Design Brief

Structural- DB1

DATE	28/10/2020
TO	Sirius Developments Pty Ltd
ATTN	John Green
PROJECT	Sirius Site, 2-60 Cumberland Street, The Rocks
REV	C – Issued for SSDA

Revision Table

REV	DATE	ISSUE DESCRIPTION	PREPARED	REVIEWED
A	01/07/2020	Issued for Information	PS	BK
B	17/08/2020	Issued for Review	PS	BK
C	28/10/2020	Issued for SSDA	PS	BK

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Appendices

1 Project Description

The proposed development is for the restoration and refurbishment of the existing Sirius building, including alterations and additions. The existing building is proposed to be substantially retained and restored with integrity. New residential additions are proposed to be added to the existing structure in appropriate locations to maintain the legibility of the original architectural form, and new structures for commercial uses are proposed to be added at the Cumberland Street and Gloucester Walk frontages of the site.

The existing Sirius building has a varied height profile due to its modular form and due to the fall across the site when observed from Cumberland Street and from Gloucester Walk. The existing building rises from the north and south towards a central tower with a maximum height of 34.6m above ground level at Cumberland Street (equivalent to an 11-storey building). Due to the existing split-level apartments, the building is conveyed as having a greater number of levels (25 storeys).

The proposed alterations and additions to the existing building will increase the overall building height by 5.4m to a maximum building height of 40.9m above ground level at Cumberland Street. On the Cumberland Street entry side of the site, the building presents as thirteen (13) levels at the highest occupied level. When observed from Gloucester Walk, and due to the fall across the site, the building presents as fourteen (14) occupied levels.

The building incorporates two levels of basement car parking.

The proposed works include:

- Alterations and additions to the existing building to provide for:
  - Residential accommodation (a total of **76** apartments)
  - Commercial premises, including retail floorspace; and
  - Basement car parking.
- Provision of a through-site link between Cumberland Street and Gloucester Walk.
- Upgrades to Gloucester Walk including landscaping and pedestrian access.
- Improvements to Cumberland Street including landscaping and improved carpark entry.
- Associated works, including:
  - Minor demolition works;
  - Earthworks;
  - Structural upgrades;
  - Services upgrades; and
  - Landscaping works.

2 Structural Scope of Work

Design and Documentation of the following:

- Brief preparation for Geotechnical and Concrete Technology review.
- Design review of existing structure, along with capacity review of vertical and lateral existing members.
- Review of existing concrete durability and future life span.
- Demolition of existing non-tower ground floor slab.
- Review penetrations in existing walls.

- Review new slab penetration requirements.
- Deletion or relocation of existing basement columns.
- New slab voids/penetrations and wall penetrations (services, windows etc.)
- Deletion of existing slabs to create double height spaces.
- Relocation of stairs between levels requiring modification to the structural steps
- Alterations to existing façade and precast panels.
- Rehabilitation of existing concrete throughout, where required (main structure and precast).
- Excavation of existing basement level to create new lower basement level consisting of carpark, truck dock and storage, etc.
- New ground floor transfer beams under existing ground floor structure as a result of column deletion or relocation.
- New north and south tower lift shafts and stair structure between existing grids at grid 14.5 to 17.0, 33 to 35.5, 102 to 109.5.
- Advise on column strengthening requirements as a result of vertical pod additions and AS3600-2018 upgrade.
- Alterations to internal non load bearing walls.
- Strengthening to existing central tower cores to sustain lateral loads to AS3826-1998 based on all new works not altering the overall modal building mass.
- New multi-level structure to west at Cumberland Street (retail, pool, etc).
- Pool Structures where applicable on existing building.
- Design of self-stacking lightweight pods on top of existing roof.
- Design of balcony prefabricated balconies.
- New low-level structure on Gloucester Walk (to east).
- Review existing structural fire rating capacity to AS3600-2018.

2.1 Structural Update Requirement

Irrespective of original statutory design requirements existing, the Sirius structure in its upgraded form will be required to satisfy the following current statutory requirements (latest revisions):

- Live loads in accordance with AS1170.0.
- Wind loads in accordance with AS1170.0.
- Earthquake loads in accordance with AS3826-1998 for minor changes or AS1170.4 for major changes, as defined in Section 2 of AS3826-1998.
- Structure fire rating requirements as required by the BCA.

- No code specific upgrade requirements are stipulated for future structural durability however the re-habilitated concrete structure should provide an NCC design life of 50+ years without significant ongoing degradation.

2.2 Existing Sirius Structure Statutory Comparison with Current Requirements

COMPARISON TABLE

ITEM	AS DESIGN	CURRENT CODE REQUIREMENTS	COMMENTS
1 Residential Floors	Live Load = 2.0 kPa	Live Load = 1.5 kPa	Design LL exceeds current requirements.
2 Corridors	Live Load = 3.0 kPa	Live Load = 4.0 kPa	Minor load deficit.
3 Stairs	Live Load = 4.0 kPa	Live Load = 4.0 kPa	Compliant.
4 Wind Loads	Ordinance 70	AS1170.0	Generally, does not govern lateral capacity.
5 Earthquake	Ordinance 70	AS3826-1998	North low rise – fail. New stability element required. Tower – Generally ok with strengthening added to cores at lower levels. South low rise – to be stabilised subject to review.
6 Slabs – Fire Rating	Ordinance 70 / AS1480	AS3600	Complies for 60mins, 90min, subject to minor areas where two way slabs are less than 200mm. This will require addition of new beams on party wall lines
7 Beams – Fire Rating	Ordinance 70 / AS1480	AS3600	Complies for 60mins in carpark and 90min in residential.
8 Columns – Fire Rating Columns – Load Capacity	Ordinance 70 / AS1480 AS1480	AS3600 AS3600	Fails for small tower columns with aspect ratio less than 4:1. Generally ok for current conditions but may need strengthening for new increased loads.
9 Vibration	N/A	AS1170.2 / SCP P354 and Assessing Vibration-2006 (Dept of	Generally, complies for structural borne vibration induced by human occupants and wind loads. Acoustic Engineer to

ITEM	AS DESIGN	CURRENT CODE REQUIREMENTS	COMMENTS
		Environment and Conservation)	comment on non-human induced vibration (external sources).

3 Codes & Authorities

The structural design of the project will be carried out in accordance with the latest version and issued amendments following Australian Standard Codes of Practice.

- AS1170 Part 0 General Principles
- AS1170 Part 1 Permanent, imposed and other actions
- AS1170 Part 2 Wind actions
- AS1170 Part 4 Earthquake
- AS3600 Concrete Structures Code
- AS3700 Masonry Code
- AS3798 Commercial Earthworks
- AS4100 Steel Structures Code
- AS4600 Cold Formed Steel Structures
- AS4678 Retaining Structures
- AS3826 Existing Structures for Earthquakes
- 2020 National Construction Code / Building Code of Australia (BCA)
- Fire Engineering Brief
- Safework NSW Requirements
- Sydney City Council
- ESD Requirements.
- Department of Environment and Conservation – Assessing Vibration 2006

Wherever reference is made to a Standards Associated of Australia (SAA) Standard, the requirements of the editions and amendments to them current at the date of Construction Certificate shall apply to the relevant materials or operations and be deemed to be incorporated in this specification.

4 Drawings

The specification shall be read in conjunction with the structural, architectural, services, and other relevant trade and package drawings. It is the responsibility of the Contractor to coordinate fixings to cladding, services, and other non-structural elements on the shop drawings that are not shown on the structural drawings.

4.1 General Notes Drawing

This specification shall be as noted on the SCP structural General Notes drawings. Any discrepancies between the drawings and notes shall be immediately referred to the structural engineer for clarification.

4.2 Document Management

The Document Management system is defined by the Principal's Representative and subject to amendment. Contractors must use the appropriate software systems required to complete its works.

5 ESD Requirements

5.1 General

This specification shall be read in conjunction with the ESD Specification.

5.2 Contractor Responsibility

The Contractor is required to complete the design, construction and documentation of the Facade works in accordance with the intent of the ESD Specification to facilitate achievement of the nominated ratings as described in the ESD Specification. It is the Contractor's responsibility to be aware of their overall responsibilities with regard to the associated environmental targets in the ESD specification.

5.3 Green Star

The ESD requirements are multi-disciplinary and affect the works described in this specification. Refer to the ESD specification and the Green Star Responsibilities matrix provided to understand the specific Green Star requirements as they relate to this specification.

It is the Contractor's responsibility to collect and compile all necessary information and supporting documentation, as required, and related to their portion of the Works.

The Contractor must prepare documentation in a presentable and appropriately formatted way and is responsible for providing all information requested by the Green Building Council of Australia (GBCA) however this will not be formally submitted. The Contractor will be responsible for collating any required information so that it can be compiled and submitted to the Principal's Representative. The submission should be in accordance with the requirements stated by the GBCA.

6 Loading Criteria

6.1 Unit Weights

Design dead load shall include all self-weight and dead loads of elements. Unit weights shall be in accordance with Appendix A of AS 1170.1 (2002)

6.2 Superimposed Dead Load

Due consideration shall be given to superimposed dead loads due to: partitions, floor finishes and toppings, ceilings and services, plant and equipment, hobs and kerbing, perimeter screens and walling, escalators and stair flights, planters and landscaped areas, and any imposed dead loads from roof framing, glazing and linings. Reference shall be made to the architectural drawings for the extent and location of these loadings.

6.3 Lightweight Roof Loads

Roof loads shall be evaluated in a systematic fashion as set out in the Pro-Forma at Appendix A of this Design Brief. Services and Acoustic Consultants are to be requested to supply the necessary loadings to allow completion of the Pro-Forma. A copy of the Pro-Forma shall be included in all calculations and shall be summarised on the roof-marking plan for each building.

Suspended ceilings, major service ducts and pipe work required to be supported by purlins shall be designed and specified to be attached to the webs of the purlins.

6.4 Groundwater

For the purpose of building design, the static groundwater is below the lowest level and no hydrostatic pressure is to be designed for the reported maximum ground water level is RL 20.00. This can be collated through a sump and pump system as advised in the Geotech report (refer to Appendix I).

Drainage to be provided at base of all retaining walls and at base of all exposed vertical rock cuts.

For seepage water behind shoring, these shall be designed for ⅓ of the shoring wall height. Refer to SCP Shoring brief. Lateral reactions shall be supplied to SCP for incorporation into the design.

6.5 Retention

All new lower basement excavation will be in class III sandstone. SCP expects to have vertical cut sandstone with local rock strengthening/stability works as required by the Geotechnical Engineer.

6.6 Vertical Loads

6.6.1 General

Vertical design loads in accordance with AS1170.1. Refer SCP drawings for diagrammatic loading plans.

LOADS			
LOCATION	**SDL**	**LIVE LOAD**	**COMMENT**
Floor Slabs and Beams	Self-weight as calculated	N/A	Reinforced and post-tensioned concrete taken as a density not less than 2,400kg/m^3 Steel to be taken at a density not less than 7,860kg/m^3
Masonry Partitions	Self-weight as calculated	N/A	Taken at a density of 2,200kg/m^3
Façade	Self-weight as calculated	N/A	TBC by Façade engineer
Residential	0.5 kPa+walls	1.5 kPa	
Retail	1.5 kPa	4.0 kPa	
Landscape	10 kPa TBC	5.0 kPa	Paved podium areas
Carparking	0.25 kPa	2.5 kPa	Basement carparking allowance
Plant Rooms	1.5 kPa + plinths	5.0 kPa	
Lobby/EOT	1.0 kPa + walls	4.0 kPa	
Loading Bay	1.5 kPa	15.0 kPa	
Podium (Paved)	2.5 kPa	5.0 kPa	
Tree pit – max 1.2m soil	24.0 kPa	5.0 kPa	
Stair	1.0 kPa	4.0 kPa	
New Steel Pods	0.5 kPa + walls	1.5 kPa	
Roofs (Non-trafficable)	0.5 kPa	0.25 kPa (non-trafficable)	
Roofs (trafficable)	1.5 kPa	4 kPa	
Pools	10 kPa/m of water + South West of pool shell	2 kPa	
Gym	1 kPa	5 kPa	Vibration requirement TBC
External Public Space	1.5 kPa	5 kPa	
Vehicle Barrier Loads (horizontal) i Light traffic (less than 2.5t) ii Light traffic at end or straight ramp exceeding 20m	N/A	i 30kN ii 240kN iii 40kN	Note all vehicle barrier loads are applied horizontally in accordance with AS1170.1, 0.5m above floor level and over 1.5m length.

LOADS			
LOCATION	SDL	LIVE LOAD	COMMENT
iii Medium traffic barriers less than 10t			

Notes: SDL – Superimposed Dead Load i.e. finishes, ceiling, services, etc.

6.7 Robustness Loads

National lateral loading of 1.0% gravity loading will be provided in accordance with AS1170.0.

6.8 Wind Loads

Wind loads will be assessed in accordance with AS 1170 Part 2, using the following parameters:

- Region A2, Vu 46 m/s
- Terrain Category 3
- Topographic multiplier 1.0
- Shielding multiplier 1.0
- Return period 1:1000

6.9 Earthquake Loads

Design shall be in accordance with AS1170.4 – Part 4 "Earthquake Loads" (2007) and AS3826(1998) "Existing Building for Earthquake" using the following parameters:

Structure	
Importance Level	3
Earthquake Design Category	III (Dynamic Analysis)
Annual Probability of Exceedance	1:1000
kp	1.3
Z	.08
Site Sub-soil Class	Be
Threshold load for South and Central tower	33% of AS1170.4 as per AS3826-1998(based on no significant modal mass increase or structural alteration)
Threshold load for North Towers	100% of AS1170.4

6.10 Minimum Lateral Loads to Infill Walls – TBC

Interior and external stud walls and permanent partitions and their fixings and supports, shall be designed to resist the following:

- Impact load of 0.7kN between 1200mm and 1500mm above FFL (which is the mid height range of all walls at 2400- 3000mm ceiling height above FFL).
- A maximum deflection criteria of span/200 but no more than 12mm (where the vertical span of the walls is between 3.5-4m between top and bottom restraint).
- The load will be applied evenly over the centre between two studs.

This allows the walls to be built as a lightweight steel framing partition as per the design intent, using a combination of 92mm single and boxed studs, 0.75-1.15BMT and limits the deflection to span/200 with a maximum of 12mm.

All internal walls should also be designed for Earthquake forces as per AS 1170.4 – 2007.

Minimum stud wall BMT = 0.75mm.

All external stud walls to be designed for applicable wind loads in addition to the above.

6.11 Temporary and Construction Loads

The building structures shall be designed to resist all loads imposed during construction. In all instances, the building components in their temporary partly constructed state shall remain structurally stable.

The Contractor to provide temporary construction loads to SCP and the D&C PT contractor if applicable.

6.12 Horizontal Loads to Handrails and Balustrades

All handrails, balustrade systems shall be designed in accordance with AS1170 Part 1 for C3-Generally and C5 –Crowd Loadings. Balustrade design and installation to be designed and certified to the BCA by the D&C balustrade contractor. Balustrade fixings to be co-ordinated with PT Contractor. All anchor embedment's to exclude hob heights, and be measured into base slab U.N.O. All balustrade anchor fixings to be installed to installed to AS5216-2018 by and product licensed/ approved installer.

6.13 In-plane Forces

Refer to SCP concrete profiles. Design for all ultimate in-plane forces as nominated.

7 Deflection Criteria

7.1 Lateral Deflection

Inter-storey drift due to wind, earthquake – Floor Height/500 (serviceability) and 1.5%Hfloor based on AS1170.4 for the ultimate earthquake event.

7.2 Vertical Deflection

DEFLECTION CRITERIA – SPECIFIC REQUIREMENTS

Floor Design Deflection Criteria	Long Term Deflection
• Slabs	Span / 250 or 25mm – Total
• Beams	Span / 500 or 25mm – Total
• Total Allowable Deflections	30mm – Total Beams + Slabs
• Supporting Masonry	Span / 500 or 15mm – Incremental (whichever is less)
• Supporting Glass Façade	Span / 500 or 15mm – Incremental (whichever is less)
• Balcony/Cantilevers	Cantilever / 150 or 20mm – Total (whichever is less)
• Balcony/Cantilevers	Cantilever / 250 or 15mm – Incremental (whichever is less)
• Transfer Structures	Span /500 total or 15mm – Total (whichever is less)

- Allow for relative transfer deflection in the floors over
- Differential short-term deflections under live load = 15 mm
- Differential deflection between levels under 100% live load, including for the most onerous live load pattern, to be contained to 10 mm or less.
- Wind lateral deflection less than H/500 (Service wind loads)
- Earthquake inter-storey drift <1.5% based on AS1170.4 with a Ductility Factor = 2.6 (TBC).

8 New Materials

Concrete	Concrete shall have river gravel or crushed basalt aggregate (no slag aggregates). All concrete slabs are to be cured with applied curing compounds compatible with floor finishes.
Reinforcing steel	Reinforcement shall be Grade 500 MPa, ACRS Certified.
Structural Steel	ACRS Certified
Glass Facades and Balustrades	Glass shall be designed and certified by the glass supplier/façade engineer.

9 Durability

The structure shall be designed giving due consideration to durability and the functionality of the building and its components. All new concrete elements shall be designed for the following exposure classifications in accordance with AS2159, AS3600 and AS5100 for a 50 year design life. Existing concrete elements will be inspected and rehabilitated/protected where required to extend the building life by another 50 years.

Interior:	A2
Exterior:	B2

10 Waterproofing

Waterproofing details are to be in accordance with architectural specifications.

Roof and other external suspended concrete exposed slabs subjected to weather shall be designed as watertight. Primary waterproofing shall be via a certified designed and installed membrane system. However external slabs under shall be designed in accordance with Section 5 of DB2, for a strong degree of crack control with maximum crack widths of 0.3 to 0.4mm.

11 Geotechnical

All design shall be in accordance with the site Geotech report.

12 New Slab on Grade Sub Grade requirements

Sub grade areas to be in-situ compacted to 98% SDD. Slab on grade to have conventional joints at the approval of the project architect based on flexible floor coverings (except in toilets and workshops etc. All subgrade to be Geotech certified to 98% SDD and CBR = 3% to 5%, as engineered compacted fill. All works in accordance with AS3798-1996.

13 New and Existing Structural Framing System

13.1 Design Life

Future Structure Design Life = 50 years for all existing and new structure, existing concrete will be rehabilitated as required.

13.2 Foundations

The existing building foundations consist of pad footings on rock under columns and core bases. All new columns will also have similar pad footings to rock. Existing pads will be extended to satisfy.

Recent Geotech advice concluded most pods are founded on class III rock (poll = 3500kPa). The original building nominated the pod footings to bear on poll = 1000kPa rock. As a result, subject to

pod capacity, there is typically a 350% geotechnical increase in the foundation load capacity compacted to the reported design. The report highlighted C54 and C158 will require confirmation investigation.

13.3 Existing and Proposed Floor Framing

The existing concrete consists of reinforced slabs, beams and columns. The load capacity of the existing structure will be determined and or modified/strengthened to comply with AS1170.1 and the new loads listed in Section 6.6

New proposed structure will consist of reinforced concrete structure to AS3600-2018. F'c= 40mPa minimum concrete strength. The existing structure will be tested for in-situ concrete strengths.

It is proposed that new double height spaces will be incorporated into the existing structure by the removal of slabs between grid bays. It will be ensured that slab the void implementation will not diminish the load capacity of the structure as the columns are braced by opposing slabs. Final detailing will need to be confirmed to ensure this outcome.

13.4 Deletion of Existing Masonry Walls

As described in appendix D and J in order to be within the scope of AS3826, the overall mass of the building will need to remain within a 5% margin to enable the 33% threshold require allowance of AS3826.

> 2. An addition, which will add mass and increase the earthquake response
> ACSE suggest that the engineer calculate the building mass before and after intended modification, If changes by more than 5% (floor by floor and overall) then it could be deemed to trigger this requirement.

By adding Pods vertically to the existing structure, it is intended to exchange the existing double skin masonry walls with a lightweight alternative to ensure the building mass remains unchanged. Refer 13.7 for a summary of the analysis outcome.

13.5 Stair Cores and Lift Cores

The existing Central tower lift and stair shaft will be retained and strengthened as required. New steel core structure will be installed to the North tower to provide to the North tower principally in the North and South direction (weak direction of the existing North tower block).

13.6 Existing Column Load Capacity to Support Proposed Vertical Extension

The existing columns throughout the structure were analysed based on the proposed Pod addition layout, landscaping and proposed swimming pools as shown below and on Landscape Plan and Architectural Elevation as issued below. There are numerous columns which will require strengthening for both fire and ultimate axial capacity. These will be by either:

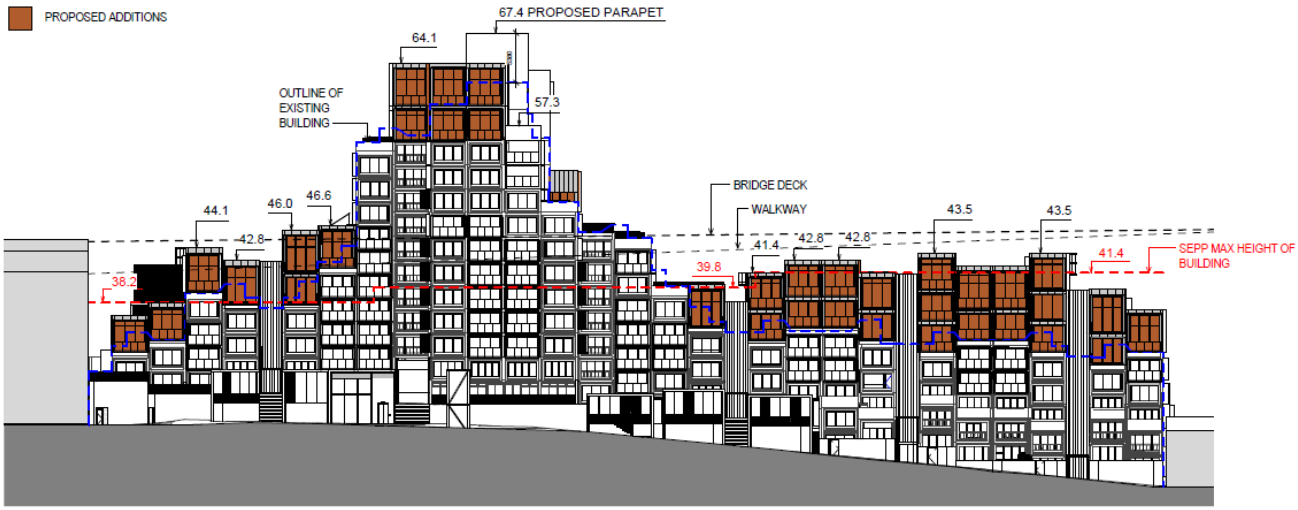
- Column jacketing.

- Column extension with steel sections at each end of column.
- Concrete extension at each end of column.

Refer to Appendix H for an annotation of columns requiring alteration based proposed vertical extension scheme as below. This takes into account the proposed pod, landscape and pool loads and deletion of internal masonry walls. It is proposed to relocate some columns in the basement to assist in planning layout. Existing and new columns will be checked/designed for any changes in forces, etc.

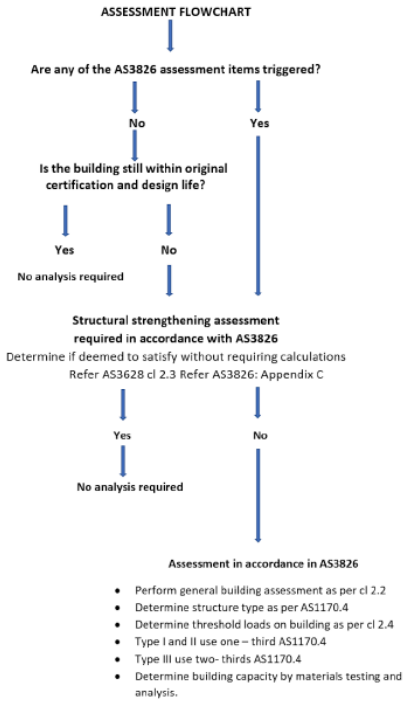
The Geotechnical investigation on the site for randomised pad footings indicated most as constructed pad footings are bearing on 3500kPa rock. The original structural design documents indicated the pad footings were bearing on 1000kPa rock. As a result, there is effectively a 350% increase in the potential foundation capacity subject to the structural pad footing assessment.

Architectural Roof Plan (above) and East addition of proposed additions (below).



13.7 Existing Central Tower Core Capacity to Laterally Support Proposed Vertical Extension

The growth in tower height has the potential to alter the forces in the cores under lateral load. The existing core structure is lightly reinforced and as such does not have the capacity to comply with AS1170.4 requirements. It is proposed to assess the central tower under AS3826 as below, on the basis that the building mass is generally unchanged, as described in section 13.4. This will allow SCP to review the modified central tower structure under the provisions of AS3826-1998 using the 33% EQ Threshold loading.



The Central tower lateral core capacity to support the proposed vertical extension of the tower has been analysed taking into consideration the:

- Revised statutory floor loading.
- Addition of balcony steel pods.
- Addition of up to two stories lightweight pods at the top of the central tower.
- Addition of landscaping to existing balconies and on top of new steel pods.
- Addition of pools/spas to existing roof slabs and on top of new steel pods.
- Deletion of all masonry walls with a lightweight replacement. Internal tenancy walls to be constructed from lightweight stud walls for reasons explained in 13.4.

Based on the proposed above, compared to the original the building, the overall proposed earthquake mass as defined in AS1170.4 is actually less.

G + 0.3Q Existing Structure: 89,900 kN

G + 0.3Q Proposed Structure: 87,600 kN

When analysed under AS1170.4, the proposed alterations actually reduce the Earthquake core base forces.

Core 1 - EQ Base Forces 100% Static			
Worst Case Mx		Worst Case My	
Existing Structure		**Existing Structure**	
Mx @ B2 (kNm)	19,641	Mx @ B2 (kNm)	-7,238
My @ B2 (kNm)	5,339	My @ B2 (kNm)	-19,142
Vx @ B2 (kN)	1,469	Vx @ B2 (kN)	-709
Vy @ B2 (kN)	466	Vy @ B2 (kN)	-1,466
Proposed Structure		**Proposed Structure**	
Mx @ B2 (kNm)	19,588	Mx @ B2 (kNm)	9,578
My @ B2 (kNm)	-6,010	My @ B2 (kNm)	-18,803
Vx @ B2 (kN)	1,454	Vx @ B2 (kN)	962
Vy @ B2 (kN)	-423	Vy @ B2 (kN)	-1,443
Base Shear Force per AS1170.4			
Existing Structure		**Proposed Structure**	
V* (kN)	2,471	V* (kN)	2,381

Core 2 - EQ Base Forces 100% Static			
Worst Case Mx		Worst Case My	
Existing Structure		**Existing Structure**	
Mx @ B2 (kNm)	24,574	Mx @ B2 (kNm)	-6,201
My @ B2 (kNm)	-5,010	My @ B2 (kNm)	-16,394
Vx @ B2 (kN)	1,133	Vx @ B2 (kN)	-32
Vy @ B2 (kN)	-303	Vy @ B2 (kN)	-991
Proposed Structure		**Proposed Structure**	
Mx @ B2 (kNm)	-22,421	Mx @ B2 (kNm)	2,732
My @ B2 (kNm)	-4,864	My @ B2 (kNm)	-15,502
Vx @ B2 (kN)	-1,025	Vx @ B2 (kN)	-233
Vy @ B2 (kN)	-277	Vy @ B2 (kN)	-908
Base Shear Force per AS1170.4			
Existing Structure		**Proposed Structure**	
V* (kN)	2,471	V* (kN)	2,381

It has therefore been proven that the proposed alterations do not increase to Earthquake mass of the (vertical and modal) building, hence the provisions of AS3826-1998 apply. (67% reduction in EQ loading is applicable).

The peak ultimate compressive stress in the walls is 5.44MPa, which is less than the code maximum of 9.75 MPa under Earthquake load. The peak tension stress is 0.93MPa, which indicates some reo in the lower section of the cores would be slightly overstressed (based on C12-300 Central), however this will be re-evaluated with further site investigation or more rigorous analysis.

At this stage, we therefore envisage no major thickening requirements to the existing central core, and only addition of carbon fibre reinforcing to the inside face of the stair and lift shaft at the lower core levels.

13.8 New North Lift

The North block is bounded by Grid 6.5 to 53. Based on the level of vertical extension compared to the current structure, it is proposed to provide lateral stability via the design of new steel framed lift shafts to allow for 100% Earthquake resistance to AS1170.4, as AS3826 will not be applicable due to the high level of vertical addition relative to the original mass.

The lift structure will comprise of 250UC/WC verticals and 150SHS Diagonals as a guide, arranged to match floor levels etc. Bracing geometry and layout will suit the architectural requirements.

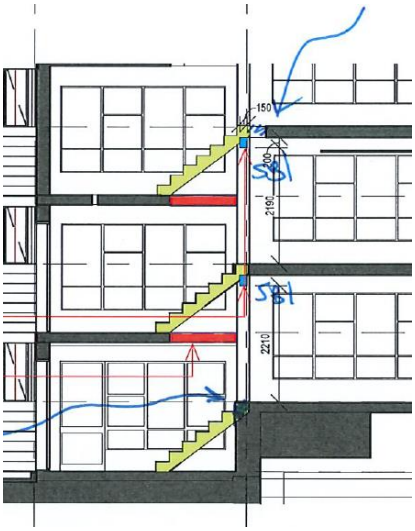
Lifts will brace the building in all directions and will occur at Grid 14.5,33.0 and 51.5. These lift shafts will have a concrete pit. Stairs to the west of the lift shaft will be framed onto the lift shaft and between the existing walls.

3D View as prepared by BVN.

13.9 Stair Modification

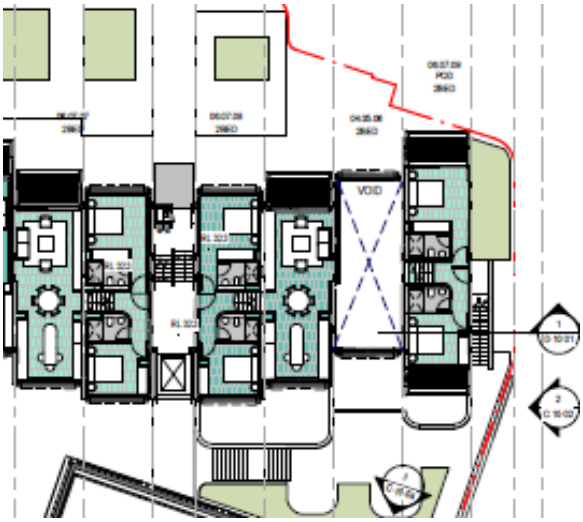
It is proposed to modify the stepping between the apartment levels by relocating existing stairs. This will be achieved by demolishing the existing fold beam within the stair zone after the erection of a steel RHS member spanning between the existing concrete columns (fire rated as required).

This methodology allows total supporting of the slab prior to the stair void demolition works. The process would involve installing SB1, demolishing the red slab zone (after slab strengthening works) and pour the new stair structure shown in yellow.

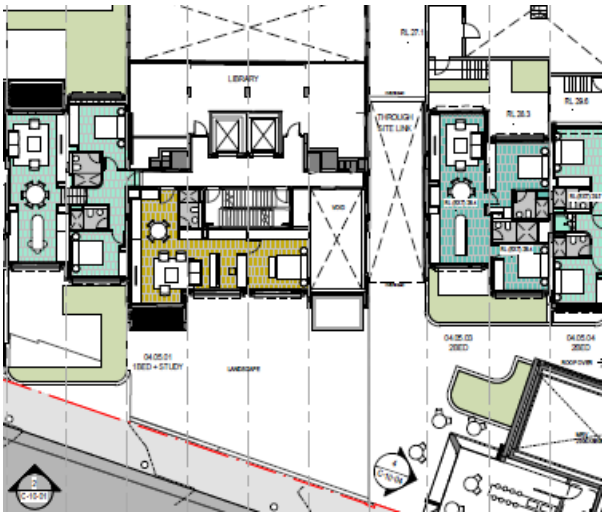


13.10 Proposed Slab Voids

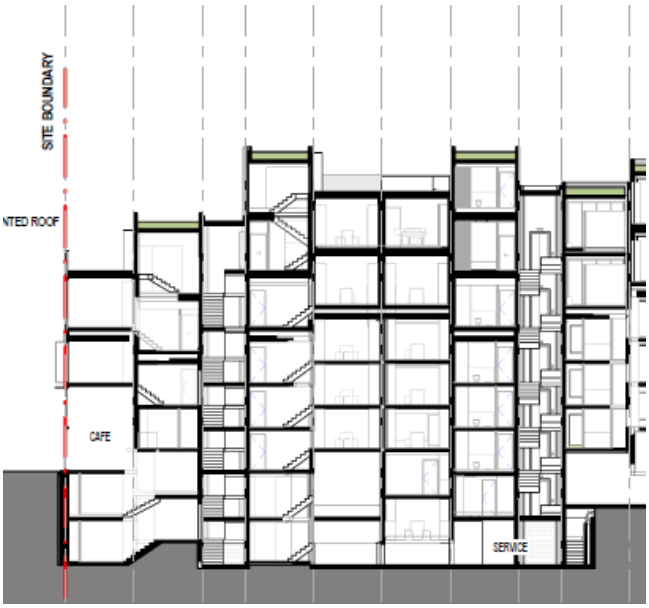
It is proposed to introduce a double height space between Grid 112.5 and 116.5 at the south tower at Level 06. This will be achieved by removing the slab between the column faces. As a result of the slab adjacent to the columns still remaining, the void can be achieved without any major structural alterations, except for new steel support beams within the party wall on Grid 112.5. These beams are to span between the concrete columns on Grid 112.5. Pending detailed bottom reinforcement investigation, some soffit strengthening of the 150mm thick slab between Grid 116.5 to 120.5 may require Carbon Fibre Reinforcing to the slab soffit (no fire rating required) as a result of the loss of continuity.



The concierge and walkthrough will be created by slab demolition over between grid 82.0 and 90.0.



At the north end, the slab over the cafe will also be deleted at Level 03. This slab again will be demolished between existing vertical structure on Grid 6.5 and 10.5. An opening will be established in the concrete wall on Grid 6.5 and this opening will be structurally re-supported by a steel lintel as well as lateral restraining elements.



14 QA Documentation

Refer to documentation checklist at Appendix L for a list of QA documentation to be provided to SCP Consulting by the builder to allow SCP Consulting to provide a certificate of construction compliance to the Principal Certifying Authority. All inspection reports issued by SCP to the Contractor site staff will need to be returned and "signed" by the Contractor staff indicating that all inspection items listed have been actioned accordingly.

15 Certification and Inspection

SCP will conduct periodic inspections of the SCP documented works to adequately certify the SCP designed components of the primary structure, that were designed by SCP.

All items designed by separate D&C Contractor sub contractors (Shoring, piling and PT Reo documented by D&C PT contractor) will require to be certified (design and construction of those specific works) in accordance with the BCA, applicable Australian Standards and the SCP Design Brief (DB1 and DB2) and SCP drawings requirements.

SCP will issue a certificate for all scope excluding D&C items. The Contractor to confirm with the PCA for the project the adequacy of the SCP Certification process.

16 Post Installed Reo and Anchors

All post installed fixings to be designed and certified to AS5216-2018. Installers of all chemical anchoring systems specified by SCP shall be approved/ licensed installers by the manufacturer of the chemical fixing.

No substitution of anchoring systems specified by SCP is allowed without the approval of SCP.

SCP will specify required load testing of anchors by manufacturer approved load testing contractors on a as required basis. Submit all load test reports to SCP for approval and as part of the certification documents, noting anchor type, date of testing, and location within the project.

All anchors stainless steel UNO.

17 Safety in Design

The attached safety in design register summarises the major safety in design issues we anticipate for this project. These will form the basis of the safety in design process through design development.

Appendix A Future Lightweight Roof Loading (where applicable)

ELEMENT DESCRIPTION	ALLOWANCE		
	Uniform (KG/SQ.M)	Concentrated (KGS)	Line (KG/M)
Insulation	3		
Normal Ceiling 2 Layers 13mm Gyprock and to suit Acoustic Requirements	20		
Electrical Cabling	1		
Lighting	2		
A/C Ducting	10		
Fan Coil Units		150 (max)	
Exhaust Units To Roof		150 (each)	
Hydraulics Pipes	10		
Sprinklers	5		
Roof Access System Anchor Loads		225kg (ultimate)	
Solar Panels		27kg Each	36 kg/m + hob
Roof Live Load (General) (In Accordance With As1170.1)	25	180	
Roof Live Load (Plant) where applicable	750	450	

Appendix B Fire Ratings

SUMMARY OF BUILDING USE AND CLASSIFICATION

Building Use	TBA
Building Classification	TBA
Type of Construction required	TBA

FIRE RESISTANCE OF BUILDING ELEMENTS

- Fire Isolated Passageways discharging from fire isolated stairs or ramps : FRL 120/120/120
- Concrete slabs between all levels : 90/90/90 residential, 120/120/102 retail
- Stairs connecting all levels : 120/120/120
- Lift and stair shafts : 120/120/120
- Columns : 120/120/120 retail, 90/90/90 residential, 60/60/60 carpark (sprinklered)
- Storage/Waste rooms: 240/240/240

Appendix C SCP Report – Structural Audit

scp engineers and development consultants

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Our Ref: 180128

11th September 2018

Dedico Development Services
Suite 02, Level 20, 100 William Street
Sydney NSW 2011

Attention: John Green

RE: 36 – 50 CUMBERLAND ST, THE ROCKS – SIRIUS BUILDING STRUCTURAL AUDIT

1.0 INTRODUCTION

The Sirius Building is an existing residential building located in Cumberland St, The Rocks.

The building was designed in 1977, at the instruction of the "Housing Commission of NSW". The structural design was by Bond James Laron Pty Ltd.

The building consists of a single storey basement structure, under a common podium level with the residential apartment floors over, up to Level 26.

The basement structure comprises of pad footings on rock, slab on grade and columns. The central core structure of the tower block is continuous to the basement level.

The upper levels consist of concrete slabs and beams bearing on columns and concrete walls. All load bearing concrete walls are essentially are orientated in the East West direction.

Based on the structure being investigated for redevelopment, this report reviews the structure and its compliance with the current Australian Standards (except for AS1170.4) including AS 3826-1998 Strengthening of Existing Building for Earthquake.

The future structural design and durability life will be required to conform with the NCC , that is 40-60 years.

2.0 STRUCTURAL DESIGN LOADS.

The structural would have been designed in accordance with Ordinance 70 and not current AS loading codes. Typically for re-developed existing buildings, the existing structure is required to comply with current Australian Standards for vertical loads and wind loads. Earthquake load resistance can be reviewed using AS3826-1998- Strengthening of Existing Buildings for Earthquake.

The following are comments in relation with current Australian Standards after reviewing the structural (excepting) documentation.

2.1 Vertical Loads

The drawings show floor design loads and these are generally accordance (or exceed) with AS 1170.1-2002 Structural Design Actions. The apartments have been designed for 2.0 kPa. Current AS 1170.1-2002 requirement is 1.5 kPa.

Existing lobbies and corridors have been designed for 3.0 kPa. Current AS 1170.1-2002 requirements is 4.0 kPa. The corridors of the existing structure should be able to be justified to the current AS 1170.1-2002 load requirements based on the small areas in question.

We note, however the design load for the exterior podium load is 4.0 kPa, and this is in accordance with AS 1170.1-2002 for public areas not subject to wheeled vehicles. We note that future construction loads on the podium will require back propping to basement level for typical scaffold, and service vehicle loads.

2.2 Wind Loads

The tower structure is comprised of a vertical core structure (lift and stair box) and concrete end walls at Grid 54, 70, 86 and 102 the critical wind direction for the core is the West Wind. The low rise sections are concrete frames consisting of slabs and columns/walls with the walls orientated in the east west direction.

The structure appears stable under AS1170.2 loading based on TC2 and Region A parameters (typical of Sydney Harbour).

SCP will has undertaken a detailed analysis of the tower structure to ensure AS1170.2 Wind load compliance. A parametric wind study may also be required to determine reduced actual wind loads if required, along with environmental wind effects.

We note that SCP will need to undertake detailed stress analysis of all members under wind load as part of the final design stage.

As the "end walls of the tower terminate at podium, their strength contribution will need to be determined, considering the stair box and lift core structure is continuous to footing level. This will be part of the 3D structural wind analysis, to be undertaken at the final design stage.

2.3 Earthquake Loads

At the time of design, Ordinance 70 did not require the building to be designed for Earthquake Forces.

AS 3826-1998 requires the building to comply with 33% of the current specified earthquake load as defined by AS 1170.4-2007, based on no significant structural alterations being undertaken as part of the proposed redevelopment.

For the Sirius redevelopment, this requirement is for all separate buildings above podium and the overall structure of the podium and below.

