple vertical spalling cracks.

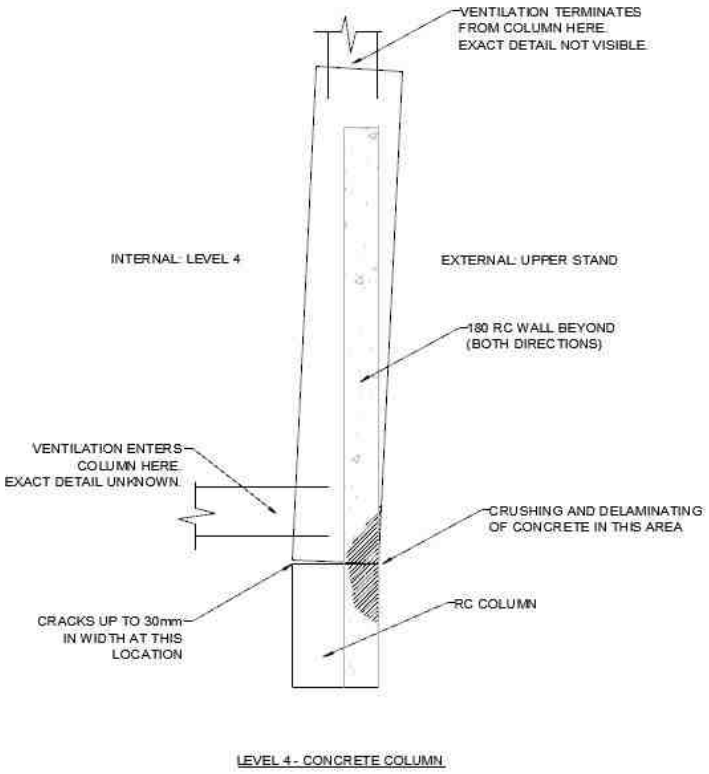


Figure 4: Severe damage to ventilation shaft column on Level 4

At the eastern and western ends of level 4 there are two 150mm thick RC wing or buttress walls. At the interface between the main east-west RC shear wall and the eastern wing-wall there is a full height vertical crack. This may be a flexural crack, occurring as a result of hinging at this point in the wall. The western wing-wall appears to have suffered spalling damage and as a result some of the reinforcing steel is exposed.

The two westernmost panels in the main east-west RC wall show signs of very poor construction. The wall is bulging at a clear line in the formwork and there is evidence of segregation of the concrete at this point also.

The roofing in this area is lightweight Colorsteel sheeting direct fixed to timber purlin sections which span between steel back span of the main upper stand roof. There is no roof bracing or lateral restraints for purlins visible in this area. The purlins are only restrained by the fixing to the sheeting itself.

Further information on the initial observations at level 4 is contained in Appendix B, drawings B.005.

3.2 Grandstand support column verticality survey

The main columns supporting the upper and lower stands are 200mm diameter concrete filled metal tubes. From a simple sounding test, these columns appear to be filled with concrete, although their exact specification is unknown. Column verticality measurements were taken with a digital spirt level on both the upper and lower stands. It was too bright to take measurements using a laser plumb and as such, more refined measurement will be required at the detailed investigation stage.

The position of the columns have been marked in Appendix B, on the initial observation plans B.001 to B.004, and are reproduced diagrammatically in Figure 5.

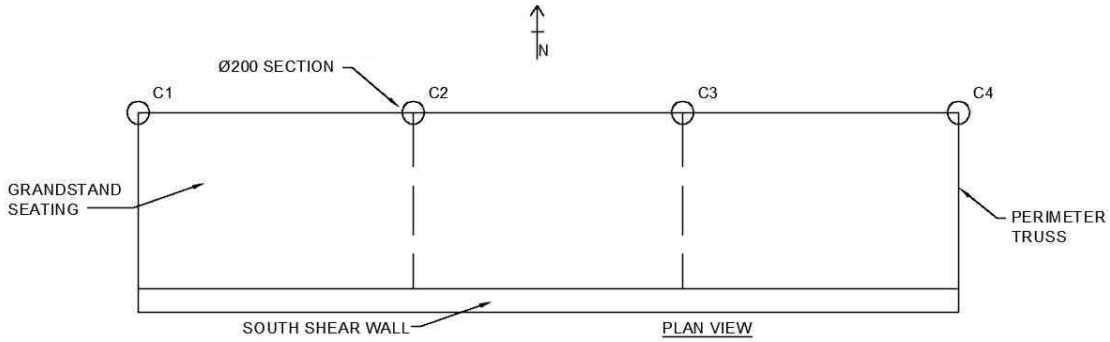


Figure 5: Layout of grandstand support columns

Table 2 – Column verticality measurements at upper stand level (1200 spirit level)

Column	Grid Ref.	Description	E/W verticality	N/S verticality	Vector	Direction
C1	A2	Northwest corner column	0.10% (W)	0.00% (plumb)	0.100%	West
C2	A8	Internal column – west	0.00% (plumb)	0.10% (S)	0.100%	South
C3	A14	Internal column – east	0.00% (plumb)	0.20% (S)	0.200%	South
C4	A20	Northeast corner column	0.10% (E)	0.30% (N)	0.316%	NNE ½ E

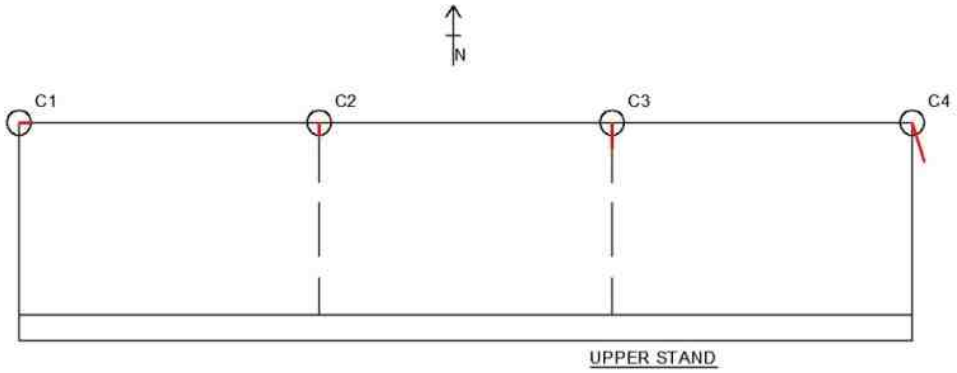


Figure 6: Direction of verticality measurements in upper grandstand support columns

Table 3 – Column verticality measurements at lower stand level (1200 spirit level)

Column	Grid Ref.	Description	E/W verticality	N/S verticality	Vector	Direction
C1	A2	Northwest corner column	0.80% (E)	0.10% (N)	0.806%	E by N
C2	A8	Internal column – west	0.15% (E)	0.75% (S)	0.765%	~SSE
C3	A14	Internal column – east	0.55% (E)	0.45% (S)	0.711%	ESE ½ S
C4	A20	Northeast corner column	0.30% (E)	0.15% (N)	0.335%	NE by E ½ E

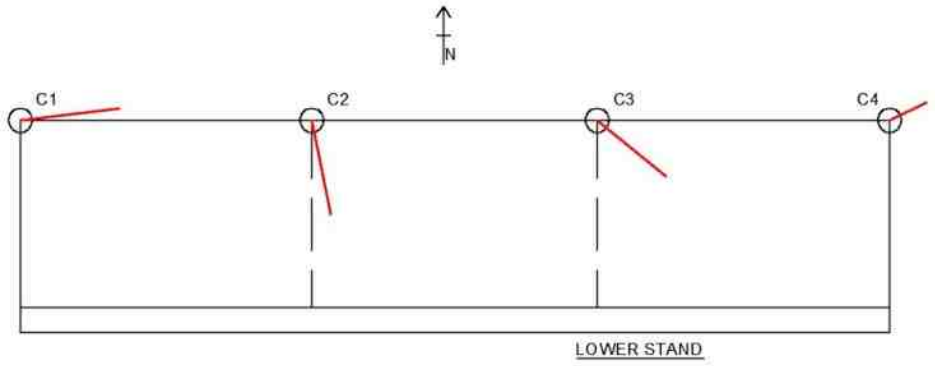


Figure 7: Direction of verticality measurements in lower grandstand support columns

It is clear from these verticality measurements that both the upper and lower stand support columns appear to be leaning in a generally easterly direction. The lower columns are leaning significantly further off vertical than the upper columns. The upper and lower columns are not a single continuous member. The lower column is bolted to the underside of a plated girder at upper stand and the upper column is bolted to the top of this plate girder. It is not possible to determine with a spirt level whether this accentuated lower level lean is due to the lower columns hinging at their base supports or hinging directly under their top support at the underside of the upper stand. AECOM will endeavour to clarify at the detailed investigation stage by the combined use of a laser plumb and theodolite. This will allow AECOM to measure the verticality of the stand columns with greater accuracy.

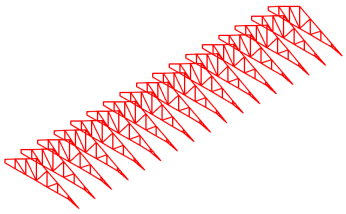
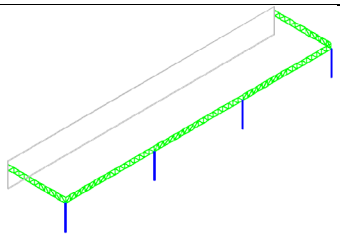
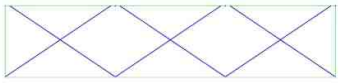
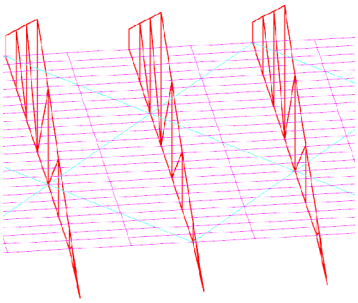
3.3 Upper stand observations

The roof of the upper stand was visually inspected from a low level, primarily to understand the layout of the timber and steel member contained there within.

There was some rust damage to the bracing connections in the south west corner of the upper stand and under loading this connection appears to have failed. Further investigation of these joints is required at the detailed investigation stage.

Further commentary on the roofing system components is given in Table 4 and in Figures 8 to 12 respectively.

Table 4 – Roofing system over upper stand

Item	Sketch	Description
Main roof structure: pitched steel trusses		The lightweight Colorsteel sheeting roof is supported directly by timber purlins which span onto a total 17 internal steel trusses (shown in red) and two hipped end bays (not shown for clarity). These trusses support the roofing system directly and cantilever over their own supports to create an overhang in the roof. The top chord of the truss supports purlins and the bottom chord supports bracing and ceiling joists.
Roof support structure: parallel chord trusses on concrete filled metal tubes and RC walls		The trussed roof system is supported directly by the east-west running southern shear wall (outline in grey) and around the perimeter by a series of parallel chord beam-type trusses (shown in green) which sit onto the RC wall and onto four cast iron columns.
Global bracing in the steel roof system		The global bracing system is a series of six circular steel rods, of approximate diameter 40mm. these tensile members are designed to provide overall rigidity and lateral resistance to the steel roofing system. A similar system is used in the lower trusses that support the upper stand. Internal truss members (edge of the 'X') act as compression elements in this system, but these elements have been omitted from this sketch for clarity.
Local bracing for trusses and ceiling joists		The ceiling joists are simply supported timber members spanning one bay between trusses (shown in magenta). At the mid-span of these ceiling joists there is a stiffener beam to prevent local buckling of the ceiling joists (seen in magenta, as a single member running perpendicular to joists). The ceiling joists are installed in-line with the bottom chord of the truss and serve as a support grillage for anti-bird mesh. There is secondary timber bracing running diagonally across the ceiling joists (shown in cyan) and these members serve to stabilize the truss and prevent local lateral torsional buckling of that member.