We note the structural joints at grid 54 and 102. The joint at Grid 102 is detrimental to the earthquake performance and will need to be tied to avoid pounding issues. The joint at Grid 54 may need to be maintained and widened to avoid pounding.to the northern low rise blocks

In the case of the north low rise component (Grid 6.5 to 51.5), the predominant lateral "weak" direction is the non-south direction as the low rise buildings do not have a lateral core structure and the predominant structural form is pure frame between the columns and walls (orientate East West). This North-South directional issue can be resolved with the installation of an egress core or lift box etc. to basement level. Refer to Appendix A, which details the requirement where major additions are made. In this case it is proposed to have the north low rise section of compliant to AS1170.4 (100% earthquake load) by the addition of two new lift shafts at grid 14.5 to 17 and 33 to 35.5. The building joint at Grid 54 will be maintained to keep the of the low rise section laterally separated from the tower structure.

A full static earthquake analysis was conducted for the main tower structure with the combined lift and stair core and shear walls providing lateral resistance. As required by AS3826-1998, the

required threshold load of one third (type 2 structure) of the earthquake load as specified in AS1170.4-2007 was applied to the tower.

The model results show the bending moments acting on the lift core due to earthquake was 6187kNm in the North-South direction and 5974kNm in the East-West direction. The earthquake bending moment acting on the stair core was 9310kNm in the North-South direction and 5936kNm in the East-West direction. The stability of the lift core and stair core were checked based on the model results. It shows that instability failure of the cores would not occur under current earthquake loads and hence the existing structure can comply with AS3826-1998, on the basis that the back fill to the lift pit walls is concrete engaging the rock cohesive strength to the east and west walls only.

This modelling was based on 100% of all lateral earthquake threshold load being taken by the cores and the basement shear walls, and ignores other lateral elements (walls, columns and frame action) for conservativeness. Ultimate core stresses were 7 MPa compression and 2.8 MPa Tension. These stresses appear to be satisfied by the current documented concrete and reinforcing in the Bond James Larson drawings.

We note that the lift core is understrength in terms of reinforcing installed based on the engineering drawings at the lift door locations. SCP propose to strengthen this localised area with Carbon fibre wall reinforcing applied to the shaft wall from the lift pit level to Level 3.

3.0 FIRE RATING COMPLIANCE

The structure fire rating was reviewed in accordance with AS3600-2009. It is understood that BCA requires 90mins FRP for residential area (from Podium level above) and 60mins FRP for carpark (sprinklered).

3.1 Residential Slabs

Essentially, the floor slabs are either on-way/two-way slabs bearing on beams/walls or two-way flat slabs supported on columns. The fire provisions for slabs for 90min FRL from AS3600-2017 are as follows:

SLAB	FRP	Min thickness (mm)	Axis distance (αs) (mm)
Flat slab on columns	90mins	200	25
One-way/two-way continuous slab on beams/walls	90mins	100	15

The concrete slab cover as shown in the structural drawing was 20mm for internal area and 30mm for external area. The min bar size used in slabs was 12mm diameter.

As all flat slabs are minimum 200 mm thick, and the Axis Distance (a_s) = 20+12/2=26mm>25mm. These slabs comply with the fire provisions of AS3600-2017 for 90min FRL.

All one way slabs (spanning between walls and beams) are at least 150thick with a a_s =26mm, and hence complies with the fire provisions of AS3600 for 90min FRL.

3.2 Residential Beams

The typical beam width of the building was 230mm and the cover was 25mm for internal area and 40mm for external area. The min reinforcing tie size used in beams was 10mm and min longitudinal reinforcing bar size was 16mm.

To comply with fire provisions, AS3600 for 90 min FRL requires the min axis distance to be 27mm for 230mm wide beam. Current beam axis distance equals 25+10+16/2=43mm (>20mm) which complies with the code provisions. This is on the basis all beams are continuous.

3.3 Residential Walls

Walls are generally 150mm to 230mm thick with wall reinforcing cover 20mm for internal and 30mm for external conditions. The most critical wall (heavily loaded) wall was checked against fire compliance. The calculated N*f/ϕNu = 0.38, where N*f is the design vertical load under fire and ϕNu is the concrete wall strength calculated based on AS3600-2017.

At 90min FRL and walls being exposed on two sides, AS3600-2017 fire provisions requires walls to have min 143mm thickness and min axis distance of 11mm.

As the min thickness of current concrete walls is 150mm and the wall cover 20mm is larger than the required axis distance 11mm, the walls are considered to comply with fire provisions.

We note that the future vertical additions with increase the wall loads. The affected walls will also comply for fire rating as their minimum thickness is 200mm.

3.4 Column

A detailed investigation was carried out for column compliance with the fire provisions. Generally, the internal columns with smaller sizes need to be strengthened to comply with the fire requirement of AS3600.

Existing 230 and 250 wide columns may require strengthening and fire rating compliance by enlarging the column to the achieve as aspect ratio of 4:1.

3.5 Chasing

No chasing will be allowed to slabs, columns and walls as a result of reduced cover to reinforcement end a failure of fire rating compliance.

4.0 CONCRETE STRUCTURE DURABILITY

As part of the structural rehabilitation, the concrete and internal steel reinforcement, shall be investigated for a future 40-60 year life.

As part of the structural audit and to understand the upgrade cost to the existing structure, a full concrete technologist material audit will be required by a concrete technologist. Once the extent of precast retention is identified, the following scope of investigation would be required. We note that the precast window frames and balustrade capping PC is non-structural.

The following should be reported on in order to understand the requirement to keep the structural serviceable for a future 40-60 years as required for the NCC, and the compliance with current AS3600 fire rating provisions. Advise of current concrete cover and concrete strength to internal and external concrete elements, including basement (both walls, columns and slabs). This should include cover at drip grooves etc.

1. Identify the future service life of all exposed external and internal in-situ structural concrete based on the current degree of ingress of chlorides, carbonation etc. This shall also include all exposed basement concrete.
2. Identify areas of cover reduction and areas of concrete spalling. Advise on rectification.
3. Advise on any areas of AAR and provide rectification advice.
4. Provide comment on the method of external cleaning the structure and the application of a coating system to arrest further ingress of chloride , sulphate etc. as required to ensure a future 40-60 service life if applicable (in lieu of REMOVAL AND PATCH)
5. Comment on the future service life of the basement slab on grade based on car park abrasion rates. Advise of any sealers/ toppings etc. if required.
6. Comment on the likely condition of the foundation structure in terms of future serviceable life. Refer attached drawings.
7. For all retained pre-cast (to be identified), comment on the future service life using the above requirement/items. This is to include connection life of the precast connection to the super structure.

We trust this report is per your requirements.

Yours faithfully
SCP Consulting Pty Ltd

Paul Siewert
Director

APPENDIX I

AS3826-1998 – EXTRACT

SECTION 2 GENERAL REQUIREMENTS

2.1 GENERAL Where required, an existing building including its parts and connections shall be assessed to determine whether it is satisfactory for resisting earthquakes.

A building shall be deemed to be satisfactory if it—

(a) complies with Clause 2.3; or

(b) resists the load combinations given in AS 1170.1 for vertical dead and live loads, and in AS 1170.4 for earthquake load combinations, where F_{eq} shall be taken as the threshold load determined in accordance with Clause 2.4. A building classified as Type III in AS 1170.4 shall be assessed as satisfactory only if it complies with this Item (b).

If the building is found to be unsatisfactory, it shall be strengthened in accordance with Clause 2.2.

NOTE: For commentary on this Clause, see Paragraph B2.1 of Appendix B.

2.2 METHODOLOGY FOR ASSESSMENT AND STRENGTHENING The building structure shall be inspected and visually assessed to determine its materials, condition, connections and the disposition and integrity of its load-resisting members.

The building structure shall be assessed to determine if it complies with Clause 2.3. If it does not comply with Clause 2.3, then the following procedure shall be adopted:

(a) Assess the load capacity of the building structure using the capacity of the existing elements. If this is greater than the design load effects arising from the load combinations for vertical load given in AS 1170.1 and the earthquake load combinations given in AS 1170.4, where F_{eq} is taken as the threshold load determined in accordance with Clause 2.4, then the building structure shall be deemed to be satisfactory.

(b) If the building structure does not comply with Item (a) of this Clause, connect the existing elements together to improve the load paths and resistance, and check the load capacity of the building structure again in accordance with Item (a) of this Clause.

(c) If the building structure still does not comply with Item (a) of this Clause, add new elements to increase the load capacity of the building structure to the required level.

In all cases, all parts and their connections to the building structure shall be assessed to ensure that the required load capacity is achieved.

The analysis of the existing building and the design of strengthening elements shall be carried out in accordance with Section 4.

NOTE: For commentary on this Clause, see Paragraph B2.2 of Appendix B.

2.3 DEEMED-TO-SATISFY REQUIREMENT

2.3.1 General An existing building, except a building classified as Type III in AS 1170.4, shall be deemed to satisfy the requirement for having a minimum resistance to earthquake loads provided it complies with Clause 2.3.2 and the appropriate parts of Clause 2.3.3.

NOTE: For commentary on this Clause, see Paragraph B2.3.1 of Appendix B.

2.3.2 All types of buildings For all types of buildings, the following shall apply:

(a) The building shall be visually assessed.

(b) The original construction shall be of a high standard of workmanship.

(c) Materials, ties and connections shall be in serviceable condition.

(d) The structure of the building shall be of regular shape and shall be free from significant weaknesses.

(e) The building shall comply with the deemed-to-satisfy details set out in Appendix C.

These details set out principles in detailing connections that shall be followed. They do not include other engineering or architectural details, which shall comply with the relevant material Standards and accepted building practice.

NOTE: For commentary on this Clause, see Paragraph B2.3.2 of Appendix B.

2.3.3 Predominant structural system

2.3.3.1 *General* The capacity of the predominant structural system to resist horizontal earthquake loads shall be assessed and the requirements of Clauses 2.3.3.2 to 2.3.3.4 shall be applied as appropriate.

NOTE: For commentary on this Clause, see Paragraph B2.3.3.1 of Appendix B.

2.3.3.2 *Unreinforced masonry or unreinforced concrete bearing walls* For buildings with a predominant structural system of unreinforced masonry or unreinforced concrete bearing walls, or both, the following shall apply:

(a) Buildings up to and including three storeys high shall have—

(i) a gross floor area at each level up to 300 m^2;

(ii) horizontal load resisting walls at 8 m centres maximum in each direction;

(iii) walls course-bonded at corners or equivalently connected;

(iv) walls with an *h/t* ratio of less than or equal to 18:1;

(v) a timber-framed roof connected to walls or concrete roof bearing on walls;

(vi) timber-framed first and second floors connected to walls or concrete floors bearing on walls; and

(vii) a timber-framed ground floor or concrete ground floor up to 1 m clear above ground level at any point, which need not be connected to walls.

(b) Buildings up to and including two storeys high shall be subject to the requirements of Item (a), except that timber-framed first floors need not be connected to walls.

NOTE: For commentary on this Clause, see Paragraph B2.3.3.2 of Appendix B.

2.3.3.3 *Reinforced masonry or reinforced concrete bearing walls* For buildings with a predominant structural system of reinforced masonry or reinforced concrete bearing walls, or both, the following shall apply:

(a) Buildings up to and including four storeys high shall—

(i) be subject to the requirements set out in Clause 2.3.3.2(a), except for Clause 2.3.3.2(a)(vi); and

(ii) have timber-framed first, second and third floors, each connected to walls.

(b) Buildings up to and including five storeys high shall—

(i) be subject to the requirements set out in Item (a), except that timber floors are not permitted; and

(ii) have any suspended concrete floor slabs bearing on or connected to walls.

NOTE: For commentary on this Clause, see Paragraph B2.3.3.3 of Appendix B.

2.3.3.4 *Reinforced concrete or structural steel frames* For reinforced concrete or structural steel frames, or both, the requirements of Clause 2.3.3.3 shall apply and, in addition, the frame shall be considered to replace the walls and shall extend to the full height of the building.

NOTE: For commentary on this Clause, see Paragraph B2.3.3.4 of Appendix B.

2.3.3.5 *Lightweight constructions* There are no limitations on lightweight frame building structures.

NOTE: For commentary on this Clause, see Paragraph B2.3.3.5 of Appendix B.

2.3.4 Parts of buildings The following shall apply to elements other than the main structure:

(a) Unreinforced masonry or unreinforced concrete parapets and chimneys, which have a ratio of unrestrained height above the uppermost connections to effective thickness greater than or equal to 3:1, shall be connected to the roof structure to prevent them from falling.

(b) Minarets, cupolas, orbs and other similar ornamentations shall be connected to the building to prevent them from falling.

(c) Cornices and similar projections in external walls shall project no further from the wall face than the thickness of the wall.

(d) Veneers and external leafs of cavity walls shall be tied to the supporting wall.

(e) Unreinforced masonry partitions, infill panels, gables and other non-load-bearing elements shall be connected to the structure either at the top or at both side edges, and they shall have an h/t ratio less than or equal to 27:1. If they are not connected, they shall have an h/t ratio less than or equal to 6:1.

(f) Awnings shall be positively anchored to the structure and a suitable load path shall be established for the transmission of the awning forces that will be imposed on the structure. It shall not be assumed that an awning is capable of supporting masonry and other heavy materials falling from above.

(g) Major items of plant and equipment shall be connected to the main structure.

NOTE: For commentary on this Clause, see Paragraph B2.3.4 of Appendix B.

2.4 THRESHOLD LOADS

2.4.1 General In determining the appropriate threshold loads, the structure types as defined in AS 1170.4 shall be used.

NOTE: For commentary on this Clause, see Paragraph B2.4.1 of Appendix B.

2.4.2 Threshold load values The threshold load values shall be determined as follows:

(a) *Types II and I structures* For earthquake design, the threshold load values shall be taken as one-third of the design earthquake load determined in accordance with AS 1170.4.

(b) *Type III structures* For earthquake design, the threshold load values shall be taken as two-thirds of the design earthquake load determined in accordance with AS 1170.4.

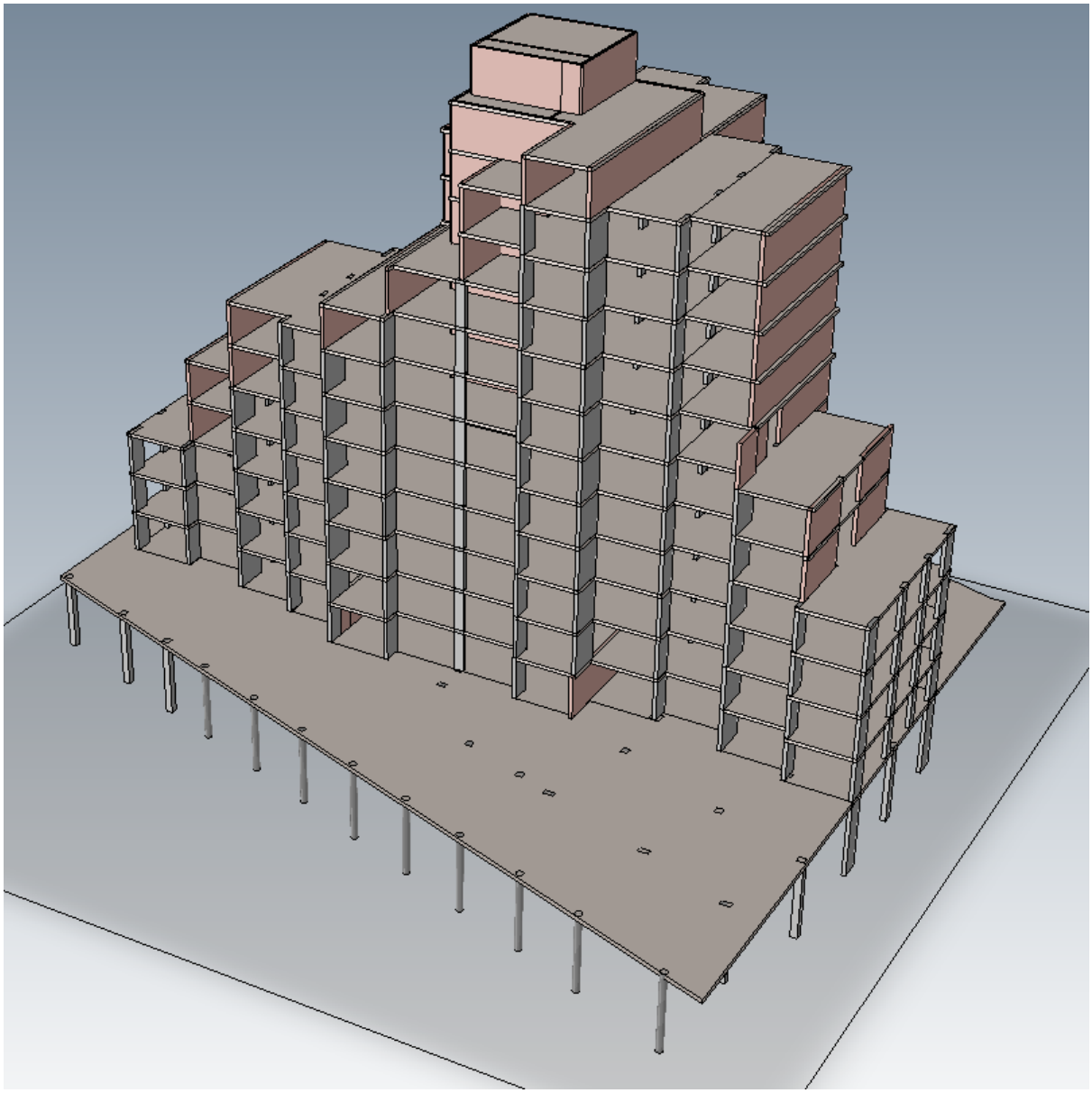
NOTE: For commentary on this Clause, see Paragraph B2.4.2 of Appendix B.

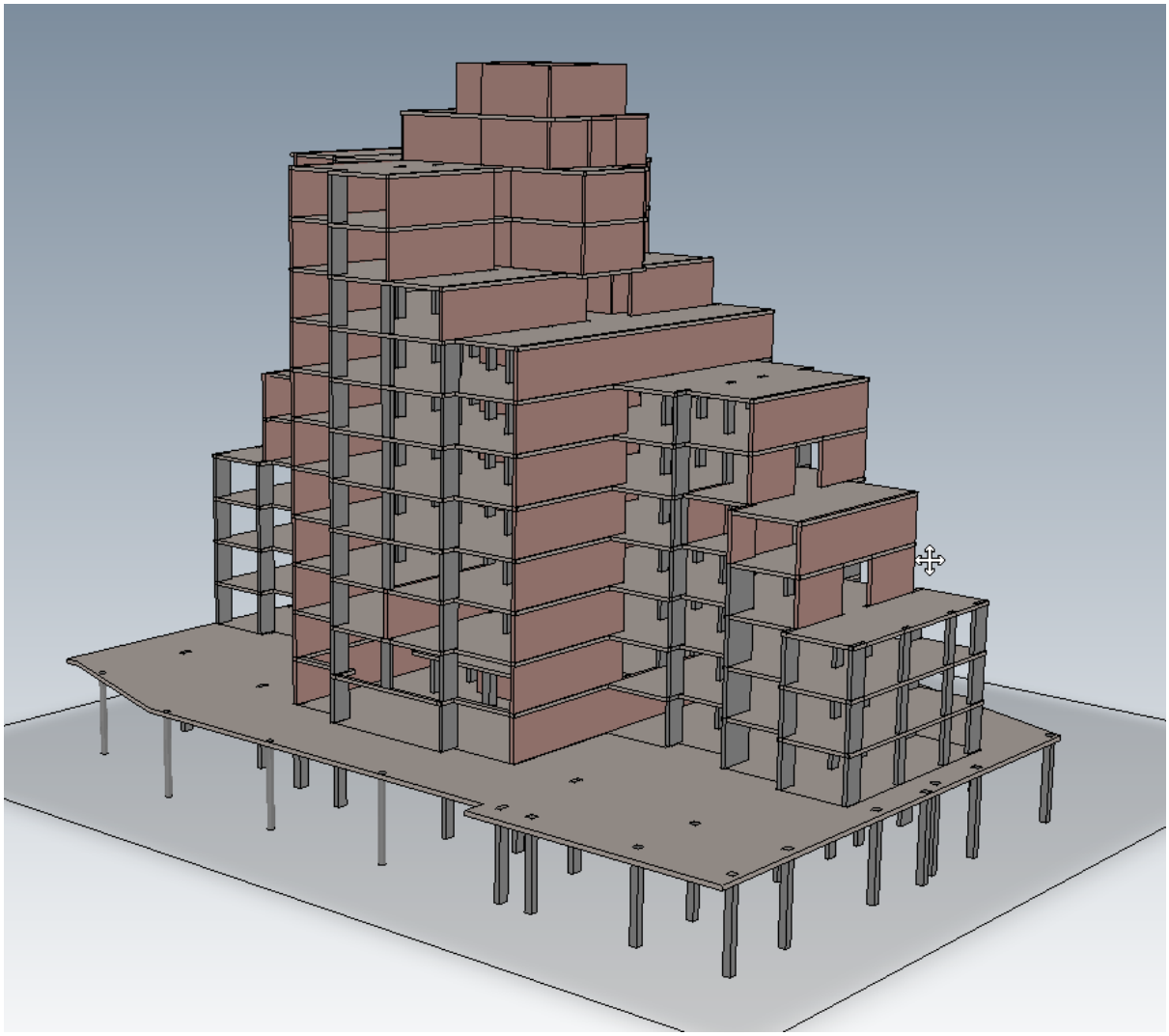
2.4.3 Parts and connections of buildings Parts and connections of building structures with load capacities less than the threshold load capacity for the part shall be strengthened in accordance with Clause 2.4.2, even if the building structure as a whole has a load capacity exceeding the threshold load capacity for the building.

NOTE: For commentary on this Clause, see Paragraph B2.4.3 of Appendix B.

APPENDIX II

STRUCTURAL MODEL EXTRACTS.





Appendix D SCP Report – Structural Advice

Report

Phase 1 – Structural Advice Report

DATE 29/10/2019

TO Sirius Developments Pty Ltd

PROJECT Sirius Building Redevelopment

Revision Table

REV	DATE	ISSUE DESCRIPTION	PREPARED	REVIEWED
A	8/10/2019	Draft Report	PS	BK
B	29/10/2019	Report	PS	BK

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Contents

Appendix

1 Introduction

Sirius Developments Pty Ltd has requested that SCP Consulting Pty Ltd provide a structural review of the existing Sirius Building with a view of providing a summary of aspects of the existing structure along with a report providing structural advice in relation to future possible structural alterations as part of the architectural design competition outcomes.

SCP was involved with Sirius Developments Pty Ltd as part of the NSW Government competition for the purchase of the site and the existing Sirius Building. As a result of the purchase bid process, SCP investigated the structural aspects of the existing building including strength of cores, existing slabs etc. There are unknowns at this point in relation to the exact condition of the externals and internals of the existing structure condition and these items will need verification as part of the Phase 2 – Part A Report (to be issued).

As part of this Phase 1 report, it is envisaged to detail the following items as part of the report, based on a review of the current structural documentation:

- General structural overview and statutory audit
- Advise on portions of apartment floor slabs that can be deleted and which must remain to retain structural integrity.
- Advise on portions of internal non load bearing apartment walls that can be deleted and which must remain to retain structural integrity.
- Provide advice regarding portions of bounding apartment walls that can be deleted and which must remain to retain structural integrity.
- Advise on portions of the low-rise apartments that can be deleted and still retain the structural integrity of the main tower apartments.
- Provide concept advice on how beams can be inserted into the façade to extend double height spaces on the window bays.
- Provide advice on how beams can be inserted where walls are removed between apartments Minimum 2100mm head height to be provided.
- Provide advice on how potential balcony construction can be achieved in relation to existing precast façade panels.
- Advise on potential floor penetrations arrangements without floor stiffening beams being added.

This report shall be read in conjunction with any future architectural concepts in relation to proposed architectural driven structural changes.

2 Structural Description

SCP are in possession of the existing structural drawings for the project. These drawings are included in Appendix D–Exisiting Plans of Competition Brief. SCP has undertaken site inspections of the Sirius Building.

The structure appears to have been designed in 1977 and constructed shortly after. The structure is in good condition internally with no obvious signs of internal degradation. We note there are visual instances of external concrete degradation which will require assessment, analysis and remediation to extend the life of all external concrete elements for a further 40 – 60 years, based on current and future exposure conditions.

The structure is of conventional concrete reinforced construction involving columns, beams and slabs. Loadings are presented on the drawings in addition to reinforcement and concrete strengths.

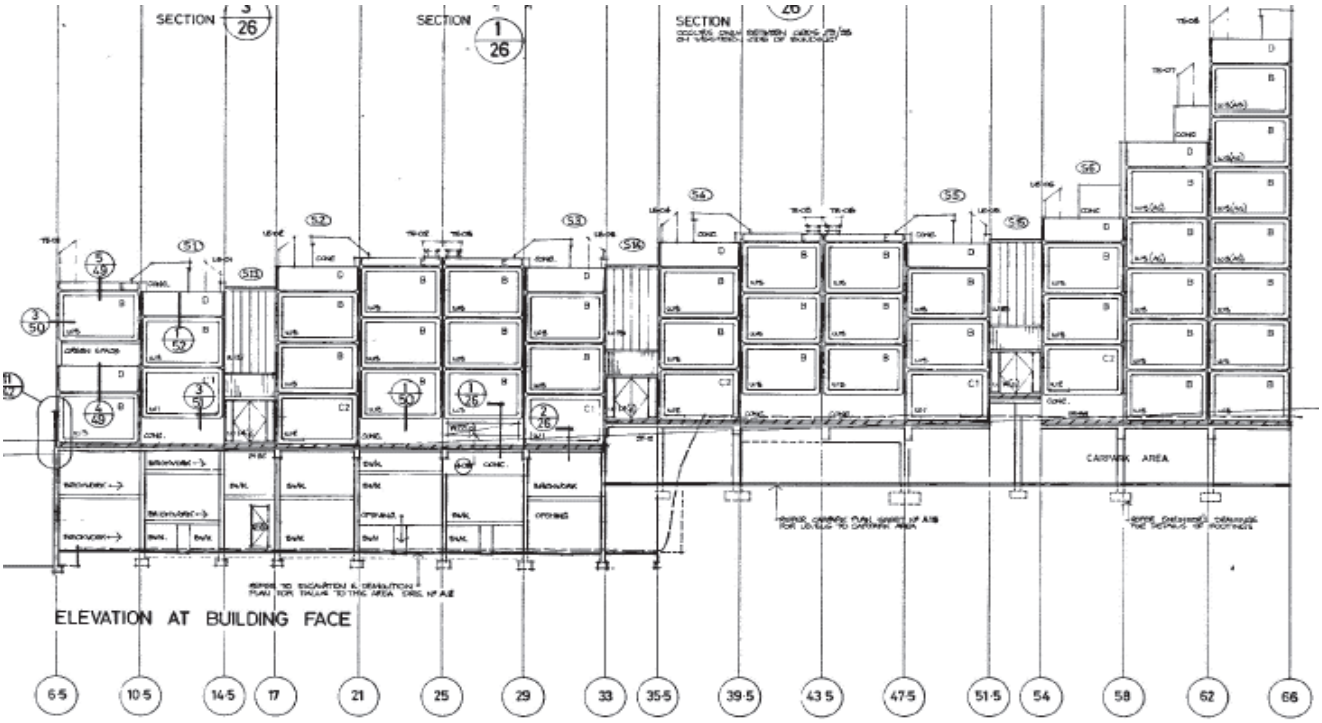
The building is laterally and vertically supported by concrete cores. Floor slabs either span between concrete beams or act as two-way flat plates supported on columns founded by pad footings onto rock.

The building would have been designed in accordance with Ordinance 70 and other specific design information at the time.

The building comprises of three sections, which are defined by the following building joints:

- North Low Rise Grid 6.5 to 52.5
- Central Tower Grid 52.5 to 103.5
- South Low Rise Grid 103.5 to 124.5

It is anticipated that the building is to be architecturally modified and this will involve alterations to the structural fabric. As part of the modification works, structural required upgrades to support current statutory loads is envisaged in combination with fire upgrade requirements.


SECTION
SECTION
SECTION
CARPARK AREA
ELEVATION AT BUILDING FACE
6·5
10·5
14·5
17
21
25
29
33
35·5
39·5
43·5
47·5
51·5
54
58
62
66


LOADING DOCK
CARPARK AREA
ELEVATION AT BUILDING FACE
58
62
66
70
74
78
82
86
90
94
98
102
104·5
108·5
112·5
116·5
120·5

2.1 Structural Update Requirement

Irrespective of original statutory design requirements, the structure in its upgraded form will structurally be required to satisfy the following current statutory requirements (latest revisions):

- Live loads in accordance with AS 1170.1.
- Wind loads in accordance with AS 1170.2.
- Earthquake loads in accordance with AS 3768 for minor changes or AS 1170.4 for major changes, as defined in Section 2 of AS 3678-1998.
- Structure fire rating requirements as required by the BCA.
- No code specific upgrade requirements are stipulated for future structural durability however the re-habilitated concrete structure should provide an NCC design life of 50+ years without significant ongoing degradation.

2.2 Statutory Comparison with Current Requirements

COMPARISON TABLE

ITEM		AS DESIGN	CURRENT CODE REQUIREMENTS	COMMENTS
1	Residential Floors	Live Load = 2.0 kPa	Live Load = 1.5 kPa (resi)	Design LL exceeds current requirements
2	Corridors	Live Load = 3.0 kPa	Live Load = 4.0 kPa	Minor load deficit
3	Stairs	Live Load = 4.0 kPa	Live Load = 4.0 kPa	Compliant
4	Wind Loads	Ordinance 70	AS 1170.2	Generally does not govern lateral capacity
5	Earthquake	Ordinance 70	AS 3826-1998	North low rise – fail. New stability element required. Tower – generally ok with strengthening added to cores. South Low rise – fail, new stability element required
6	Slabs – Fire Rating	Ordinance 70 / AS1480	AS 3600	Complies for 60min, 90min
7	Beams – Fire Rating	Ordinance 70 / AS1480	AS 3600	Complies for 60min, 90min
8	Columns – Fire Rating Columns – Load Capacity	Ordinance 70 / AS1480 AS 1480	AS 3600 AS 3600	Fails for small tower columns with aspect ratio less than 4:1 Generally ok for current conditions but may need strengthening for new increased loads

ITEM	AS DESIGN	CURRENT CODE REQUIREMENTS	COMMENTS
9 Pad Footings – Load Capacity	600 to 1000 kPa rock	To be determined by new geotech report	Investigation required to verify rock capacity based on future coring to determine upgrade requirements

3 Structural Alteration Advice

We understand that as part of the project works, there will be a requirement to undertake numerous alterations/modifications to the structure in order to incorporate the architectural design intent.

SCP identifies below the following items which should be considered as part of the proposed architectural changes.

The structure will have limitations due to the low floor to floor height, and the advice below takes this into account.

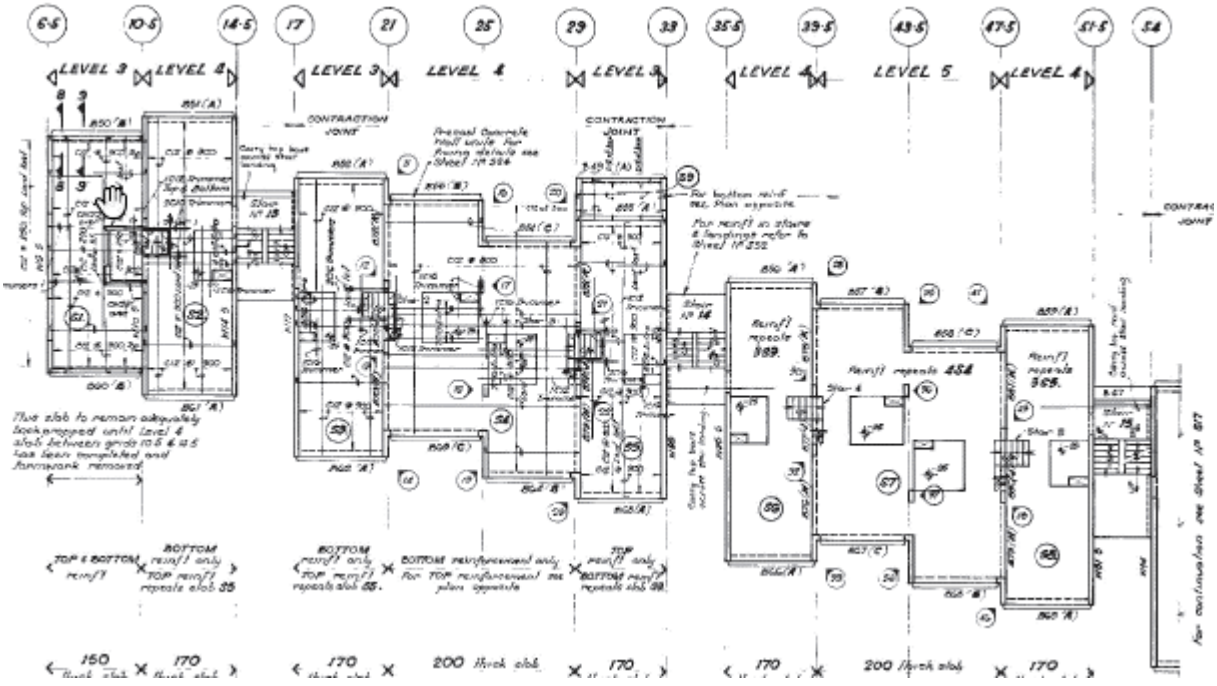
We also note that any remediation work will require the works to be justifiable to current codes and have all fire issues resolved.

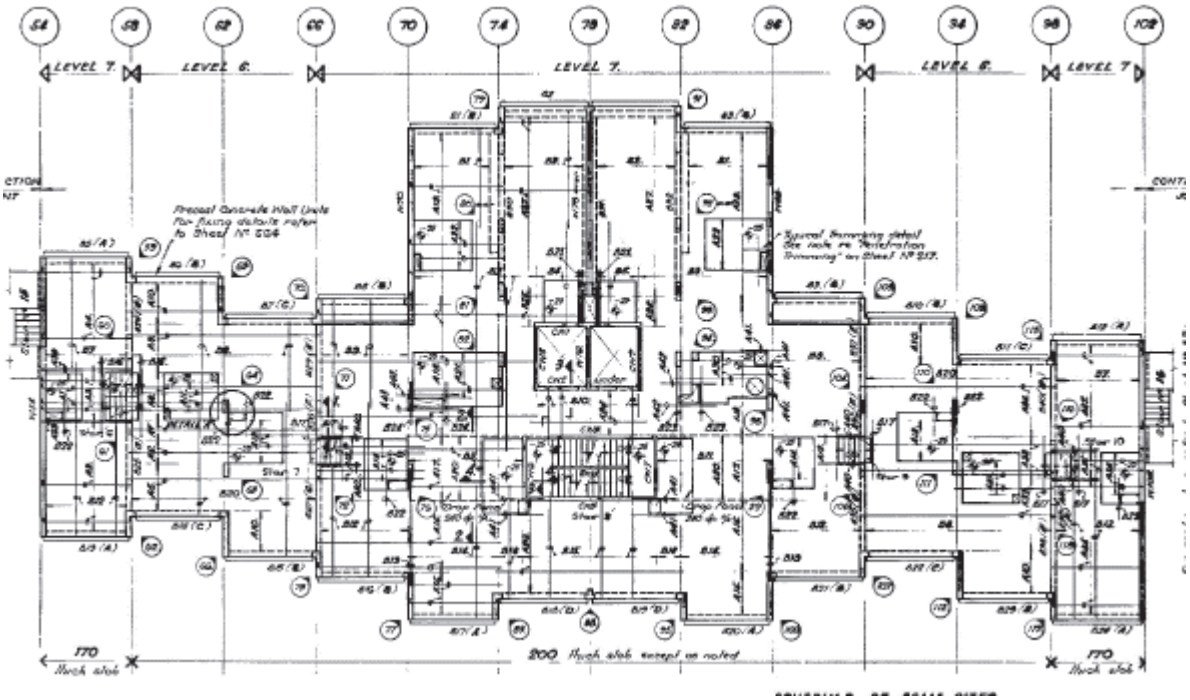
Sections 3.1 to 3.9 list items that will require consideration in developing the architectural concept.

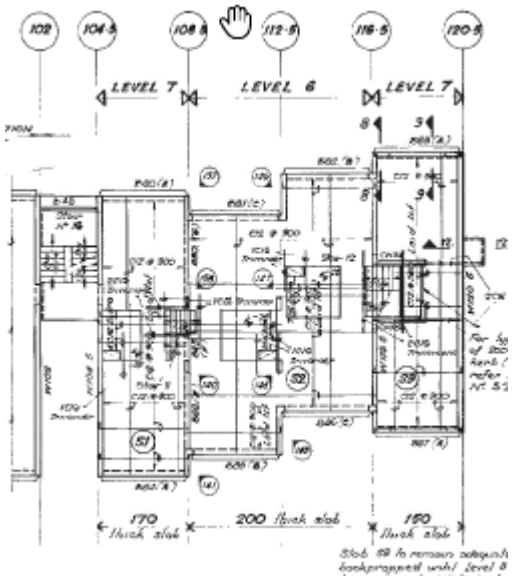
3.1 Existing Apartment Floor Penetrations

The apartment floors essentially span north to south (4m between grids) in one-way zones (pink) and supported by columns in two-way zones (orange) and in most cases are supported by beams. Slabs are designed to be continuous over the beams. In general slabs can be removed between beams for a width of 1000mm to 1500mm width without the requirement for strengthening or stiffening, based on typical top and bottom reo being C12-300 top and bottom.