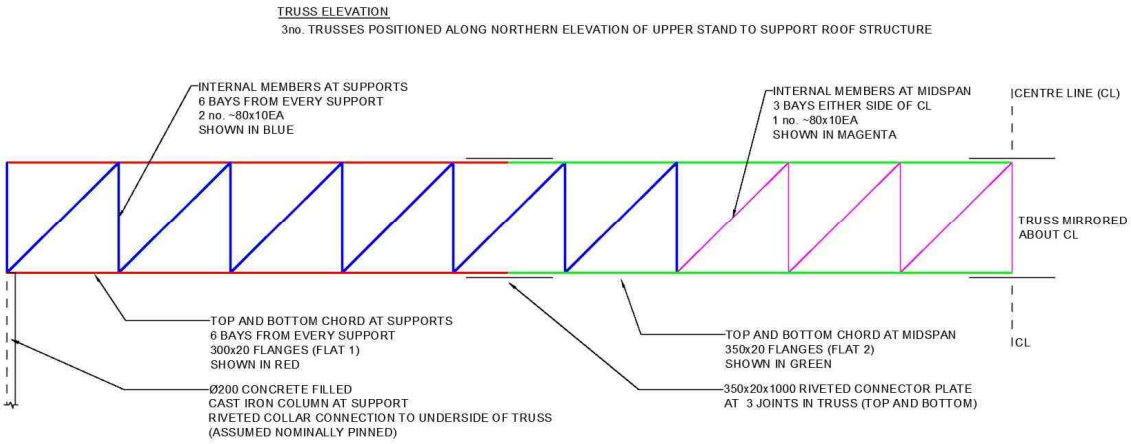


Figure 8: upper stand roof truss along northern elevation

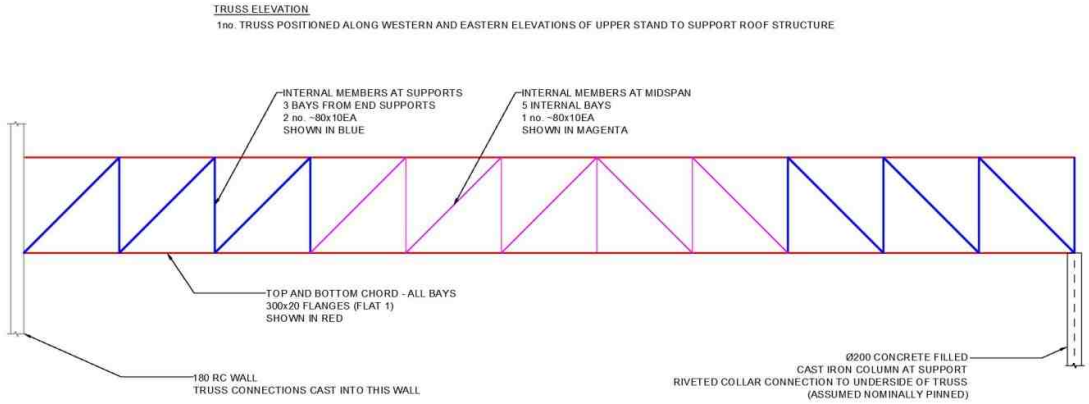


Figure 9: upper stand roof truss along eastern/ western elevations

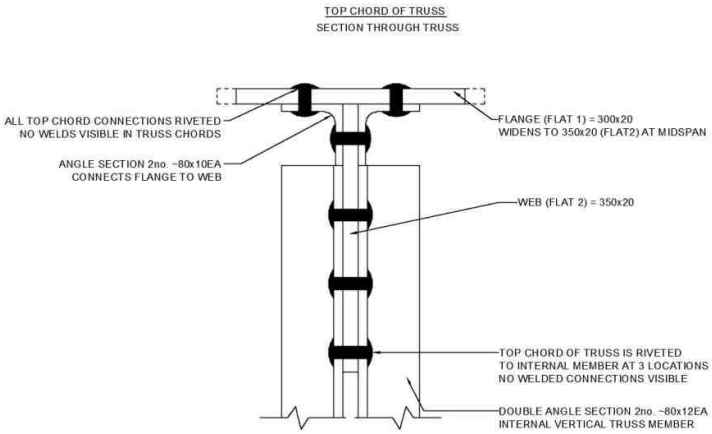


Figure 10: Observed truss connection (applicable to Figure 8 and 9)

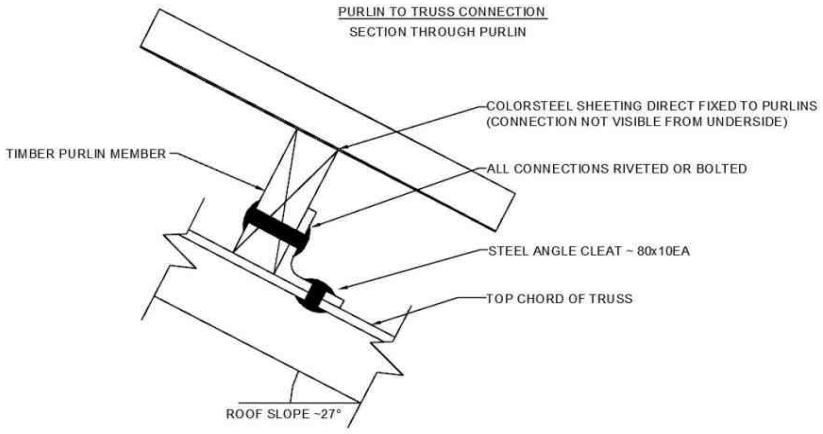


Figure 11: Roof to truss connection

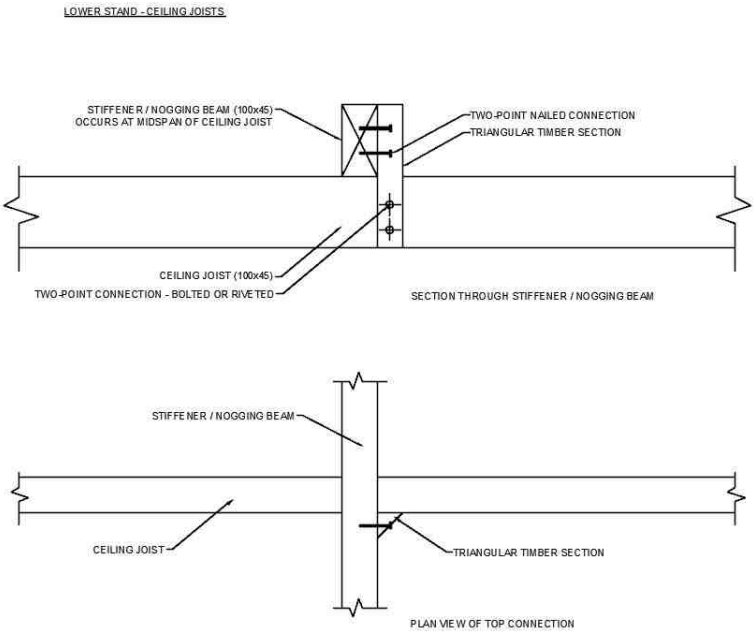


Figure 12: Ceiling joist stiffener connection

Level 3 observations

The main issue noted on level three is that there is evidence that significant alterations were undertaken to the lateral structural system as noted on drawing B.004. Significant further investigation of this issue is required at the detailed stage.

3.4 Observations on lower levels

All initial observations on the lower levels of the structure are marked in Appendix B, drawings B.001 to B.003.

4.0 Intrusive work instructions

4.1 Introduction

The recommended intrusive works are identified in this section of the report. Each item of intrusive work has been given an individual identification number so that the item can be identified on the Intrusive Work Key Plans which are provided in Appendix A. Intrusive work key plans have been provided for each level of the building. Intrusive areas were also denoted on site using signage on 2" green masking tape.

Further information relating to the intrusive work instructions has been tabulated in Section 3.2. The Intrusive Work Key Plans are to be read in conjunction with Table 5.

Contractor to satisfy himself prior to undertaking intrusive works about the presence (or otherwise) of potentially hazardous materials, particularly asbestos and take all necessary precautions.

4.2 Protocol for concrete sampling

- Cores to be taken at points away from joints or edges of the concrete element and reinforcement should be avoided. It is recommended to extract samples minimum 1.0m away from supports (beams, columns, walls)
- Do not remove cores in location of cracked or otherwise damaged concrete.
- Nominal core diameter to be 100mm.
- Where possible, nominal length of cores to be 200mm. If not possible the nominal length of cores to be 100mm.
- Immediately after drilling, clearly mark each core and place adjacent to the core for visual examination and collection by an AECOM engineer.

4.3 Protocol for steel sampling

- Locate the bar using cover meter or similar.
- Carefully scabble concrete around the bar for the length of approximately 600mm.
- Cut out 500mm long sample ensuring that the bar remains straight (i.e. do not bend the bar).
- Clearly mark each bar and place adjacent to where it was removed from for visual examination and collection by an AECOM engineer.

4.4 Intrusive investigation instructions

Table 5: Intrusive investigation reference table

Item	Photo	Instruction
L0.1		Remove 6 no. ceiling tiles in order to enable assessment of the first floor concrete slab and beams.
L0.2		Provide access to room to allow for assessment of shear walls, underside of slab and beams.

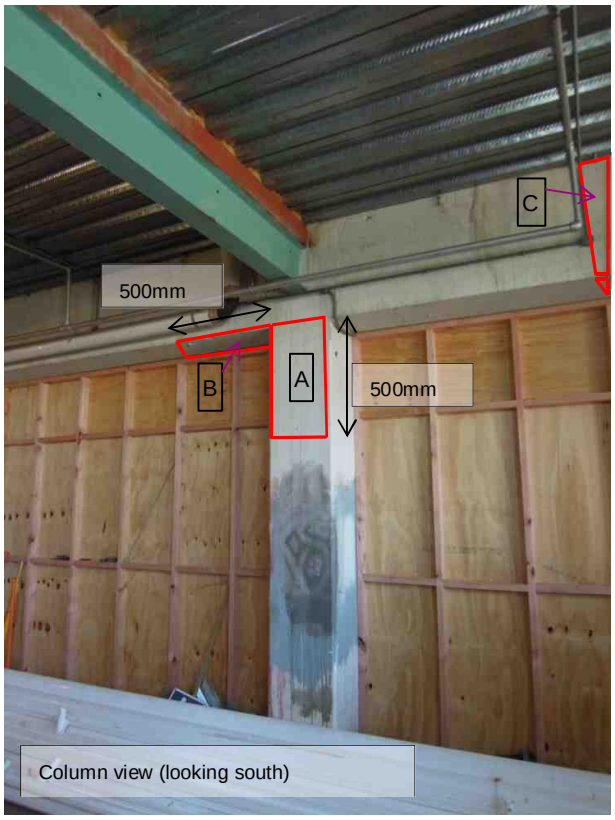
L0.3

Provide access to room to allow for assessment of slab-on-grade, walls, beams and the underside of stands.

L0.4

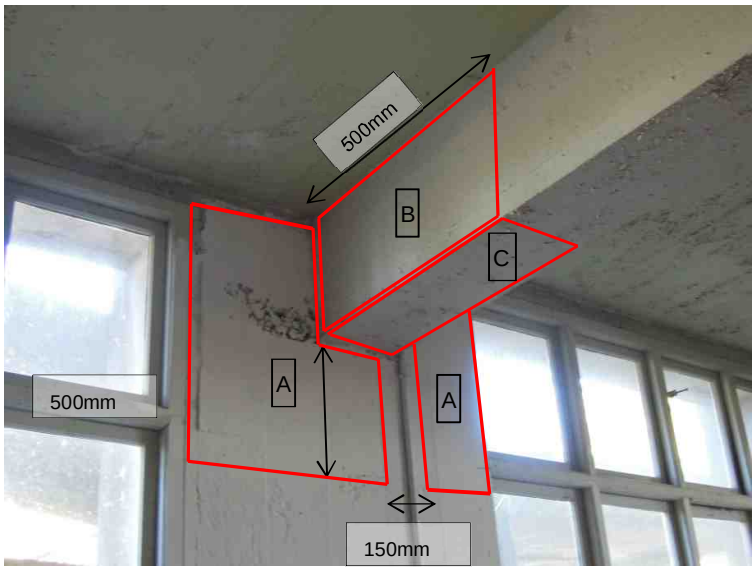
Provide access to room to allow for assessment of slab-on-grade, walls, beams and the underside of stands.