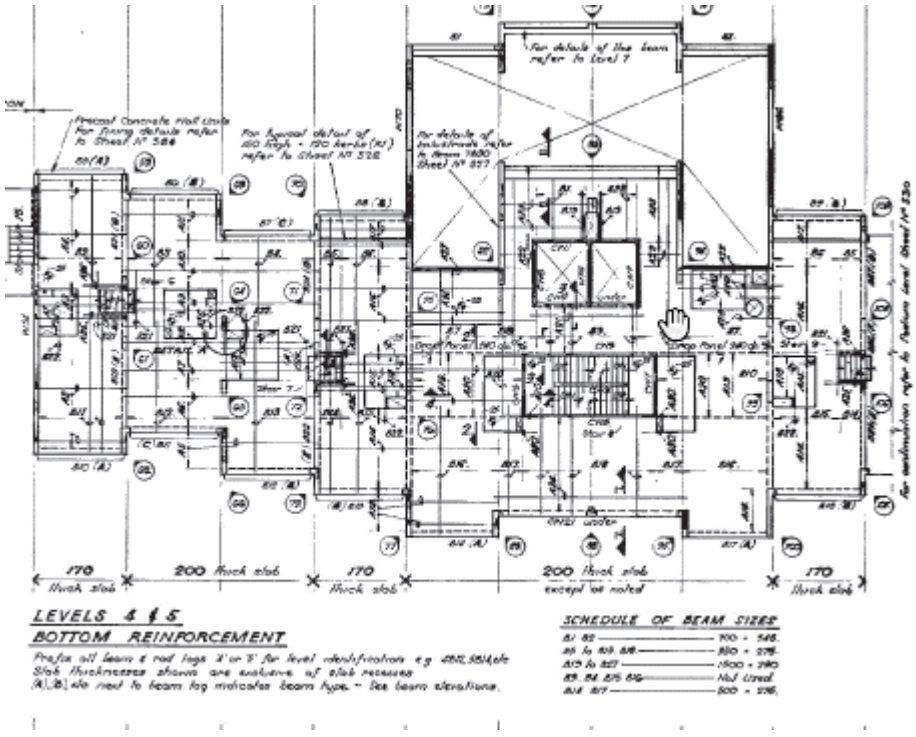
Examples as below


LEVEL 3
LEVEL 4
LEVEL 3
LEVEL 4
LEVEL 3
LEVEL 4
LEVEL 5
LEVEL 4
CONTRACTION JOINT
CONTRACTION JOINT
Precast Concrete Wall Units For fixing details refer to Sheet No 504
For reinf. to stairs & landings refer to Sheet No 552
Reinf. repeats 489
Reinf. repeats 454
Reinf. repeats 565
Flue slab to remain adequately back propped until Level 4 slab between grids 10.5 & 12.5 has been completed and formwork removed
TOP & BOTTOM reinf
BOTTOM reinf only
TOP reinf repeats slab 55
BOTTOM reinf only
TOP reinf repeats slab 55
BOTTOM reinforcement only For TOP reinforcement see plan opposite
TOP reinf only
BOTTOM reinf repeats slab 98
150 thick slab
170 thick slab
170 thick slab
200 thick slab
170 thick slab
170 thick slab
200 thick slab
170 thick slab

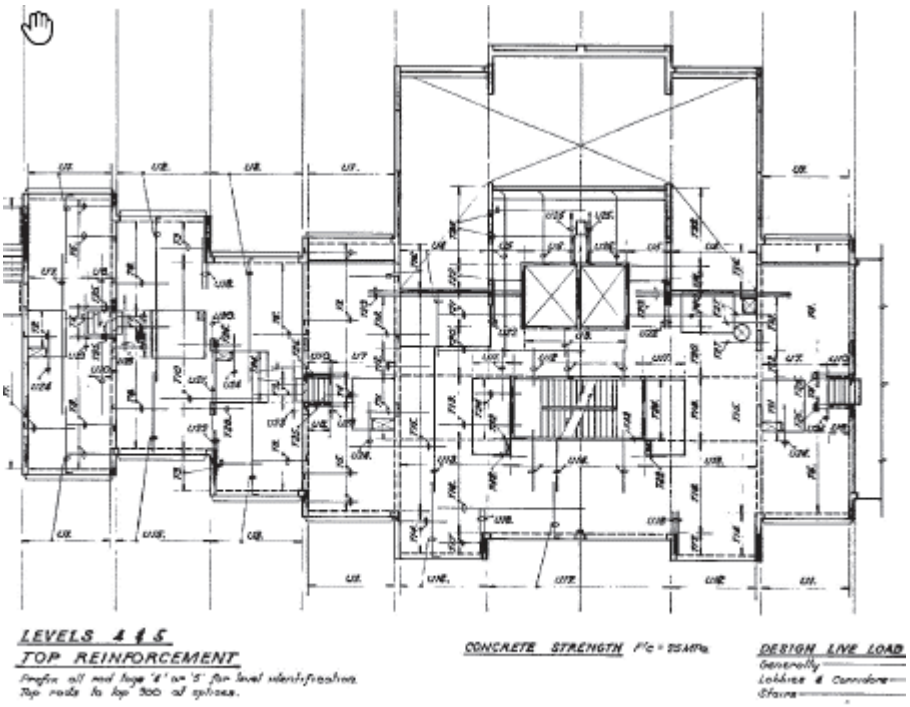

LEVEL 7
LEVEL 6
LEVEL 7
LEVEL 6
LEVEL 7
Precast Concrete Wall Units For fixing details refer to Sheet No 504
Typical Basement slab See note re "Protection Driveway" on Sheet No 217
170 thick slab
200 thick slab except as noted
170 thick slab



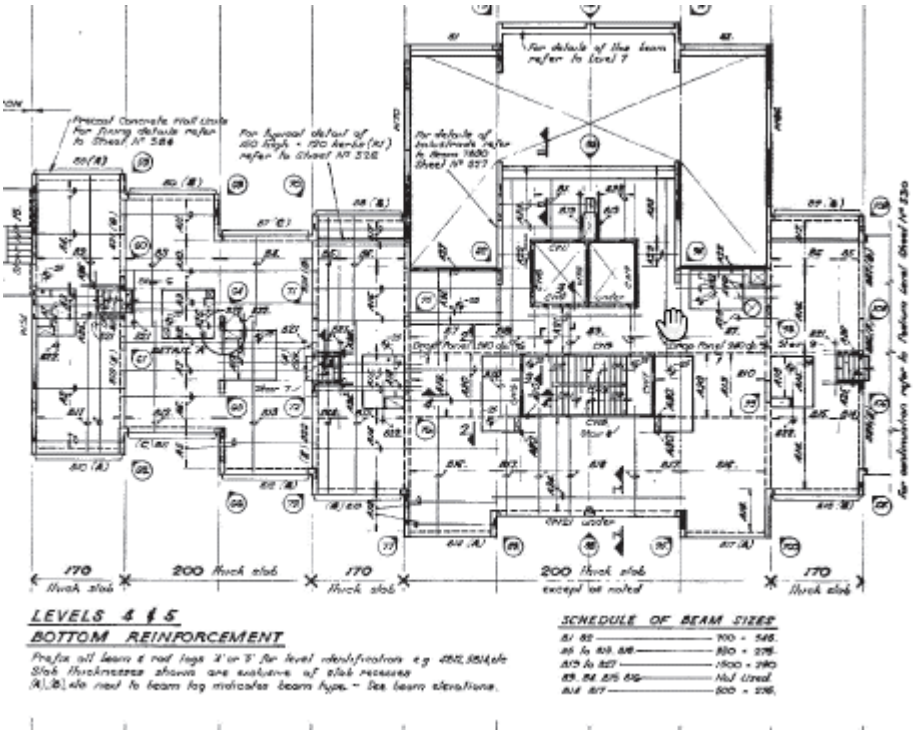
DESIGNATION OF ONE-WAY AND TWO-WAY SLAB ZONES



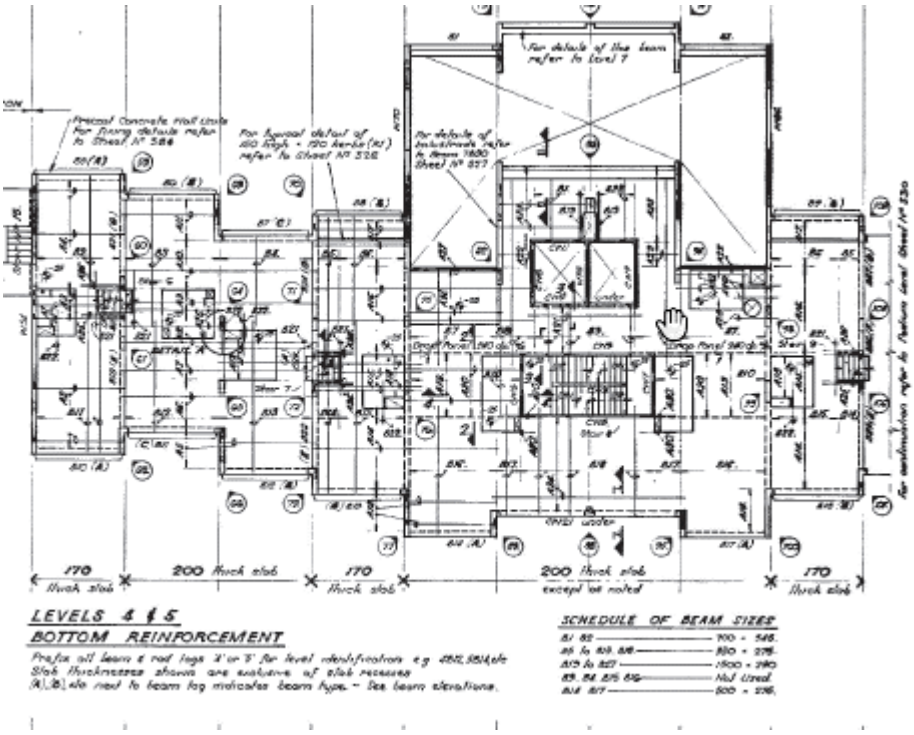
EXAMPLE 1 – NEW SLOT PENETRATION IN ONE WAY ZONES



EXAMPLE 2 – NEW SLOT PENETRATIONS ADJACENT TO CORES – CASE 1



EXAMPLE 3 – NEW SLOT PENETRATIONS ADJACENT TO CORES – CASE 2

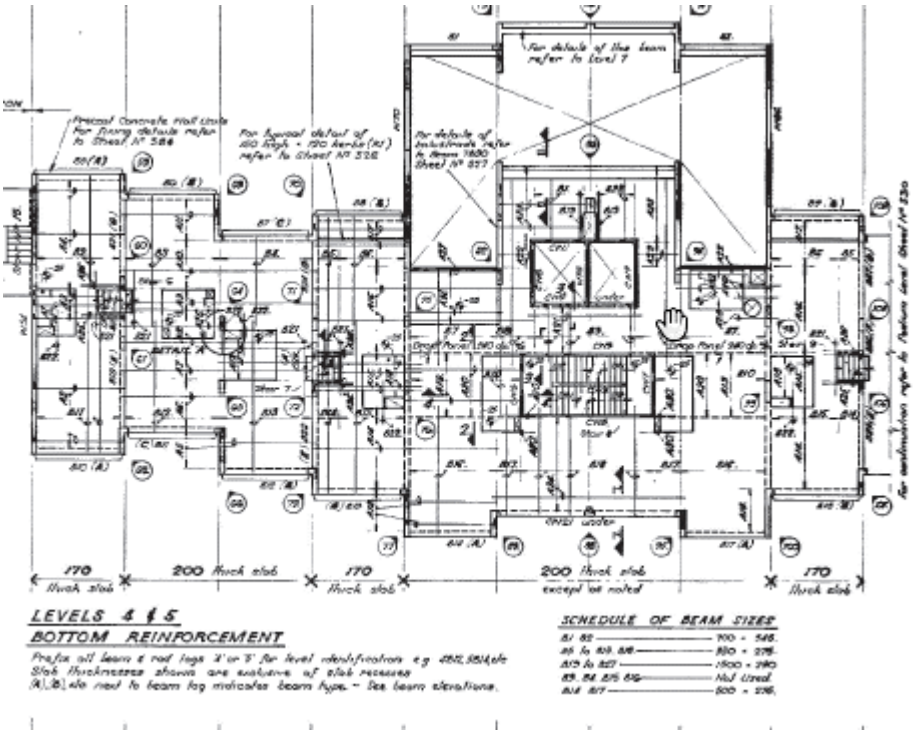


EXAMPLE 4 – NEW SLOT PENETRATION IN TWO WAY SLABS (NORTH-SOUTH)

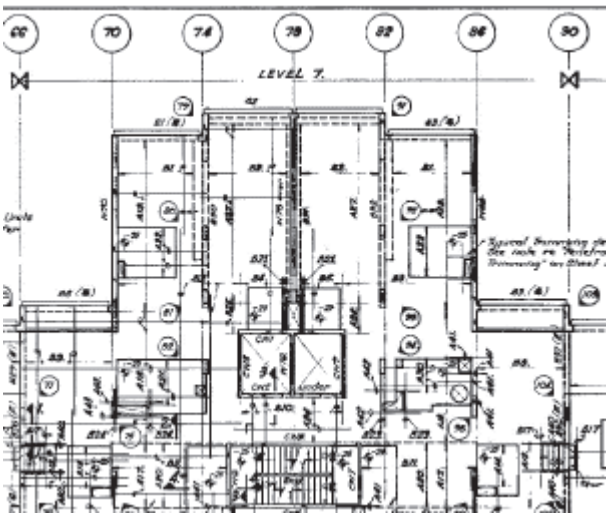
For slabs spanning between beams and walls, any further widening (beyond 1.5m) may typically require secondary beam steel strengthening between the soffit level of the slab span adjacent to the desired cut out.

For two-way slab zones , penetrations will require 200 deep steel beams each side spanning to columns and or existing concrete beams. These steel beams will require fire rating. Additional strengthening of the existing concrete beams may also be required.

Any new penetrations can only occur in alternate 3rd grid bays to ensure slab continuity over the beams and walls.



EXAMPLE 5 – NEW SLOT PENETRATION IN TWO-WAY SLABS (EAST-WEST)

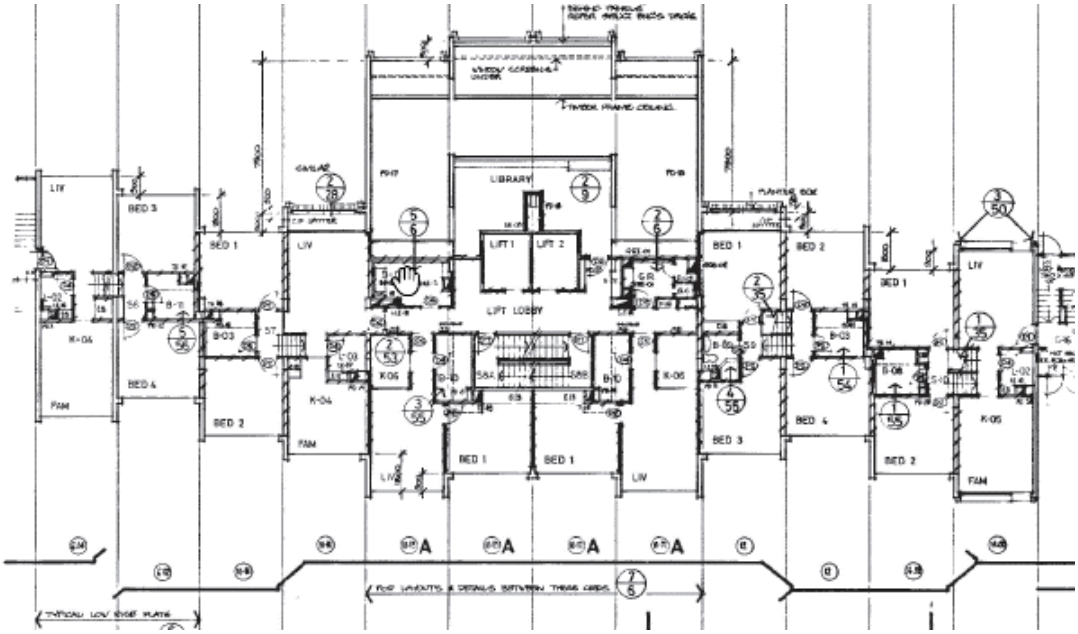


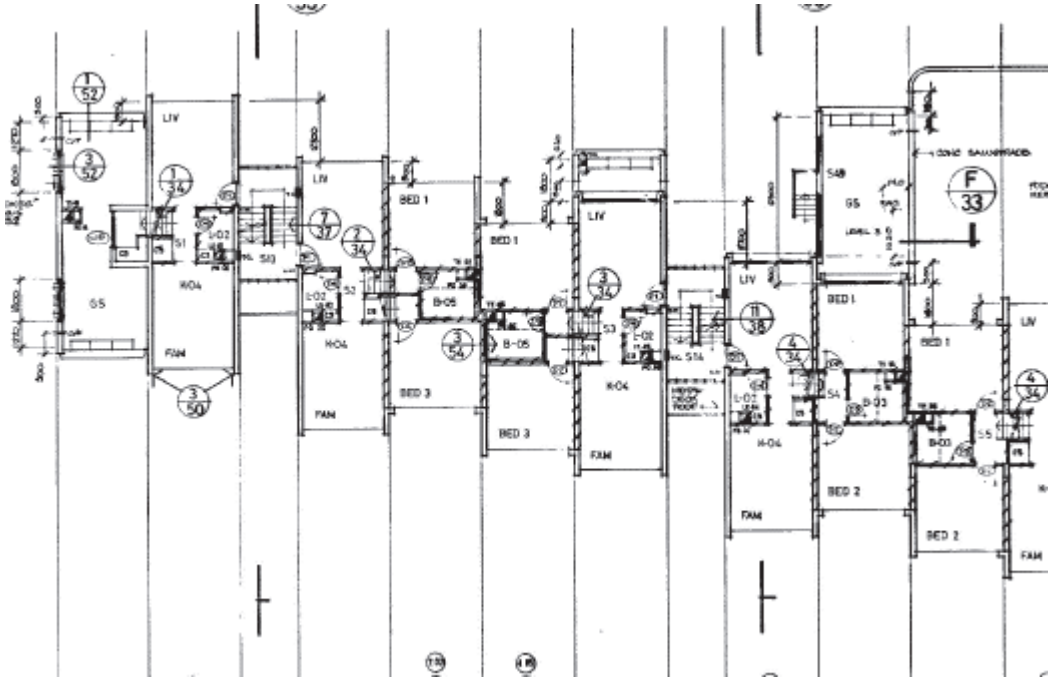
EXAMPLE 6 – REQUIRED ALTERNATE SLOT PENETRATION ARRANGEMENT

The above is based on party fire walls being maintained on grid lines, and any new walls being lightweight and non-load bearing.

3.2 Non-Load Bearing Apartment Walls Deletion

The structure has numerous non-load bearing brick walls to the underside of the slabs between columns and beams over. The walls are non-load bearing and can be removed to underside of slab/beam over and up to the column faces without any structural works. These walls are shown in the pink below





3.3 Non-Load Bearing Apartment Walls and Internal Concrete Walls

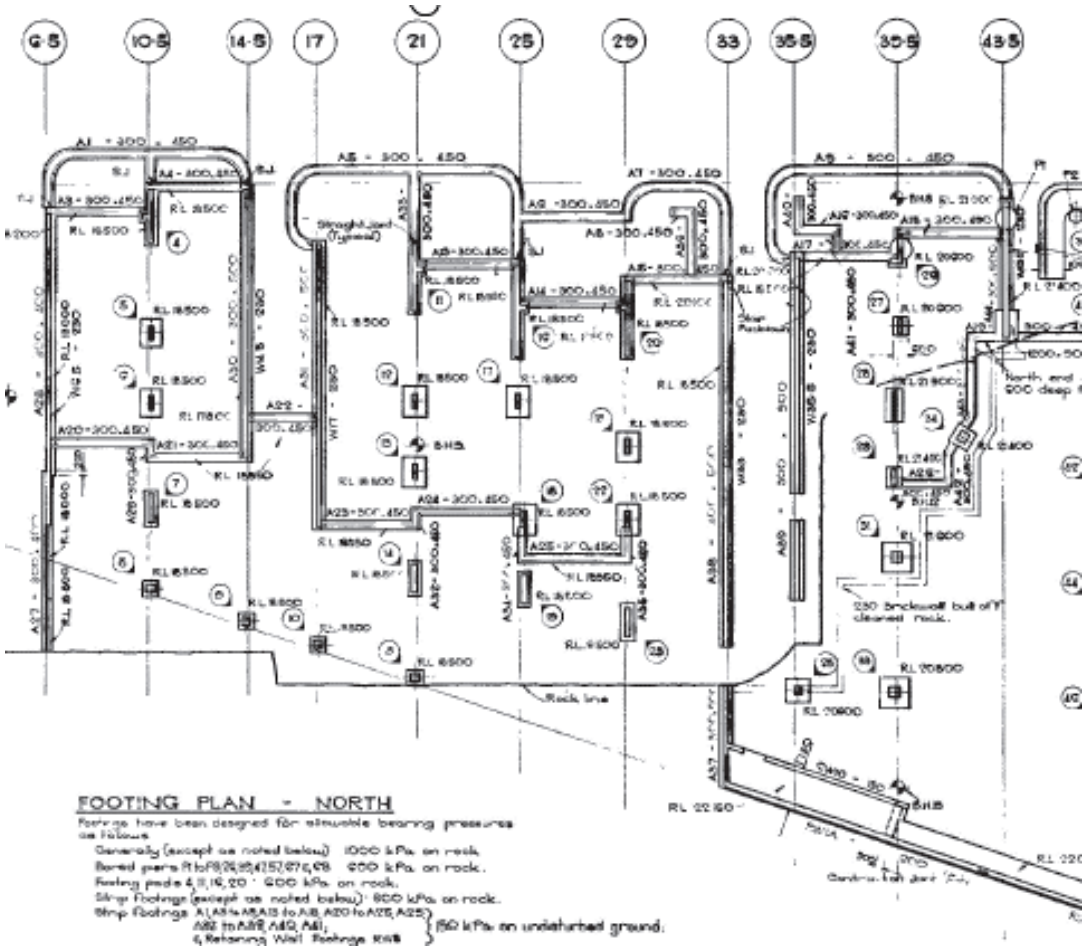
Concrete walls in the east/west direction occur on anchor grids:

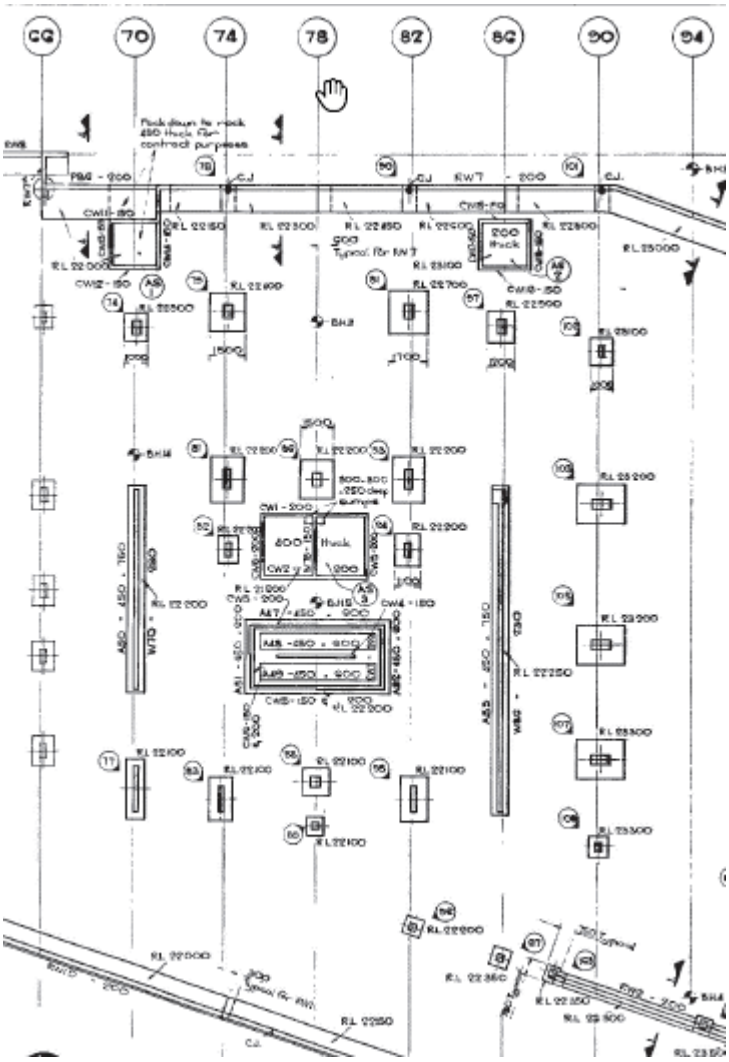
6.5, 14.5, 17, 21, 25, 29, 33, 35.5, 39.5, 43.5, 47.5, 49.5, 54, 70, 86 and 108.

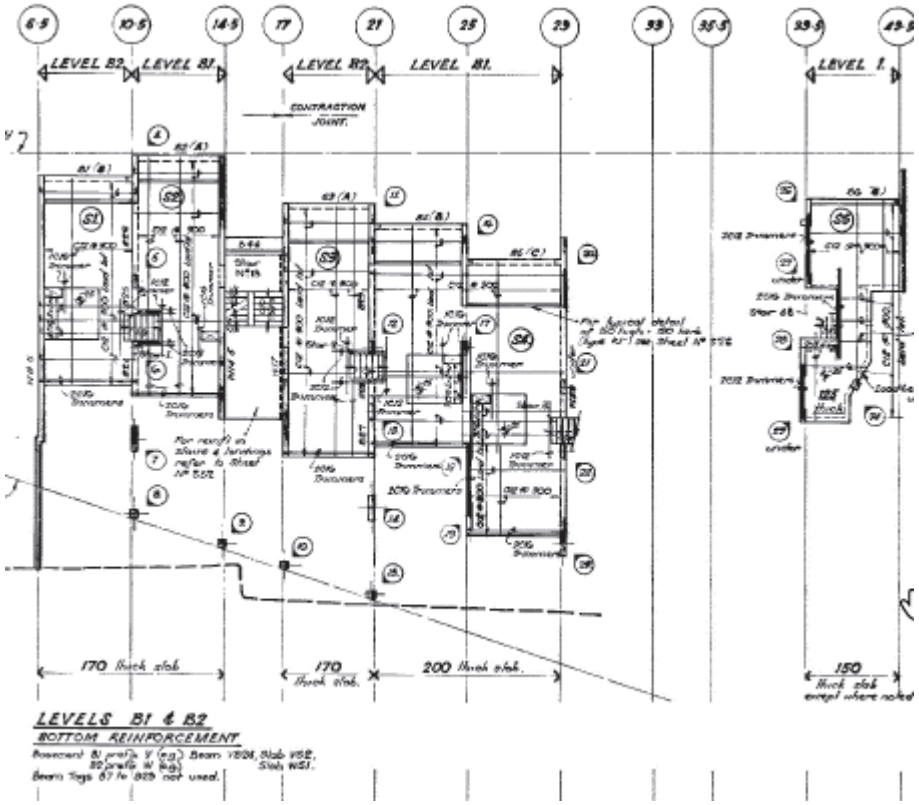
These walls from part of the lateral capacity system for earthquake and wind resistance, as well as supporting the floor slabs, and are shown in green below.

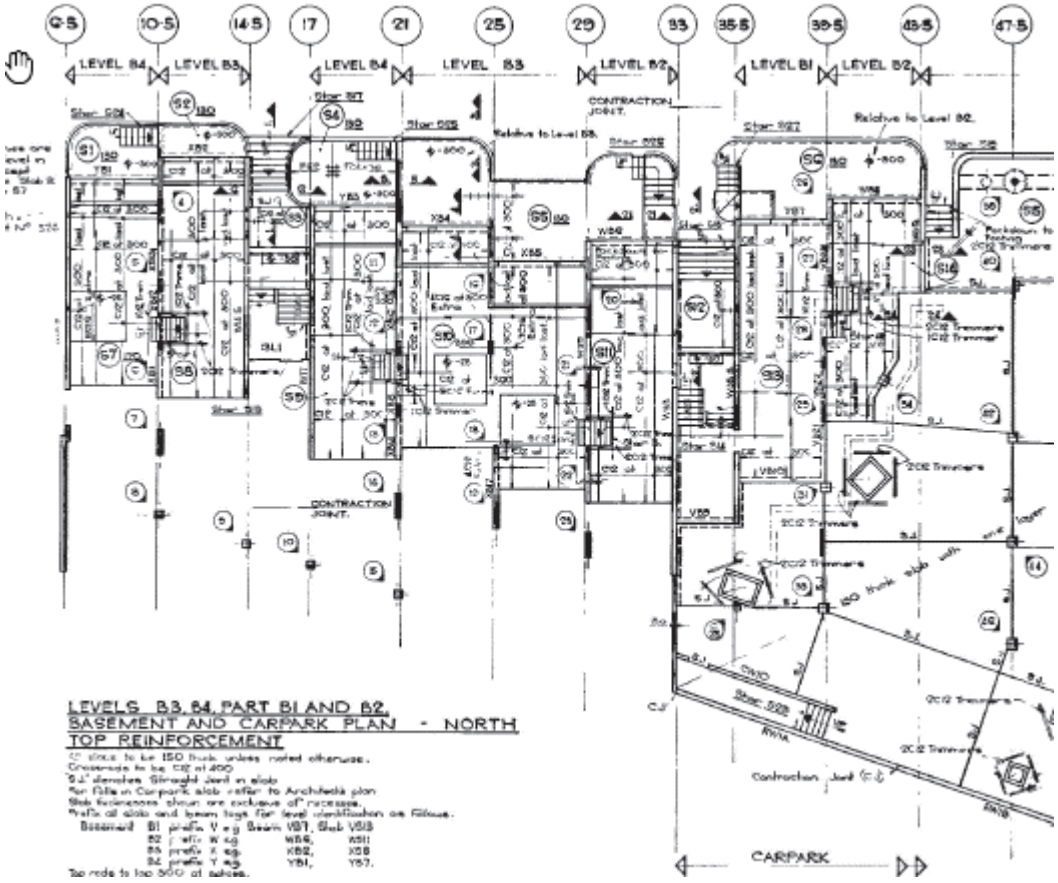
These concrete walls are bi-directionally reinforced, however as they are principally required to support the building laterally, some penetration in the walls can be made in the long walls on grids 6.5, 17, 14.5, 29, 33, 35.5, 54, 70, 86 and 108.

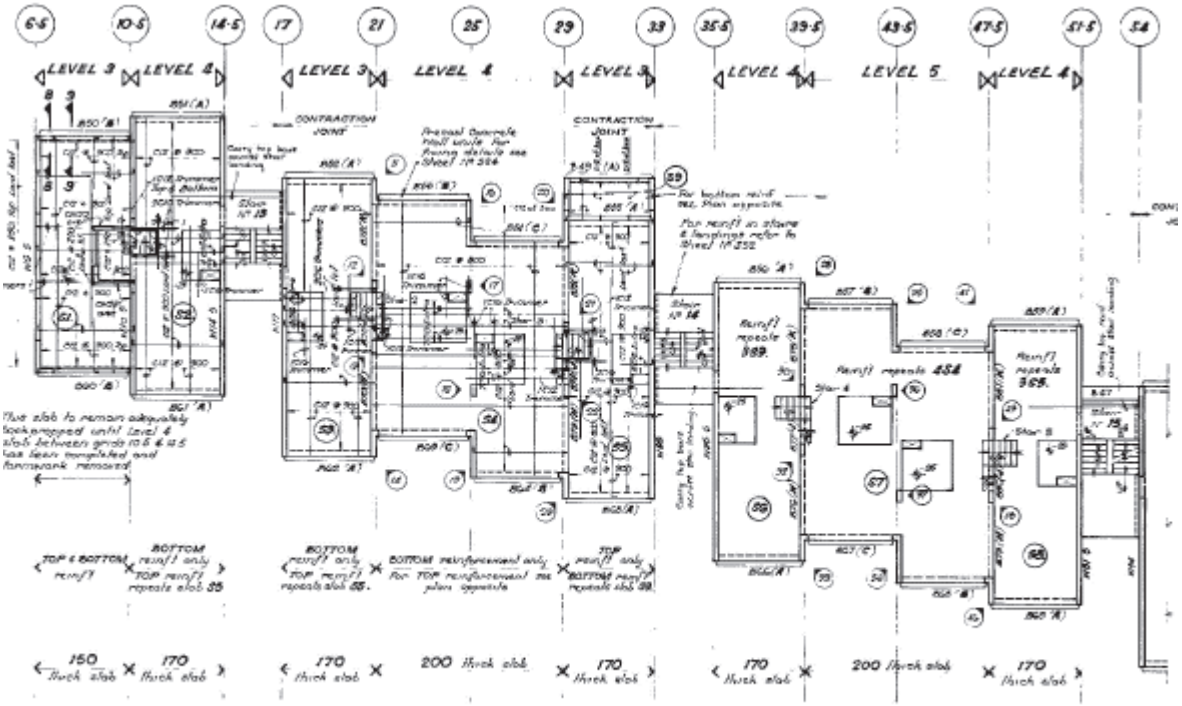
These penetrations if small in width and height will not require strengthening and as a result, small windows and doors could be installed without structural modification. Generally, these penetrations need to be aligned vertically or spaced apart by twice the penetrations width.




CG
70
74
78
82
86
90
94

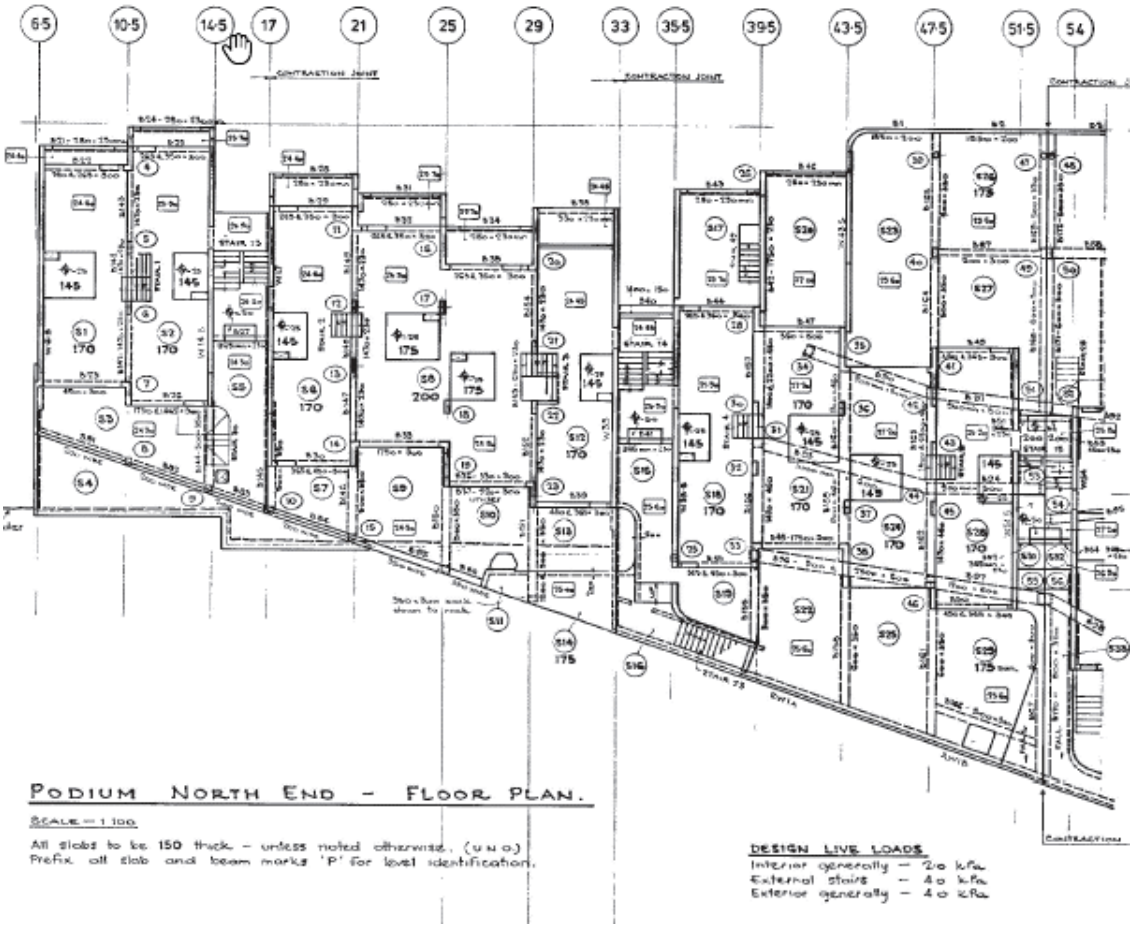

LEVEL B2
LEVEL B1
LEVEL B2
LEVEL B1
LEVEL 1
CONTRACTION JOINT
170 thick slab
170
200 thick slab
150
LEVELS B1 & B2
BOTTOM REINFORCEMENT


LEVEL B4
LEVEL B3
LEVEL B4
LEVEL B3
LEVEL B2
LEVEL B1
LEVEL B2
CONTRACTION JOINT
CONTRACTION JOINT
CARPARK
LEVELS B3, B4, PART B1 AND B2,
BASEMENT AND CARPARK PLAN - NORTH
TOP REINFORCEMENT



LEVELS 3,4&5

Prefix all slab, beam and wall tags '3,4&5' for level identification e.g. '3S1' '3B6' etc
Slab thicknesses shown are exclusive of slab recesses
For trimmers to penetrations refer to 'Penetration Trimming' note on Sheet No 317
Lap top rods 300 at splices

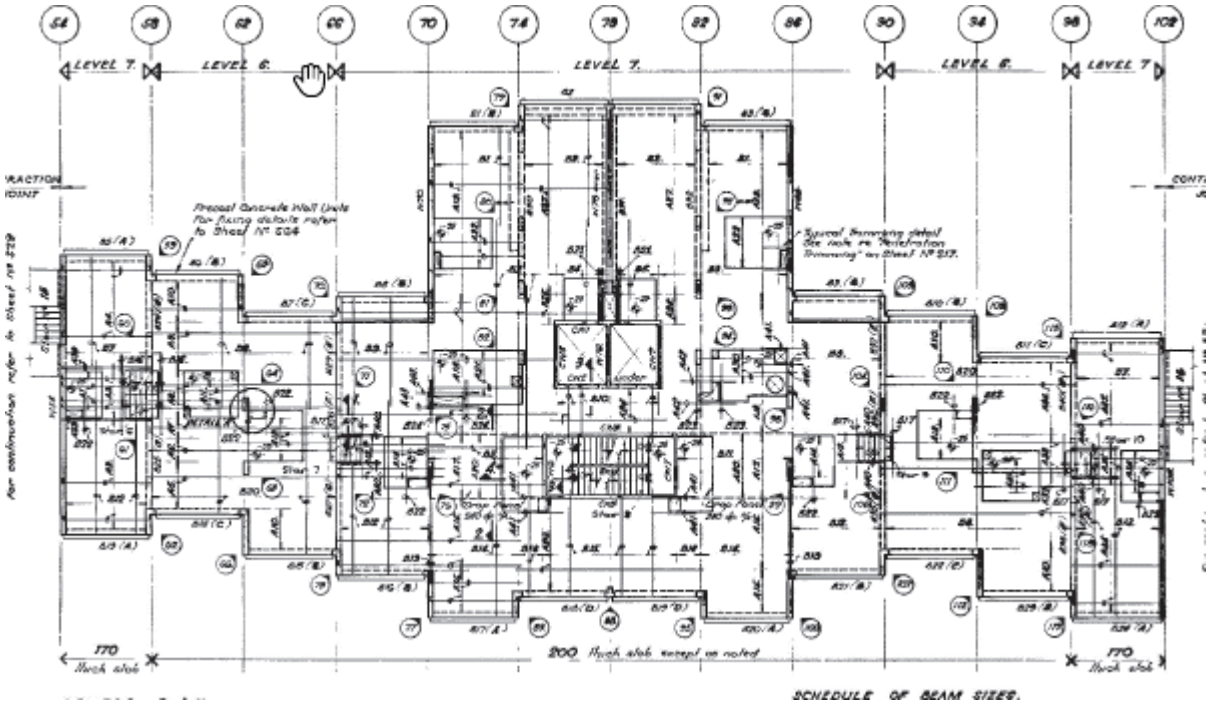


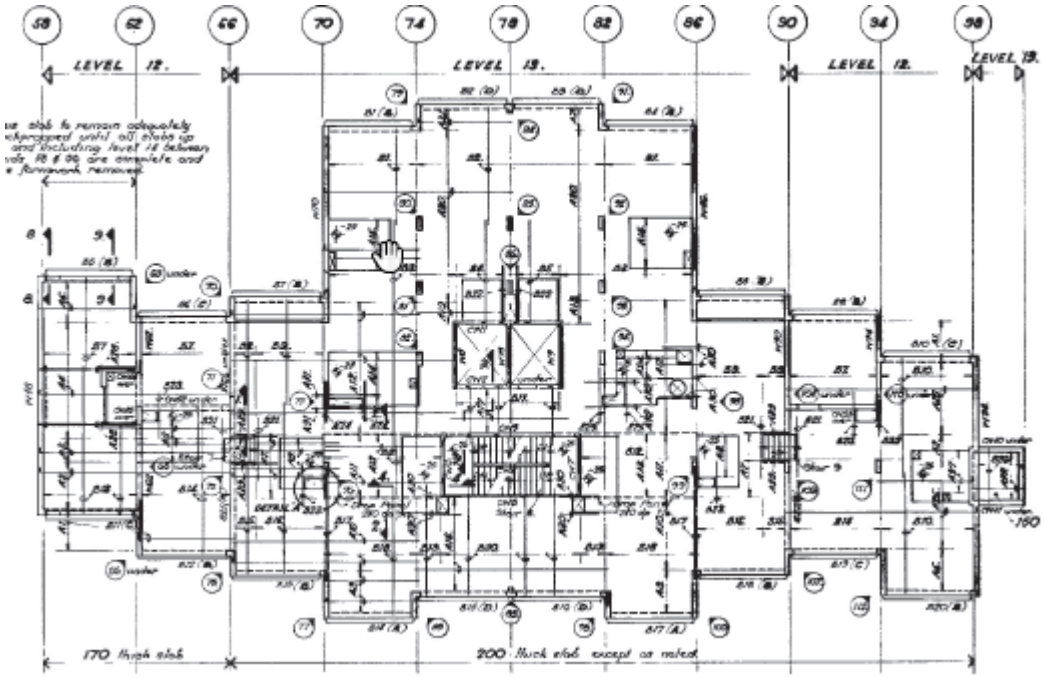
PODIUM NORTH END - FLOOR PLAN.

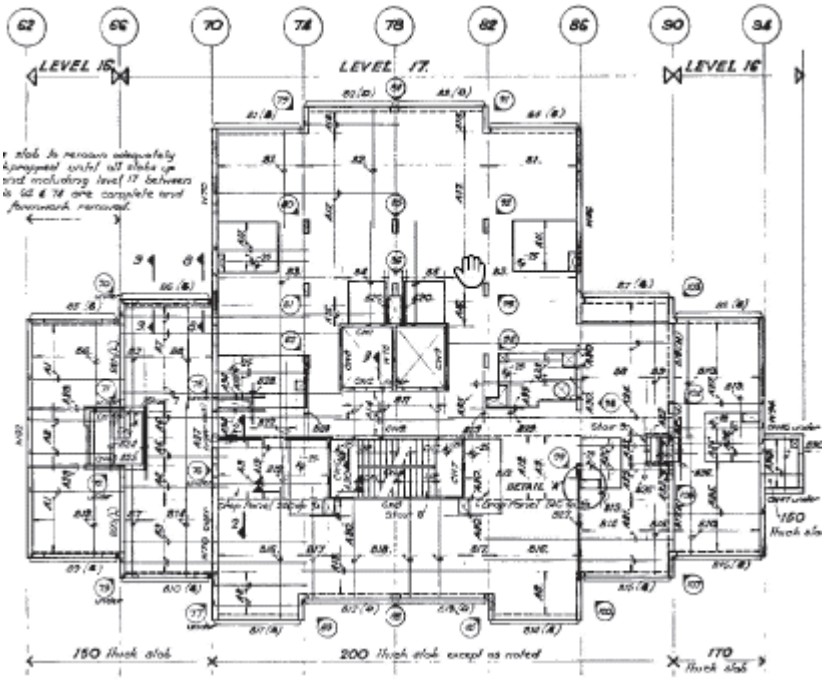
SCALE = 1:100

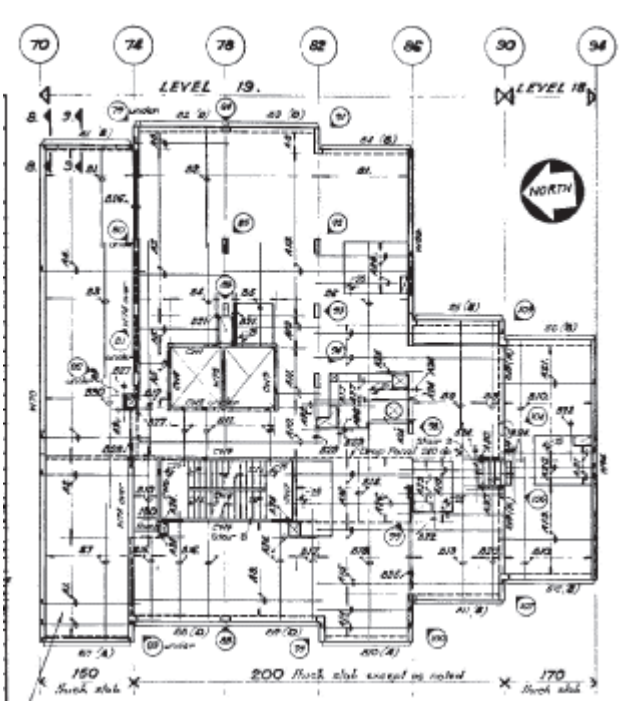
All slabs to be 150 thick - unless noted otherwise. (U.N.O.)
Prefix all slab and beam marks 'P' for level identification.