L0.5



Scan reinforcement to determine location, diameter, spacing of rebar and cover.

L0.6



Remove concrete cover from beams approximately 500mm from the face of the column both side faces (B) and bottom face (C).

Remove concrete cover from the column 500mm below the bottom of the beam (A).

Expose reinforcement to allow for assessment of rebar diameter, spacing, and visual condition assessment.

A 150mm wide channel around the galvanised piping may be left in place in all cases.

L0.7

Provide access to room to allow for assessment of slab-on-grade, walls, beams and the underside of slab.

L0.8

Lift carpet to allow for crack assessment of slab-on-grade (approximately 4x9m).

L1.1

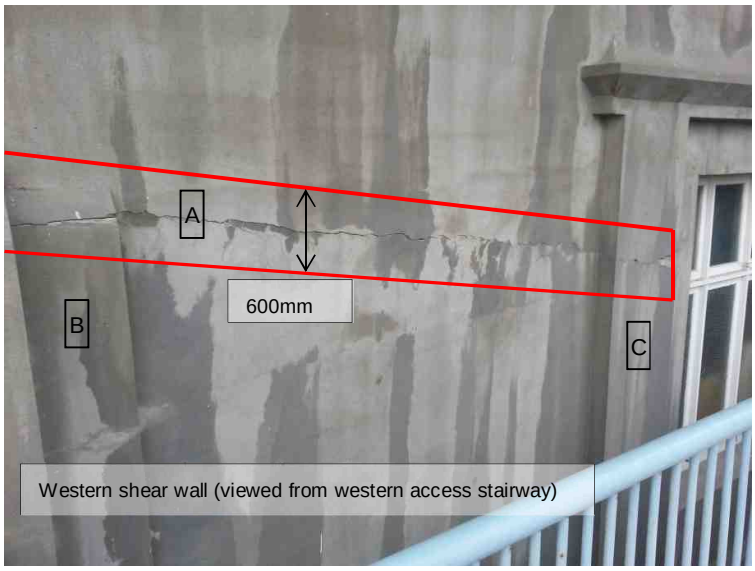
Lift carpet to allow for crack assessment of slab (approximately 12x9m).

Extract three core samples (100mm diameter) from the slab.

Extract two straight rebar samples 500mm long.

Extraction minimum 1.0m away from support.

L1.2

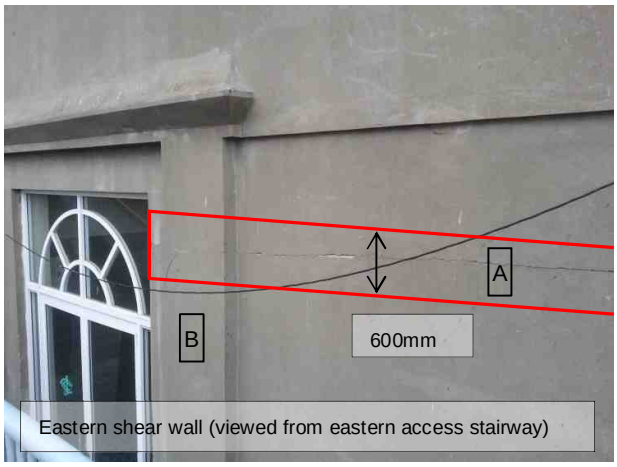


Remove concrete cover from wall approximately 300mm above and below the crack, along the full length of the shear wall (A).

This includes at the columns near the window opening and end of shear wall (B and C)

Expose reinforcement to allow for assessment of rebar diameter, spacing, and visual condition assessment.

L1.3

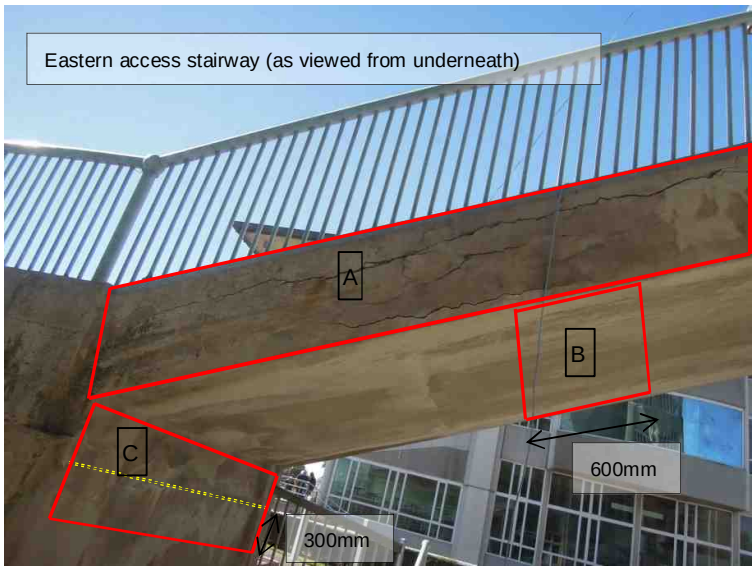


Remove concrete cover from wall approximately 300mm above and below the crack, along the full length of the shear wall (A).

This includes at the columns near the window opening (B) to the end of shear wall (extent beyond photo).

Expose reinforcement to allow for assessment of rebar diameter, spacing, and visual condition assessment.

L1.3a



(A) Remove concrete cover from the inside of the stringer beam on the eastern access stairway, along its entire length.

(B) Remove concrete cover from a 600mm wide strip along the underside of the stairs at approximately mid-span on the eastern access stairway.

(C) Remove concrete cover from a strip along the underside of the stairs at the abutment. This strip should begin at the abutment-stairs joint and continue 300mm below the large horizontal crack (highlighted in yellow).

L1.4

Scan reinforcement to determine location, diameter, spacing of rebar and cover.

L2.1

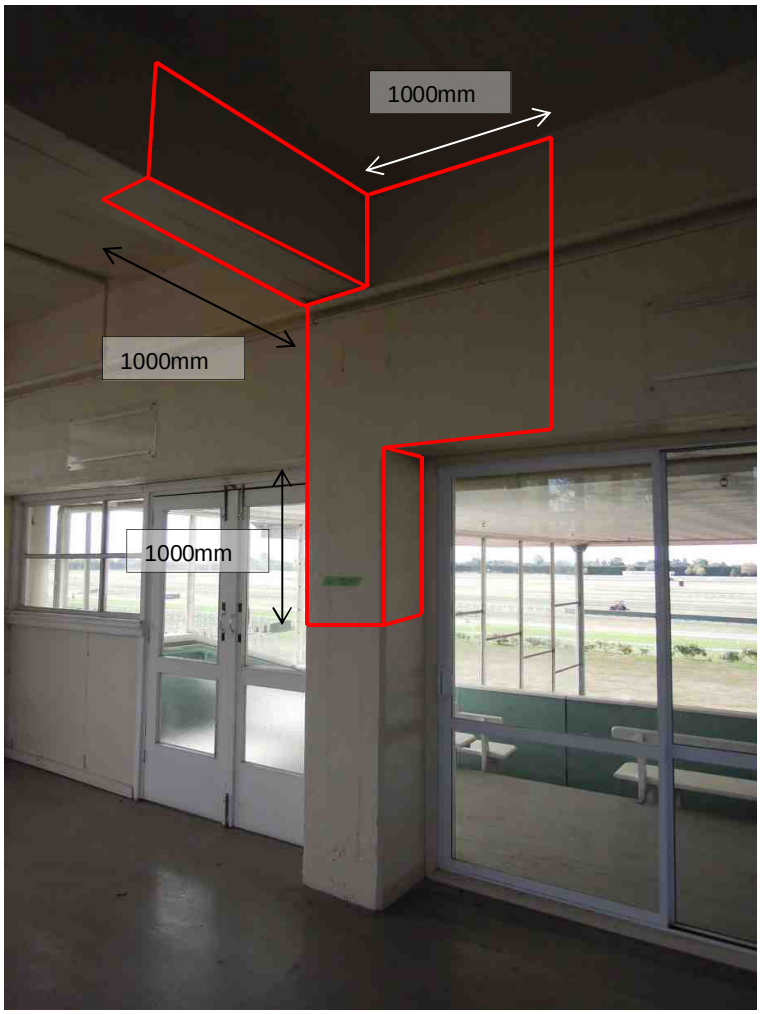
Lift carpet to allow for crack assessment of slab (approximately 8x9m).

Extract three core samples (100mm diameter) from the slab.

Extract two straight rebar samples 500mm long.

Extraction minimum 1.0m away from support.

L2.2



Scan reinforcement to determine location, diameter, spacing of rebar and cover.

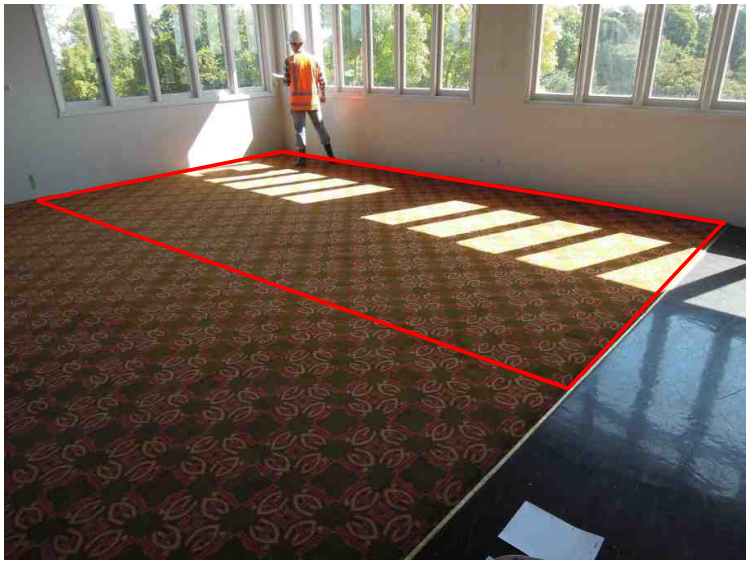
L2.3

Scan reinforcement to determine location, diameter, spacing of rebar and cover.

L2.4

Scan reinforcement to determine location, diameter, spacing of rebar and cover.

L3.1



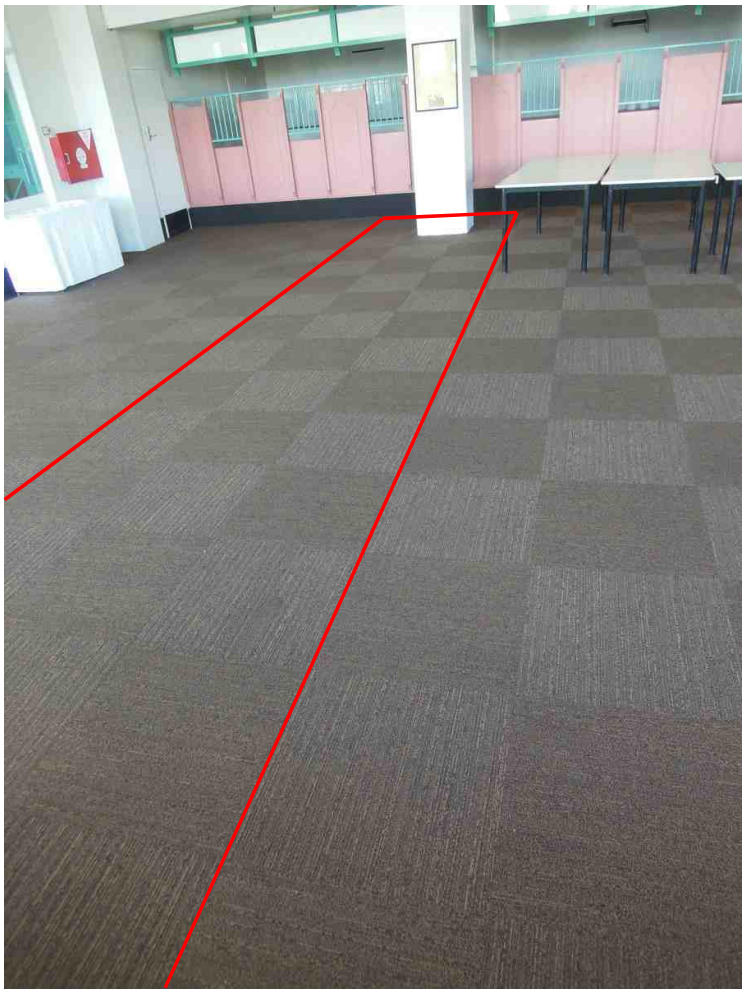
Lift carpet to allow for crack assessment of slab (approximately 4x8m).