DESIGN LIVE LOADS
Interior generally - 2·0 kPa
External stairs - 4·0 kPa
External generally - 4·0 kPa

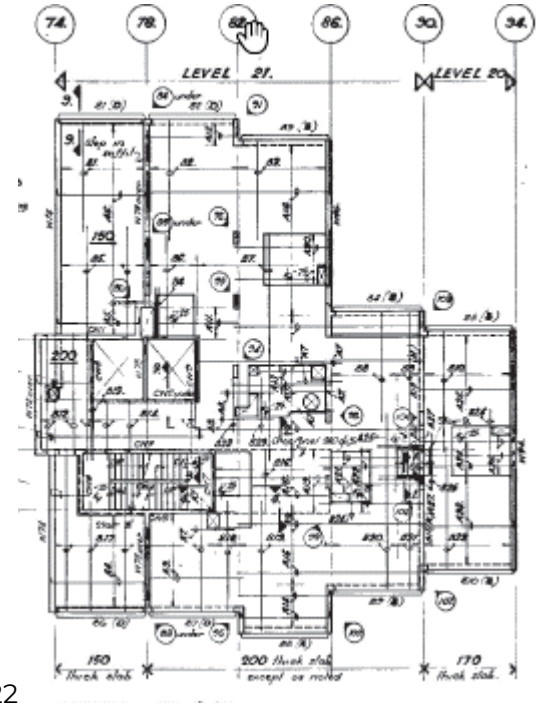

LEVEL 7.
LEVEL 6.
LEVEL 7.
LEVEL 6.
LEVEL 7.
Precast Concrete Wall Units
For fixing details refer
to Sheet N° S04
Typical Penetration detail
See note re Penetration
Trimming on Sheet N° S17.
170
thick slab
200 thick slab except as noted
170
thick slab
SCHEDULE OF BEAM SIZES

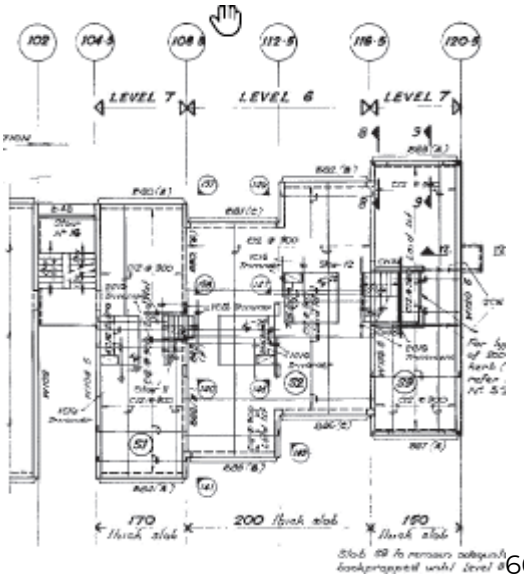

LEVEL 12.
LEVEL 13.
LEVEL 12.
LEVEL 13.
170 thick slab
200 thick slab except as noted


LEVEL 16
LEVEL 17
LEVEL 16
150 thick slab
200 thick slab except as noted
170 thick slab

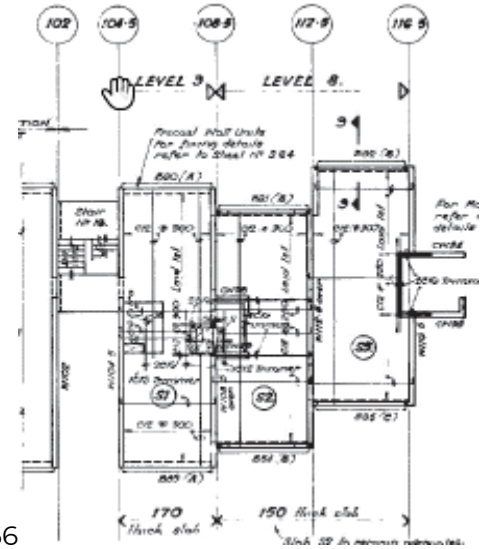

LEVEL 19
LEVEL 18
NORTH
150 thick slab
200 thick slab except as noted
170 thick slab

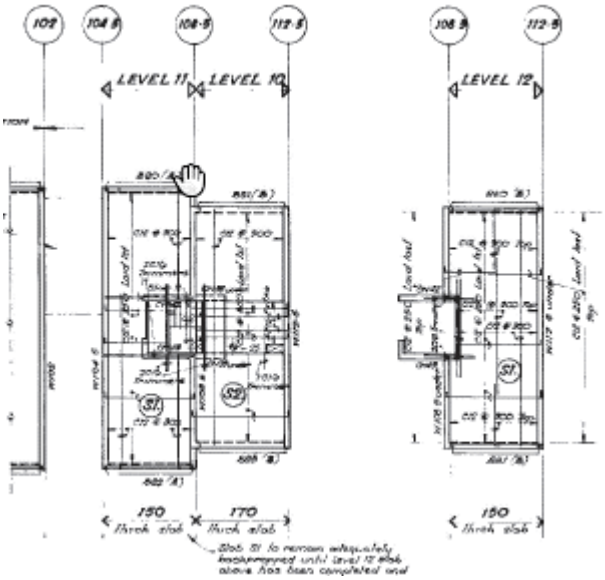
66622


LEVEL 21
LEVEL 20
150 thick slab
200 thick slab except as noted
170 thick slab



666666666

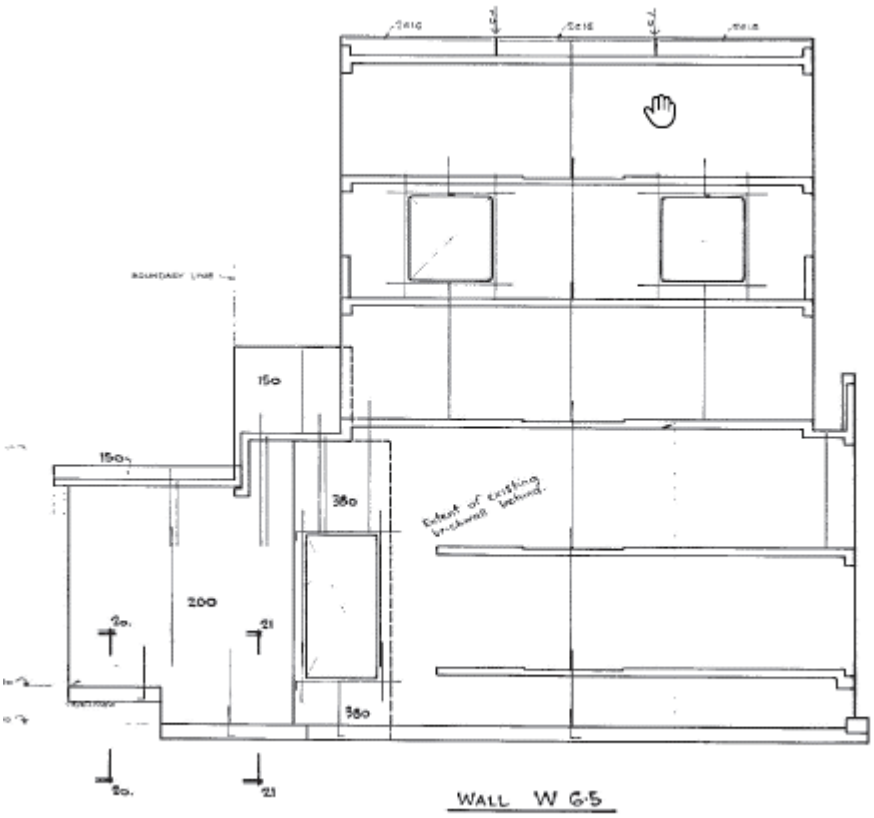




Large penetrations cannot be staggered and will require vertical alignment and / or spacing apart in order to retain the lateral integrity of the wall.

Strengthening of the wall via carbon fibre may be required and will require future structural assessment.

Openings should be limited in height to enable a door head in order to support adjacent slabs.



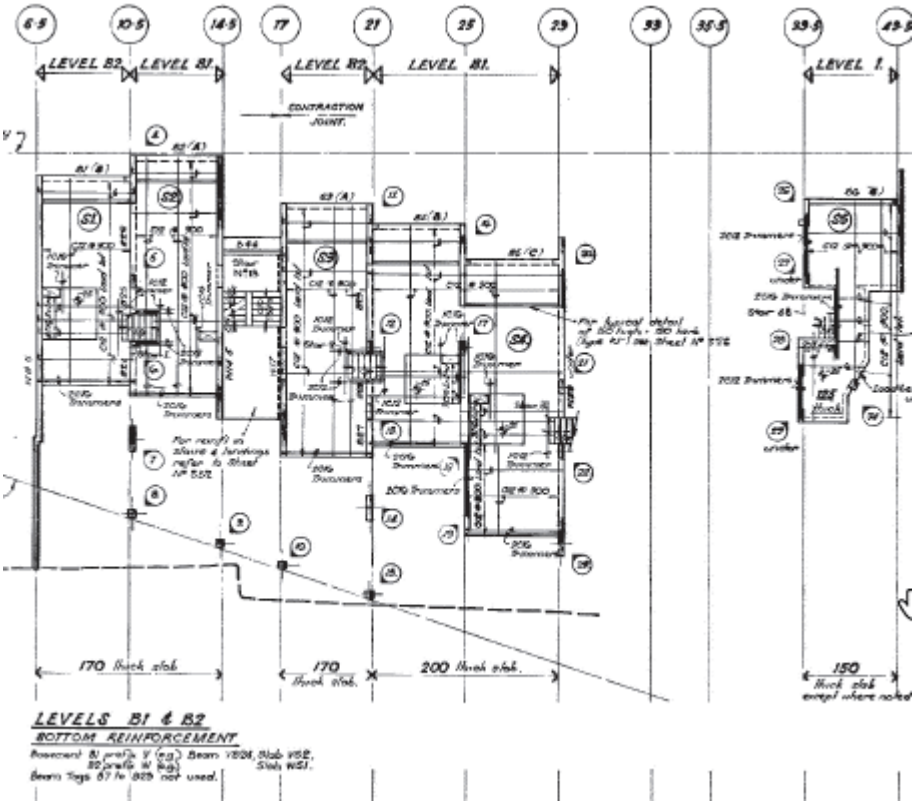
EXAMPLE OF TYPICAL NEW OPENING LOCATIONS

3.4 North Apartment Stability

The north low-rise north apartments (Grid 6.5 to 43.5) is laterally separated at B1, B2. As a result, in order to comply with AS3679 requirements in relation to earthquake load, new lateral restraint elements are required to be located between grid 6.5 to grid 29, connected to the floor structure. This could be a shear wall, bracing wall, stair or lift shaft, or combination of. Depending on the amount of proposed alterations to the north block, it may be a requirement to have the north block fully compliant with AS1170.4 (100% of the earthquake load) by the addition of at least two major structural elements. The building joint at Grid 54 will need to be maintained to keep the low- rise section laterally separated from the tower structure.

3.5 South Apartment Stability

The low- rise south apartments stability will need review subject to future proposed modifications, however the apartment block can be stabilised by installing a shear wall, bracing wall, stair or lift shaft or installing a tie member across the Grid 102-104.5 building joint and then laterally supporting the south tower to the main central tower structure.



EXAMPLE OF NEW POSSIBLE LATERAL SUPPORT ELEMENT LOCATIONS

3.6 Low Rise Apartments that can be Deleted

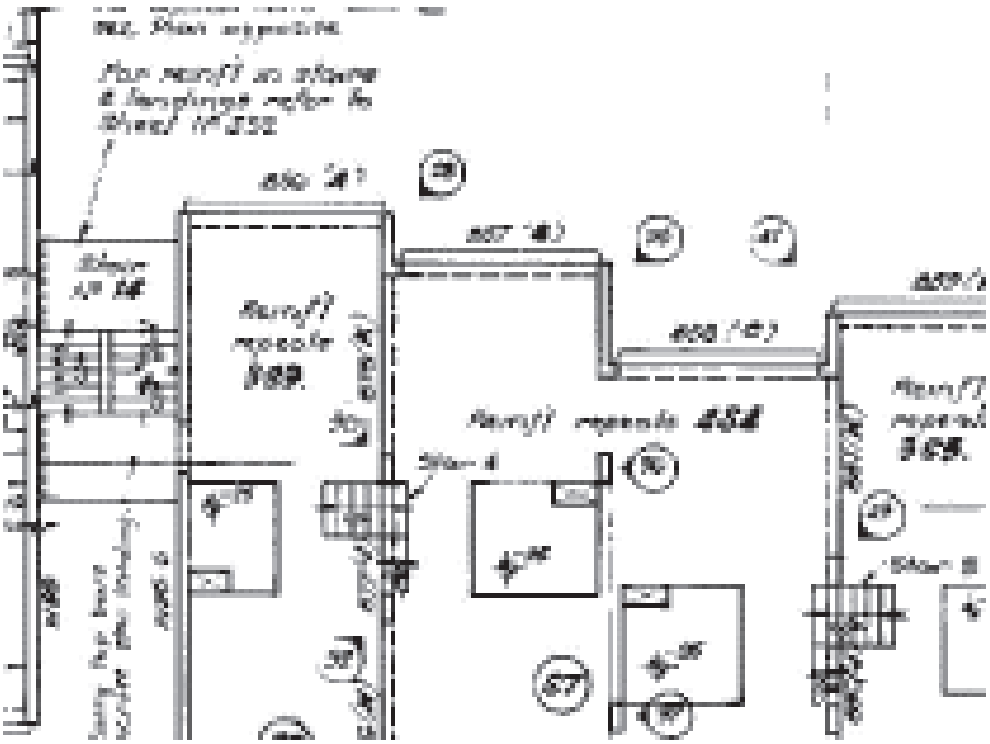
The structure in the north low-rise apartments (between Grid 6.5 to 52.5) consist of columns and walls and infill brickwork. As discussed previously the apartments can be separated or modified internally without consequence by altering the non-load bearing elements (shown in pink in Section 3.2).

In relation to possible partial demolition of the north low-rise apartments, demolition is possible between the northern block (grid 6.5) to the south in multiples of two Grid bays. If any separation of existing apartments is required, additional lateral restraint will be required.

3.7 Structural Requirement to Achieve Penetrations Adjacent to Windows

The opportunity to create double height units may require additional façade support to the remaining concrete wall. This will be dependent on the proximity of any new voids relative to the slab edge and the particular in-situ edge beam current detailing requirements. Typically, this would involve a new steel beam fixed to the adjacent existing concrete edge beam and will require fire rating and fixing to the concrete columns.

Alternatively, the existing precast façade system can be replaced with a self-spanning light weight system between load bearing grids



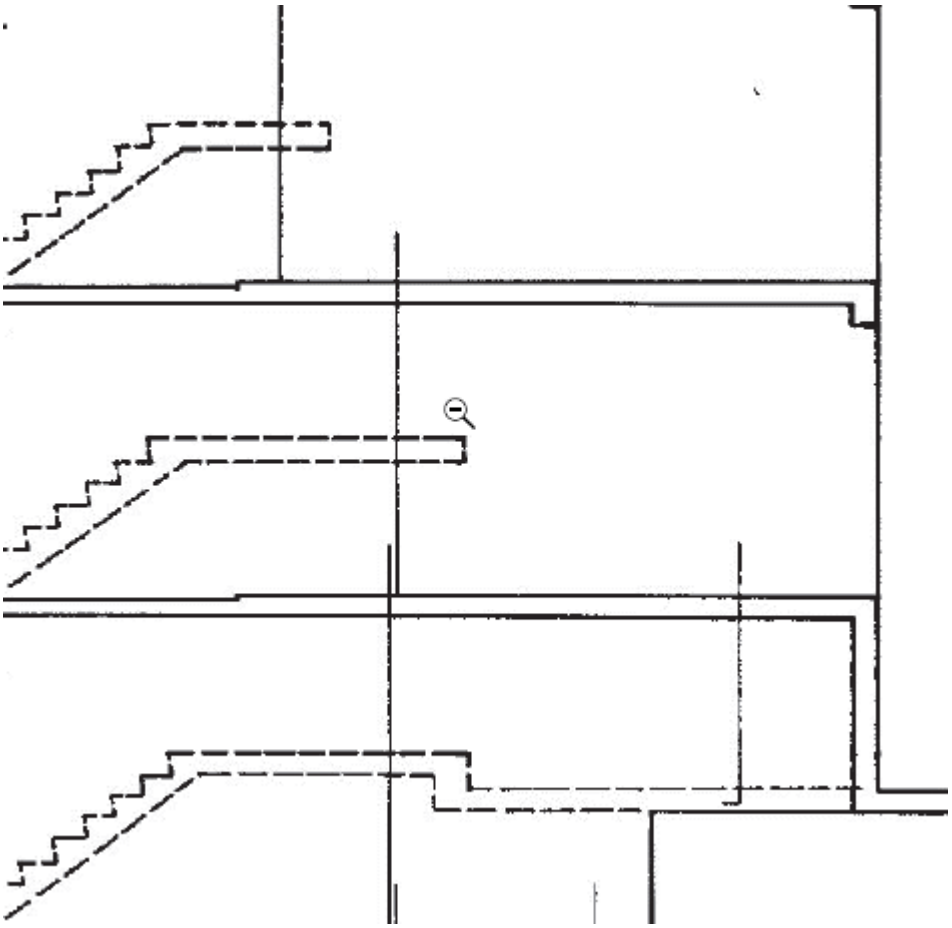
EXAMPLE OF DOUBLE HEIGHT VOID TO ADJACENT WINDOWS

3.8 Required Lintel Framing for Penetrations in Structural Walls and Non-Structural Walls

Any penetrations in non-structural walls (brickwork) where the penetration height is lower than slab over, will require an integrated lintel beam over.

Penetrations in load bearing walls may require structural steel strengthening via supplementary frame and possible use of carbon fibre strips on the internal face.

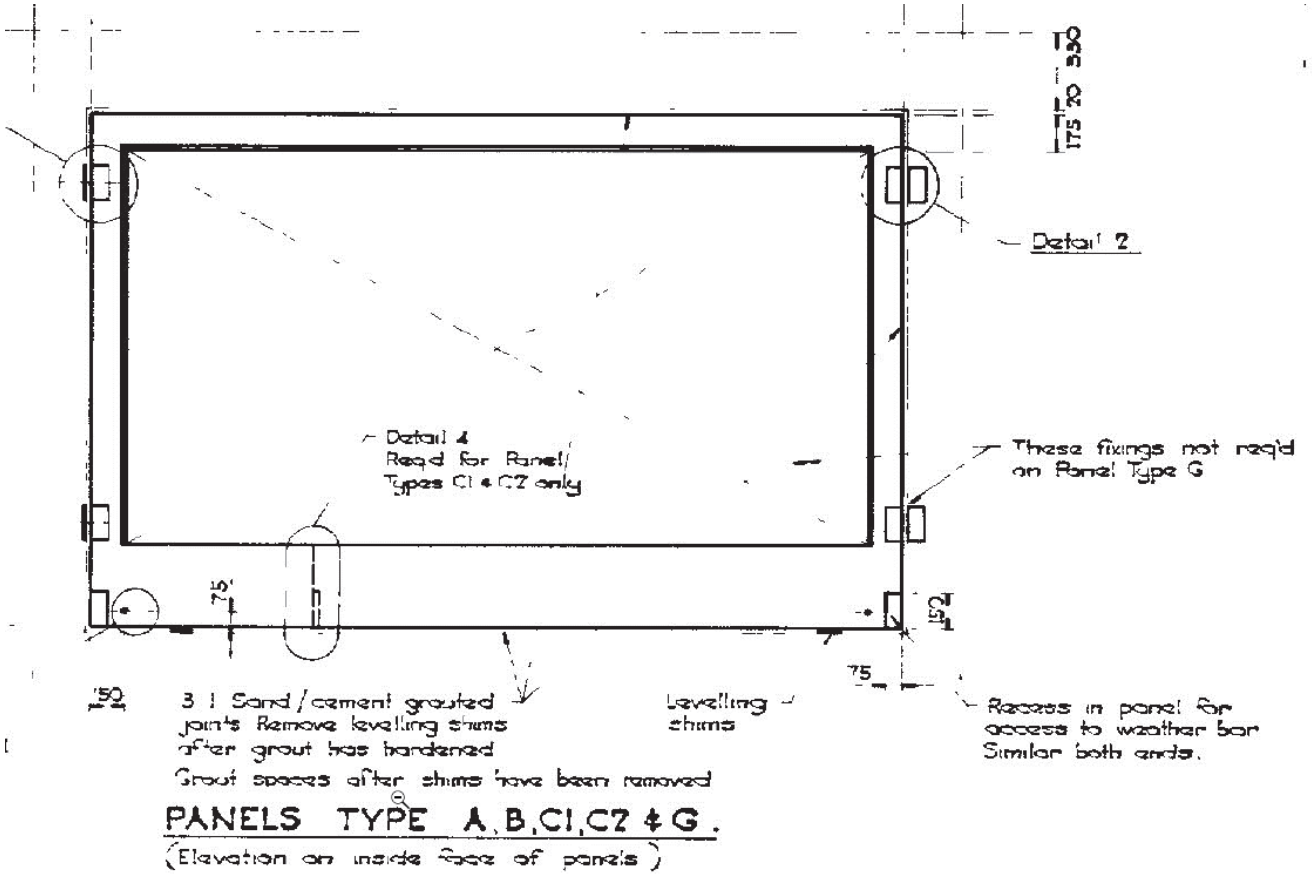
Section 3.3 describes what is required to ensure vertical load capacity.



EXAMPLE OF TYPICAL DOOR FRAME STRENGTHENING AT NEW PENETRATIONS IN WALLS

3.8 Required Details for Possible Balcony Option

The existing face is a precast wall unit that is installed to the slab edges. The precast has a lower lip which clips onto the slab edge beam. These edge beams are typically 370mm deep recessed from the top of the wall panel.

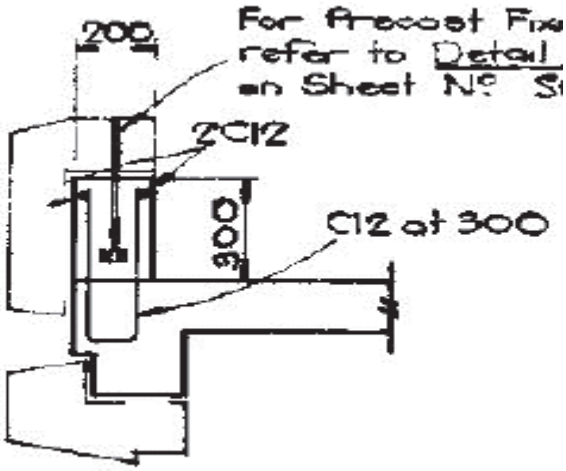


TYPICAL PRECAST PANEL ELEVATION

Balcony additions would require extension of the existing slab by the following means:

1. Modifying the existing precast to expose the slab edge.
2. Exposing the top reinforcement in the slab.
3. Welding new reinforcement to the existing reo.
4. Pouring balcony slab.
5. Install steel strengthening beams under as shown.

As a result of the light reinforcement in the existing slab, we envisage that using a lightweight balustrade, the resulting new balcony cantilever will be in the order of 1.5m.

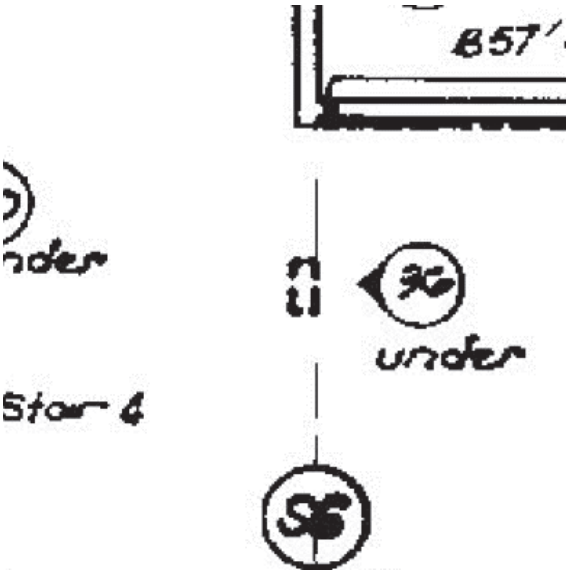


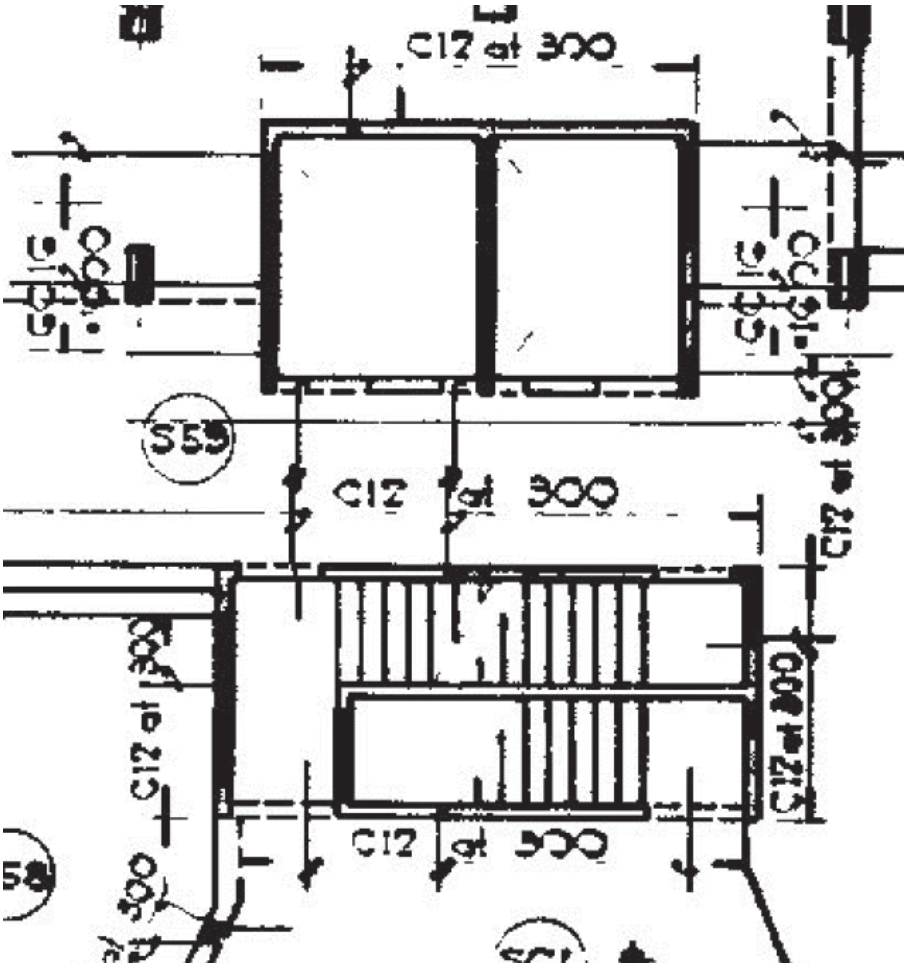
3.9 Potential Floor Penetration Arrangement

The existing slabs are lightly reinforced and future penetration requirements will be particular to location and proximity, and the availability for local strengthening.

In general:

- Minor penetrations can occur subject to not clashing with reo bars away from existing support lines of slabs.
- No penetrations in beams.
- Some minor penetrations can occur around the lift and stair core.
- Multiple penetrations around existing columns should be avoided and should be limited to a single 100dia penetrations each side of the column as a guide at this stage.
- Large box cut penetrations will need to be at least 600 away from the columns and can include the installation of 200 deep beams under.


B57
under
Stair 4
S6


C12 at 300
S59
C12 at 300
C12 at 300
C12 at 300
C12 at 300

3.10 Apartment Columns

There are numerous columns sizes within the existing structure, varying from 300x300 to 3530 x 230 in size.

At this stage, it is envisaged that columns are structurally adequate to support the current structure. We note however, that in general (with the low concrete strength specified), the blade columns in the tower may be prone to fail under the current fire requirements of AS3600-2018 for columns with an aspect ratio less than 4:1. That is, columns less than 920 x 230 or 1000 x 250 in size.

As a result, tower blade columns may need to be increased in size to comply with AS 3600-2018 fire rating requirements by the addition of concrete to one side (e.g. increasing 600 x 230 to 920 x 230). This should be allowed for within the re-planned apartment layouts.

A full audit of required column upgrade requirements will need to be reviewed as part of the final structural upgrade design process based on final load and required FRL and columns size.

4 Summary

The existing Sirius building is over 40 years old and is of sound structural condition, although the external facades and other external structural elements have shown signs of durability degradation. A full phase 2 part 1 audit of the structure is required in order to determine the extent of degradation and to specify the required works in order to increase the life of the structure for a further 50+ years as per NCC requirements.

The sound condition of the structure and the current structural layout indicates there is some flexibility with structural modifications such as penetrations in slabs and walls.

Columns and lift cores will require upgrade to current code requirements by additional strengthening and enlarging, in order to satisfy strength and fire requirements.

The north low-rise apartments are required to remain separated from the tower structure and will require up to at least two new lateral support structures depending on the level of modifications.

The central tower is structurally adequate laterally and vertically apart from some minor lift shaft strengthening required

The south low-rise apartments will need a lateral element in the north south direction or tied to the central tower for lateral stability.

The report details the above and other structural considerations for future architectural planning of the Sirius building redevelopment.

Appendix E SCP Report – Additional Tower Structure Allowance

Report

DATE 27/11/2019

TO Dedico Development Services

ATTN Mr John Green

RE Sirius Re-Development Additional Tower Structure Allowance

We refer to the above and your request for SCP Consulting to describe the process and requirements to accommodate additional floor structure to be placed on the central tower portion of the Sirius project.

The central tower portion occupies Grid 52.5 to 103.5 and is supported vertically via columns and walls, and laterally supported by a combined stair and lift core structure.

The structure of the tower is founded at the basement level.

Structural Design Loads.

The structural would have been designed in accordance with Ordinance 70 and not current AS loading codes. Typically for re-developed existing buildings, the existing structure is required to comply with current Australian Standards for vertical loads and wind loads. Earthquake load resistance can be reviewed using AS3826-1998- Strengthening of Existing Buildings for Earthquake.

The following are comments in relation with current Australian Standards after reviewing the structural (excepting) documentation.

Vertical Loads

The drawings show floor design loads and these are generally accordance (or exceed) with AS 1170.1-2002 Structural Design Actions. The apartments have been designed for 2.0 kPa. Current AS 1170.1-2002 requirement is 1.5 kPa.

Existing lobbies and corridors have been designed for 3.0 kPa. Current AS 1170.1-2002 requirements is 4.0 kPa. The corridors of the existing structure should be able to be justified to the current AS 1170.1-2002 load requirements based on the small areas in question.

We note, however the design load for the exterior podium load is 4.0 kPa, and this is in accordance with AS 1170.1-2002 for public areas not subject to wheeled vehicles. We note that future construction loads on the podium will require back propping to basement level for typical scaffold, and service vehicle loads.

Generally, the vertical load capacity of the existing columns and walls will need to be re-assessed with any new additions, but based on the Option 1 EQ requirements below, the deletion of mass would not alter the column loads to any great effect. If however Option 2 is taken forward, there typically would be a increase in load in the tower columns and strengthening may be required.

Wind Loads

The tower structure is comprised of a vertical core structure (lift and stair box) and concrete end walls at Grid 54, 70, 86 and 102 the critical wind direction for the core is the West Wind. The low rise sections are concrete frames consisting of slabs and columns/walls with the walls orientated in the east west direction.

The structure appears stable under AS1170.2 loading based on TC2 and Region A parameters (typical of Sydney Harbour).

SCP has undertaken a detailed analysis of the tower structure to ensure AS1170.2 Wind load compliance. A parametric wind study may also be required to determine reduced actual wind loads if required, along with environmental wind effects.

We note that SCP will need to undertake detailed stress analysis of all members under wind load as part of the final design stage.

As the “end walls of the tower terminate at podium, their strength contribution will need to be determined, considering the stair box and lift core structure is continuous to footing level. This will be part of the 3D structural wind analysis, to be undertaken at the final design stage.

Typically though, the heavy nature of the central tower typically indicates that wind loads do not generally govern. This will need confirmation after the wind report is reviewed by SCP.

Earthquake Loads

At the time of design, Ordinance 70 did not require the building to be designed for Earthquake Forces.

AS 3826-1998 requires the building to comply with 33% of the current specified earthquake load as defined by AS 1170.4-2007, based on no significant structural alterations being undertaken as part of the proposed redevelopment.

For the Sirius redevelopment, this requirement is for all separate buildings above podium and the overall structure of the podium and below.

We note the structural joints at grid 52.5 and 103.5 define the Central Tower.

A full static earthquake analysis was conducted for the main tower structure with the combined lift and stair core and shear walls providing lateral resistance. As required by AS3826-1998, the required threshold load of 33%-one third (type 2 structure) of the earthquake load as specified in AS1170.4-2007 was applied to the tower.

The model results show the bending moments acting on the lift core due to earthquake was 6187kNm in the North-South direction and 5974kNm in the East-West direction. The earthquake bending moment acting on the stair core was 9310kNm in the North-South direction and 5936kNm in the East-West direction. The stability of the lift core and stair core were checked based on the model results. It shows that instability failure of the cores would not occur under current earthquake loads and hence the existing structure can comply with AS3826-1998, on the basis that the back fill to the lift pit walls is concrete engaging the rock cohesive strength to the east and west walls only.

This modelling was based on 100% of all lateral earthquake threshold load being taken by the cores and the basement shear walls, and ignores other lateral elements (walls, columns and frame action) for conservativeness. Ultimate core stresses were 7 MPa compression and 2.8 MPa Tension. These stresses appear to be satisfied by the current documented concrete and reinforcing in the Bond James Larson drawings.

We note that the lift core is understrength in terms of reinforcing installed based on the engineering drawings at the lift door locations. SCP propose to strengthen this localised area with Carbon fibre wall reinforcing applied to the shaft wall from the lift pit level to Level 3.

In short, the current Tower structure can satisfy the required Earthquake Threshold load with a minor addition of internal Carbon Fibre core wall reinforcement.

Tower A Discussion

There are principally two options for additions to the refurbished tower structure-

Option 1- Work with existing core Structure.

In order to maintain the existing structure without adding additional core structure, the critical criteria for the tower additions will relate to AS3826-1996 requirements.

AS3826-1996 stipulates that an existing structure is required to only satisfy 33% of the current specified earthquake load as defined by AS 1170.4-2007, based on no significant alterations (only minor additions allowed) as described below:

For the particular case of adding to an existing building, which will increase its earthquake response, the authority may apply special criteria. New construction will be required to conform to the Building Code of Australia, and this will include the full earthquake loads given in AS 1170.4. For minor additions, the increase in risk to the building's occupants may also be minor, and the authority may accept that an overall accumulation of loads, based on full earthquake loads for the additions and threshold loads for the existing building, will be adequate in assessing the capacity of the building. For significant additions however, it is desirable, and the authority may require, that a higher capacity for the existing building is appropriate. Whichever option is applied, all earthquake design loads from the addition should be transferred through the existing building's structure to the existing foundations. Notwithstanding the above, the relevant authority may apply more stringent design load criteria.

In short, the central tower structure only just complies with the AS3826-1996 33% threshold load requirement. In order to satisfy the above effectively, the aim is not to change the seismic mass of the building**. On this basis, adding new structure to the tower can be achieved by removing mass elsewhere in the tower**

As a general rule, additions to the tower structure can be undertaken at the top level without adding additional lateral strengthening by adhering to the following guidelines:

- Additional mass to the tower to be compensated by deletion of mass (e.g. reduction in existing brick walls etc)
- If reduction of mass at floor level is made, then addition at floor level can be made for the same mass.
- If reduction of mass throughout the height of the tower is made, then additional mass to the top of the tower can be made to approx. 50% to 65% of the total mass reduction. For example, if 100T of masonry is removed from the tower building evenly over the height of

the building, then 50 to 60T of new structure can be added at the top without increasing the forces on the core structure.

Obviously, using light weight additions to the top of the tower would deem the least requirements in terms of weight reduction or allow the most number additional boxes to be placed on the top of the tower.

Conversely, solid additions would require the most amount of weight reduction or allow the least number of additional boxes

Option 2- Add additional core Structure

If the proposed design is to add beyond the scope of Option 1, then the Earthquake dispensation granted under AS3826-1996 is not applicable.

In this case, the tower structure will need to be designed for the full earthquake force requirement under AS1170.4 , that is 100% required earthquake force.

In this case, it is envisaged that a new core structure would be required and or strengthening to the existing core would be required.

The new core would be required as per normal building structures with a core base and permanent rock anchors.

Alternatively, it may be possible to strengthen the existing core with structural jacketing around the existing core perimeter. This is a significant exercise and will also require footing extension and rock anchors in the base of the core jacketing.

The size of any new core structure or strengthening requirements of the existing core is a function of the height and mass growth of the central tower.'

Based on say an additional 5 levels being added, a new core option and strengthening option could be as below.

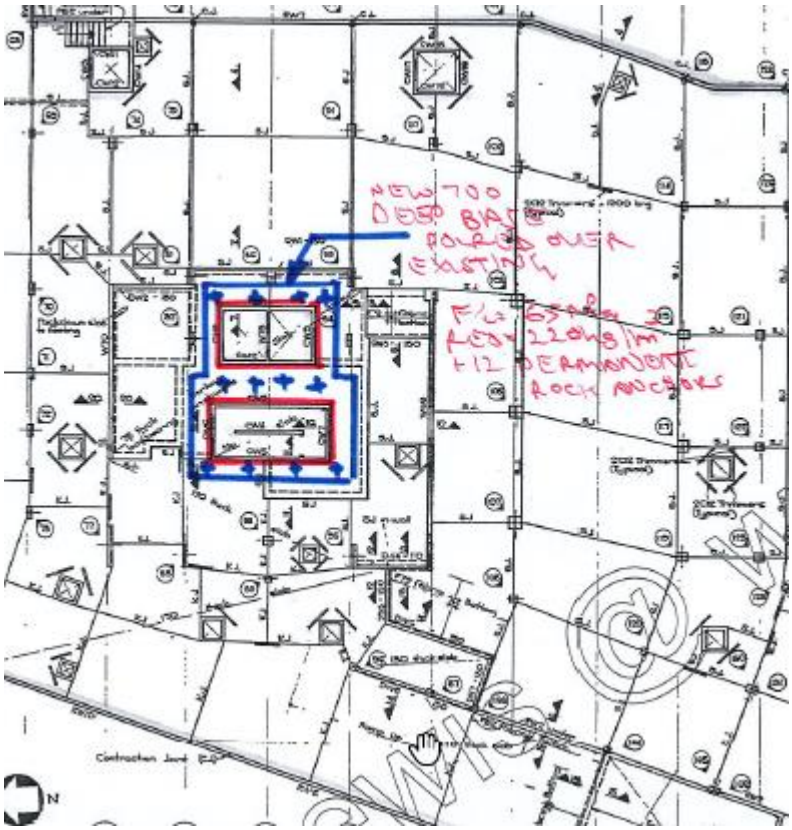
Option 1 – New core.

This would typically be a new core of say up to 6mx3m in size, walls 250 thick average from basement to say new roof level. Reo would be 200kg/m3 average and 40MPa average. Allow for a 8mx5x base at 800 thick. 50MPa and Reo=200kg/m3 with 10 to 12 rock anchors.