Extract three core sample (100mm diameter) from the slab.

Extract one straight rebar sample 500mm long.

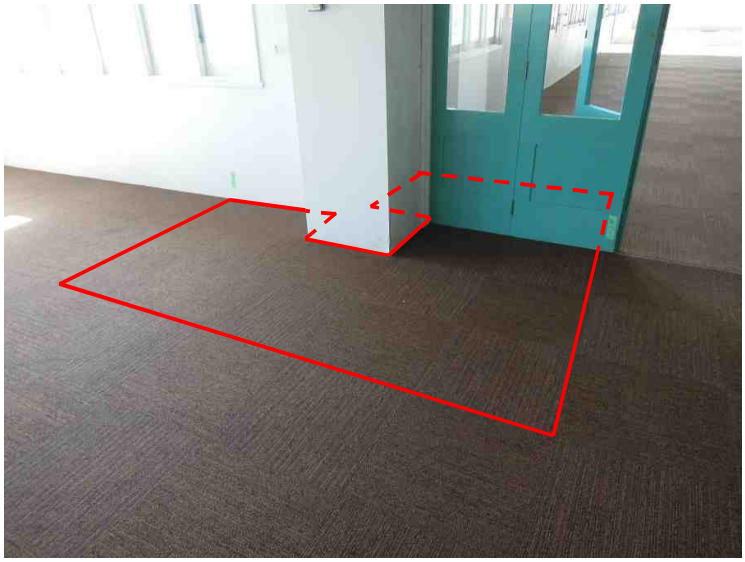
Extraction minimum 1.0m away from support.

L3.2



Lift carpet to allow for crack assessment of slab (approximately 1.5x9m).

L3.3

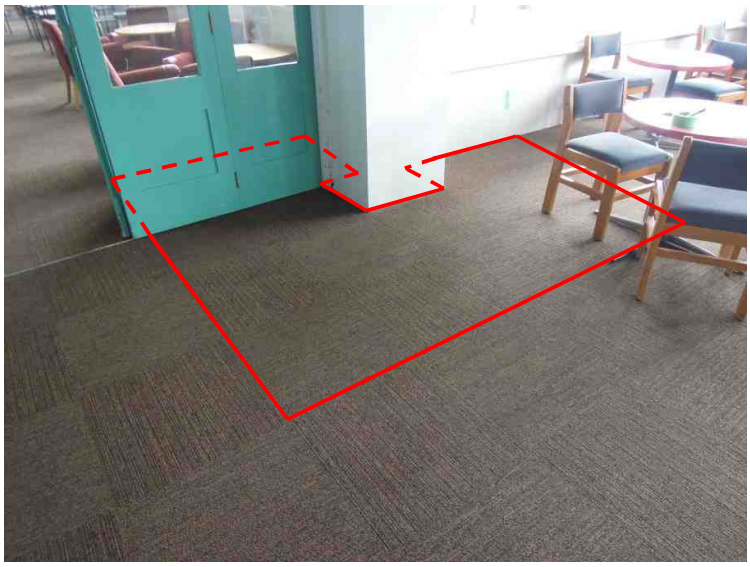


Lift carpet tiles (two tiles wide) around riser shaft to allow for slab crack assessment in the area.

L3.4

Remove plasterboard from the service shaft to allow for assessment of slab and beam-column joint at this location.

L3.5

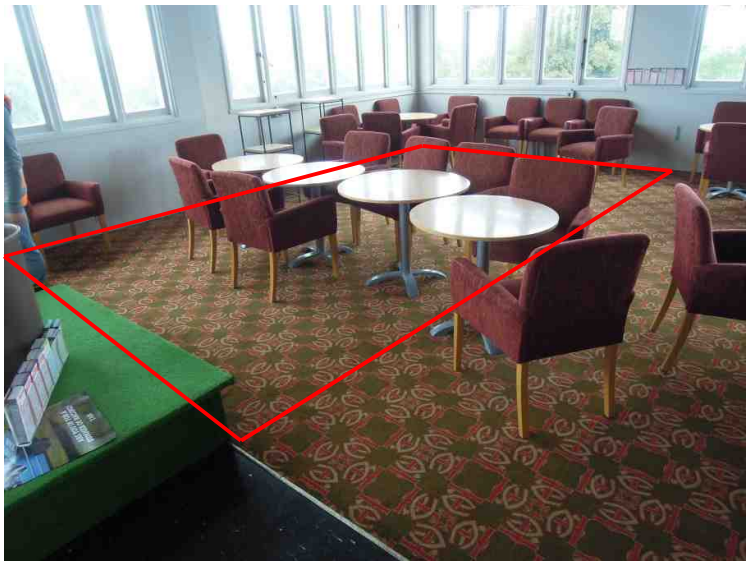


Lift carpet tiles (two tiles wide) around riser shaft to allow for slab crack assessment in the area.

L3.6

Remove plasterboard from the service shaft to allow for assessment of slab and beam-column joint at this location.

L3.7



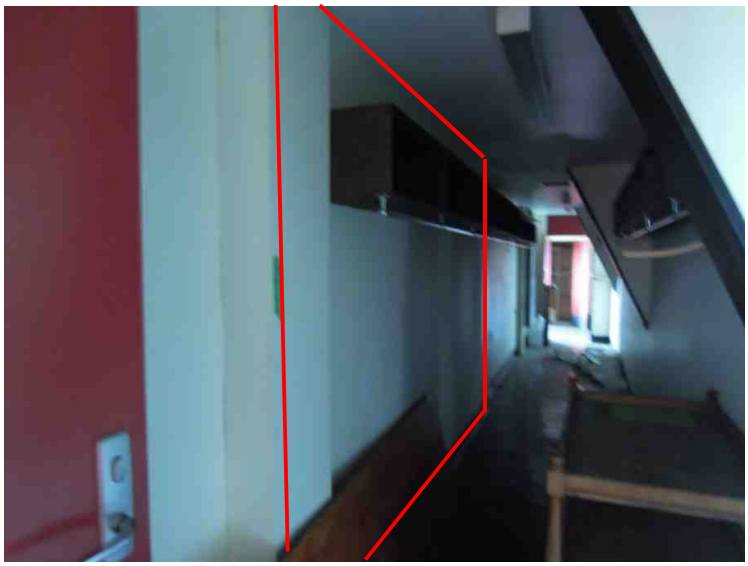
Lift carpet to allow for crack assessment of slab (approximately 4x8m).

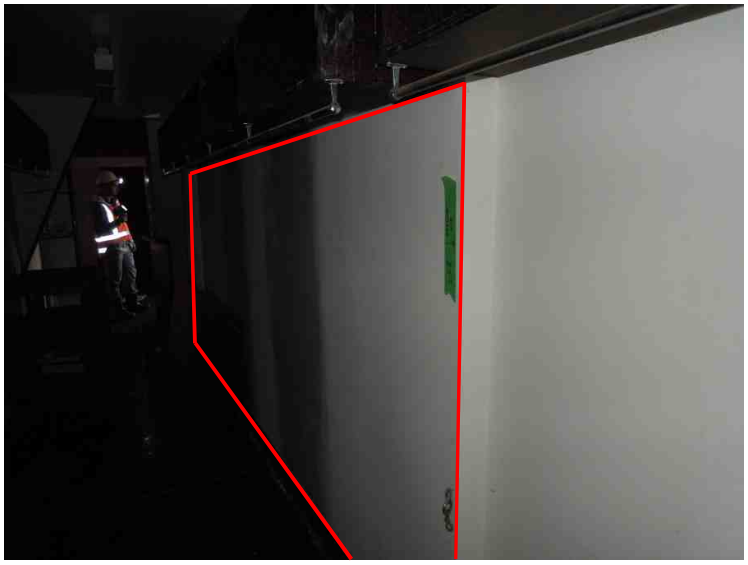
Extract three core sample (100mm diameter) from the slab.

Extract one straight rebar sample 500mm long.

Extraction minimum 1.0m away from support.

L3.8



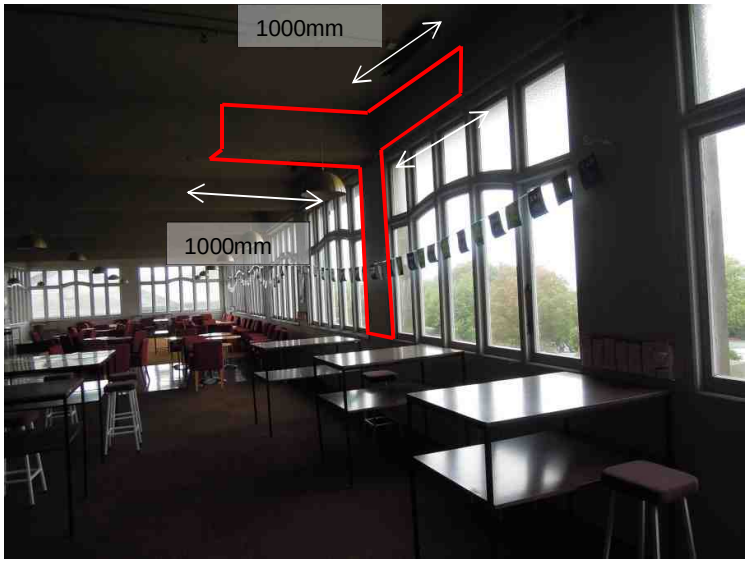


Remove plasterboard lining from the back of the shear wall to allow for assessment.

L3.9

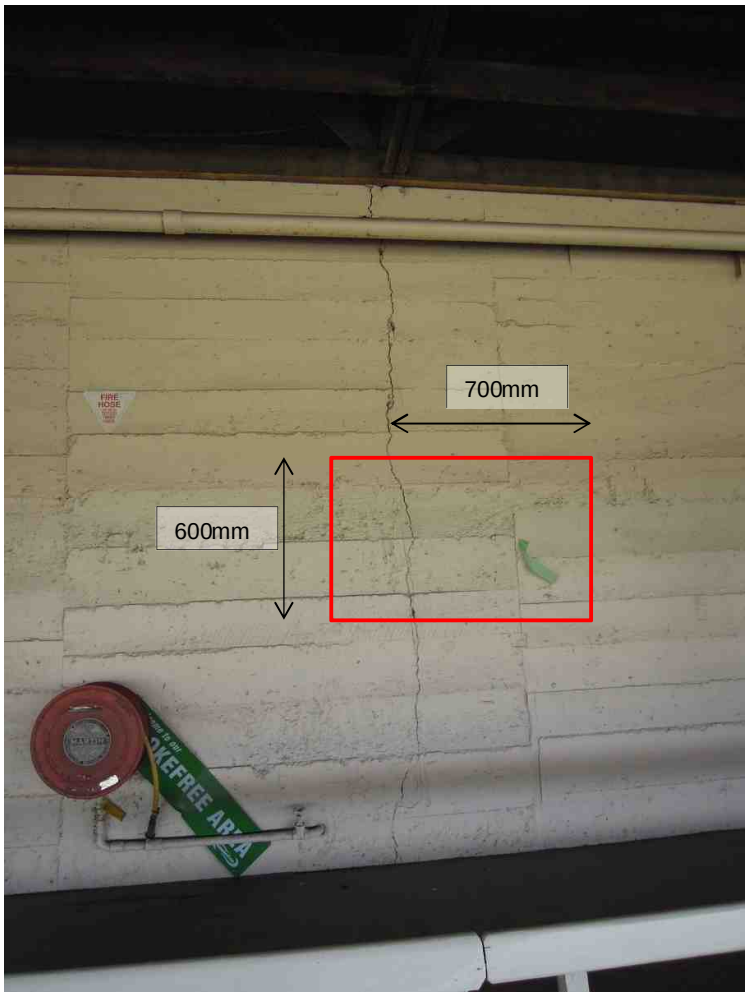
Scan reinforcement to determine location, diameter, spacing of rebar and cover.

L3.10



Scan reinforcement to determine location, diameter, spacing of rebar and cover.

TS.1



Remove concrete cover from the face of the shear wall adjacent to crack.

Expose reinforcement to allow for assessment of rebar diameter and spacing.

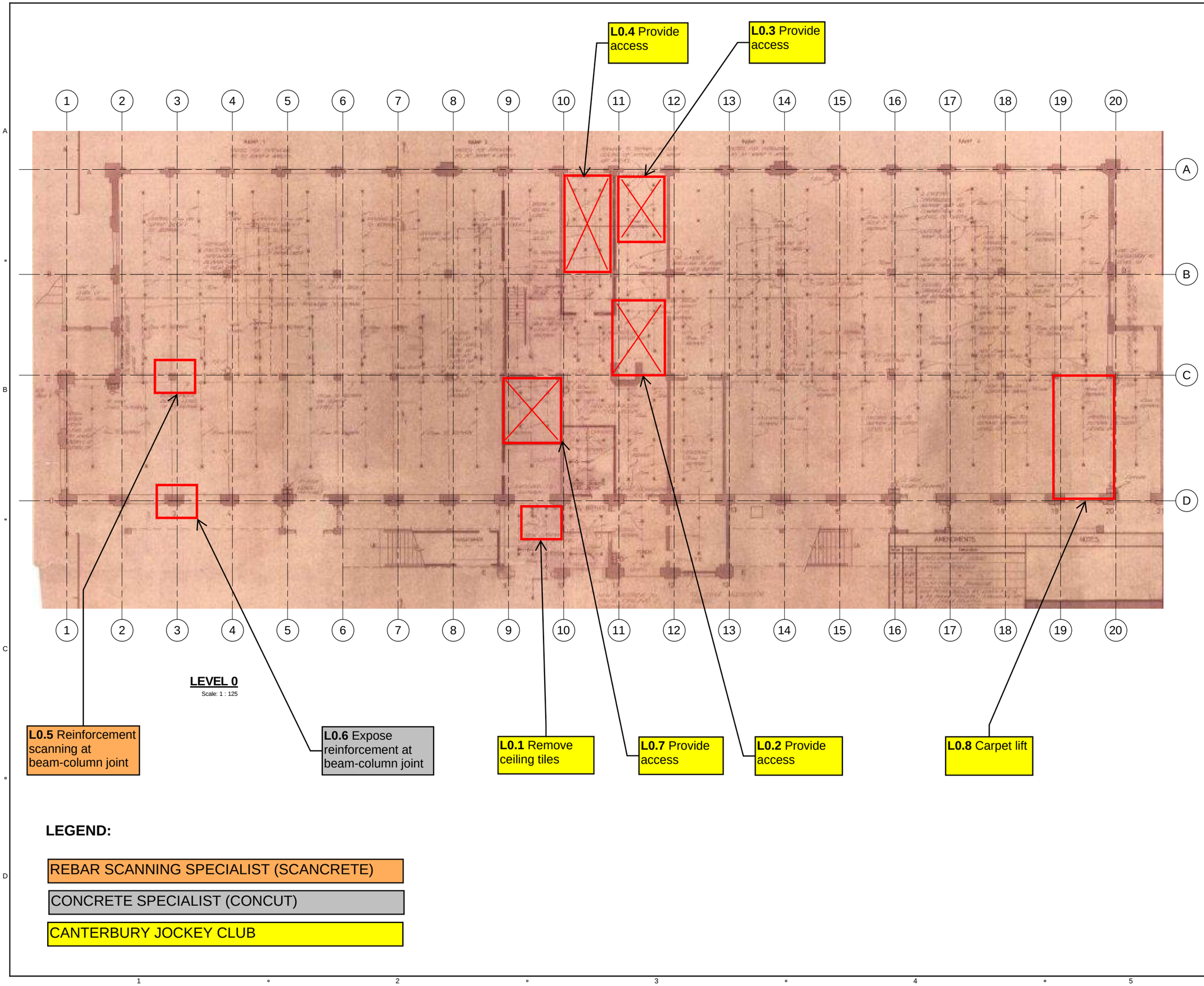
Extract three core samples (100mm diameter) from the slab.

Extract two straight rebar samples 500mm long.

Appendix A

Intrusive work key plans

ISO A1 594mm x 841mm



LEVEL 0

Scale: 1 : 125

LEGEND:

REBAR SCANNING SPECIALIST (SCANCRETE)

CONCRETE SPECIALIST (CONCUT)

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KEY PLAN

PROJECT NUMBER

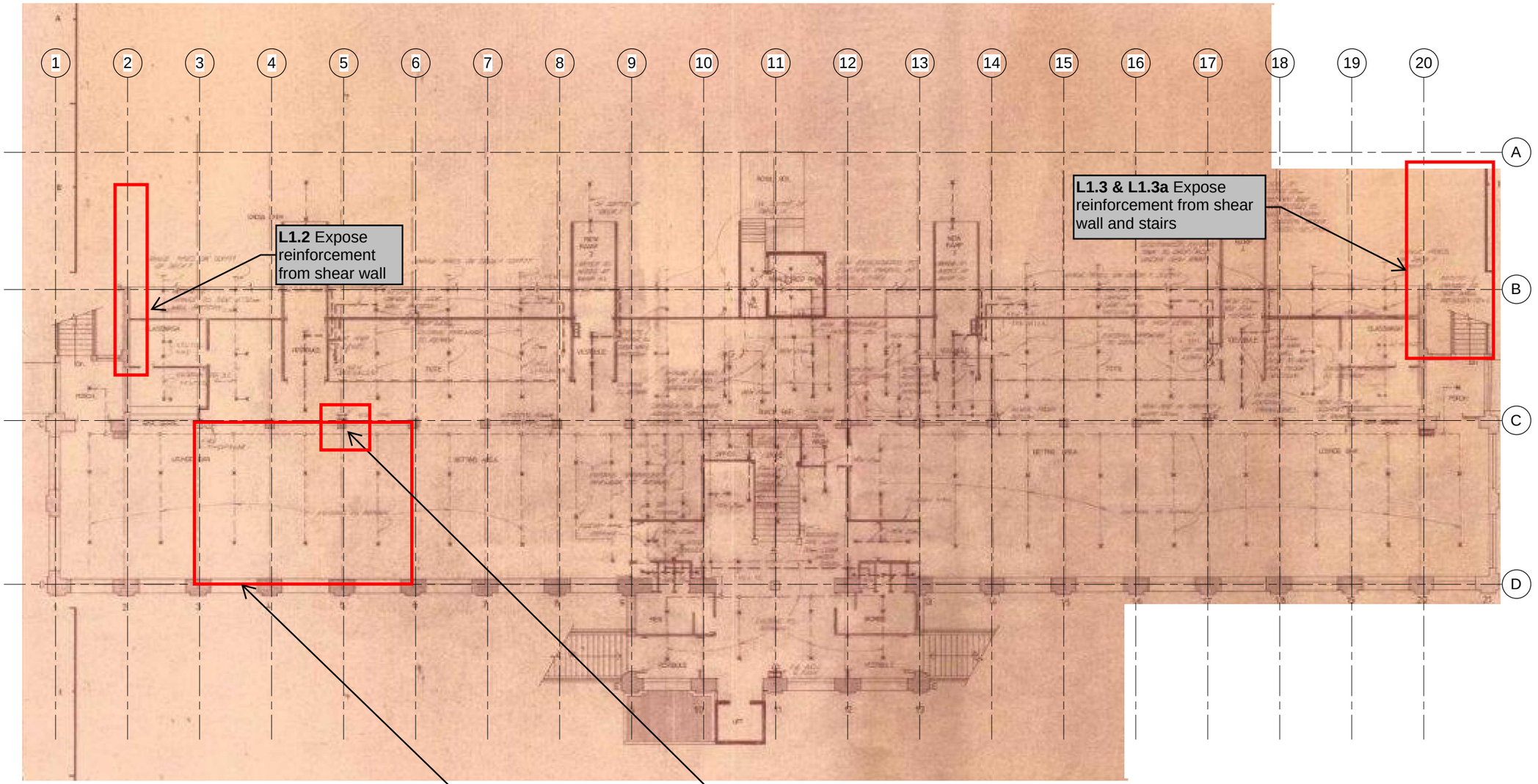
60332326

SHEET TITLE

GRAND NATIONAL STAND
INTRUSIVE WORKS KEY PLAN
LEVEL 0

SHEET NUMBER	REV
A.001	2

ISO A1 594mm x 841mm



LEVEL 1

Scale: 1 : 125

LEGEND:

REBAR SCANNING SPECIALIST (SCANCRETE)

CONCRETE SPECIALIST (CONCUT)