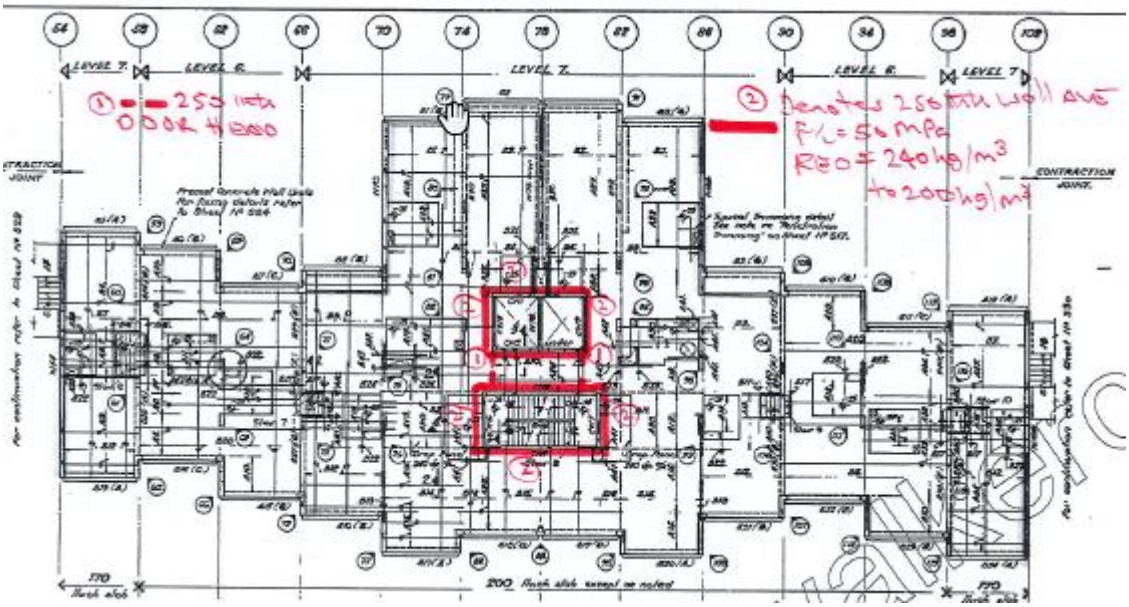
Option 2- Existing core strengthening.

This option would need exploration but would involve pouring around the existing walls with a concrete jacket (say 250mm average) and pouring a strip core base outside the existing walls and installing say 10 to 12 rock anchors around the perimeter.

The height of the jacket would be to the new roof level without extending the existing walls. Header beams may need to be provided between cores.



Footing concept- poured under jacket and around existing walls



Proposed Jacket extent.

Yours faithfully
SCP Consulting Pty Ltd

Paul Siewert
Director

Appendix F SCP Report – Concrete Investigation Scope

Brief

DATE 10/12/2019
TO Dedico Development Services
ATTN Mr John Green
RE Sirius Building – Concrete Investigation Scope

Dear John

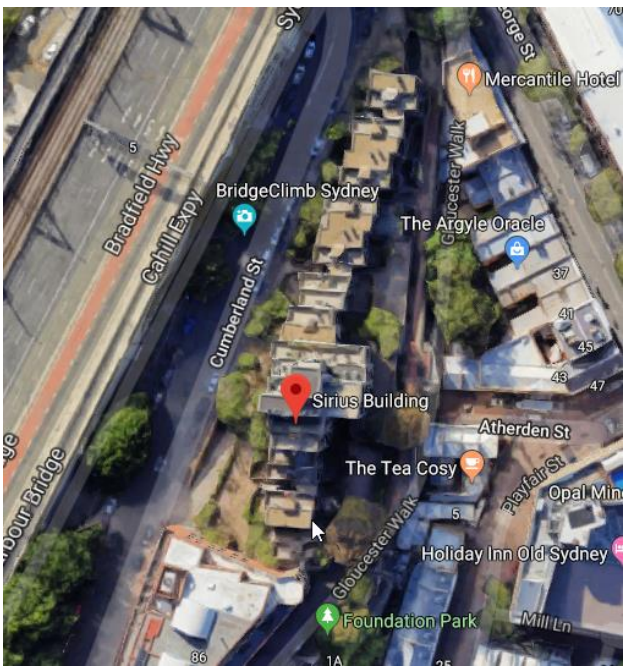
We refer to the above project and your request for SCP Consulting to provide a concrete investigation scope brief for the project, based on the proposed redevelopment.

1 Introduction

Sirius Developments Pty Ltd has requested SCP Consulting to investigate the opportunity to redevelop the existing Sirius building, with a view of additional levels, alterations to façade and along with general structural alterations internally and externally.

The resultant redevelopment works will require the existing concrete to provide adequate durability for a future 40-60 years.

As a result, an understanding of future ongoing durability requirements of the concrete structure is required to both ascertain the strength and fire rating of the concrete structure as presented along with the understanding of the current condition of the concrete in terms of future life and treatments or coatings required.



2 Structural Description

SCP are in possession of the existing structural drawings for the project. These drawings are included in Appendix D–Exisiting Plans of Competition Brief. SCP has undertaken site inspections of the Sirius Building.

The structure appears to have been designed in 1977 and constructed shortly after. The structure is in good condition internally with no obvious signs of internal degradation. We note there are visual instances of external concrete degradation which will require assessment, analysis and remediation to extend the life of all external concrete elements for a further 40 – 60 years, based on current and future exposure conditions.

The structure is of conventional concrete reinforced construction involving columns, beams and slabs. Loadings are presented on the drawings in addition to reinforcement and concrete strengths.

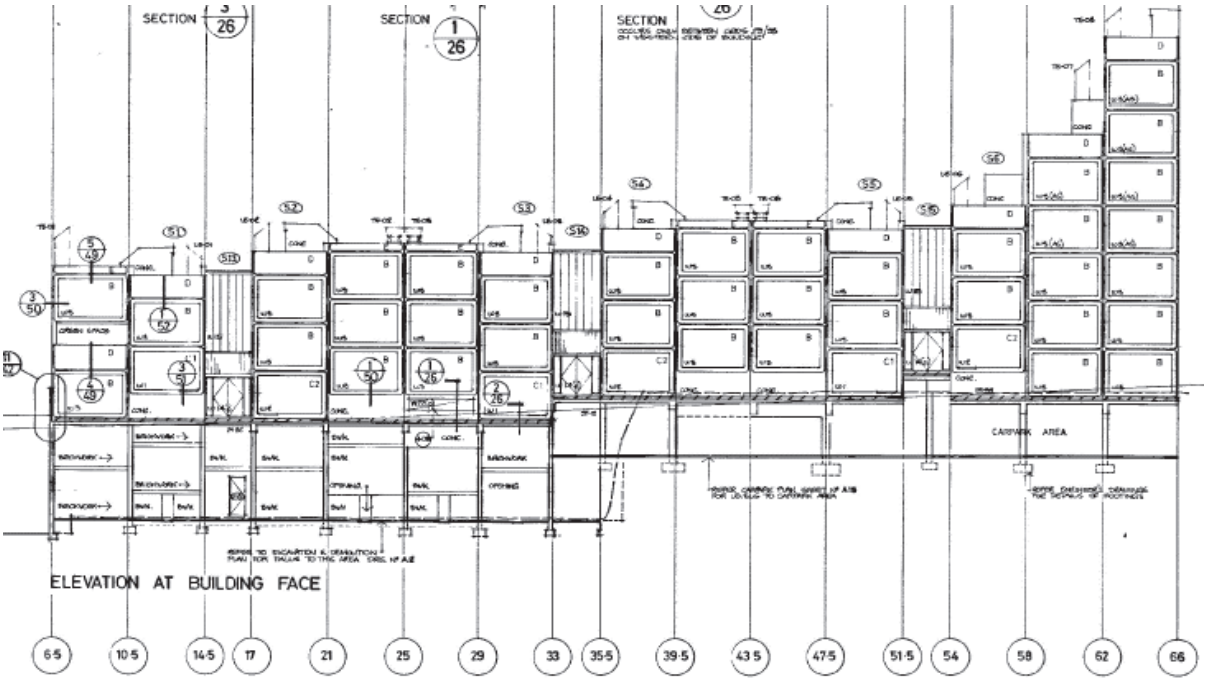
The building is laterally and vertically supported by concrete cores. Floor slabs either span between concrete beams or act as two-way flat plates supported on columns founded by pad footings onto rock.

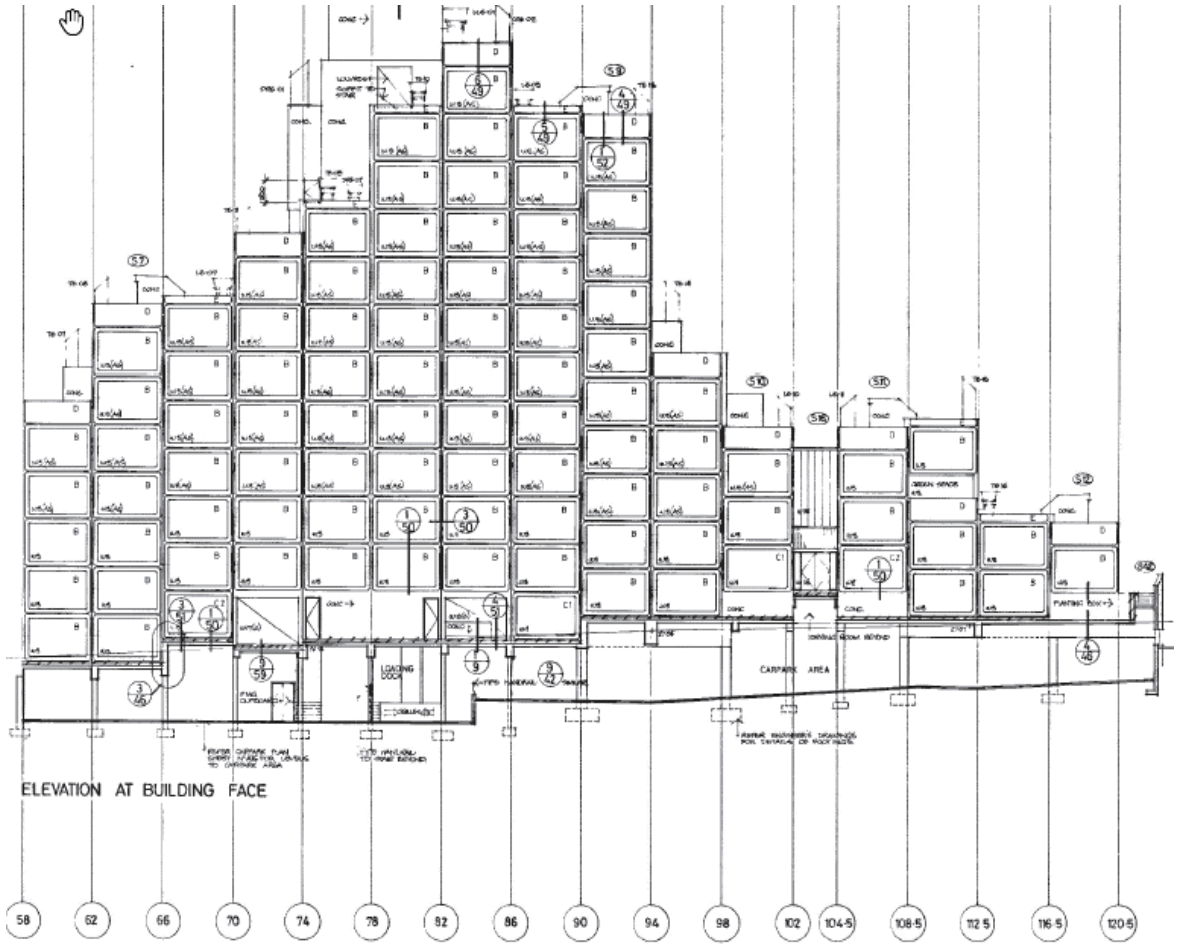
The building would have been designed in accordance with Ordinance 70 and other specific design information at the time.

The building comprises of three sections, which are defined by the following building joints:

- North Low Rise Grid 6.5 to 52.5
- Central Tower Grid 52.5 to 103.5
- South Low Rise Grid 103.5 to 124.5

It is anticipated that the building is to be architecturally modified and this will involve alterations to the structural fabric. As part of the modification works, structural required upgrades to support current statutory loads is envisaged in combination with fire upgrade requirements.





3 Concrete properties.

Existing drawings show the specification for the concrete on the project to be 20-25MPa grade with the following covers.

CONCRETE

C1 Concrete quality:

Element	Slump	Max. Size Aggregate	Cement AS1480 Type	F'c MPa	Admixture
Generally	80	20	A	As noted on drawings	Nil
Meshed Columns	80	10			

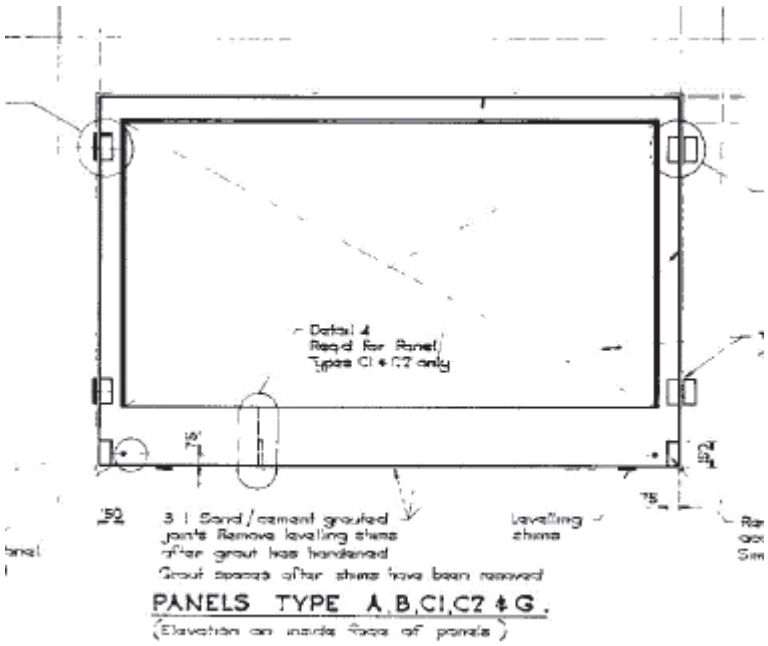
All cement to be in accord with Association of Consulting Structural Engrs specification.

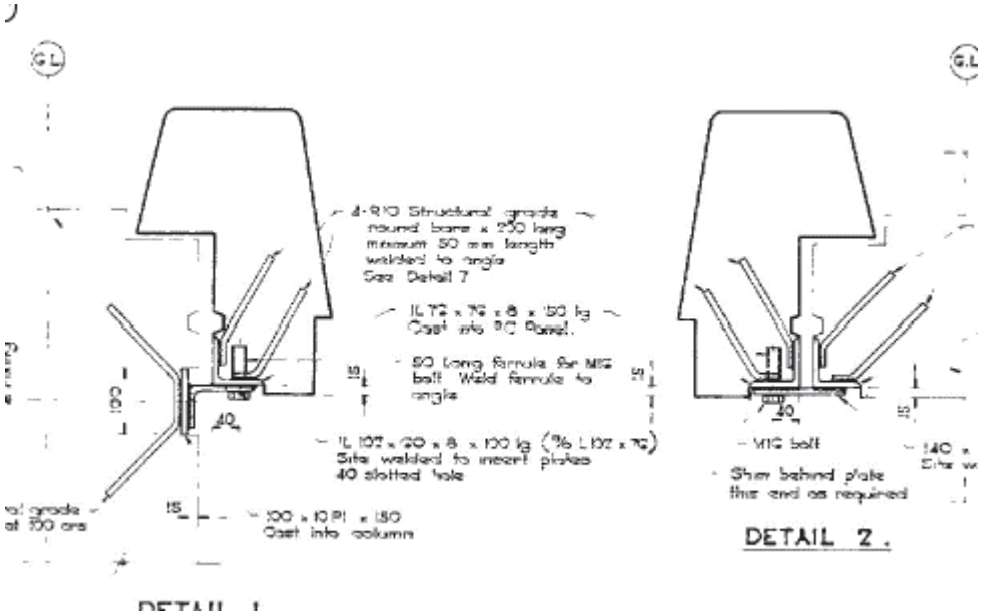
C2 Clear concrete cover to reinforcement (outside of stirrups and ties) shall be follows unless noted otherwise.

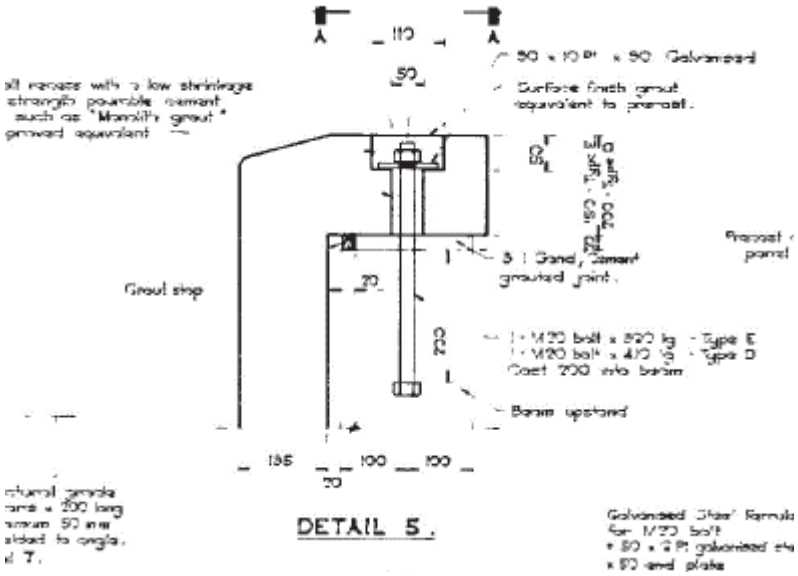
Element	Formed and Sheltered mm	Formed and Exposed mm	Not Formed mm
Slabs	20	30*	65
Beams	25	40	65
Walls	20	30	65
Columns and Pedestals	40	50	75
Footings		40	65

Bored Piers are recorded to be 15MPa. There are columns in the documents specified at 30MPa.

Precast Panels window units typically frame windows. These units as documented are specified at 30MPa and are fixed to slab edge beams using a bolted cleat arrangement.







3 Required Non -destructive Concrete Investigation Items

SCP require a full audit of the concrete structure to both determine the strength of the existing members, their fire rating and the require remediation to ensure a future life span of 40-60 years.

1. Comments on the durability and future life of the Bored pier and pad foundations based on all elements not exposed and bearing on rock. It is no envisaged that there is any ground water, only minor seepage water typical with a high set site.
2. Verify the in-situ concrete strength of the following items
    a) Basement slab on grade
    b) Basement retaining walls
    c) Basement columns
    d) Basement core walls (all exposed walls)
    e) All visible columns above the basement level
    f) All suspended concrete slab for all levels for the north , central and south tower
    g) All concrete walls above the ground level including both internal and external walls
    h) Core walls above the ground level
    i) Roof slab

3. Provide cover reports for all column and wall elements. This along with Item 2 will allow SCP to report on fire rating of existing elements.

4. Verify all vertical and horizontal reo in the lift and stair shaft advising of bar size and spacing at basement level, ground level podium level and at every third level above the podium.

5. Provide sample bottom reo cover readings to all suspended slabs at random locations to test construction compliance with the original drawings.

6. Provide reo cover at any drip grooves that are visible.

7. Identify the future service life of all exposed external and internal in-situ structural concrete based on the current degree of ingress of chlorides, carbonation, sulphate etc. This shall also include all exposed basement concrete. This shall include cover to all reo bars and projected rate of future ingress.

8. Identify areas of cover reduction and areas of concrete spalling throughout the full height of the building. Advise on rectification. This includes underside of all balconies etc. Rectification methodology to be sympathetic to the existing concrete finishes and will require durability for a future 40-60 years

9. Advise on any areas of Alkali Aggregate Reaction and provide rectification advice. Rectification methodology to be sympathetic to the existing concrete finishes and will require durability for a future 40-60 years

10. Provide comment on the method of external cleaning the structure and the application of a coating system to arrest further ingress of chloride, sulphate etc. as required to ensure a future 40-60 service life if applicable as an alternative if applicable to arrest and halt

11. Comment on the future service life of the basement slab on grade based on car park abrasion rates. Advise of any sealers/ toppings etc. if required.

12. Identify degradation in all basement elements from water ingress and provide rectification advice.

13. For all retained pre-cast (to be identified), inspect to understand the future service life using the above requirement/items. This is to include connection life of the precast connection to the super structure. Identify any spalling and provide rectification details as required to achieve durability for 40-60 years. Identify any connection degradation and advise on remedial measures accordingly.

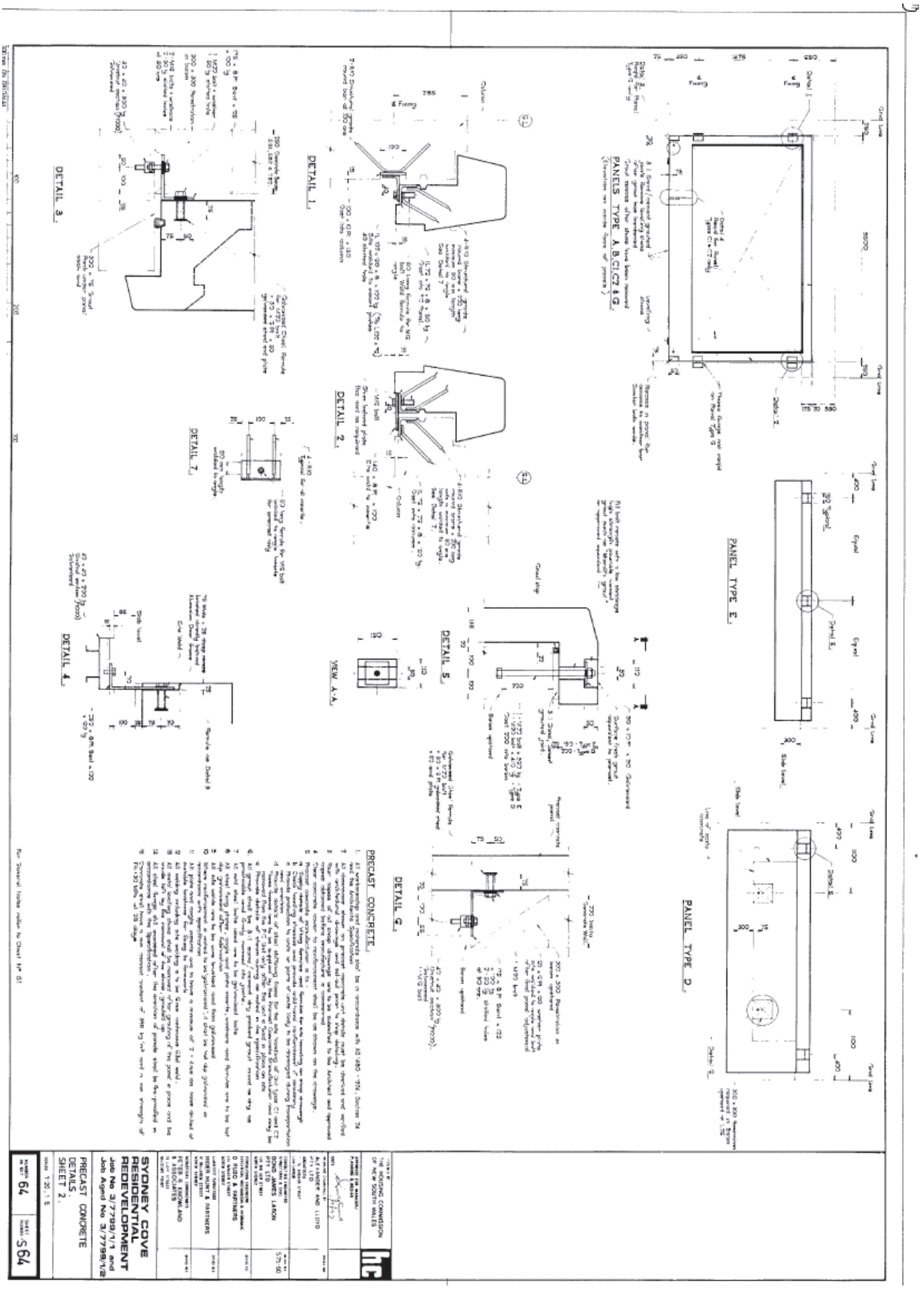
14. Any other item pertinent to the redevelopment and critical to concrete durability for the next 40-60 years that is not mentioned above.

4 Required Destructive Concrete Investigation Items

1. Undertake test core sampling of pad footings to determine Pad footing concrete strength. This shall be undertaken for at numerous locations under the tower. Core sampling to be at the top edge of the existing pad footing. SCP will highlight the most highly loaded columns where testing is to occur based on the requirement for the concrete in the pad footings to be greater than the F'c=20MPa as stated on the structural drawings.
2. Undertake test core dept of slab on grade to determine the structural depth and sub-base composition at locations to be provided by SCP based on future heavy vehicle movement locations.
3. Test core (if required the lift and stair shaft walls) based on the future requirement for SCP to have a concrete strength of greater than 25Mpa, should the non-destructive test provide a too -conservative reading
4. Provide a proposal to inspect the precast fixing points and removal of pre-cast concrete as required to inspect the current condition and future life of the precast fixing cleats. This is dependant on the residual precast to be left on the project subject to the proposed refurbishment design. See attached
5. Any other core holing or drilling or coring required to satisfy the project requirements and or where the results of items listed in Section 3 are non- conclusive or require further investigation.

Yours faithfully
SCP Consulting Pty Ltd

Paul Siewert
Director


PANELS TYPE A, B, C1, C2 & G
PANEL TYPE E
PANEL TYPE D
DETAIL 1
DETAIL 2
DETAIL 3
DETAIL 4
DETAIL 5
DETAIL 6
DETAIL 7
VIEW A-A
PRECAST CONCRETE
SYDNEY COVE RESIDENTIAL REDEVELOPMENT
Job No 3/7799/1/1 and Job No 3/7799/1/2
PRECAST CONCRETE DETAILS SHEET 2.
S64

Appendix G SCP Report – Precast Investigation

Report

Precast Panel Investigation

DATE	29/05/2020
TO	Dedico Development Services
ATTN	Mr Aldo Donato
PROJECT	Sirius Redevelopment

Dear Aldo

We refer to the above project and your request for SCP Consulting to comment on the procedure to investigate the condition of the precast panel connections.

The project consists of two types of precast panels. These are “window frame” panels and “curtain” panels as below:

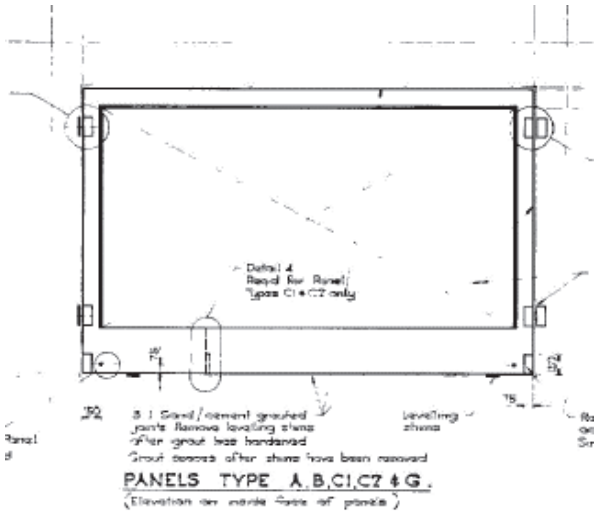


Figure 1 - Window Panels

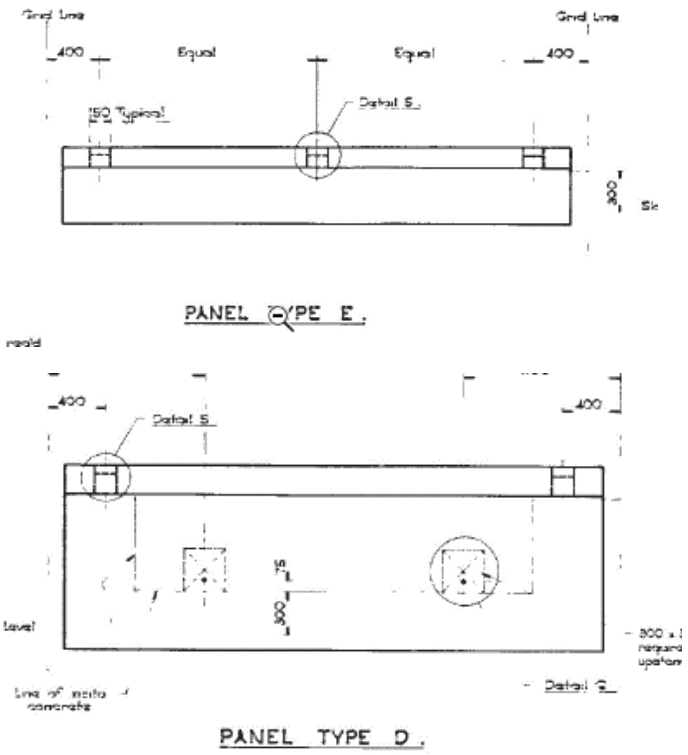
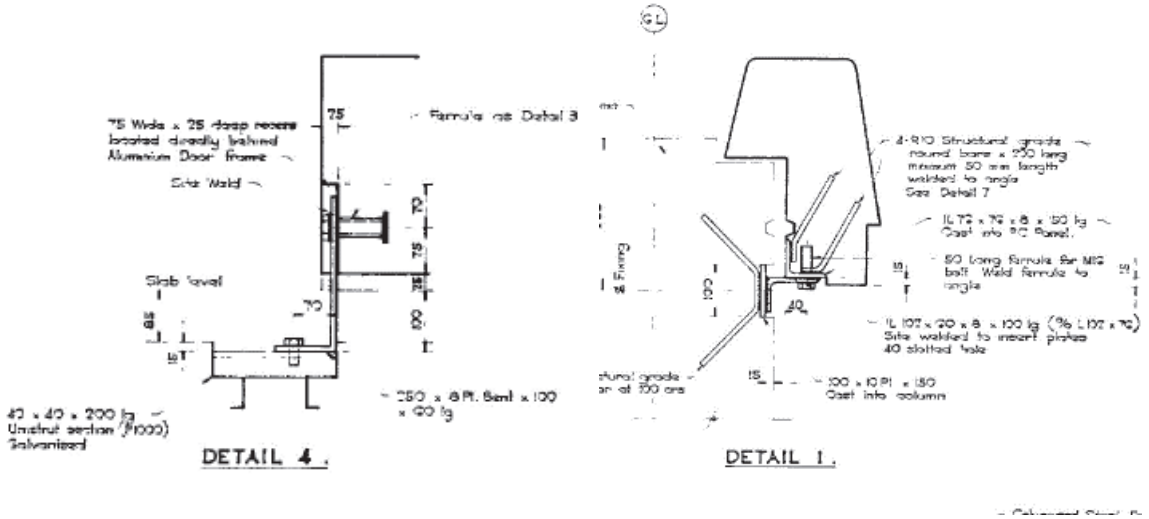


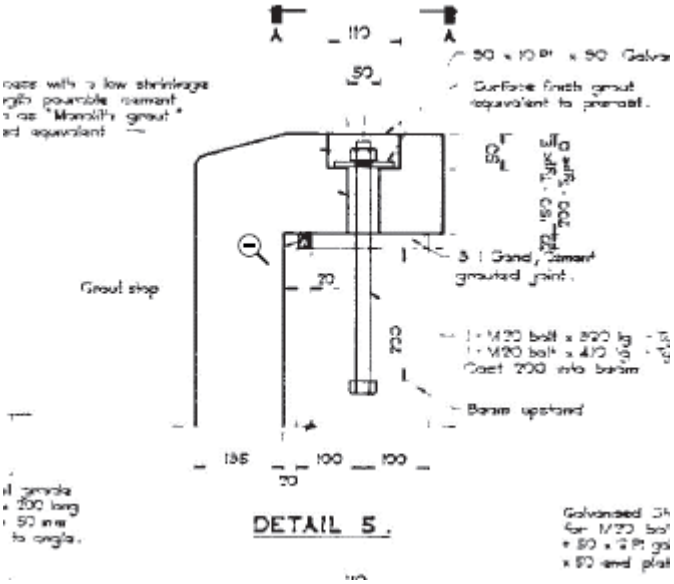
Figure 2- Curtain Panels.

Both types of panels are fixed back to the main structure with cleats and dowels. Due to their age and exposure of the life of the building, the connections are prone to degradation and require investigation to ascertain their future longevity.

The window panels are supported at the sides and top by steel cleats as shown below.



The Curtain Panels are supported at the top by dowels pinned into the structural slab, as shown below.



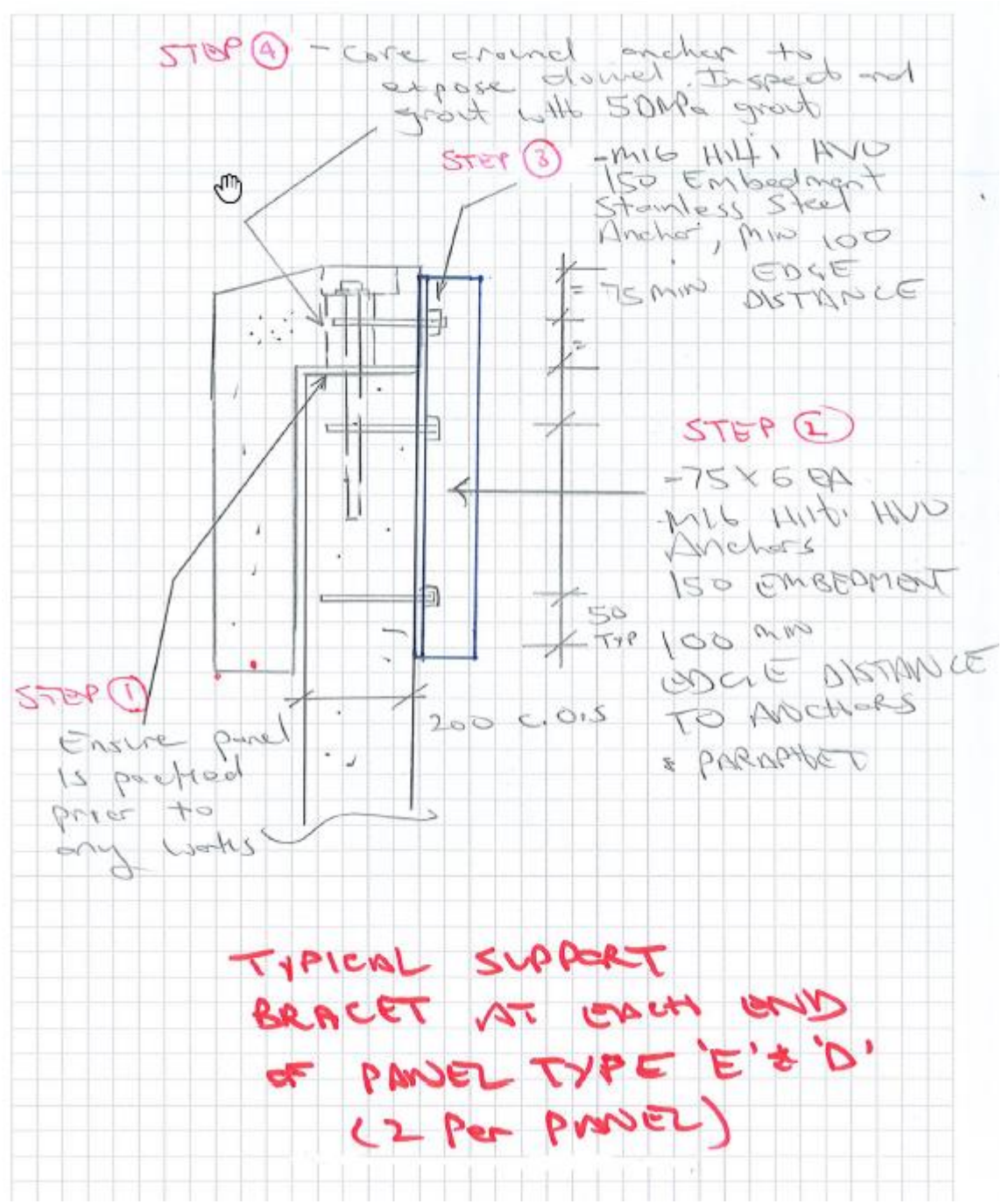
All of the above fixings tie the panels to the structure and are critical to ensure that the façade panels remain fixed in place in the long term. These fixings therefore require investigation in order to ascertain their current degree of potential degradation and structural adequacy and assess their future longevity.

As a result, some destructive investigation is required to obtain access to the connections. For the "Window Panels", this will include the removal of protective grout within an apartment or on external balcony linings (Detail 1) or toppings around the sill cleat at floor level within an apartment or on external balcony floor finish(Detail 4) to get access to the cleat for a visual inspection of the extent of any corrosion. Twelve (12) "window panels" (shaded in green on the attached elevations) in total will be investigated.

For "Curtain Panels" dowel fixings (Detail 5), minor demolition of the panels to view the sides of the dowel connections is required to be undertaken (Detail 5). Ten (10) "curtain panels" will be investigated (shaded in green on the attached elevations).

For the "Curtain Panels", prior to removal of concrete around the dowels (Detail 5), a temporary restraint fixing angle shall be installed to prevent structural collapse of the panels. This angle would be a 150x150x300 long steel angle bolted to the panel and the floor (inside of apartment or balcony) supporting the panel and will be fixed with 2-M16 Stainless Steel safety anchors into the panel and 2M16 Stainless Steel expansion anchors into the supporting floor. Final details will be provided on site based on suitable fixing locations.

Please refer below. This detail shall be located next to each dowel to be investigated.



SCP shall view the existing dowel once exposed. The concrete around the inspected dowel shall be re- instated with a high strength structural grout (50MPa) . This will be co-ordinated with Mahaffey& Assoc. The temporary angle M16 fixing anchors can be removed or cut back and patched at the completion of the investigation. No panel steel reinforcement is to be cut as part of the investigation works.

Refer attached for the required panels to be investigated (in green).

We trust this report is as per your requirements.