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KEY PLAN

PROJECT NUMBER

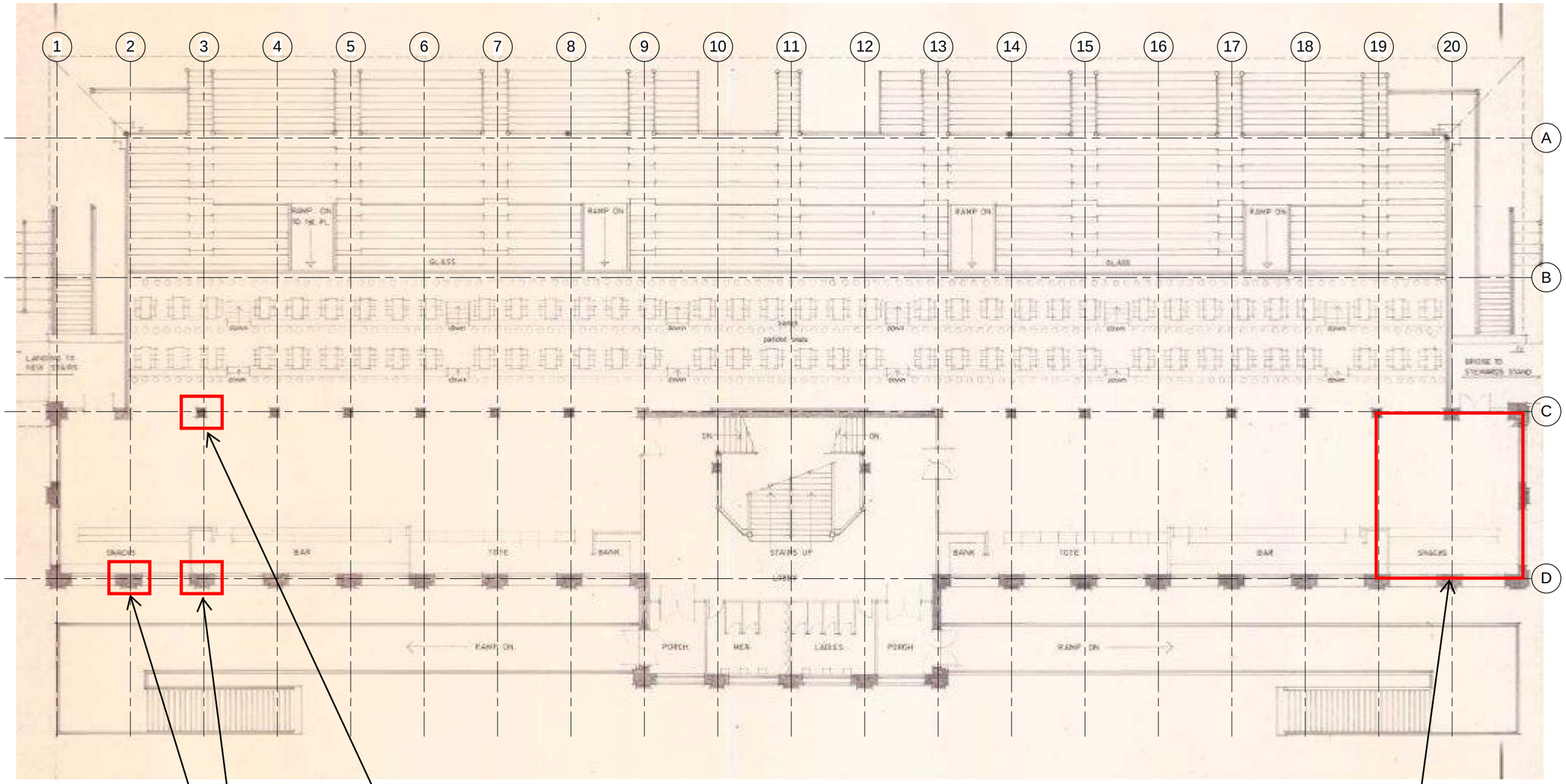
60332326

SHEET TITLE

GRAND NATIONAL STAND
INTRUSIVE WORKS KEY PLAN
LEVEL 1

SHEET NUMBER	REV
A.002	2

ISO A1 594mm x 841mm



LEVEL 2
Scale: 1 : 125

L2.2 Reinforcement scanning

L2.3 Reinforcement scanning

L2.4 Reinforcement scanning

L2.1 Carpet lift

L2.1 Extract three core samples and two rebar samples from slab

LEGEND:

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CONCRETE SPECIALIST (CONCUT)

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KEY PLAN

PROJECT NUMBER

60332326

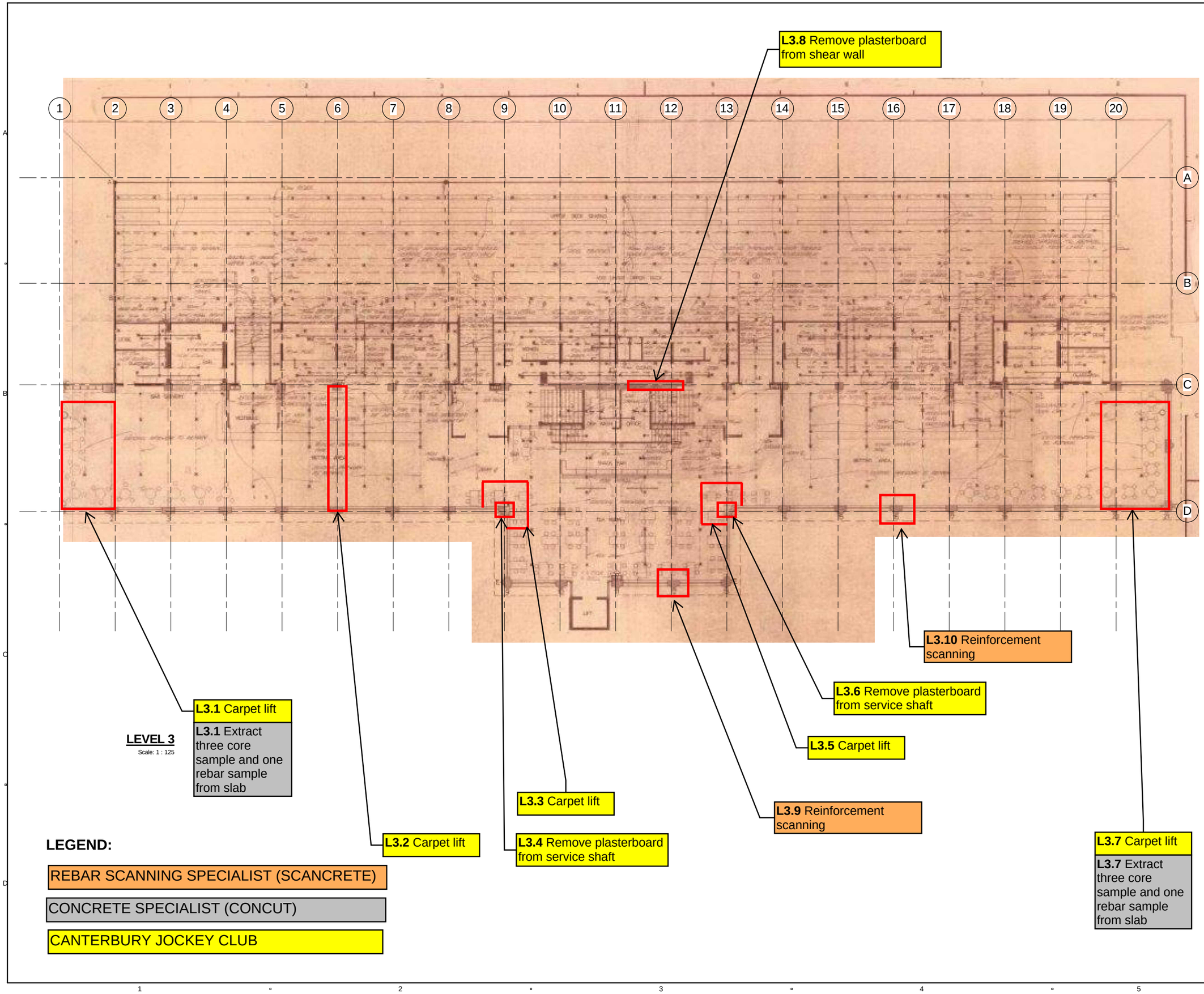
SHEET TITLE

GRAND NATIONAL STAND INTRUSIVE WORKS KEY PLAN LEVEL 2

SHEET NUMBER **REV**

A.003 2

ISO A1 594mm x 841mm



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KEY PLAN

PROJECT NUMBER

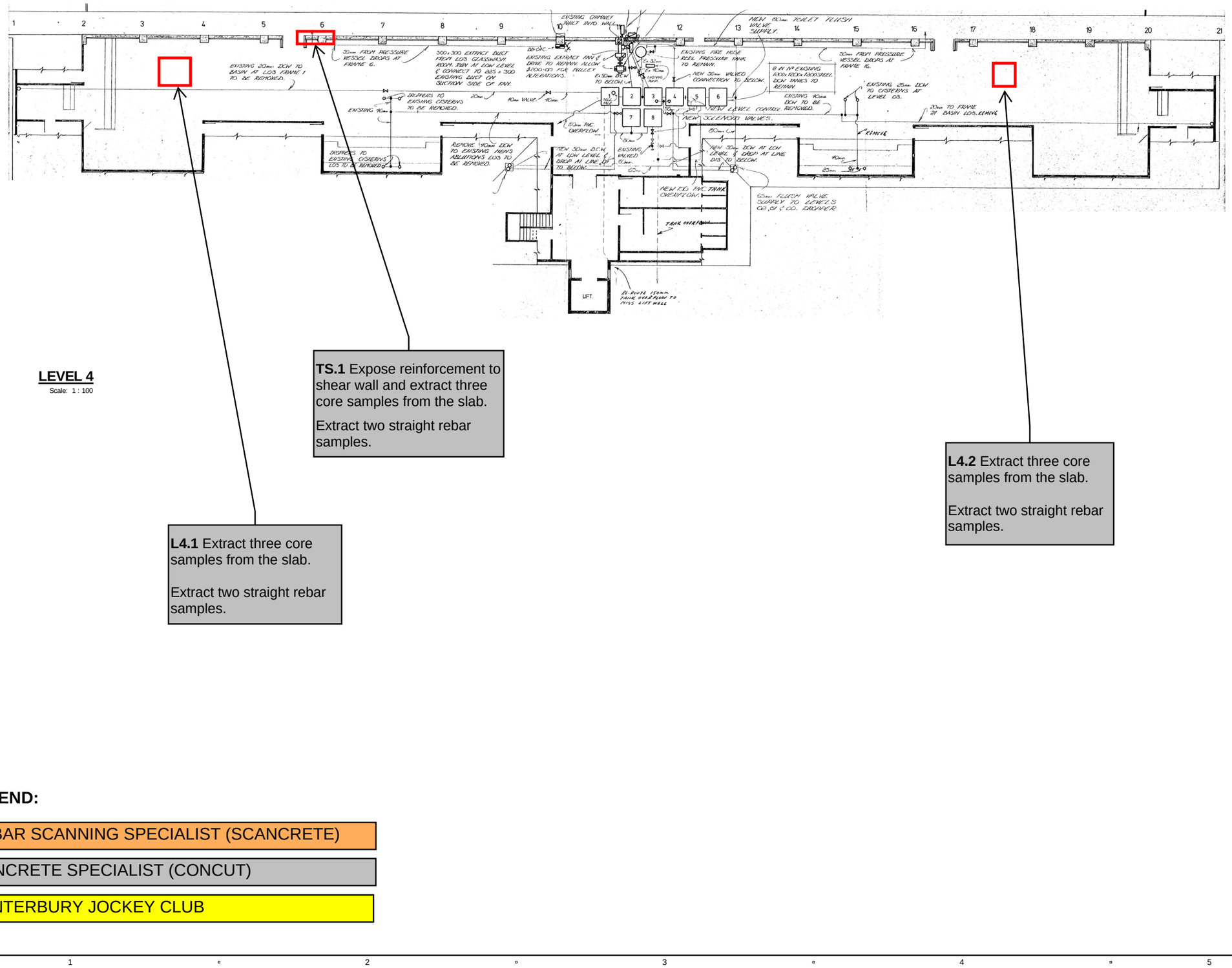
60332326

SHEET TITLE

GRAND NATIONAL STAND
INTRUSIVE WORKS KEY PLAN
LEVEL 3

SHEET NUMBER A.004

REV 2



LEVEL 4
Scale: 1 : 100

TS.1 Expose reinforcement to shear wall and extract three core samples from the slab.

Extract two straight rebar samples.

L4.1 Extract three core samples from the slab.

Extract two straight rebar samples.

L4.2 Extract three core samples from the slab.

Extract two straight rebar samples.

LEGEND:

REBAR SCANNING SPECIALIST (SCANCRETE)

CONCRETE SPECIALIST (CONCUT)

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KEY PLAN

PROJECT NUMBER

60332326

SHEET TITLE

GRAND NATIONAL STAND
INTRUSIVE WORKS KEY PLAN
LEVEL 4

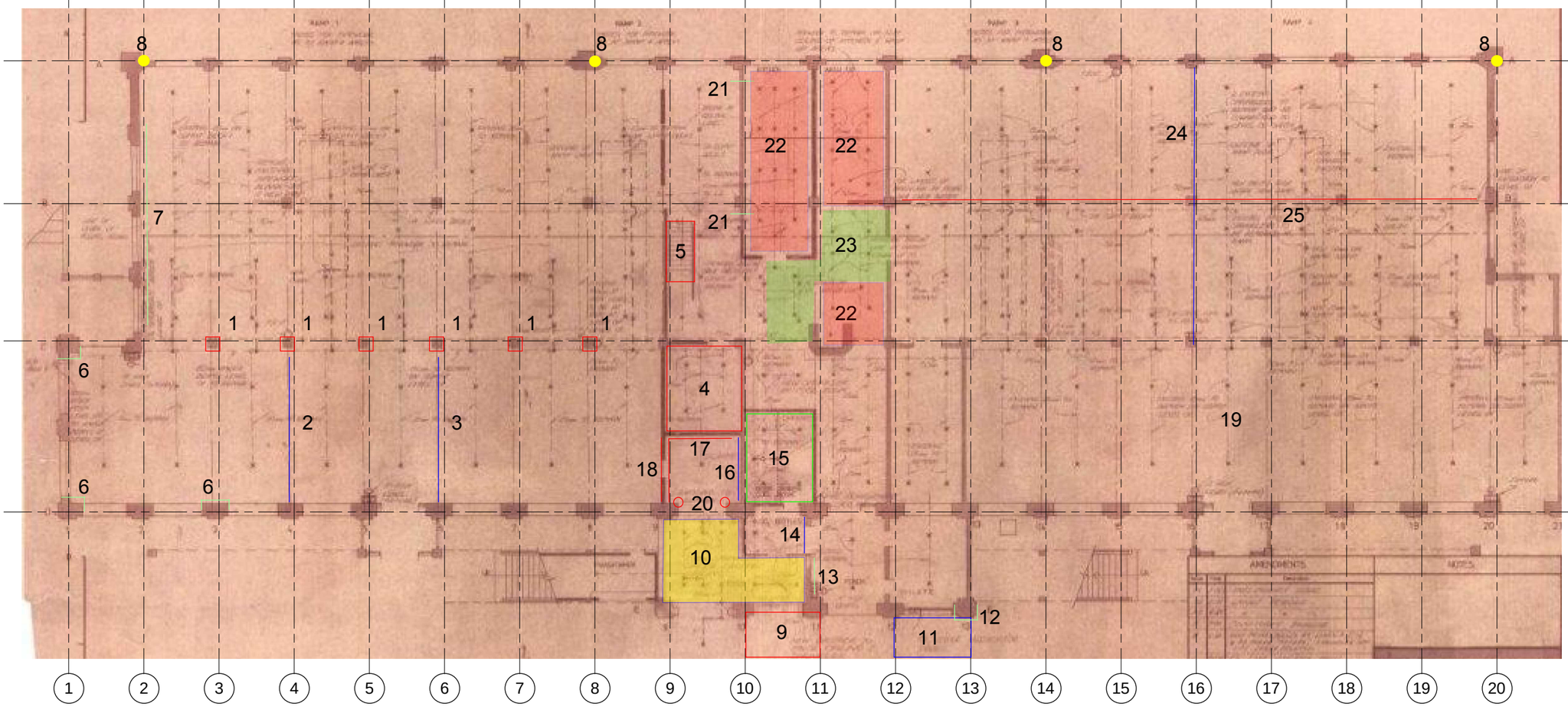
SHEET NUMBER A.005

REV 2

Appendix B

Initial observations

ISO A1 594mm x 841mm



LEVEL 0
Scale: 1 : 125

Observations Key

1. Horizontal cracks below beam-column joint, on all faces of column.
2. Full depth flexural cracks visible at discrete intervals along length of RC beam.
3. Deficient workmanship in suspended RC beam.
   Concrete mix has segregated at midspan.
4. No access to inspect this room. Blue plastic barrels are stacked to roof level.
5. Stair shown on historic plans does not exist.
6. Crack damage to columns in workshop area.
7. Some cracking damage to wall panels, columns, and window lintels in this area.
8. Enlarged perimter columns in these locations to transfer load from stand-supporting circular cast iron columns.
9. RC elevator shaft here.
10. HAZARD. Possible Asbestos ceiling tiles in this area.
11. Masonry-walled toilet block here. Reinforcement unknown.
12. Horizontal cracking in RC column, visible inside toilet block.
13. Diagonal crack in RC wall panel.
14. Vertical full height crack in RC wall panel to the right of the door.
    Crack #13 visible at this location also - appears to be a full depth crack.
15. Cold storage room for beverages - structural walls obscured by insulation panels.
16. Concrete wall. Likely RC wall, reinforcement unknown.
17. Red brick infill wall panel, some diagonal step cracking at left edge.
18. Red brick infill wall panel, door has been sealed.
19. GIB finishes obscure structural elements. No crack damage noted in GIB finishes.
20. Large holes and openings cut in RC slab for services. Reinforcement exposed.
21. Vertical cracks in concrete walls. Likely RC wall, reinforcement unknown.
22. No access to this room - locked door.
23. This area does not match historical drawings.
24. Single RSJ - Approx. size: 380 deep, 150mm wide, 17mm thick flange
25. Double RSJ's, similar size to #24. Cut to span as simply supported members.

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PROJECT NUMBER
60332326

SHEET TITLE
GRAND NATIONAL STAND
INITIAL INVESTIGATION LEVEL 0

SHEET NUMBER B.001 **REV** 1

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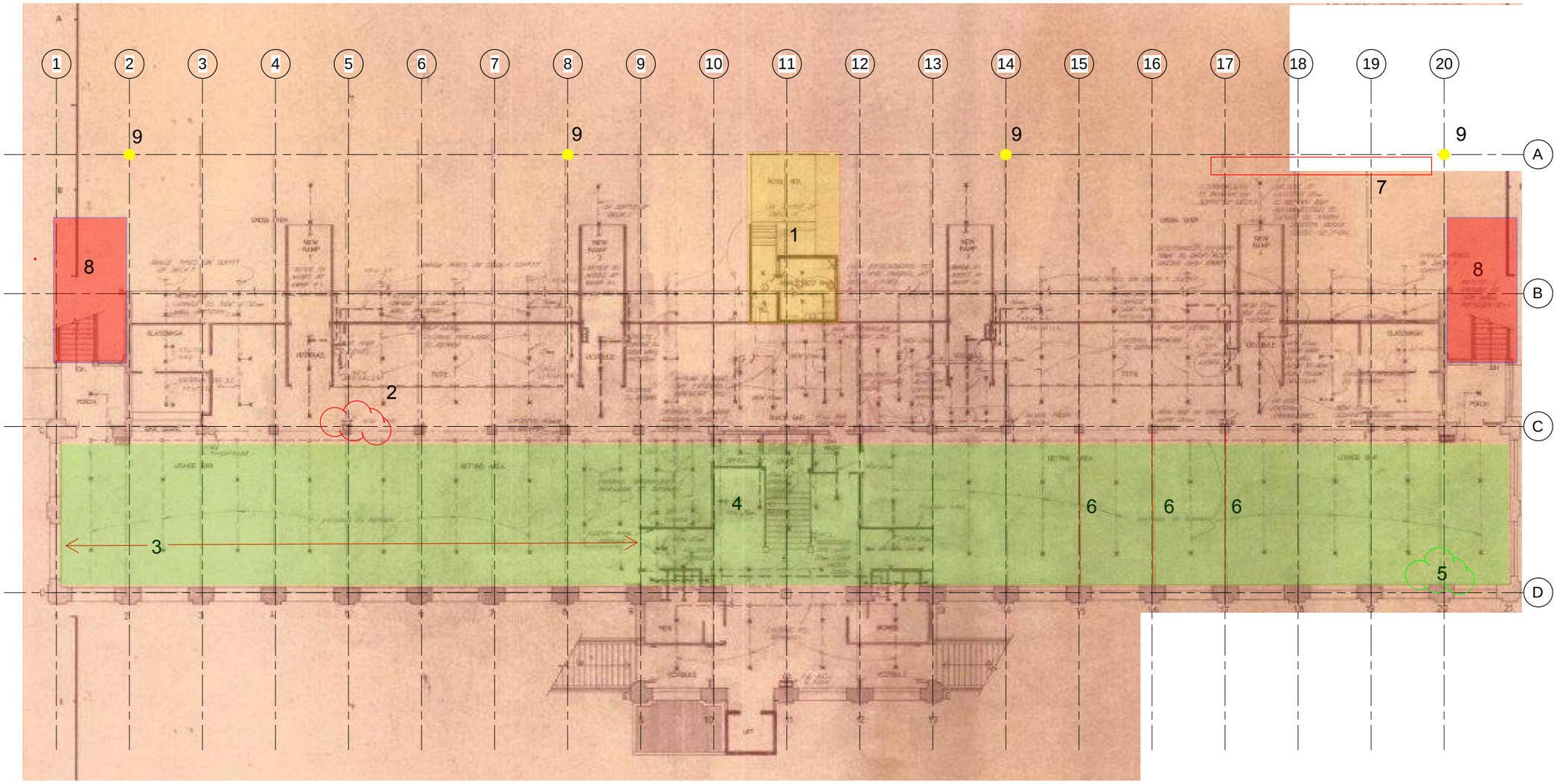

Observations Key

1. Royal box area shown on historic plans does not exist.
2. Severe cracking damage to suspended RC floor slab, >3.5mm in width. Crack is visible where carpet is torn. Crack is likely to be on the interface between the original slab and 1980's additional section below the stand.
3. Floor levels appear to undulate under foot throughout this area.
4. HAZARD. Plaster finish to underside of ceiling may be Asbestos.
5. Moisture damage to plaster ceiling finish.
6. Full depth flexural cracks visible at discrete intervals along length of RC beam.
7. Rotten and loose timber decking boards. Trip hazard.
8. HAZARD. Significant cracking damage to RC stairs / ramps. Do not use until further notice.
9. Outline/ position of stand-supporting circular cast iron columns.

LEVEL 1

Scale: 1 : 125

ISO A1 594mm x 841mm

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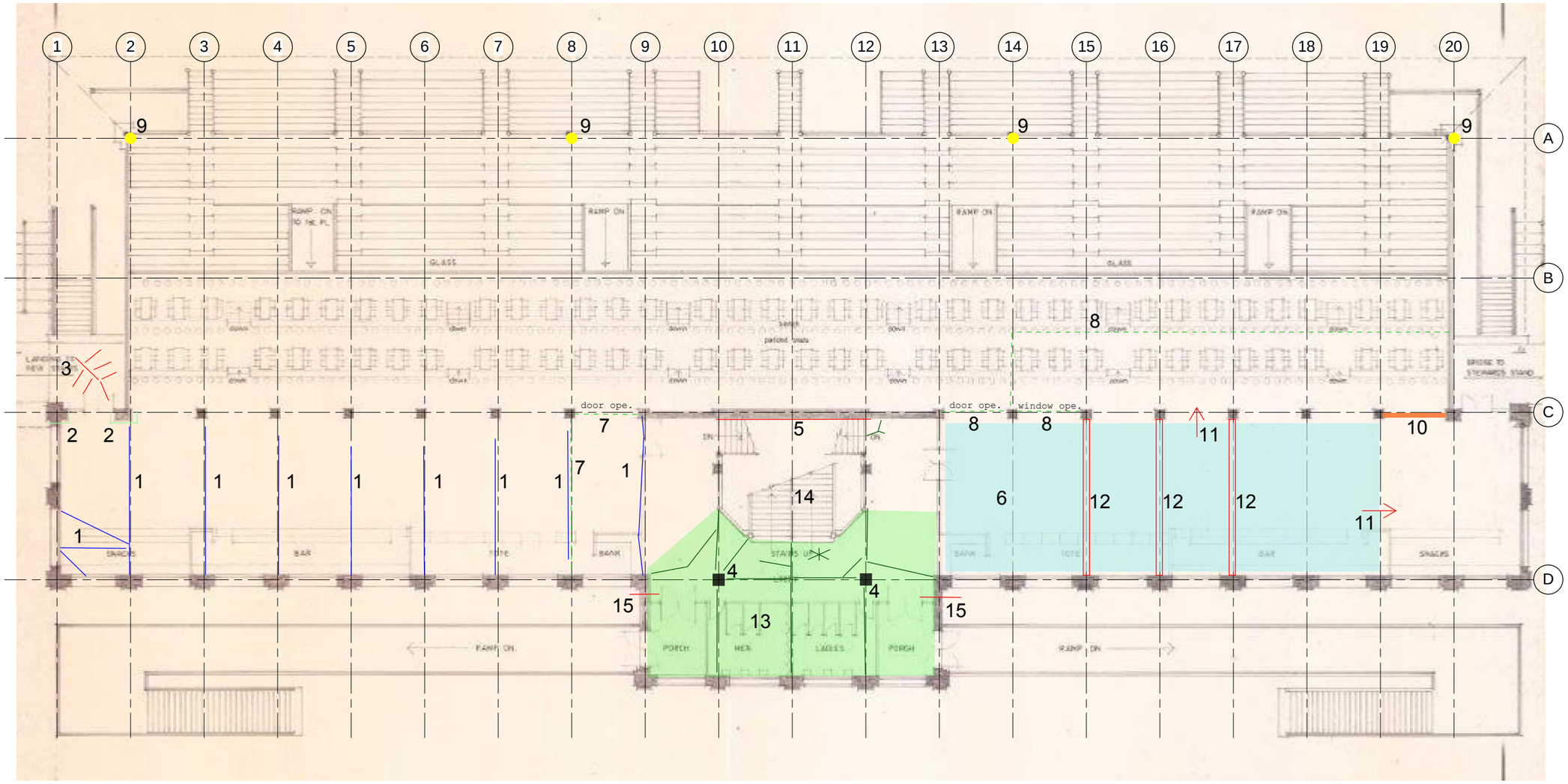
SHEET TITLE