Yours faithfully
SCP Consulting Pty Ltd

Paul Siewert
Director

scp engineers and development consultants

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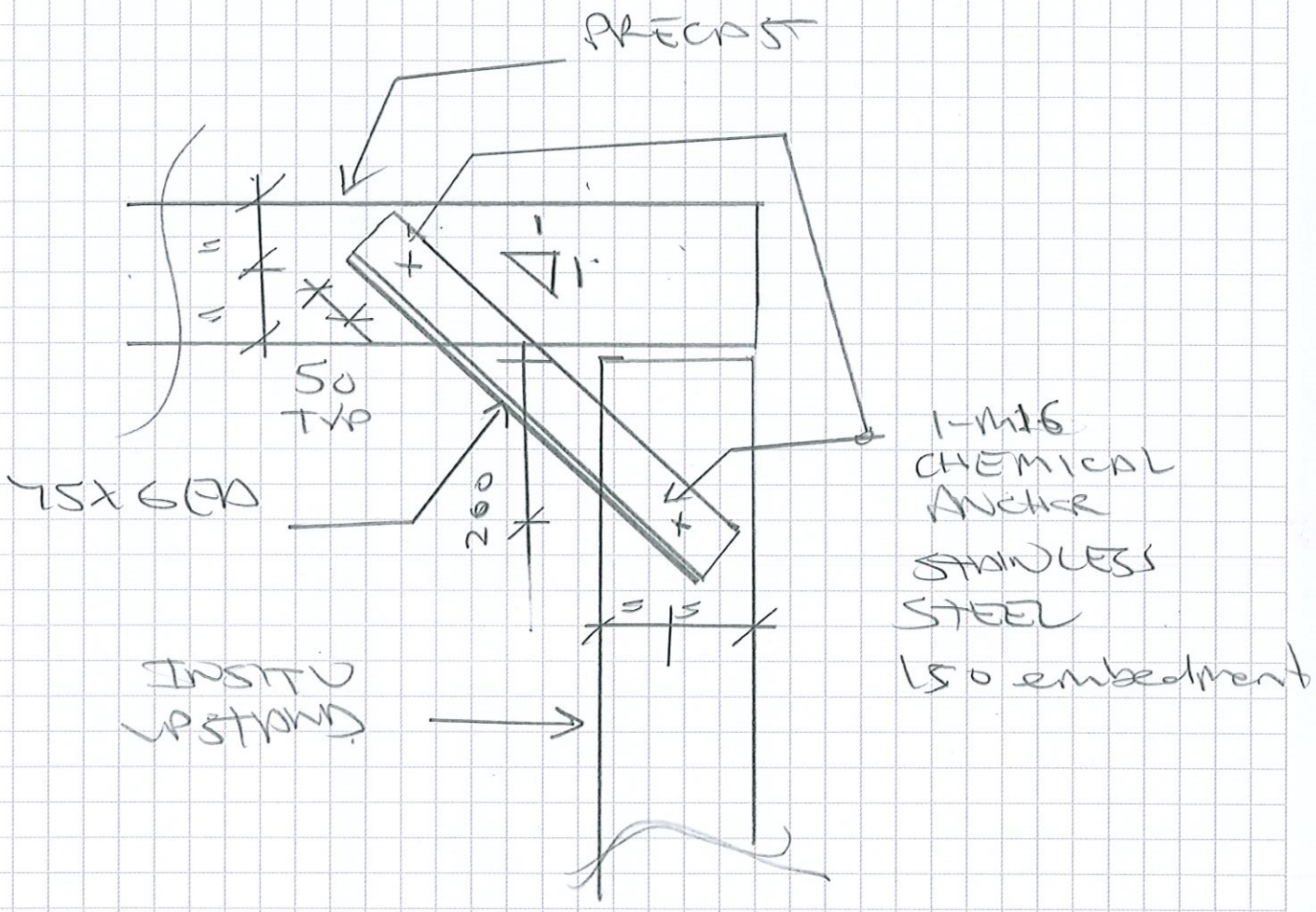
PROJECT JOB NO

SECTION OF WORK

SUBJECT

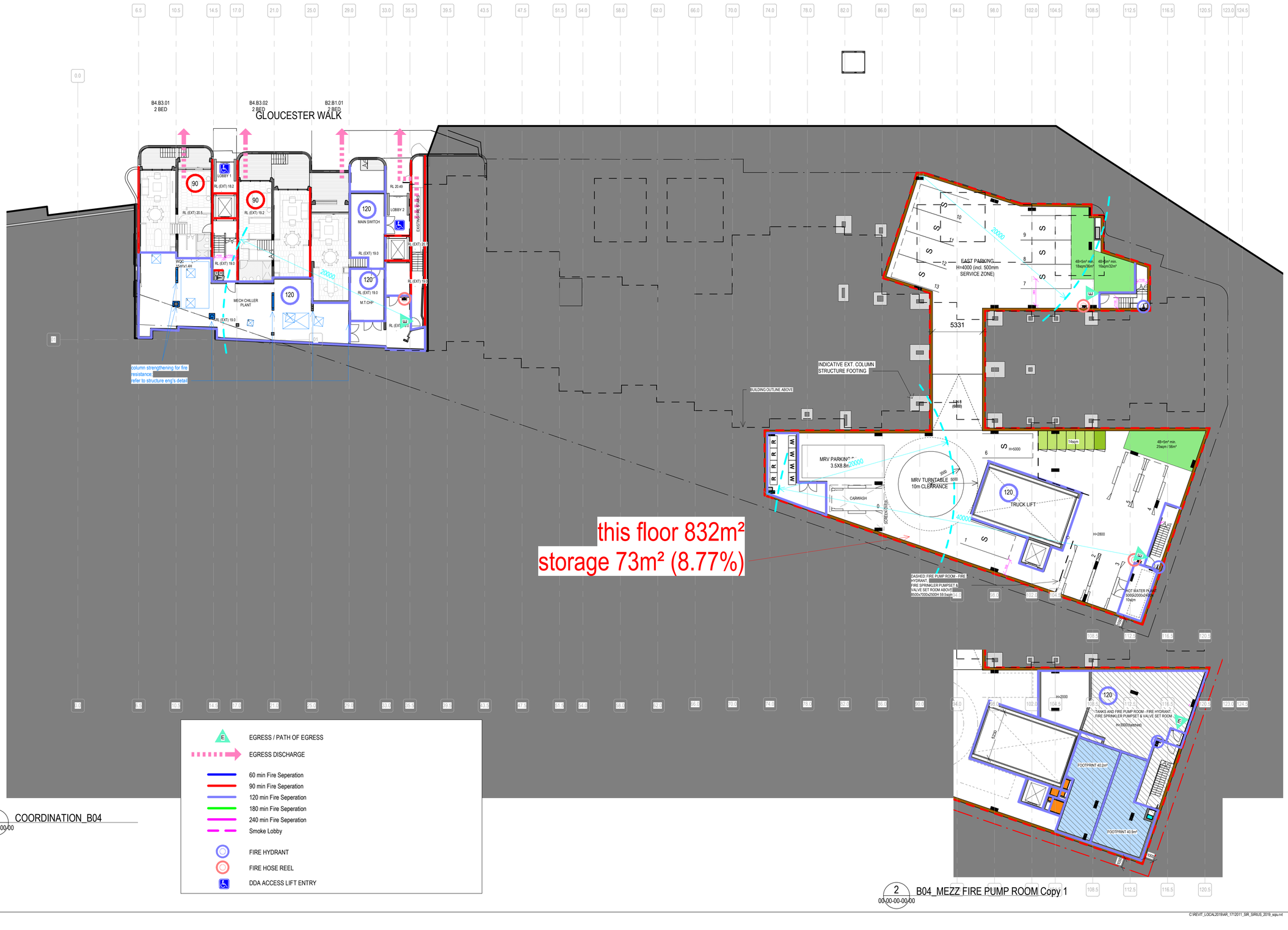
REFERENCE PAGE

DESIGNED DATE CHECKED DATE



TYPICAL TOP BRACE DETAIL

Appendix H Existing Column Upgrade Map



1 COORDINATION_B04
00-00-00-00-00

2 B04_MEZZ FIRE PUMP ROOM Copy 1
00-00-00-00-00

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3	05.05.20	FOR INFORMATION
4	08.05.20	FOR INFORMATION
5	26.05.20	FOR INFORMATION

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CLIENT NUMBER

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BVN PROJECT NUMBER

1712011
DRAWING KEY

TRUE NORTH PROJECT NORTH

GRAPHIC SCALE
0 2000 5000
SCALE

1 : 200@A1
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COORDINATION_BASEMENT B4-B3

AR-R-10-01 ISSUE 5

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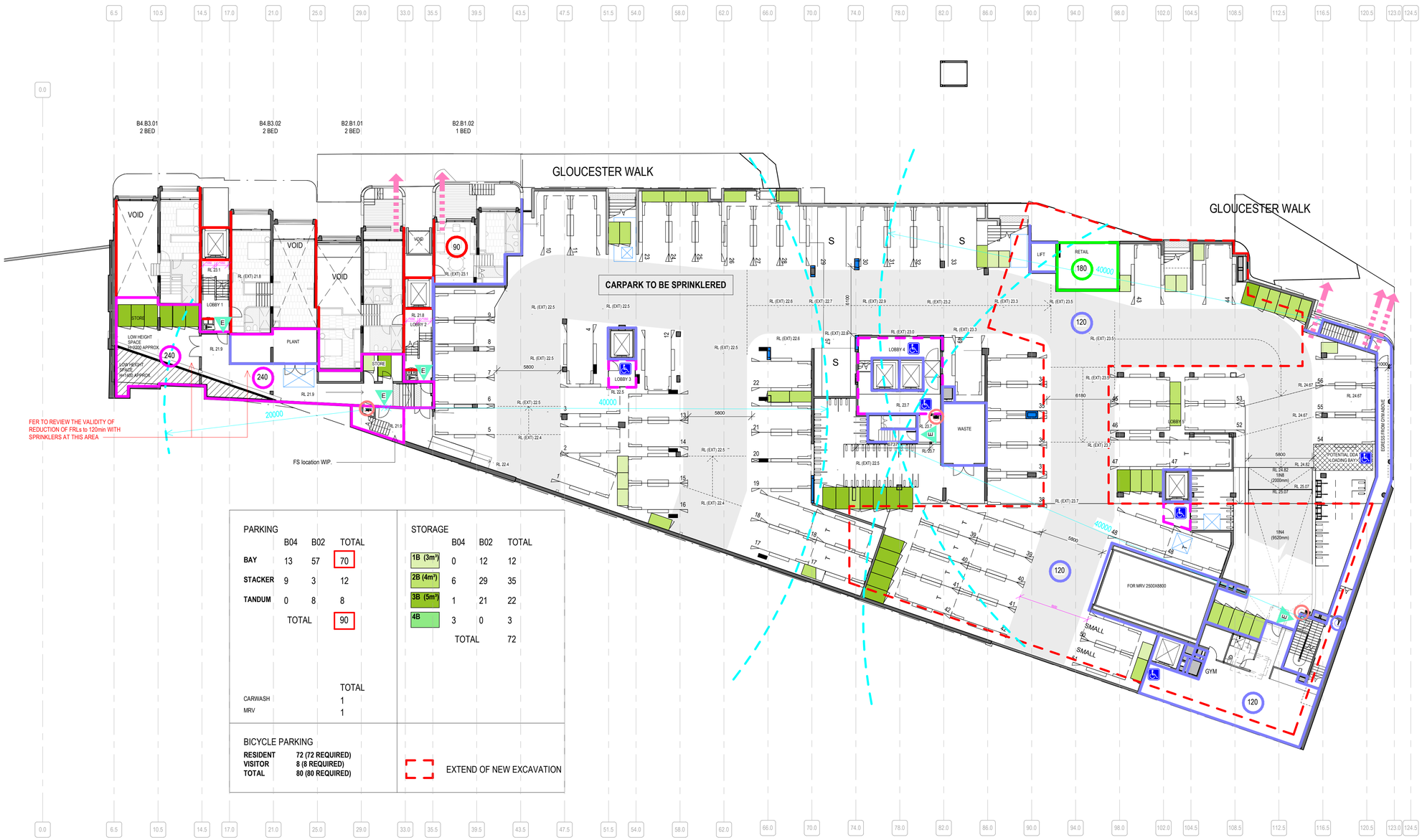

PARKING	B04	B02	TOTAL
BAY	13	57	70
STACKER	9	3	12
TANDUM	0	8	8
TOTAL			90

	TOTAL
CARWASH	1
MRV	1

STORAGE	B04	B02	TOTAL
1B (3m³)	0	12	12
2B (4m³)	6	29	35
3B (5m³)	1	21	22
4B	3	0	3
TOTAL			72

BICYCLE PARKING

RESIDENT	72 (72 REQUIRED)
VISITOR	8 (8 REQUIRED)
TOTAL	80 (80 REQUIRED)

EXTEND OF NEW EXCAVATION

1 COORDINATION_B02
00-00-00-00-00

- EGRESS / PATH OF EGRESS
- EGRESS DISCHARGE
- 60 min Fire Seperation
- 90 min Fire Seperation
- 120 min Fire Seperation
- 180 min Fire Seperation
- 240 min Fire Seperation
- Smoke Lobby
- FIRE HYDRANT
- FIRE HOSE REEL
- DDA ACCESS LIFT ENTRY

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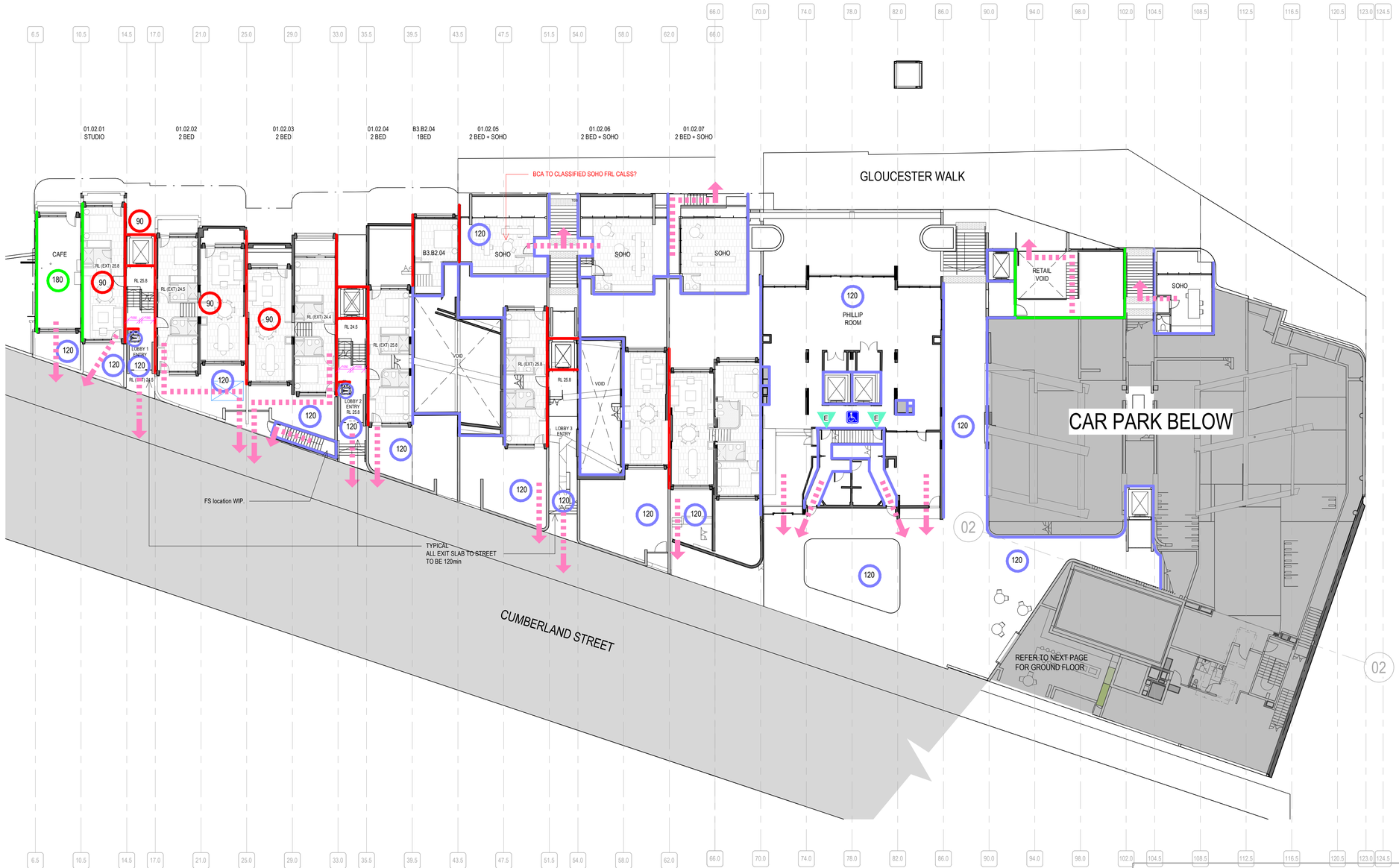

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2 LEVEL 02-03 1
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- EGRESS / PATH OF EGRESS
- EGRESS DISCHARGE
- 60 min Fire Seperation
- 90 min Fire Seperation
- 120 min Fire Seperation
- 180 min Fire Seperation
- 240 min Fire Seperation
- Smoke Lobby
- FIRE HYDRANT
- FIRE HOSE REEL
- DDA ACCESS LIFT ENTRY

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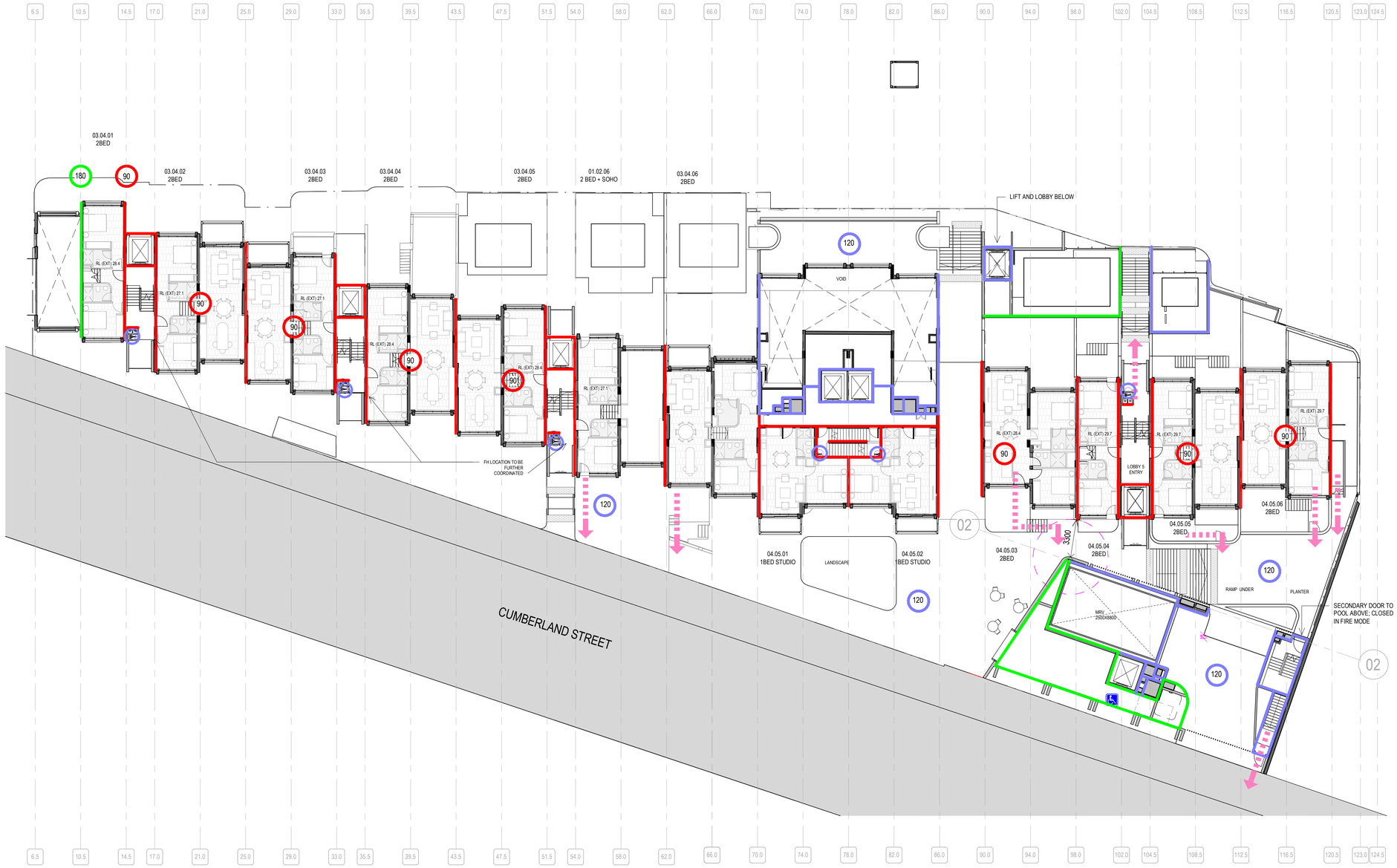

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- EGRESS / PATH OF EGRESS
- EGRESS DISCHARGE
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- 90 min Fire Seperation
- 120 min Fire Seperation
- 180 min Fire Seperation
- 240 min Fire Seperation
- Smoke Lobby
- FIRE HYDRANT
- FIRE HOSE REEL
- DDA ACCESS LIFT ENTRY

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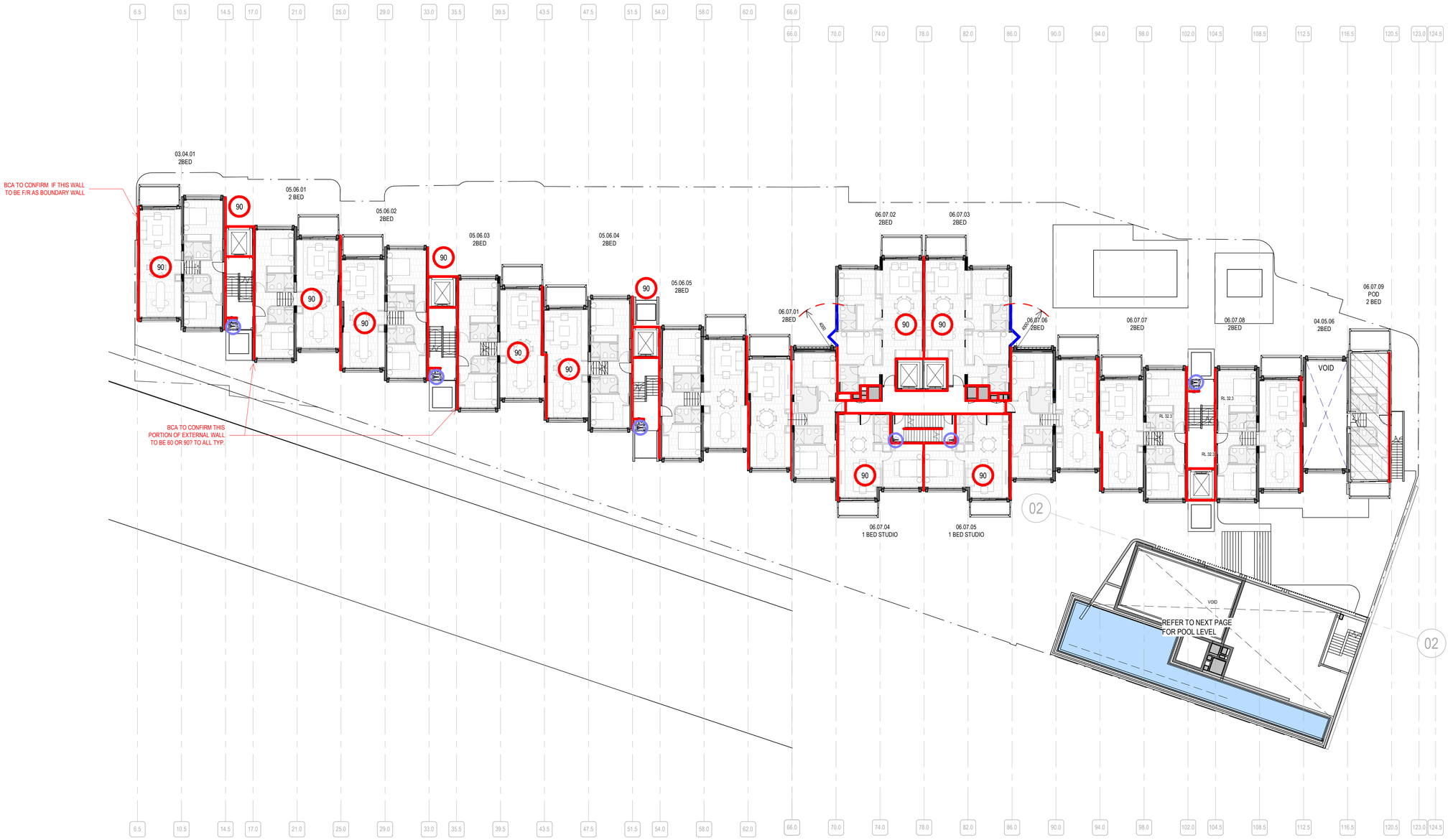

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2 00.00-00-00.00 LEVEL 06-07 3

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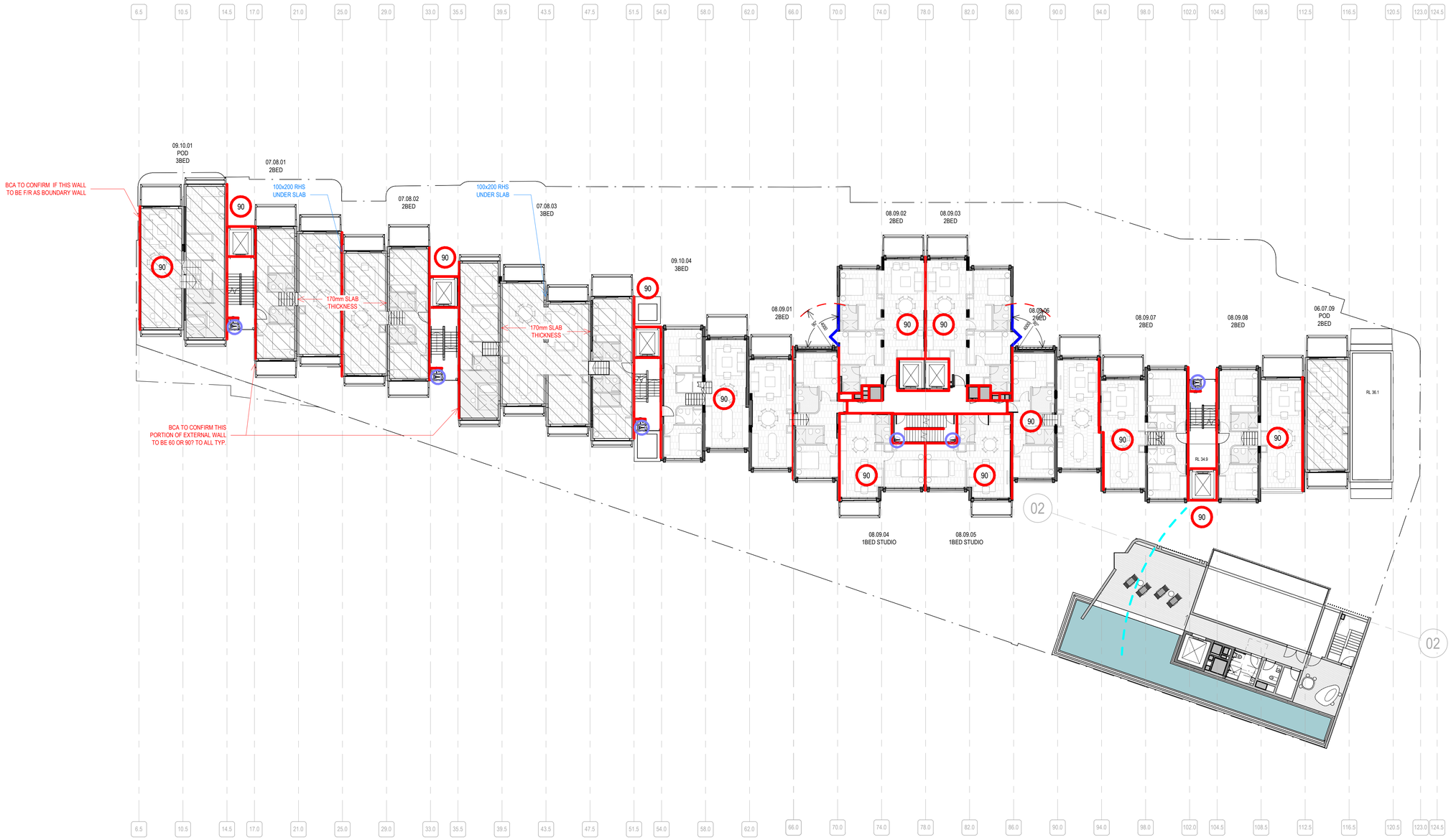

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2 LEVEL 08-09 3 00.00-00-00.00

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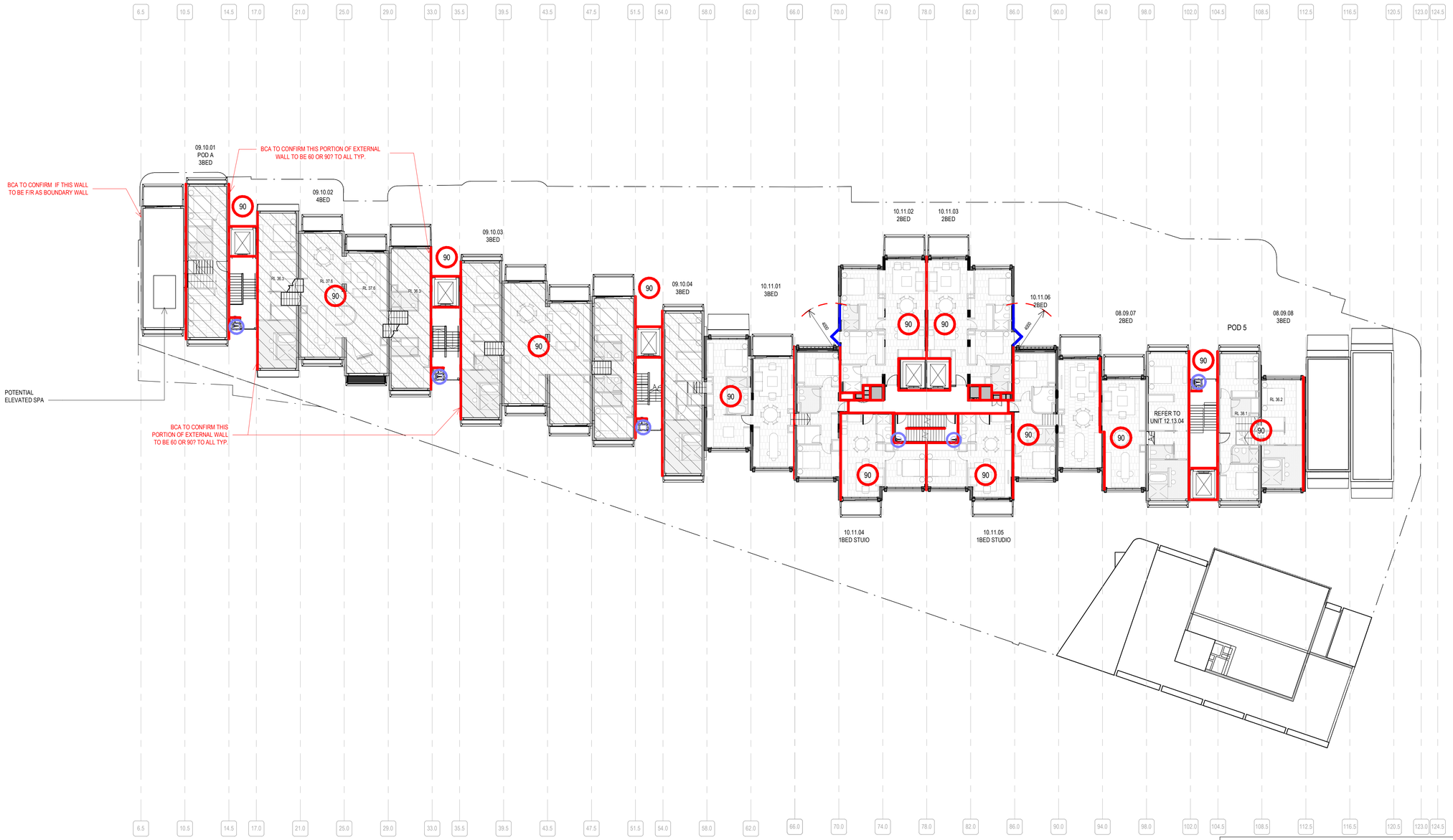

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AR-R-10-07 | ISSUE 1

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PROJECT SIMUS JOB NO 180128

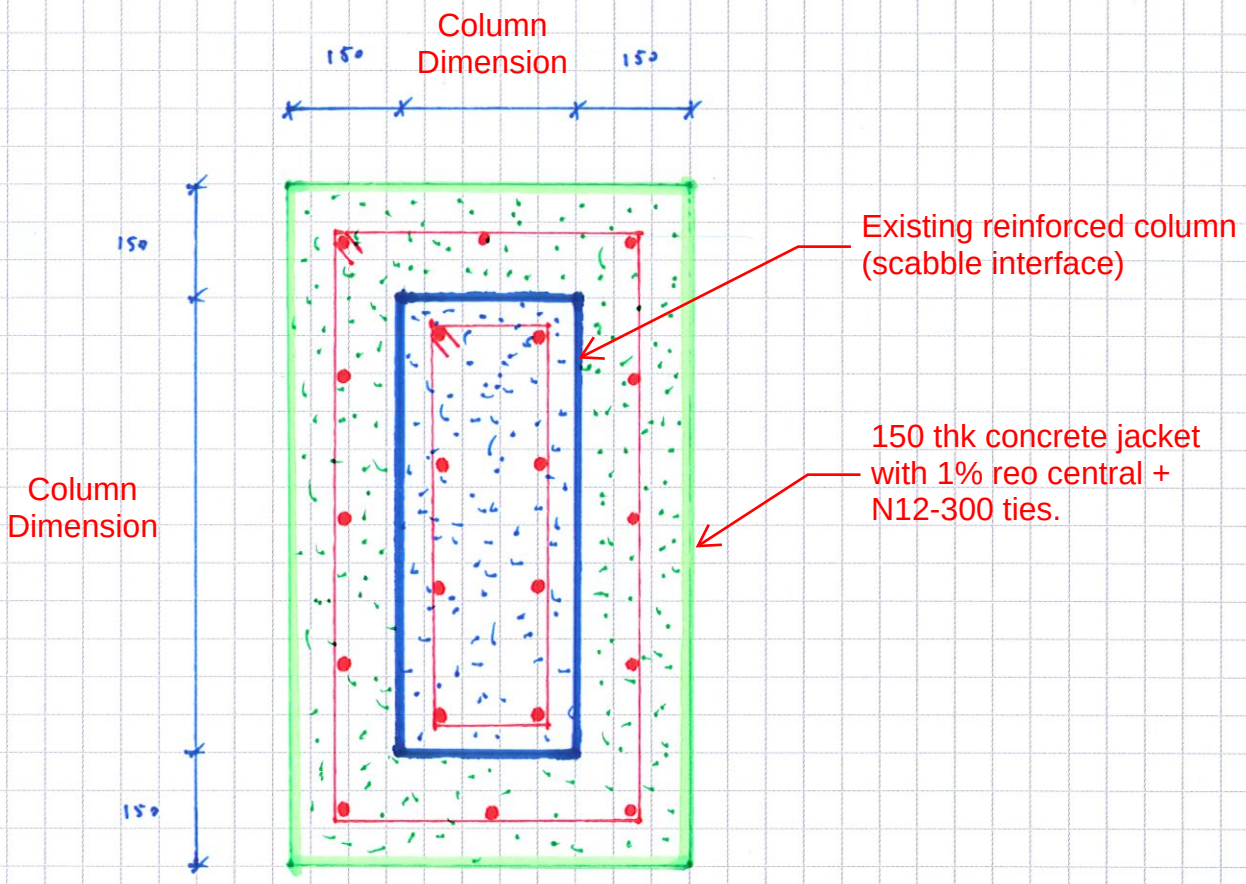
SECTION OF WORK COLUMN STRENGTHENING DETAILS

SUBJECT OPTION 1

REFERENCE PAGE 1/2

DESIGNED B.V. DATE 10/8/20 CHECKED DATE

=) OPTION 1 - 150 THK CONCRETE JACKET



NOTES
-Refer SCP column review mark-ups for columns requiring rectification for strength or fire purposes.
-Concrete grade for 150 thk jacket to be 32 MPa

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PROJECT SIMUS JOB NO 18012-8

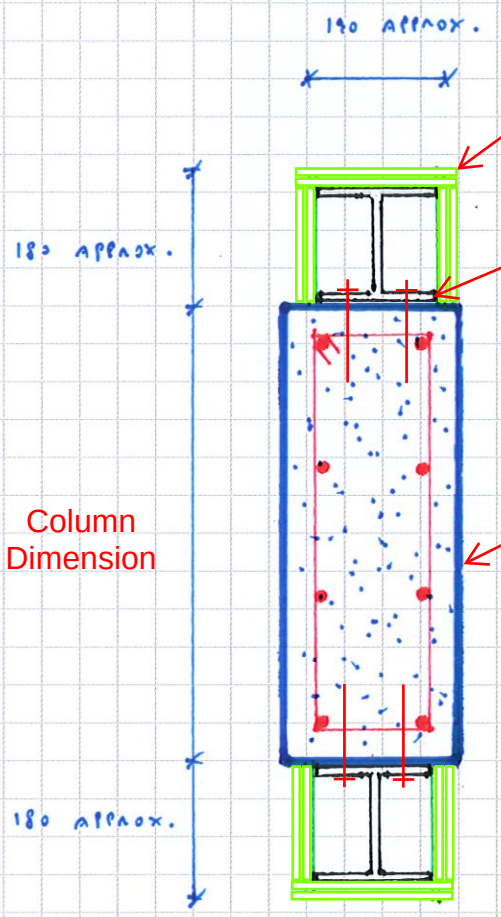
SECTION OF WORK COLUMN STRENGTHENING DETAILS

SUBJECT OPTION 2

REFERENCE PAGE 2/2

DESIGNED B.U. DATE 10/8/20 CHECKED DATE

OPTION 2 - 2x 150 UC COLUMNS



2x layers 16mm thk Fyrchek board all around UC.

150UC37.2 columns either end with post-installed fixings at 300 cts.

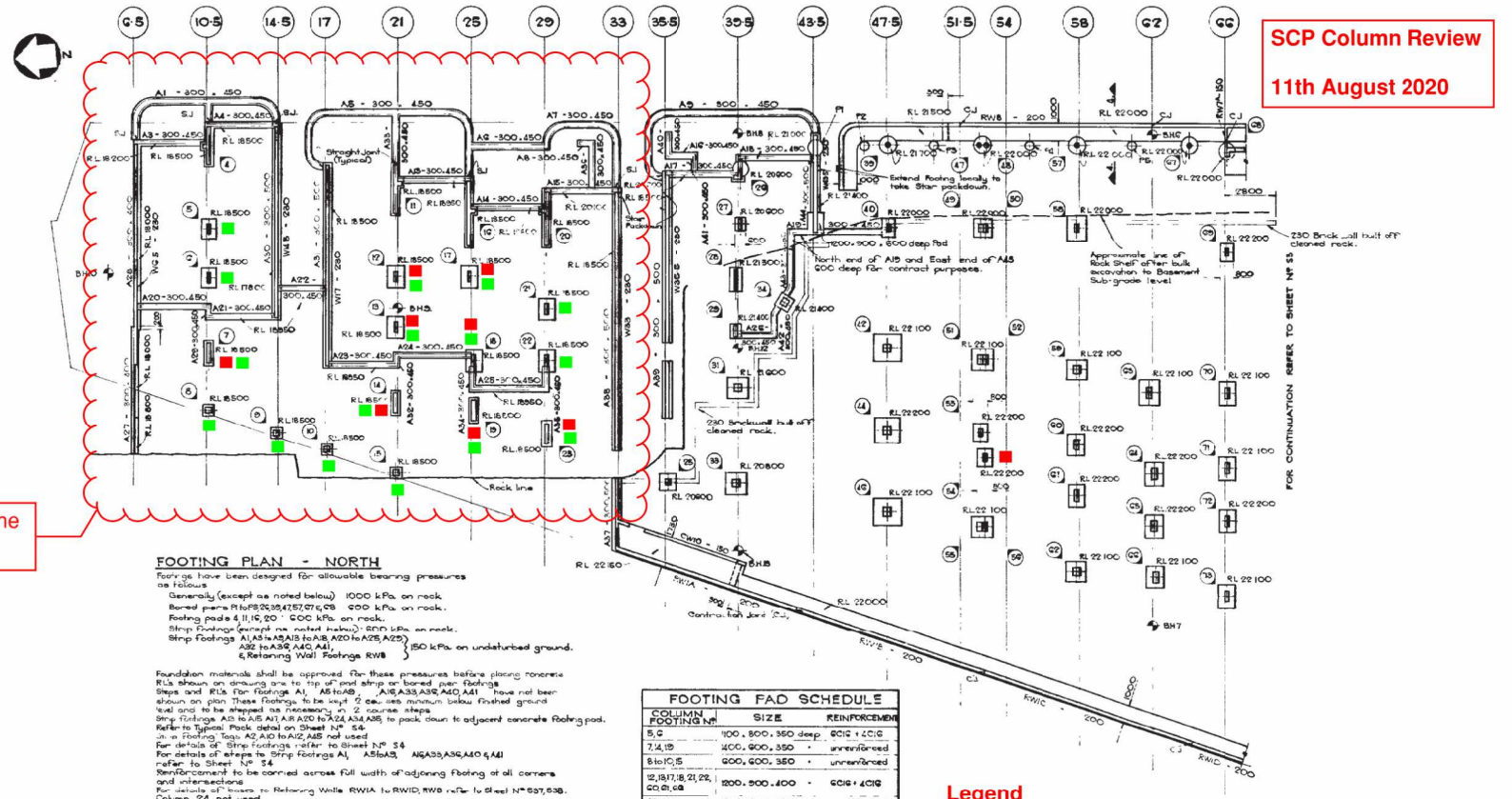
Existing reinforced column

NOTES
-Refer SCP column review mark-ups for columns requiring rectification for strength or fire purposes.
-Steel UC sections to be Grade 300

SCP Column Review

11th August 2020

Columns in this zone continue to B3-B4.



FOOTING PLAN - NORTH

Footings have been designed for allowable bearing pressures as follows

Generally (except as noted below) 1000 kPa on rock.
Bored piers P1 to P8, P26, P38, P47, P57, P76, P78 2000 kPa on rock.
Footing pads 4, 11, 16, 20 - 600 kPa on rock.
Strip Footings (except as noted below): 600 kPa on rock.
Strip footings A1, A5 to A8, A13 to A18, A20 to A25, A29, A32 to A39, A40, A41, & Retaining Wall Footings RW8 } 150 kPa on undisturbed ground.

Foundation materials shall be approved for these pressures before placing concrete
RL's shown on drawing are to top of pad strip or bored pier footings
Steps and RL's for footings A1, A5 to A8, A16, A33, A39, A40, A41 have not been shown on plan These footings to be kept 0 cm. min. minimum below finished ground level and to be stepped as necessary in 2 course steps
Strip footings A8 to A15, A17, A18, A20 to A24, A34, A35, to pack down to adjacent concrete footing pad.
Refer to Typical Pack detail on Sheet Nº S4
Strip Footing Tags A2, A10 to A12, A45 not used
For details of Strip footings refer to Sheet Nº S4
For details of steps to Strip Footings A1, A5 to A8, A16, A33, A39, A40 & A41 refer to Sheet Nº S4
Reinforcement to be carried across full width of adjoining footing at all corners and intersections
For details of Pilasters to Retaining Walls RW1A to RW10, RW8 refer to Sheet Nº S37, S38.
Column 24 not used.
For Section refer to Sheet Nº S38

Bored pier sizes to be as follows:-

Tag	Diameter
P1, 2, 3, 5, 6, 7, 8, 9, 27, 28,	900
P2 to P8	500

Bored piers to be taken to R.L. 18000 for contract purposes.
Builder shall allow for the use of a temporary steel casing in all pier holes until concrete is placed

The builder shall allow for drilling 1#2 test holes 40 diameter and 1200 deep below the bottom level of footing excavations for inspection by the Engineer prior to pouring the footing Number of holes is based on:-

Column Footings ——— 1 each
Lift Well and Stair 8 ——— 8 total
Concrete Wall Footings ——— 1 every 15000.

FOOTING PAD SCHEDULE

COLUMN FOOTING Nº	SIZE	REINFORCEMENT
5,6	1100 . 800 . 350 deep	6C16 + 4C16
7,14,19	1400 . 900 . 350 "	unreinforced
8 to 10, 15	600 . 600 . 350 "	unreinforced
12,13,17,18,21,22, 60,61,68	1200 . 900 . 400 "	6C16 + 4C16
23	1500 . 600 . 400 "	unreinforced
24,40	1000 . 700 . 350 "	6C16 + 4C16
25	900 . 900 . 350 "	4C16 + 4C16
27,29	700 . 600 . 350 "	unreinforced
28	1600 . 700 . 350 "	7C16 + 5C16
31,33,51,55	1200 . 1200 . 450 "	4C20 + 4C20
42,62	1500 . 1500 . 700 "	7C20 + 7C20
44	1400 . 1400 . 550 "	6C20 + 6C20
45	1000 . 1000 . 350 "	5C16 + 5C16
53,54,63	1000 . 800 . 350 "	5C16 + 4C16
58,65	1400 . 1100 . 550 "	6C20 + 5C20
59,64	1100 . 1100 . 400 "	6C16 + 6C16
64,65,70 to 73	1300 . 1000 . 400 "	6C16 + 5C16
34	800 . 800 . 350 "	4C16 + 4C16
4,11,16,20	Locally Deeper 800 . 800 . 350 "	

Note: Dimensions in East - West direction are given first. For rectangular footings "lateral" bars are called up first in schedule above Refer to Typical Footing Pad detail on Sheet Nº S4.
For details of Footings to Columns 4,11,16,20 & 25 refer to Sheet Nº S4.

Legend

Denotes column not structurally compliant for strength

Denotes column not structurally compliant for fire

Notes

FRL's as per BVN fire compartment plans dated 26/5/20

CONCRETE STRENGTHS:
Bored Footing Piers —— Fc = 15MPa.
Remainder —— Fc = 20MPa.

For General Notes refer to Sheet Nº S1

S.E.W

300mm ON ORIGINAL

ISSUED BY: THE HOUSING COMMISSION OF NEW SOUTH WALES

APPROVED FOR MANAGER/ PLANNING & DESIGN

DATE 4/11/97

WORKING DRAWINGS BY: ALEXANDER AND LLOYD PTY LTD
ARCHITECTS
LIVERPOOL

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124 WALKER STREET NORTH SYDNEY

CONSULTING ENGINEERS ELECTRICAL MECHANICAL & HYDRAULIC: D. RUDD & PARTNERS
124 WALKER STREET NORTH SYDNEY

QUANTITY SURVEYORS: RIDER HUNT & PARTNERS
61 McLAREN STREET NORTH SYDNEY

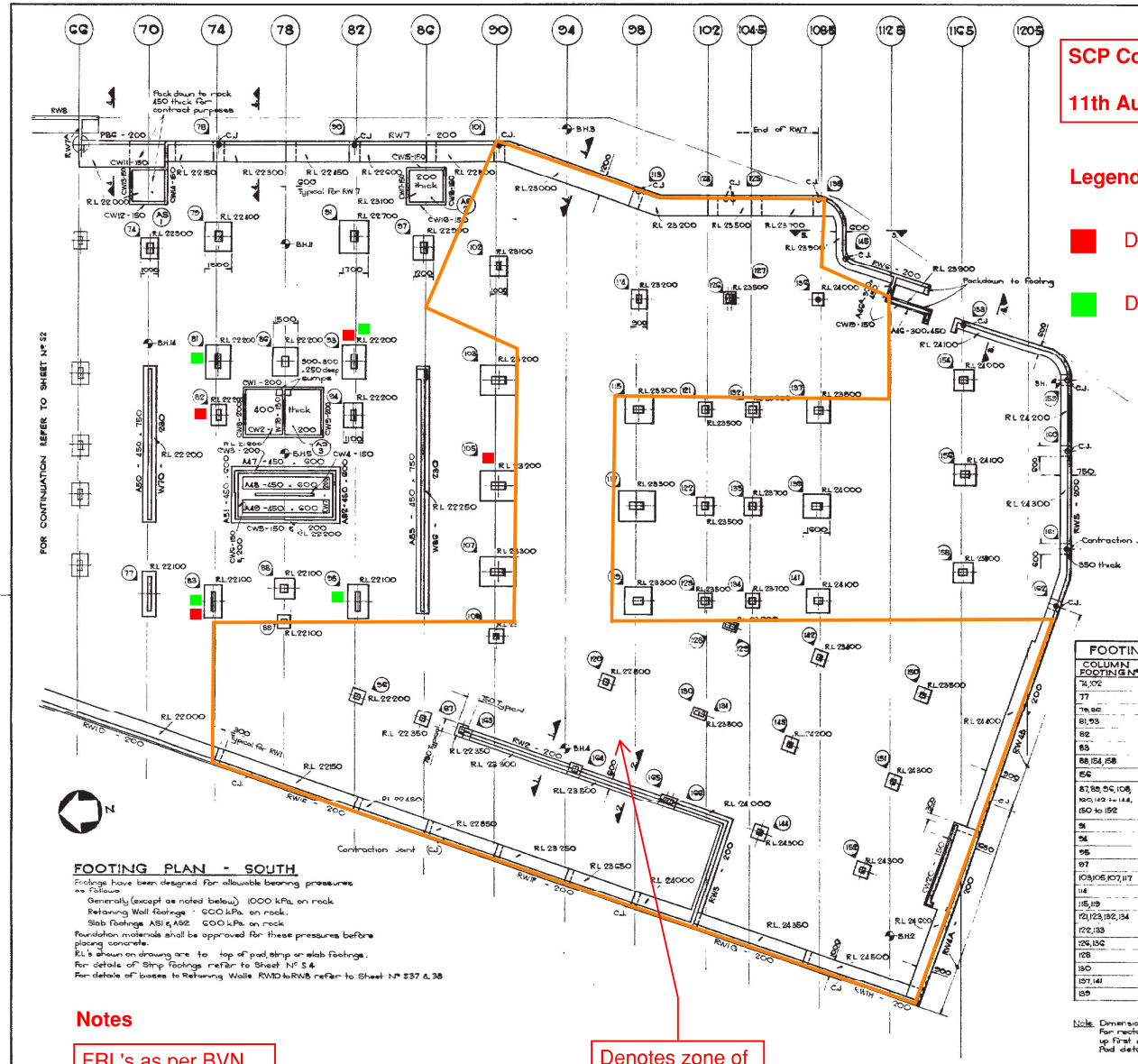
ACOUSTICAL CONSULTANTS: PETER R KNOWLAND & ASSOCIATES
14 CLARK STREET MILSONS POINT

SYDNEY COVE RESIDENTIAL REDEVELOPMENT
Job No 3/7799/1/1 and Job Aged No 3/7799/1/2

FOOTING PLAN - NORTH

SCALES 1:100

SHEET NUMBER IN SET 64 | SHEET NUMBER S2



SCP Column Review

11th August 2020

Legend

Denotes column not structurally compliant for strength

Denotes column not structurally compliant for fire

FOOTING PAD SCHEDULE

COLUMN FOOTING N°	SIZE	REINFORCEMENT
74,102	1200 x 1000, 400 deep	6C16 + 6C16
77	2600 x 800 x 350	12C16 + 4C16
78,82	1500 x 1500 x 600	9C20 + 9C20
81,93	2000 x 1400 x 600	10C20+ 7C20
82	1200 x 900 x 400	6C16 + 4C16
83	1500 x 1000 x 450	6C20 + 3C20
88,154,158	1200 x 1200 x 450	4C20 + 4C20
156	1300 x 1300 x 500	5C20 + 5C20
87,88,89,108, 120,142 to 144, 150 to 152	900 x 900 x 350	5C16 + 5C16
91	1900 x 1700 x 700	10C20+10C20
94	1400 x 1100 x 500	5C20+5C20
95	2000 x 1200 x 500	8C20+5C20
97	1400 x 1200 x 450	5C20+5C20
103,105,107,117	1700 x 2100 x 700	8C20+ 11C20
114	1100 x 900 x 350	6C16 + 6C16
115,119	1200 x 1600 x 450	8C20+ 8C20
121,123,132,134	800 x 800 x 350	4C16 + 4C16
122,133	1000 x 1000 x 350	5C16 + 5C16
126,152	700 x 700 x 350	3C16 + 3C16
128	600 x 800 x 350	unreinforced
130	900 x 900 x 350	unreinforced
137,141	1400 x 1400 x 550	9C20 + 9C20
139	1400 x 1600 x 550	7C20 + 7C20

Note: Dimensions in East - West direction are given first. For rectangular footings "lateral" bars are called up first in schedule above. Refer to Typical Footing Pad detail on Sheet N° S4

CONCRETE STRENGTH: Generally Fc = 20MPa.

FOOTING PLAN - SOUTH

Footings have been designed for allowable bearing pressures as follows:

Generally (except as noted below) 1000 kPa. on rock
Retaining Wall footings 600 kPa. on rock.
Slab footings AS1 & AS2 600 kPa. on rock

Foundation materials shall be approved for these pressures before placing concrete.
R.L.'s shown on drawing are to top of pad, strip or slab footings.
For details of Strip Footings refer to Sheet N° S4.
For details of bases to Retaining Walls RWD to RWB refer to Sheet N° S37 & 38

Notes

FRL's as per BVN fire compartment plans dated 26/5/20

Denotes zone of columns to be demolished.

For General Notes refer to Sheet N° S1

300mm ON ORIGINAL

THE HOUSING COMMISSION OF NEW SOUTH WALES

ALEXANDER AND LLOYD PTY LTD
ARCHITECTS

BOND, JAMES LARON PTY LTD
CONSULTING ENGINEERS STRUCTURAL & CIVIL

D RUDD & PARTNERS
CONSULTING ENGINEERS ELECTRICAL MECHANICAL & HYDRAULIC

RIDER HUNT & PARTNERS
QUANTITY SURVEYORS

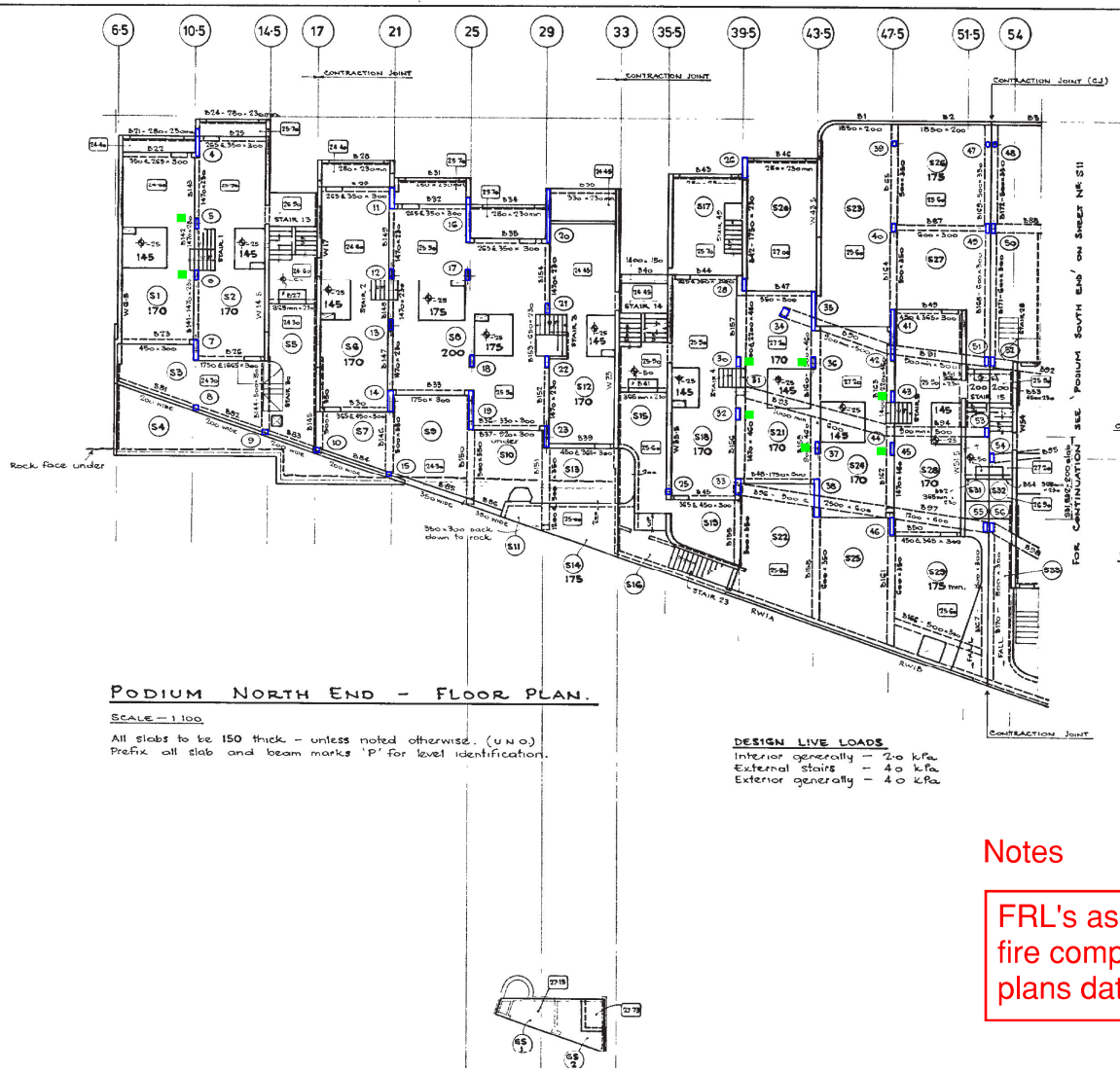
PETER R KNOWLAND & ASSOCIATES
ACOUSTICAL CONSULTANTS

SYDNEY COVE RESIDENTIAL REDEVELOPMENT
Job No 3/7799/1/1 and Job Aged No 3/7799/1/2

FOOTING PLAN - SOUTH

SCALES 1:100

NUMBER IN SET 64 | SHEET NUMBER S3



DRYING ROOM FLOOR PLAN

PODIUM NORTH END - FLOOR PLAN.

SCALE — 1:100

All slabs to be 150 thick - unless noted otherwise. (U N O)
Prefix all slab and beam marks 'P' for level identification.

DESIGN LIVE LOADS
Interior generally — 2·0 kPa
External stairs — 4·0 kPa
Exterior generally — 4·0 kPa

BEAM REFERENCE SCHEDULE	
BEAM MARK	DETAILED ON SHEET No.
PB 1 to 20	S54
PB 21 to 80.	S55
PB 81 to 104, 108 to 113	S56
PB 105, 106, 107.	S57, 58
PB 114 to 140.	S59
PB 141 to 173.	S30
PB 174 to 202.	S61
PB 203 to 232	S62

SCP Column Review

11th August 2020

Notes

FRL's as per BVN fire compartment plans dated 26/5/20

Denotes column not structurally compliant for strength

Denotes column not structurally compliant for fire

CONCRETE STRENGTH f'_c = 25 MPa AT 28 DAYS.
FOR GENERAL NOTES REFER TO SHEET No. S1

THE HOUSING COMMISSION OF NEW SOUTH WALES	hc
APPROVED FOR MANAGER, PLANNING & DESIGN — DATE 4/11/20	
ALEXANDER AND LLOYD PTY LTD, ARCHITECTS, 74 ARCHER STREET CHATSWOOD	OFFICE No.
BOND, JAMES, LARON PTY LTD, 126 WALKER STREET NORTH SYDNEY	S75-60
CONSULTING ENGINEERS ELECTRICAL MECHANICAL & HYDRAULIC O HUDD & PARTNERS, 124 WALKER STREET NORTH SYDNEY	
QUANTITY SURVEYORS RIDER HUNT & PARTNERS, 41 McLAREN STREET NORTH SYDNEY	
ACOUSTICAL CONSULTANTS PETER R KNOWLAND & ASSOCIATES, 19 GOFF STREET MOSMAN POINT	

SYDNEY COVE RESIDENTIAL REDEVELOPMENT
Job No 3/7799/1/1 and Job Aged No 3/7799/4/C

PODIUM NORTH END FLOOR PLAN

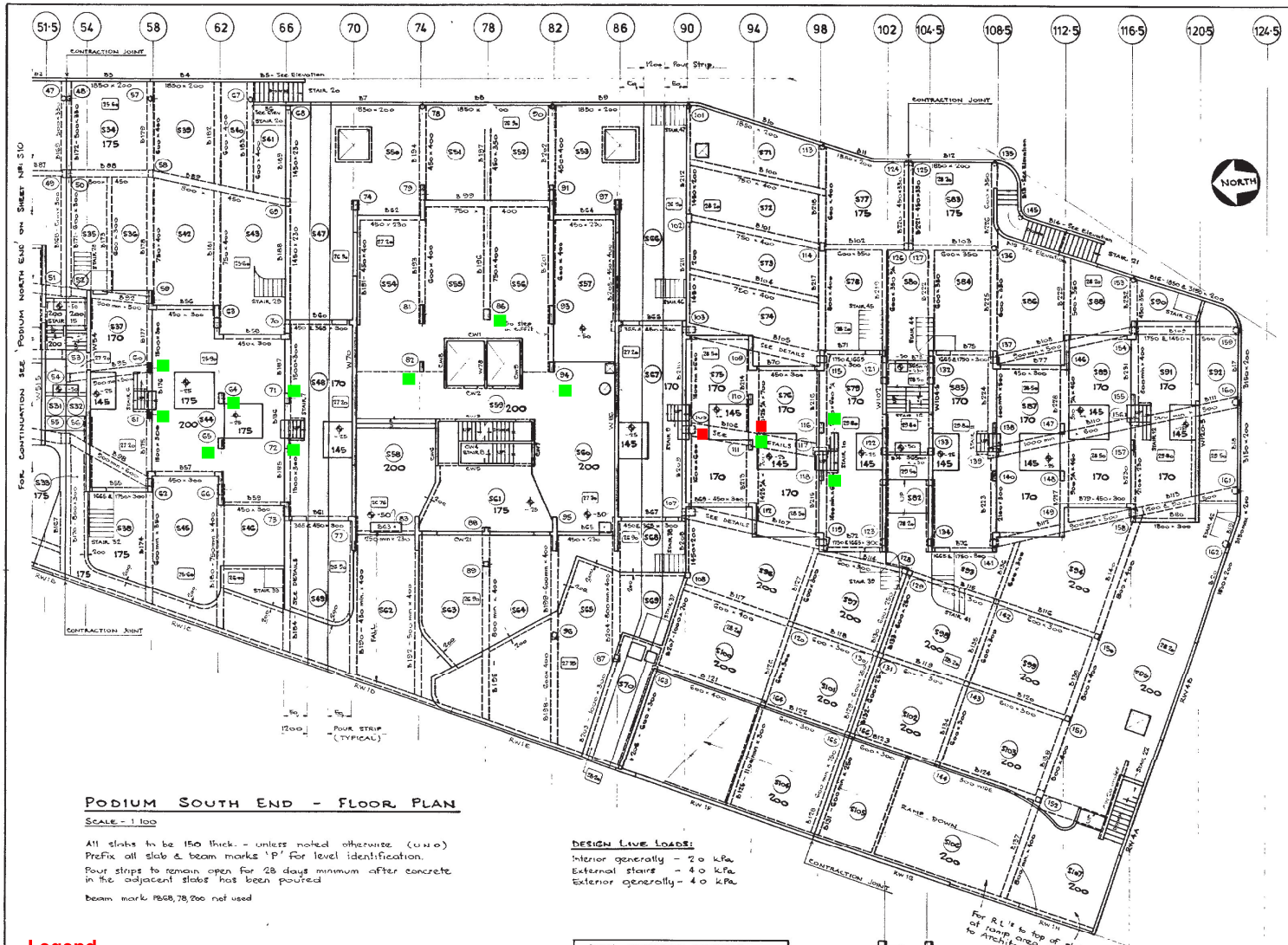
SCALES 1:100

NUMBER IN SET 64 | SHEET NUMBER S10

100 mm ON ORIGINAL

SCP Column Review

11th August 2020



PODIUM SOUTH END - FLOOR PLAN

SCALE - 1:100

All slabs to be 150 thick. - unless noted otherwise (U.N.O)
Prefix all slab & beam marks 'P' for level identification.
Pour strips to remain open for 28 days minimum after concrete in the adjacent slabs has been poured

Beam mark PB68, 78, 200 not used

DESIGN LIVE LOADS:

Interior generally - 2.0 kPa
External stairs - 4.0 kPa
Exterior generally - 4.0 kPa

BEAM REFERENCE SCHEDULE	
BEAM MARK	DETAILED ON SHEET NR:
PB 1 to 20	S54
PB 21 to 80	S55
PB 81 to 104, 108 to 115.	S56
PB 105, 106, 107.	S57,58
PB 114 to 140	S59
PB 141 to 173	S60
PB 174 to 202	S61
PB 203 to 232	S62

DRYING ROOM FLOOR PLAN

For R.L's to top of slab of ramp areas refer to Architectural Drawings.

Legend

Denotes column not structurally compliant for strength

Denotes column not structurally compliant for fire

Notes

FRL's as per BVN fire compartment plans dated 26/5/20

CONCRETE STRENGTH F'c - 25 MPa at 28 DAYS.

FOR GENERAL NOTES REFER TO SHEET Nº S1

300mm ON ORIGINAL

DRAWING BY: THE HOUSING COMMISSION OF NEW SOUTH WALES — hc

APPROVED FOR MANAGER/PLANNING & DESIGN

DATE

WORKING DRAWINGS BY: ALEXANDER AND LLOYD PTY LTD

CONSULTING ENGINEERS STRUCTURAL & CIVIL: BOND JAMES, LARON PTY LTD, 104 WALKER STREET NORTH SYDNEY — DRWG NO S75-60

CONSULTING ENGINEERS ELECTRICAL MECHANICAL & HYDRAULIC: D. HUDD & PARTNERS, 104 WALKER STREET NORTH SYDNEY

QUANTITY SURVEYORS: RIDER HUNT & PARTNERS, 41 MCLAREN STREET NORTH SYDNEY

ACOUSTICAL CONSULTANTS: PETER R KNOWLAND & ASSOCIATES, 10 CLIFF STREET MILSONS POINT

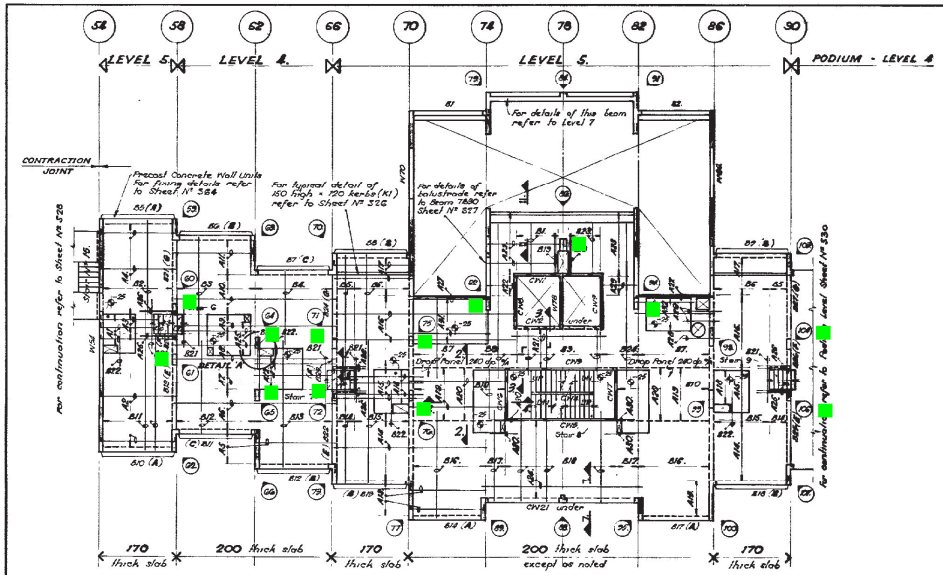
SYDNEY COVE RESIDENTIAL REDEVELOPMENT

Job No 3/7799/1/1 and Job Agcy No 3/7799/1/2

PODIUM - SOUTH END FLOOR PLAN

SCALES 1:100

NUMBER IN SET 64 — SHEET NUMBER S11



LEVELS 4 & 5
BOTTOM REINFORCEMENT

Prefix all beam & rod tags '4' or '5' for level identification e.g 4B12, 5B14 etc
Slab thicknesses shown are exclusive of slab recesses
(A),(B), etc next to beam tag indicates beam type. – See beam elevations.

SCHEDULE OF BEAM SIZES

B1 B2	700 × 525.
B5 to B9, B16	350 × 275.
B10 to B27	1500 × 290.
B3, B4, B15 B16	Not Used.
B14 B17	500 × 275.

BOTTOM REINFORCEMENT SCHEDULE

TAG.	REINFT.	TAG.	REINFT.
A1.	8 O12 Extra	B1.	7 O12 @ 300
A2.	30 O12 @ 300	B2.	12 O12 @ 300
A3.	3 O12 @ 300.	B3.	13 O12 @ 300.
A4.	16 O12 @ 300.	B4.	13 O12 @ 300.
A5.	6 O12 @ 300.	B5.	3 O12 @ 300.
A6.	7 O12 @ 300	B6.	10 O12 @ 300
A7.	4 O12 @ 300	B7.	13 O12 @ 300.
A8.	6 O12 @ 300.	B8.	6 O12 @ 300
A9.	6 O12 @ 300	B9.	15 O12 @ 300
A10.	7 O12 @ 300.	B10.	16 O12 @ 300
A11.	6 O12 @ 300	B11.	12 O12 @ 300.
A12.	7 O16 Extra	B12.	13 O12 @ 300.
A13.	2 O12 @ 300	B13.	18 O12 @ 300
A14.	11 O12 @ 300	B14.	3 O12 @ 300
A15.	3 O12 @ 300	B15.	10 O12 @ 300
A16.	13 O12 @ 300	B16.	13 O12 @ 300
A17.	5 O12 @ 300	B17.	3 O12 @ 300.
A18.	4 O16 Extra.	B18.	2 O16 @ 300
A19.	9 O12 @ 300	B19.	2 O16 Transmiss
A20.	10 O16 Extra.	B20.	25 O12 @ 300.
A21.	7 O12 @ 300.	B21.	1 O16 Trimmer
A22.	4 O12 @ 300	B22.	1 O16 Trimmer
A23.	19 O12 @ 300	B23.	5 O12 @ 300
A24.	14 O12 @ 300	B24.	6 O12 @ 300
A25.	7 O16 Extra.		
A26.	2 O12 Trimmers		
A27.	2 O16 Trimmers		
A28.	1 O16 Trimmer		
A29.	4 O12 @ 300		
A30.	1 O16 Trimmer		
A31.	4 O16 Extra.		
A32.	4 O16 Extra		

PENETRATION TRIMMING

1. For penetrations 400 square and less gather bars shown on plan equally to both sides
2. For larger penetrations 0.11 m and bars shown on plan may be cut either side of the penetration Unless shown otherwise on plan trim penetration with 1012 top and bottom on all sides
3. 'Extra' bars (see Reinforcement Schedules) are not to be cut, but are to be gathered to either side of the penetration where necessary.

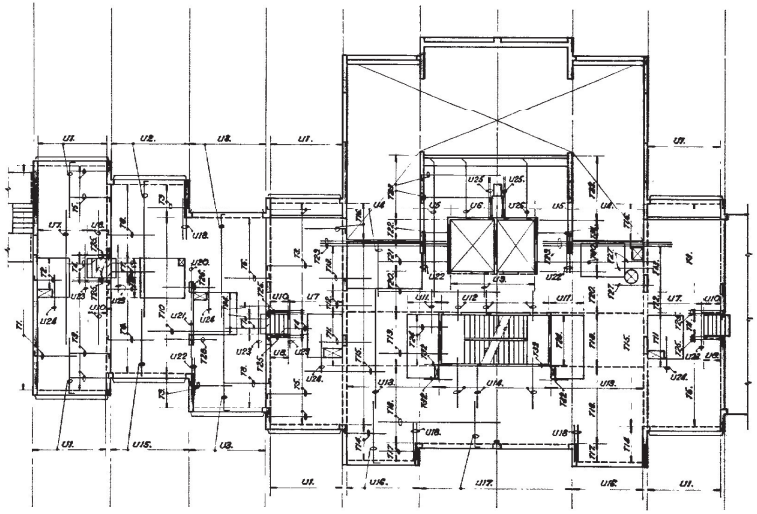
SCP Column Review

11th August 2020

Legend

Denotes column not structurally compliant for strength

Denotes column not structurally compliant for fire



LEVELS 4 & 5
TOP REINFORCEMENT

Prefix all rod tags '4' or '5' for level identification.
Top rods to top 300 at splices.

TOP REINFORCEMENT SCHEDULE.

TAG.	REINFT.	TAG.	REINFT.
U1.	12 O12 @ 300	T1.	33 O12 @ 300.
U2.	13 O12 @ 300	T2.	8 O16 Extra
U3.	13 O12 @ 300	T3.	20 O12 @ 300
U4.	19 O12 @ 300	T4.	3 O12 @ 300
U5.	6 O12 @ 300	T5.	16 O12 @ 300
U6.	7 O12 @ 300	T6.	17 O12 @ 300
U7.	9 O12 @ 300	T7.	3 O12 @ 300
U8.	3 O12 @ 300	T8.	13 O12 @ 300
U9.	15 O12 @ 300	T9.	6 O12 @ 300
U10.	3 O12 @ 300	T10.	27 O12 @ 300
U11.	5 O16 @ 300	T11.	5 O16 Extra.
U12.	13 O12 @ 300	T12.	3 O20 Extra
U13.	16 O12 @ 300	T13.	4 O16 Extra
U14.	20 O12 @ 300	T14.	6 O12 @ 300
U15.	13 O12 @ 300	T15.	32 O12 @ 300
U16.	13 O12 @ 300	T16.	7 O12 @ 300
U17.	17 O12 @ 300	T17.	3 O12 @ 300
U18.	2 O16 Extra.	T18.	14 O12 @ 300
U19.	26 O12 @ 300	T19.	10 O12 @ 300
U20.	4 O16 @ 300 Extra	T20.	7 O12 @ 300
U21.	4 O16 @ 300 Extra	T21.	3 O12 @ 300
U22.	2 O16 Extra.	T22.	4 O12 @ 300.
U23	1 O12 Trimmer	T23.	19 O12 @ 300
U24	1 O16 Trimmer	T24.	3 O16 @ 300 Extra
U25.	2 O16 Trimmers	T25.	2 O12 Trimmers
U26.	5 O12 @ 300	T26.	7 O16 @ 300 Extra
		T27.	1 O16 Trimmer
		T28.	4 O16 @ 300 Extra
		T29.	3 O16 @ 35 Extra
		T30.	3 O12 @ 300
		T31.	4 O12 @ 300
		T32.	1 O16 Trimmer
		T33.	8 O16 Extra
		T34.	4 O16 Extra

CONCRETE STRENGTH

$F'c = 25 MPa$

DESIGN LIVE LOAD

Generally	2.0 kPa.
Lobbies & Corridors	3.0 kPa.
Stairs	4.0 kPa.

Notes

FRL's as per BVN fire compartment plans dated 26/5/20

For Beam details refer to Sheet Nº 527
For 'Arrangement of Reinforcement in Flat Slabs' refer to Sheet Nº 526
For Sections refer to Sheet Nº 526
For General Notes refer to Sheet Nº 51

S.F.K.

DESIGNED BY THE HOUSING COMMISSION OF NEW SOUTH WALES

APPROVED FOR MANAGER/PLANNING & DESIGN

DATE

WORKING DRAWINGS BY ALEXANDER AND LLOYD PTY LTD

CONSULTING ENGINEERS STRUCTURAL & CIVIL BOND, JAMES, LARON PTY LTD 124 WALKER STREET NORTH SYDNEY

CONSULTING ENGINEERS ELECTRICAL MECHANICAL & HYDRAULIC D RUDD & PARTNERS 114 WALKER STREET NORTH SYDNEY

QUANTITY SURVEYORS RIDER HUNT & PARTNERS 61 MCLAREN STREET NORTH SYDNEY

ACOUSTICAL CONSULTANTS PETER R KNOWLAND & ASSOCIATES 18 CLIFF STREET MILSONS POINT

SYDNEY COVE RESIDENTIAL REDEVELOPMENT

Job No 3/7799/1/1 and Job Aged No 3/7799/1/2

LEVELS 4 & 5 - PLAN
Grids 54 to 90

SCALE 1:100

DRAWING NUMBER S75-60

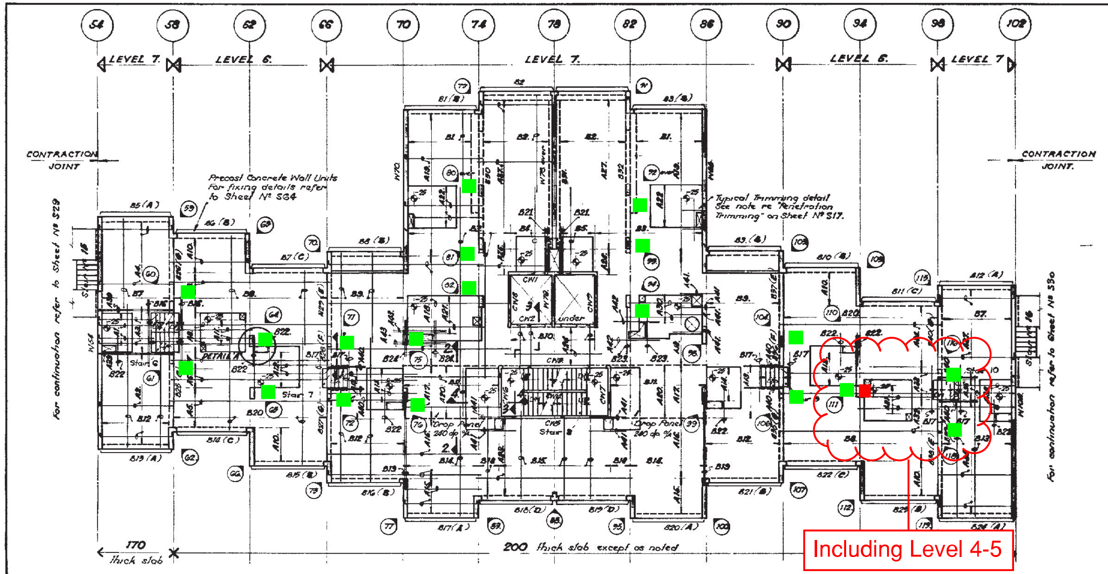
SHEET NUMBER S17

NUMBER IN SET 64

100mm IN ORIGINAL

SCP Column Review

11th August 2020



LEVELS 6 & 7
BOTTOM REINFORCEMENT

Prefix all beam & rod tags '6' or '7' for level identification e.g. '6A10', '7B2', etc.
Slab thicknesses shown are exclusive of slab recesses

SCHEDULE OF BEAM SIZES.

B1 B3 B5 to B24	330 × 275
B25 to B29 B35 to B40	1500 × 290
B30 B32	1000 × 600
B31	500 × 600
B2	2800 × 250
B4 B33 B34	Not used.

BOTTOM REINFORCEMENT SCHEDULE

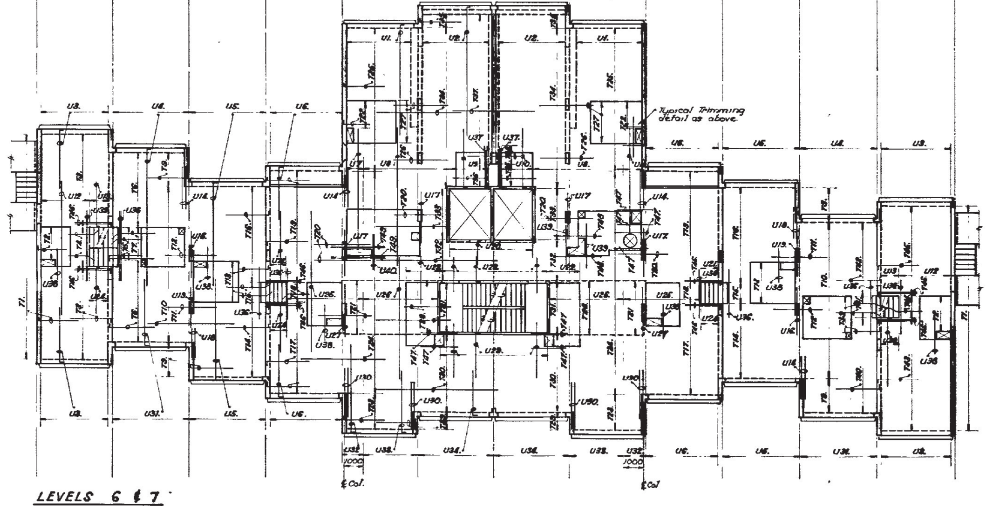
TAG	REINF'T.	TAG	REINF'T.	TAG	REINF'T.
A1	4 C16 Extra	A33	6 C12 @ 300	B1	11 C12 @ 300
A2	16 C12 @ 300	A34	11 C12 @ 300	B2	12 C12 @ 300
A3	7 C12 @ 300	A35	20 C12 @ 300	B3	18 C12 @ 300
A4	16 C12 @ 300	A36	4 C12 @ 300	B4	7 C12 @ 300
A5	7 C12 @ 300	A37	15 C12 @ 300	B5	6 C12 @ 300
A6	3 C12 @ 300	A38	4 C16 Extra	B6	Not Used.
A7	3 C12 @ 300	A39	2 C16 Trimmers	B7	12 C12 @ 300
A8	7 C12 @ 300	A40	2 C12 Trimmers	B8	27 C12 @ 300
A9	7 C12 @ 300	A41.	1 C16 Trimmer	B9	13 C12 @ 300
A10	6 C12 @ 300	A42.	1 C16 Trimmer	B10	15 C12 @ 300
A11	7 C16 Extra	A43.	2 C12 Trimmers	B11	17 C12 @ 300
A12	7 C16 Extra			B12	12 C12 @ 300
A13	9 C12 @ 300			B13	12 C12 @ 300
A14	4 C16 Extra			B14	13 C12 @ 300
A15	6 C12 @ 300			B15	20 C16 @ 300
A16	10 C12 @ 300			B16	2 C16 Trimmers
A17	9 C12 @ 300			B17	1 C12 Trimmer
A18	19 C12 @ 300			B18	4 C16 @ 300
A19	25 C12 @ 300			B19	2 C16 Extra
A20	10 C16 Extra			B20.	27 C12 @ 300
A21	4 C16 Extra			B21.	2 C16 Trimmers
A22	4 C16 Extra			B22.	1 C16 Trimmer
A23	14 C12 @ 300			B23.	1 C16 Trimmer
A24	7 C12 @ 300			B24.	2 C16 Trimmers
A25	Not Used				
A26	5 C12 @ 300				
A27	26 C12 @ 300				
A28	Not Used				
A29	Not Used				
A30	4 C16 Extra				
A31	7 C16 Extra				
A32	11 C12 @ 300.				

NORTH

Legend

■ (red) Denotes column not structurally compliant for strength

■ (green) Denotes column not structurally compliant for fire



LEVELS 6 & 7
TOP REINFORCEMENT

Prefix all rod tags '6' or '7' for level identification
Lap top rods 300 at splices

CONCRETE STRENGTH F'c = 25 MPa.

DESIGN LIVE LOADS

Generally	2·0 kPa.
Lobbies & Corridors	3·0 kPa.
Stairs	4·0 kPa.