GRAND NATIONAL STAND
INITIAL INVESTIGATION LEVEL 1

SHEET NUMBER B.002

REV 1

ISO A1 594mm x 841mm



LEVEL 2
Scale: 1 : 125

Observations Key

1. Approximate pattern of cracking observed in exposed RC floor slab on western end of structure (marked in blue).
2. Crack damage to columns at this location.
3. Spiderweb-like pattern of cracking observed on deck.
4. Reinforced concrete columns exist at this location - not shown on historic drawings.
5. Horizontal crack across full width of shear wall.
6. Carpet in this area, could not detect or map floor cracks as a result.
7. RC walls here - not shown on historic drawings.
8. Lightweight partition walls and glazing panels - not shown on historic drawings.
9. Outline/ position of stand-supporting circular cast iron columns.
10. Concrete infill wall panel - not shown on historic plans. Likely RC, reinforcement unknown. Horizontal cracking across full width of wall at approx 2.5m above ground.
11. Step up from carpeted area.
12. Full depth flexural cracks visible at discrete intervals along length of RC beam.
13. Significant cracking in stairwell. Major cracks marked on plan in dark green.
14. Full investigation of stair and connection required at detailed stage - cracking noted.
15. Full height vertical cracks in concrete wall panels. Likely RC panels, reinforcement unknown. It appears that the area beyond Gridline D has pulled away from the rest.

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SHEET TITLE
GRAND NATIONAL STAND
INITIAL INVESTIGATION LEVEL 2

SHEET NUMBER B.003 **REV** 1

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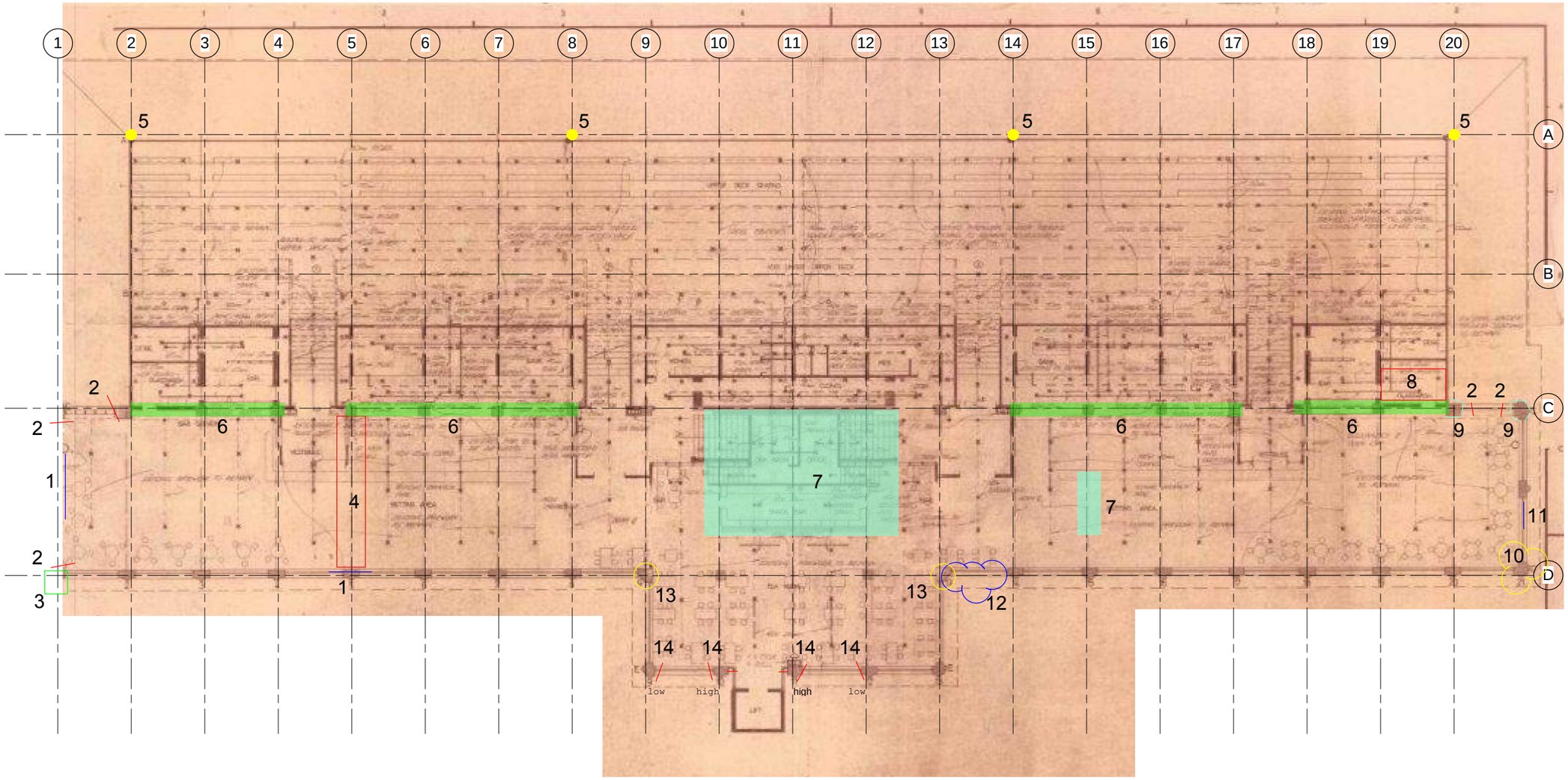

LEVEL 3
Scale: 1 : 125

Observations Key

1. Patch repair of concrete observed on concrete column at window level.
2. Vertical cracking (1mm x 1m) in concrete wall members at columns.
3. Vertical spalling and cracking of RC column observed on exterior at the SW corner.
4. Noticeable bump in carpet and undulation of floor level in this area.
5. Outline/ position of stand-supporting circular cast iron columns.
6. Evidence to suggest that shear walls have been removed from these areas in a previous retrofit/ modification of the structure. Evidence can be seen from rear.
7. Evidence of significant water penetration through concrete ceiling slab. HAZARD. plaster ceiling lining may contain Asbestos.
8. Damage to timber floor - settles noticeably under foot.
9. Horizontal cracks at discrete intervals vertically along columns.
10. Significant vertical spalling and cracking of RC column observed on exterior at the SE corner. Major vertical cracks in parapet.
11. Window does not close properly, indication that frame may have racked.
12. Severe damage to soffit.
13. Timber encasement around columns.
14. Cracking damage to concrete wall elements. Elevator core appears to have pulled from main structure at high level.

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PROJECT NUMBER
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SHEET TITLE
GRAND NATIONAL STAND
INITIAL INVESTIGATION LEVEL 3

SHEET NUMBER B.004 **REV** 1

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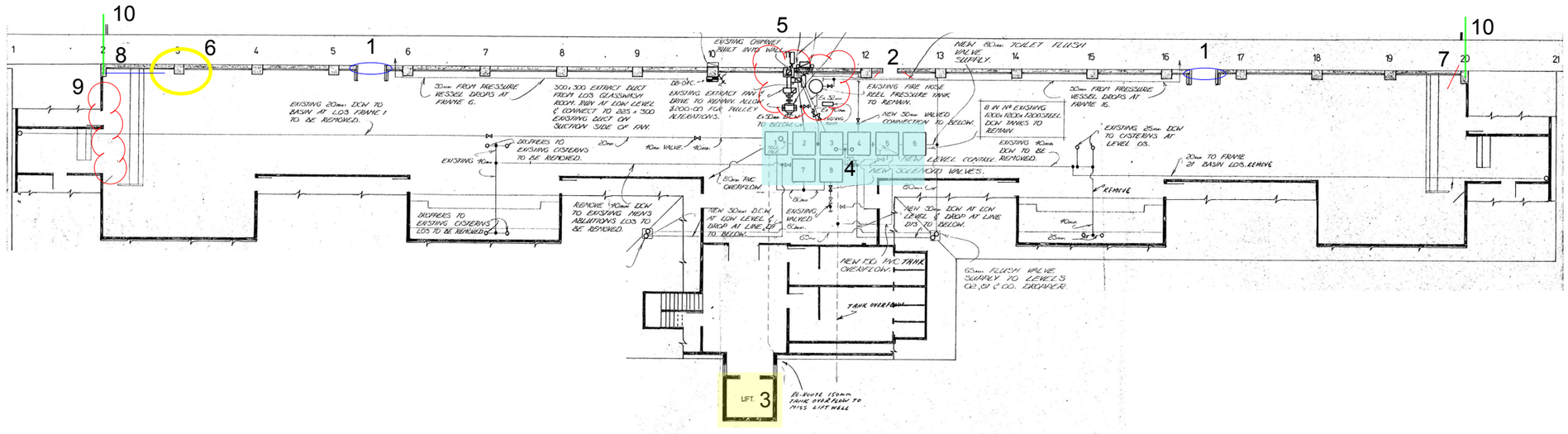

LEVEL 4

Scale: 1 : 100

Observations Key

1. Door shown on historic drawings does not exist.
2. Diagonal vertical at each corner of door opening. Warning ~800mm step from upper stand level down to fourth floor.
3. Could not access fourth floor via elevator. Elevator works down only. No damage observed to elevator core, connections to main structure or to roof locally.
4. Evidence of significant amounts of water ponding under water tanks.
5. Concrete column containing ventilation has failed. Cracks up to 30mm visible from fourth floor level.
6. None of these columns are concrete rectangles as shown. All columns are double steel angle sections, inset into the rear of the RC wall.
   Vertical cracks in exterior of RC wall (up to 5mm in width) line up with he location of these columns. Full crack mapping exercise to follow in detailed stage.
7. Cracking to the interior of the RC wall.
8. Historic damage to RC wall. Formwork may have failed during concrete pour. Segregation of concrete and bulging of wall at joint in formwork.
9. Horizontal cracking of RC 'wing-wall', some spalling and exposed horizontal reinforcing steel. Bars appear to be approx 2no. 6mm bars at 400mm vertical centres.
10. Steel trusses (roof system) connect to RC structure at this point - detailed investigation of roof to follow in detailed stage. Some purlins and other timber members visibly broken from quick inspection.

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KEY PLAN

PROJECT NUMBER

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SHEET TITLE

GRAND NATIONAL STAND
INITIAL INVESTIGATION LEVEL 4

SHEET NUMBER B.005

REV 1