TOP REINFORCEMENT SCHEDULE

TAG	REINF'T.	TAG	REINF'T.	TAG	REINF'T.
U1	11 C12 @ 300	T1	39 C12 @ 300	T37	26 C12 @ 300
U2	12 C12 @ 300	T2	8 C16 Extra	T38	4 C16 @ 300 Extra
U3	12 C12 @ 300	T3	16 C12 @ 300	T39	8 C16 Extra
U4	13 C12 @ 300	T4	7 C12 @ 300	T40	17 C12 @ 300
U5	13 C12 @ 300	T5	8 C16 Extra.	T41.	4 C12 @ 300
U6	13 C12 @ 300	T6	13 C12 @ 300	T42	13 C12 @ 300
U7	3 C12 @ 300	T7	7 C12 @ 300	T43	19 C12 @ 300
U8	15 C12 @ 300	T8	Not Used.	T44	4 C12 @ 300
U9	7 C12 @ 300	T9	6 C12 @ 300	T45	15 C12 @ 300
U10	6 C12 @ 300	T10	27 C12 @ 300	T46	2 C16 Trimmers
U11	3 C12 @ 300	T11	5 C16 @ 300 Extra	T47	1 C16 Trimmer
U12	9 C12 @ 300	T12	7 C16 @ 300 Extra	T48	1 C16 Trimmer
U13	3 C12 @ 300	T13	8 C16 Extra	T49	2 C12 Trimmers
U14	2 C16 Extra.	T14	13 C12 @ 300		
U15	Not Used	T15	3 C12 @ 300		
U16	3 C16 @ 300 Extra	T16	17 C12 @ 300		
U17	4 C16 @ 300 Extra	T17	16 C12 @ 300		
U18	2 C16 Extra	T18	3 C12 @ 300		
U19	3 C16 @ 300 Extra	T19	20 C12 @ 300		
U20	14 C12 @ 300	T20	2 C16 Extra		
U21	3 C12 @ 300	T21	9 C16 Extra		
U22	6 C16 @ 300	T22	6 C16 Extra		
U23	19 C12 @ 300	T23	6 C12 @ 300		
U24	3 C12 @ 300	T24	38 C12 @ 300		
U25	13 C12 @ 300	T25	25 C12 @ 300		
U26	13 C12 @ 300	T26	4 C16 @ 300 Extra		
U27	4 C16 @ 300 Extra	T27	7 C16 Extra		
U28	3 C12 @ 300	T28	9 C16 @ 300 Extra		
U29	19 C12 @ 300	T29	3 C12 @ 300		
U30	2 C16 Extra	T30	14 C12 @ 300		
U31	13 C12 @ 300	T31	8 C12 @ 300		
U32	4 C12 @ 300	T32	7 C12 @ 300		
U33	10 C12 @ 300	T33	9 C12 @ 300		
U34	13 C12 @ 300	T34	28 C12 @ 300		
U35.	2 C16 Trimmers	T35	2 C12 @ 300		
U36.	1 C12 Trimmer	T36	4 C12 @ 300		
U37.	2 C16 Trimmers				
U38.	1 C16 Trimmer				
U39.	1 C16 Trimmer				
U40.	2 C16 Trimmers				

Notes

FRL's as per BVN fire compartment plans dated 26/5/20

...Nº S27 ... 'Flat Slabs' refer to Sheet Nº S2... 6 ... Nº S1

DESIGNED BY THE HOUSING COMMISSION OF NEW SOUTH WALES

APPROVED FOR MANAGER/PLANNING & DESIGN

DATE

WORKING DRAWINGS BY ALEXANDER AND LLOYD PTY LTD ARCHITECTS 72-76 ARCHER STREET CHATSWOOD

CONSULTING ENGINEERS STRUCTURAL & CIVIL BOND JAMES, LARON PTY LTD 174 WALKER STREET NORTH SYDNEY — OFFICE REF S75-60

CONSULTING ENGINEERS ELECTRICAL MECHANICAL & HYDRAULIC D RUDD & PARTNERS ... WALKER STREET NORTH SYDNEY

QUANTITY SURVEYORS RIDER HUNT & PARTNERS 41 McLAREN STREET NORTH SYDNEY

ACOUSTICAL CONSULTANTS PETER R KNOWLAND & ASSOCIATES 19 CLIFF STREET MILSONS POINT

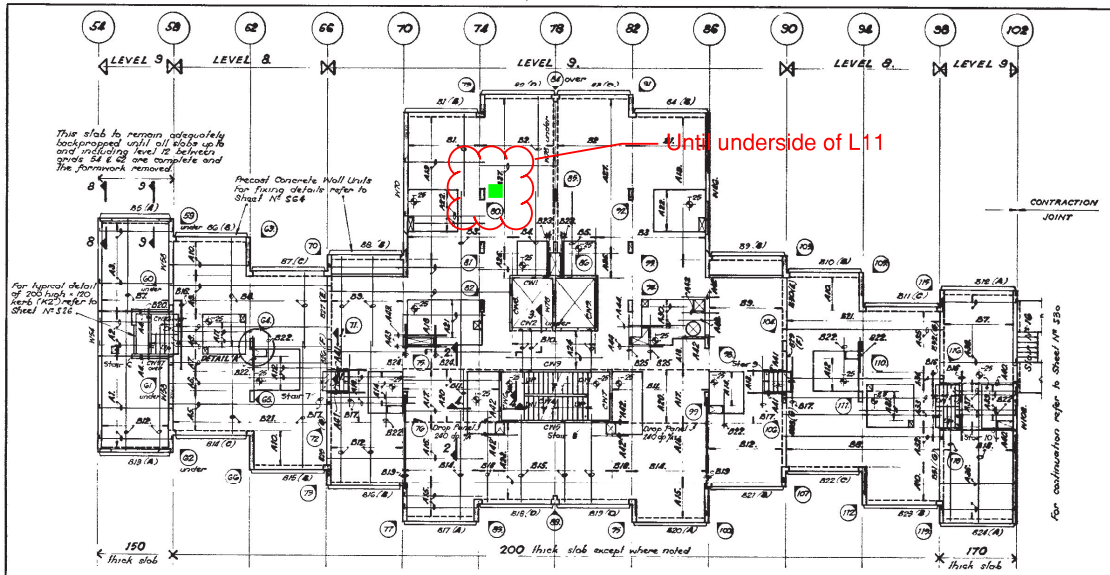
SYDNEY COVE RESIDENTIAL REDEVELOPMENT
Job No 3/7799/1/1 and
Job Aged No 3/7799/1/2

LEVELS 6 & 7 - PLAN
Grids 54 to 102

SCALES 1 100

NUMBER IN SET 64 — SHEET NUMBER S18

300mm ON ORIGINAL

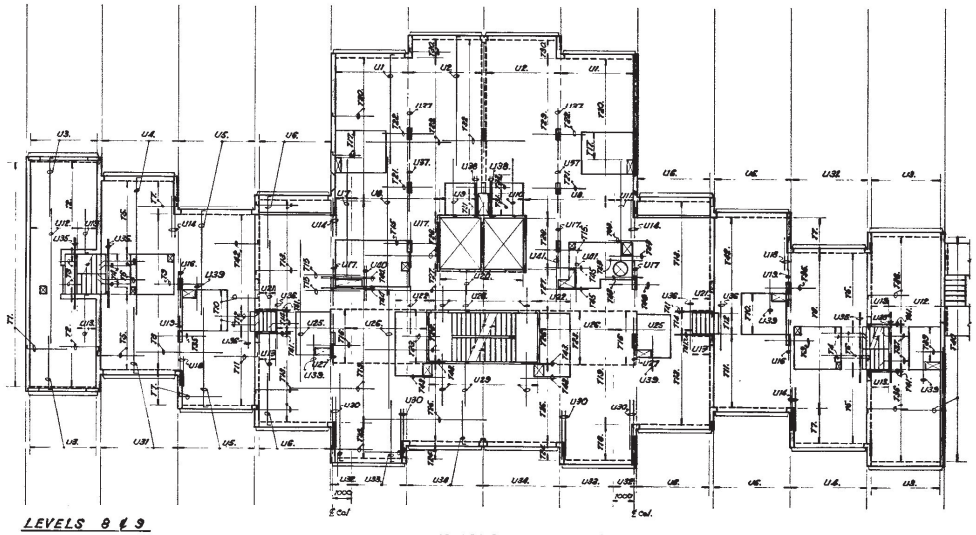


LEVELS 8 & 9
BOTTOM REINFORCEMENT

Prefix all beam & rod tags '8' or '9' for level identification.
Slab thicknesses shown are exclusive of slab recesses.
For trimmers to penetrations see "Penetration Trimming" note on Sheet N° S17

SCHEDULE OF BEAM SIZES.

B1 to B24	350 x 275
B25 to B82	1500 x 290



LEVELS 8 & 9
TOP REINFORCEMENT

Prefix all rod tags '8' or '9' for level identification.
Lap top rods 900 at splices.

CONCRETE STRENGTH f'c = 25 MPa.

DESIGN LIVE LOADS

Generally	2.0 kPa
Lobbies & Corridors	3.0 kPa
Stairs	4.0 kPa
Roofs	3.0 kPa

BOTTOM REINFORCEMENT SCHEDULE

TAG	REINFT.	TAG	REINFT.	TAG	REINFT.
A1.	N12 @ 350	A29.	7 C12 @ 300	B1.	12 C12 @ 300
A2.	7 C12 @ 300	A34.	8 C12 @ 300	B2.	18 C12 @ 300
A3.	N12 @ 320	A35.	11 C12 @ 300	B3.	18 C12 @ 300
A4.	2 C16 Trimmers	A36.	16 C12 @ 300	B4.	7 C12 @ 300
A5.	7 C12 @ 300	A37.	7 C12 @ 300	B5.	6 C12 @ 300
A6.	3 C12 @ 300	A38.	16 C12 @ 300	B6.	Not Used
A7.	3 C12 @ 300	A39.	4 C16 Extra	B7.	15 C12 @ 300
A8.	7 C12 @ 300	A40.	2 C16 Trimmers	B8.	27 C12 @ 300
A9.	7 C12 @ 300	A41.	2 C12 Trimmers	B9.	13 C12 @ 300
A10.	6 C12 @ 300	A42.	1 C16 Trimmer	B10.	14 C12 @ 300
A11.	7 C16 Extra	A43.	2 C12 Trimmers	B11.	17 C12 @ 300
A12.	7 C16 Extra	A44.	1C16 Trimmer	B12.	12 C12 @ 300
A13.	9 C12 @ 300			B13.	12 C12 @ 300
A14.	4 C16 Extra			B14.	13 C12 @ 300
A15.	6 C12 @ 300			B15.	20 C12 @ 300
A16.	11 C12 @ 300			B16.	2 C16 Trimmers
A17.	9 C12 @ 300			B17.	1 C12 Trimmer
A18.	19 C12 @ 300			B18.	4 C16 @ 300
A19.	25 C12 @ 300			B19.	2 C16 Extra
A20.	10 C16 Extra			B20.	2 C16 Trimmers
A21.	4 C16 Extra			B21.	27 C12 @ 300
A22.	4 C16 Extra			B22.	1 C16 Trimmer
A23.	14 C12 @ 300			B23.	9 C16 Trimmers
A24.	7 C12 @ 300			B24.	2C16 Trimmers
A25.	Not Used			B25.	1C16 Trimmer
A26.	5 C12 @ 300				
A27.	27 C12 @ 300				
A28.	Not Used				
A29.	Not Used				
A30.	4 C16 Extra				
A31.	7 C16 Extra				
A32.	7 C12 @ 300				

TOP REINFORCEMENT SCHEDULE.

TAG.	REINFT.	TAG.	REINFT.	TAG.	REINFT.
U1.	12 C12 @ 300	T1.	40 C12 @ 250	T37.	7 C12 @ 300
U2.	18 C12 @ 300	T2.	19 C12 @ 250	T38.	16 C12 @ 300
U3.	12 C12 @ 300	T3.	8 C12 @ 300	T39.	8 C16 Extra
U4.	13 C12 @ 300	T4.	8 C16 Extra	T40.	39 C12 @ 300
U5.	13 C12 @ 300	T5.	13 C12 @ 300	T41.	2 C16 Trimmers
U6.	13 C12 @ 300	T6.	7 C12 @ 300	T42.	17 C12 @ 300
U7.	3 C12 @ 300	T7.	6 C12 @ 300	T43.	1 C16 Trimmer
U8.	16 C12 @ 300	T8.	27 C12 @ 300	T44.	2 C12 Trimmers
U9.	7 C12 @ 300	T9.	7 C16 @ 300 Extra	T45.	1 C16 Trimmer
U10.	6 C12 @ 300	T10.	8 C16 Extra	T46.	4C16 @ 900 Extra
U11.	3 C12 @ 300	T11.	13 C12 @ 300		
U12.	9 C12 @ 300	T12.	3 C12 @ 300		
U13.	3 C12 @ 300	T13.	16 C12 @ 300		
U14.	2 C16 Extra	T14.	3 C12 @ 300		
U15.	Not Used	T15.	2 C16 Extra		
U16.	3 C16 @ 300 Extra	T16.	9 C16 Extra		
U17.	4 C16 @ 300 Extra	T17.	6 C16 Extra		
U18.	2 C16 Extra	T18.	6 C12 @ 300		
U19.	3 C16 @ 300 Extra	T19.	38 C12 @ 300		
U20.	18 C12 @ 300	T20.	28 C12 @ 300		
U21.	8 C12 @ 300	T21.	4 C16 @ 300 Extra		
U22.	6 C12 @ 300	T22.	5 C16 @ 300 Extra		
U23.	13 C12 @ 300	T23.	9 C16 @ 300 Extra		
U24.	Not Used	T24.	2 C12 @ 300		
U25.	13 C12 @ 300	T25.	14 C12 @ 300		
U26.	13 C12 @ 300	T26.	8 C12 @ 300		
U27.	4 C16 @ 300 Extra	T27.	7 C12 @ 300		
U28.	Not Used	T28.	9 C12 @ 300		
U29.	19 C12 @ 300	T29.	25 C12 @ 300		
U30.	2 C16 Extra	T30.	3 C12 @ 300		
U31.	13 C12 @ 300	T31.	4 C12 @ 300		
U32.	3 C12 @ 300	T32.	27 C12 @ 300		
U33.	10 C12 @ 300	T33.	4 C16 @ 300 Extra		
U34.	13 C12 @ 300	T34.	Not Used		
U35.	2 C16 Trimmers	T35.	3 C16 @ 300 Extra		
U36.	1 C12 Trimmer	T36.	16 C12 @ 300		
U37.	3 C16 @ 300 Extra				
U38.	2 C16 Trimmers				
U39.	1 C16 Trimmer				
U40.	2 C12 Trimmers				
U41.	1 C16 Trimmer				

NORTH

SCP Column Review

11th August 2020

Legend

Denotes column not structurally compliant for strength

Denotes column not structurally compliant for fire

Notes

FRL's as per BVN fire compartment plans dated 26/5/20

DESIGNED BY THE HOUSING COMMISSION OF NEW SOUTH WALES

APPROVED FOR MANAGER/ PLANNING & DESIGN

DATE

WORKING DRAWINGS BY ALEXANDER AND LLOYD PTY LTD

CONSULTING ENGINEERS STRUCTURAL & CIVIL BOND JAMES LARON PTY LTD 124 WALKER STREET NORTH SYDNEY — DRWG NO S75-60

CONSULTING ENGINEERS ELECTRICAL MECHANICAL & HYDRAULIC D RUDD & PARTNERS NORTH SYDNEY

QUANTITY SURVEYORS RIDER HUNT & PARTNERS 61 McLAREN STREET NORTH SYDNEY

ACOUSTICAL CONSULTANTS PETER R KNOWLAND & ASSOCIATES 4 CLIFF STREET MILSONS POINT

SYDNEY COVE RESIDENTIAL REDEVELOPMENT

Job No 3/7799/1/1 and Job Aged No 3/7799/1/2

LEVELS 8 & 9 - PLAN
Grids 54 to 102

SCALES 1:100

NUMBER IN SET 64 — SHEET NUMBER S19

35 mm ON ORIGINAL

Appendix I Site/Existing Building Geotech Report

eiaustralia

Contamination | Remediation | Geotechnical

SIRIUS DEVELOPMENTS PTY LTD

Geotechnical Investigation

2-60 Cumberland Street, The Rocks

E24614.G03
26 June 2020

Document Control

Report Title: Geotechnical Investigation

Report No: E24614.G03

Copies	Recipient
1 Soft Copy (PDF – Secured, issued by email)	Mr John Green Sirius Developments Pty Ltd 52 Victoria St, Paddington
2 Original (Saved to Digital Archives) (\\Pah\ei$\07 - Projects\E24614_Sirius Building_The Rocks_GI_DSI_HMS\05_Deliverables\Work in Progress\E24614.G03 - Report - IW.docx)	EI Australia Suite 6.01, 55 Miller Street, PYRMONT NSW 2009

Author	Technical Reviewer
	
Ian Watts **Geotechnical Engineer**	**Shahzada Rizvi** **Principal Engineering Geologist**

Revision	Details	Date	Amended By
	Original	26 June 2020	

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Appendices

1. Introduction

1.1 Background

At the request of Sirius Developments Pty Ltd (the Client), EI Australia (EI) has carried out a Geotechnical Investigation (GI) for the proposed development at 2-60 Cumberland Street, The Rocks (the Site).

This GI report has been prepared to provide advice and recommendations to assist in the preparation of designs for the proposed development. The investigation has been carried out in accordance with the agreed scope of works outlined in EI's proposal referenced P17797.6, dated 5 March 2020, and with the Client's signed authorisation to proceed, dated 10 March 2020.

1.2 Proposed Development

The following documents, supplied by the Client, were used to assist with the preparation of this GI report:

- Geotechnical Brief, Prepared by SCP Engineers and development consults, dated 12 December 2019;
- Preliminary Site Investigation, prepared by EP Risk Management Pty Ltd, Project No. EP0643.001, dated 28 September 2017; and
- Architectural and structural plans, prepared the Housing Commission of NSW, Job No. 3/7799/1/1, dated circa 1977. Note that these plans are not as-built plans and their accuracy is not confirmed by Property NSW.

No drawings showing the proposed plans have been released at the time of writing of this report. However, based on onsite discussions with the client, EI understands that the proposed development involves the refurbishment of the existing structure, including an additional basement level in the southern portion of the site. In the absence of any plans, EI has assumed that excavation depths of up to 3.00m below the existing slab level will be required in the southern portion of site. Locally deeper excavations may be required for footings, and service trenches.

1.3 Objectives

The objective of the GI was to investigate the existing site subsurface conditions at 11 borehole locations. It is understood that as part of the proposed modification to the structure, the existing footings may be required to support the additional loads that originally designed for. To investigate the founding conditions beneath the existing footings, 9 boreholes were drilled through the existing footings and 2 boreholes were drilled adjacent to the existing retaining walls in order to provide preliminary geotechnical advice and recommendations addressing the following:

- Excavation methodologies and monitoring requirements;
- Groundwater considerations;
- Vibration considerations;
- Excavation support requirements, including preliminary geotechnical design parameters for retaining walls and shoring systems;

- Building foundation options, including;
  - Preliminary design parameters for material beneath the footings.
  - Earthquake loading factor in accordance with AS1170.4:2007.
- The requirement for additional geotechnical works.

1.4 Scope of Works

The scope of works for the GI included:

- Preparation of a Work Health and Safety Plan;
- Review of relevant geological maps for the project area;
- Site walkover inspection by a Geotechnical Engineer to assess topographical features and site conditions;
- Scanning of proposed borehole locations for buried conductive services using a licensed service locator with reference to Dial Before You Dig (DBYD) plans;
- Drilling of eleven boreholes (BH1 to BH11M) using NMLC and Diatube diamond coring techniques to termination depths of between 3.69m to 8.47m BEGL (RL18.91m to RL 14.86m). The rock core photographs are presented in **Appendix A**;
  - The approximate surface levels shown on the borehole logs were interpolated from spot levels shown on the supplied architectural plans. Approximate borehole locations are shown on **Figure 2**;
- Borehole BH6M, BH8M and BH 11M were converted into groundwater monitoring wells with a depth of 5.02m BEGL (RL17.68m), 5.62m BEGL (RL17.98m) and 8.00m BEGL (RL16.80m) to allow for long-term groundwater monitoring;
- The remaining boreholes were filled with grout and capped with concrete upon completion;
- Soil and rock samples were sent to Macquarie Geotechnical Pty Ltd (Macquarie) and SGS Australia (SGS), which are National Australian Testing Authority (NATA) accredited laboratories, for testing and storage; and
- Preparation of this GI report.

An EI Geotechnical Engineer was present full-time onsite to set out the borehole locations, direct the testing and sampling, log the subsurface conditions and record groundwater levels.

1.5 Constraints

The GI was limited by the intent of the investigation and the presence of existing site structures. The discussions and advice presented in this report are preliminary and intended to assist in the preparation of initial designs for the proposed development. Further geotechnical inspections should be carried out during construction to confirm the geotechnical and groundwater models, and the preliminary design parameters provided in this report.

2. Site Description

2.1 Site Description and Identification

The site identification details and associated information are presented in **Table 2-1** below while the site locality is shown on **Figure 1.** An aerial photograph of the site is presented in **Plate 1** below.

Table 2-1 Summary of Site Information

Information	Detail
Street Address	2-60 Cumberland Street, The Rocks
Lot and Deposited Plan (DP) Identification	Lot 100 in DP 264104
Brief Site Description	At the time of our investigation, the site was occupied by a concrete apartment building, the Sirius Building, with a single level basement carpark extending below the majority of the site.
Site Area	The site area is approximately 3,647m^2 (based on the provided Preliminary Site Investigation referenced above).

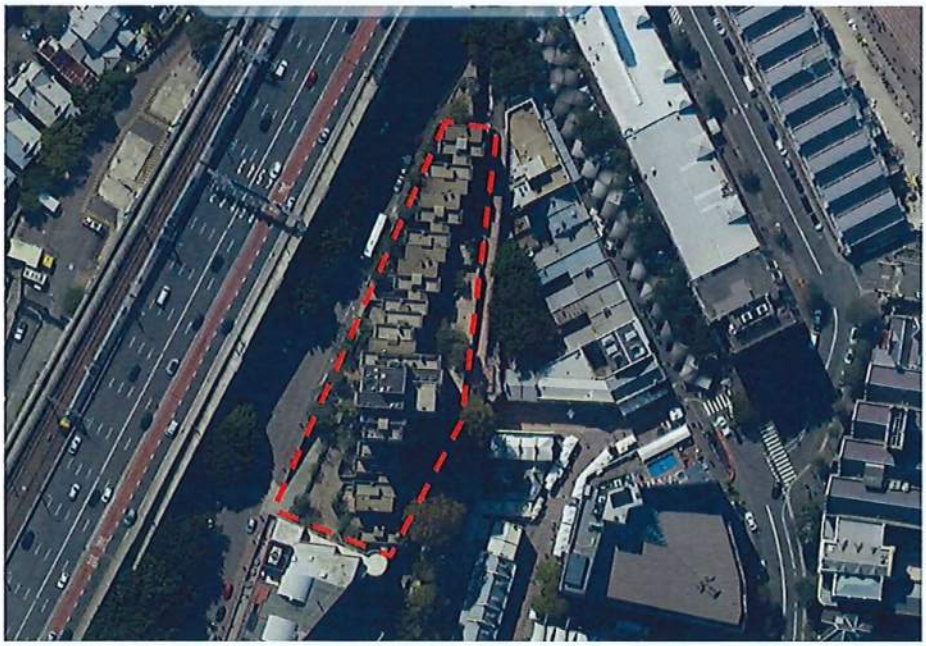


Plate 1: Aerial photograph of the site (source: Six Maps, accessed 16/6/20)

2.2 Local Land Use

The site is situated within an area of commercial and residential use. Current uses on surrounding land at the time of our presence on site are described in **Table 2-2** below. For the sake of this report, the site boundary adjacent to Cumberland Street shall be adopted as the western site boundary.

Table 2-2 Summary of Local Land Use

Direction Relative to Site	Land Use Description
North	Property at No. 23 Gloucester Walk, consisting of a two storey, brick and concrete building, with at least one basement level observed. The structure is built into the existing slope underneath Cumberland Street above. No. 23 Gloucester Walk is on a similar elevation to the northern site boundary.
East	Gloucester Walk, a public pedestrian walkway, followed by a sandstone block retaining wall located above a vertical cut face, of approximately 10m to 15m height. The bedrock exposed over the cut face is characterised as slightly weathered, massive sandstone of at least medium strength containing sub-horizontal bedding defects. The retaining wall and vertical cut was followed by properties No. 25 to 41 George Street, No. 3 and 4 Atherden Street and No. 5, 13 and 19A Playfair Street, consisting of one to three storey brick terrace buildings.
South	Property at No. 86 Cumberland Street, consisting of a 4 storey brick and concrete building, taht appeared to be on similar level to the site, with a basement carpark observed.
West	Cumberland Street, a two lane asphalt paved road with on street parking, followed by the Bradfield Hwy, consisting of a raised eight lane highway leading to the Sydney Harbour Bridge.

2.3 Regional Setting

The site topography and geological information for the locality is summarised in **Table 2-3** below.

Table 2-3 Topographic and Geological Information

Attribute	Description
Topography	The site is located on the eastern side of Cumberland Street within moderately (10° to 18°) east dipping topography.
Regional Geology	Information on regional sub-surface conditions, referenced from the Department of Mineral Resources Geological Map Sydney 1:100,000 Geological Series Sheet 9130 (DMR 1983) indicates the site to be underlain by Hawkesbury Sandstone, which consists of medium to coarse-grained quartz sandstone with very minor shale and laminite lenses.

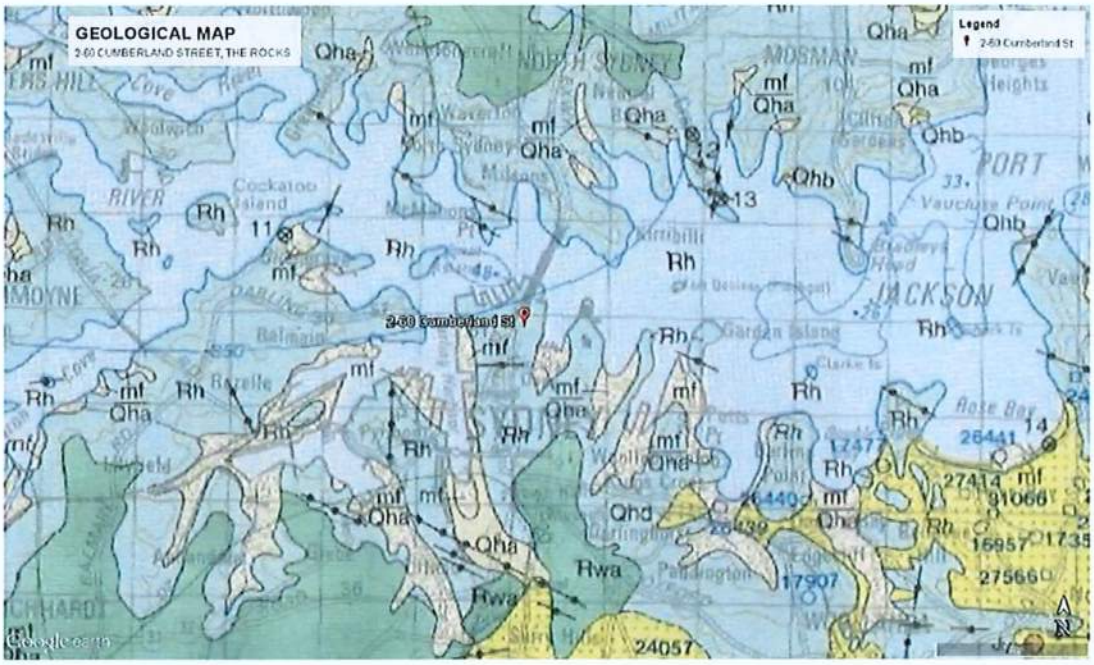


Plate 2: Excerpt of geological map showing location of site.

3. Investigation Results

3.1 Stratigraphy

For the development of a site-specific geotechnical model, the stratigraphy observed in the GI has been grouped into two geotechnical units. A summary of the subsurface conditions across the site, interpreted from the investigation results, is presented in **Table 3-1** below. More detailed descriptions of subsurface conditions at each borehole location are available on the borehole logs presented in **Appendix A**. The details of the methods of soil and rock classifications, explanatory notes and abbreviations adopted on the borehole logs are also presented in **Appendix A.**

Table 3-1 Summary of Subsurface Conditions

Unit	Material2	Depth to Top of Unit (m BEGL)1	RL of Top of Unit (m AHD)1	Observed Thickness (m)	Comments
1	**Concrete Slab, Fill and Concrete footings**	Surface	19.10 to 24.80	0.26 to 3.08	Concrete pavements of between 90mm and 190mm thickness, underlain by sandy Gravel and Gravel fill, generally underlain by Concrete footings of between 350mm and 1130mm thickness.
2	**Medium to High Strength Sandstone**	0.26 to 3.08	18.00 to 24.54	-[3]	Slightly weathered to fresh, medium to high strength, fine to medium grained sandstone. Areas of core loss were observed within BH9, core loss usually infers the presence of extremely weathered zones and seams.

Note 1 Approximate depth and level at the time of our investigation. Depths and levels may vary across the site.
Note 2 For more detailed descriptions of the subsurface conditions, reference should be made to the borehole logs attached to **Appendix A.**
Note 3 Observed up to termination depth in all boreholes

The footing thicknesses and the subsurface ground conditions encountered beneath the investigated footings are outlined in **Table 3-2** below. EI recommends that further investigation is conducted at the location of BH4 (Column 58) and BH10 (Column 154) as in-situ ground conditions at the founding level of the existing footing could not be identified during our investigation.

Table 3-2 Footing Thicknesses and Encountered Conditions at Founding Level

Borehole	Column Number	Observed Footing thickness (mm)	Strength of Rock Underlying Existing Footing
BH1	7	350	High Strength Sandstone
BH2	24	500	High Strength Sandstone
BH3	31	1130	Medium Strength Sandstone
BH4	58	850	Not Confirmed
BH5	65	450	Medium Strength Sandstone

Borehole	Column Number	Observed Footing thickness (mm)	Strength of Rock Underlying Existing Footing
BH6M	88	690	High Strength Sandstone
BH7	81	680	High Strength Sandstone
BH8	114	740	Medium Strength Sandstone
BH9	N/A	N/A	Medium Strength Sandstone
BH10	154	Not Observed	Medium Strength Sandstone
BH11	N/A	N/A	High Strength Sandstone

3.2 Groundwater Observations

Water circulation required for rock coring prevented observations of groundwater levels within all boreholes during drilling operation. Following completion of the drilling, groundwater monitoring wells were installed in BH6M, BH8M and BH11M and bailed dry. The groundwater levels were then measured within the monitoring wells as per **Table 3-3** below. No long term groundwater monitoring was carried out.

Table 3-3 Groundwater Levels

Borehole ID	Measurement Date	Depth to Groundwater (m BEGL)	Groundwater RL (m AHD)
BH6M	19/6/20	3.85	18.85
BH8M	19/6/20	4.48	19.12
BH11M	19/6/20	4.80	20.00

3.3 Test Results

Two soil samples were selected for laboratory testing to assess the following:

- Soil aggressivity (pH, chloride and sulfate content and electrical conductivity).

A summary of the soil test results is provided in **Table 3-4** below. Laboratory test certificates are presented in **Appendix B**.

Table 3-4 Summary of Soil Laboratory Test Results

Test/ Sample ID		BH3_2.45-2.49	BH7_0.35-0.45
Unit		2	1
Material Description [1]		SANDSTONE	FILL
Aggressivity	Chloride Cl (ppm)	2.6	11
	Sulfate SO_4 (ppm)	7.4	510
	pH	6.5	6.8
	Electrical Conductivity (µS/cm)	8	190

Note 4 More detailed descriptions of the subsurface conditions at each borehole location are available on the borehole logs presented in **Appendix A**.

The investigation indicated high permeability fill was present above the groundwater table. In accordance with Tables 6.4.2(C) and 6.5.2(C) of AS 2159:2009 'Piling – Design and Installation', the results of the pH, chloride and sulfate content and electrical conductivity of the soil provided the following exposure classifications:

- 'Non-Aggressive' for buried concrete structural elements; and
- 'Non-Aggressive' for buried steel structural elements.

In accordance with Table 4.8.1 of AS3600-2009 'Concrete Structures' these soils would be classified as exposure classification 'A1' for concrete in sulfate soils.

47 selected rock core samples were tested by Macquarie to estimate the Point Load Strength Index (Is_{50}) values to assist with rock strength assessment. The results of the testing are summarised on the attached borehole logs.

The point load strength index tests correlated reasonably well with our field assessments of rock strength. The approximate Unconfined Compressive Strength (UCS) of the rock core, estimated from correlations with the point load strength index test results, varied from <1 MPa to 37 MPa.

4. Recommendations

4.1 Geotechnical Issues

Based on the results of the investigation, we consider the following to be the main geotechnical issues for the proposed development:

- Additional basement level excavation and retention to limit lateral deflections and ground loss as a result of excavations, resulting in damage to the existing structure;
- Rock excavation; and
- Foundation design for building loads.

4.2 Dilapidation Surveys

Prior to excavation of the additional basement level, we recommend that detailed dilapidation surveys be carried out on all structures and infrastructures surrounding the site that falls within the zone of influence of the excavation to allow assessment of the recommended vibration limits and protect the client against spurious claims of damage. The zone of influence of the excavation is defined by a distance back from the excavation perimeter of twice the total depth of the excavation. The reports would provide a record of existing conditions prior to commencement of the work. A copy of each report should be provided to the adjoining property owner who should be asked to confirm that it represents a fair assessment of existing conditions. The reports should be carefully reviewed prior to demolition and construction.

4.3 Demolition Considerations

Care should be taken during demolition, particularly the concrete pavement, to avoid damaging the existing structure. Demolition of concrete slabs, pavement and floor slabs may require breaking into smaller size prior to disposal offsite. We recommend that saw cut slots be provided near adjoining columns to reduce the risk of vibrations being transferred to the existing structure.

4.4 Excavation Methodology

4.4.1 Excavation Assessment

Prior to any excavation commencing, we recommend that reference be made to the Safe Work Australia Excavation Work Code of Practice, dated August 2019.

EI assumes that the proposed development will require an excavation depth of about 3.00m BEGL. Locally deeper excavations for footings and service trenches may be required.

Based on the borehole logs, the proposed basement excavations will therefore extend through all units as outlined in **Table 3-1** above. As such, an engineered retention system must be installed prior to excavation commencing.

Unit 1 could be excavated using buckets of earthmoving Hydraulic Excavators, particularly if fitted with 'Tiger Teeth'. Excavation of Unit 2 may present hard or heavy ripping, or "hard rock" excavation conditions. Hydraulic rock breakers, rock saws, ripping hooks or rotary grinders are recommended for this site, as access for bulldozers or large construction equipment is not expected to be possible, though productivity may be low and equipment wear will be high, which should be allowed for.

Should rock hammers be used for the excavation of the bedrock, excavation should commence away from the adjoining structures and the transmitted vibrations monitored to assess how close the hammer can operate to the adjoining structures while maintaining transmitted vibrations within acceptable limits. To fall within these limits, we recommend that the size of rock hammers do not exceed a medium sized rock hammer, say 900 kg, such as a Krupp 580, and be trialled prior to use. The transmitted vibrations from rock hammers should be measured to determine how close each individual hammer can operate to the adjoining buildings.

The vibration measurements can be carried out using either an attended or an unattended vibration monitoring system. An unattended vibration monitoring system must be fitted with an alarm in the form of a strobe light or siren or alerts sent directly to the site supervisor to make the plant operator aware immediately when the vibration limit is exceeded. The vibration monitor must be set to trigger the alarm when the overall Peak Particle Velocity (PPV) exceeds set limits outlined by a vibration monitoring plan. Reference should be made to **Appendix C** for a guide to acceptable limits of transmitted vibrations.

If it is found that the transmitted vibrations by the use of rock hammers are unacceptable, then it would be necessary to change to a smaller excavator with a smaller rock hammer, or to a rotary grinder, rock saws, jackhammers, ripping hooks, chemical rock splitting and milling machines. Although these are likely to be less productive, they would reduce or possibly eliminate risks of damage to adjoining properties through vibration effects transmitted via the ground. Such equipment would also be required for detailed excavation, such as footings or service trenches, and for trimming of faces. Final trimming of faces may also be completed using a grinder attachment rather than a rock breaker in order to assist in limiting vibrations. The use of rotary grinders generally generates dust and this may be supressed by spraying with water.

To assist in reducing vibrations and over-break of the sandstone, we recommend that initial saw cutting of the excavation perimeters through the bedrock may be provided using rock saw attachments fitted to the excavator. Rock sawing of the excavation perimeter has several advantages as it often reduces the need for rock bolting as the cut faces generally remain more stable and require a lower level of rock support than hammer cut excavations, ground vibrations from rock saws are minimal and the saw cuts will provide a slight increase in buffer distance for use of rock hammers. However, the effectiveness of such approach must be confirmed by the results of vibration monitoring.

Also, there is a potential for poorly oriented defects within the excavated bedrock to result in localized rock slide/topple failure with potential impact to the work site or the adjacent structures. However through selection of suitable excavation equipment, geotechnical inspections and mapping during the excavation works along with the installation of support measures as determined necessary by the inspections, the risk from the proposed works can be maintained within 'Acceptable' levels. In addition, we recommend that only excavation contractors with appropriate insurances and experience on similar projects be used. The contractor should also be provided with a copy of this report to make his own judgement on the most appropriate excavation equipment.

Groundwater seepage monitoring should be carried out during bulk excavation works and prior to finalising the design of a pump out facility. Outlets into the stormwater system will require Council approval.

Furthermore, any existing buried services, which run below the site, will require diversion prior to the commencement of excavation or alternatively be temporarily supported during excavation, subject to permission or other instructions from the relevant service authorities. Enquiries should also be made for further information and details, such as invert levels, on the buried services.

4.4.2 Excavation Monitoring

Consideration should be made to the impact of the proposed development upon neighbouring structures, roadways and services. Basement excavation retention systems should be designed so as to limit lateral deflections.

Contractors should also consider the following limits associated with carrying out excavation and construction activities:

- Limit vertical settlements of ground surface at common property boundaries and services easement; and
- Limit Peak Particle Velocities (PPV) from vibrations, caused by construction equipment or excavation, experienced by any nearby structures and services.

Monitoring of deflections of retaining structures and surface settlements should be carried out by a registered surveyor at agreed points along the excavation boundaries and along existing building foundations / services / pavements and other structures located within or near the zone of influence of the excavation. Owners of existing services adjacent to the site should be consulted to assess appropriate deflection limits for their infrastructures. Measurements should be taken in the following sequence:

- Before commencing installation of retaining structures where appropriate to determine the baseline readings. Two independent sets of measurements must be taken confirming measurement consistency;
- After excavation to a depth of 1.5m, and every 1.5m interval thereafter;
- After excavation to the base of the excavation;
- One month after completion of the permanent retaining structure or after three consecutive measurements not less than a week apart showing no further movements, whichever is the latter.

4.5 Groundwater Considerations

Groundwater was observed in all monitoring wells as detailed in **Table 3-3**, all of which are below the assumed excavation of 3.00m BEGL.

Even though groundwater was encountered beneath the proposed excavation depth, we expect that some groundwater inflows into the excavation through any defects within the sandstone bedrock (such as jointing, and bedding planes, etc.) may be possible, particularly following a period of heavy rainfall. Flows into the excavation at time may be locally high, but would be expected to decrease considerably with time as the bedding seams/joints are drained. We recommend that monitoring of seepage be implemented during the excavation works to confirm the capacity of the drainage system.

We expect that any seepage that does occur will be able to be controlled by a conventional sump and pump system. We recommend that a sump-and-pump system be used both during construction and for permanent groundwater control below the basement floor slab.

In the long term, drainage should be provided behind all basement retaining walls, around the perimeter of the basement and below the basement slab. The completed excavation should be inspected by the hydraulic engineer to confirm that adequate drainage has been allowed for. Drainage should be connected to the sump-and-pump system and discharging into the stormwater system. The permanent groundwater control system should take into account any possible soluble substances in the groundwater which may dictate whether or not groundwater can be pumped into the stormwater system.

The design of drainage and pump systems should take the above issues into account along with careful ongoing inspections and maintenance programs.

4.6 Excavation Retention

4.6.1 Support Systems

From a geotechnical perspective, it is critical to maintain the stability of all adjacent structures and infrastructures during demolition, excavation and construction works.

No architectural plans were provided at the time of writing of this report, however EI understands that excavation of up to 3.00m BEGL is expected to occur in the southern portion of the site, in places adjacent to the footings of the existing structure.

Allowance must be made for the retention of any fill layers beneath the existing slab, such as a concrete block wall or similar.

Excavation within Unit 2 sandstone should generally be able to be cut vertically and without support. For vertical cuts, the excavations must be inspected by a geotechnical engineer at regular intervals to check for any inclined joints or weak seams that require stabilisation. Said inclined joints and weak seams were evident in the boreholes, particularly in BH9. Such geotechnical inspections should be carried out at depth intervals of no more than 1.5m. If adverse defects are encountered, the stabilisation measures may comprise rock bolts, shotcrete and mesh or dental treatment of thin weak seams using non-shrink grout, and this should be allowed for.

Table 4-1 Geotechnical Design Parameters

Material [1]		Unit 1 Fill	Unit 2 Medium to High Strength Sandstone
RL of Top of Unit (m AHD) [2]		19.10 to 24.80	18.00 to 24.54
Bulk Unit Weight (kN/m^3)		18	24
Friction Angle, ϕ' (°)		25	-
Earth Pressure Coefficients	At rest, K_o [3]	0.58	-
	Active, K_a [3]	0.41	-
	Passive, K_p [3]	-	4.60
Allowable Bearing Pressure (kPa) [5]		-	3500
Allowable Shaft Adhesion (kPa) [4, 5]	in Compression	-	350
	in Uplift	-	175
Allowable Toe Resistance (kPa)		-	350
Allowable Bond Stress (kPa)		-	300
Earthquake Site Risk Classification		▪ AS 1170.4:2007 indicates an earthquake subsoil class of Class B_e (Rock) ▪ AS 1170.4:2007 indicates that the hazard factor (z) for Sydney is 0.08.	

Notes:

1 More detailed descriptions of subsurface conditions are available on the borehole logs presented in **Appendix A.**
2 Approximate levels of top of unit at the time of our investigation. Levels may vary across the site.
3 Earth pressures are provided on the assumption that the ground behind the retaining walls is horizontal.
4 Side adhesion values given assume there is intimate contact between the pile and foundation material and should achieve a clean socket roughness category R2 or better. Design engineer to check both 'piston pull-out' and 'cone liftout' mechanics in accordance with AS4678-2002 Earth Retaining Structures.
5 To adopt these parameters we have assumed that:
- Footings have a nominal socket of at least 0.3m, into the relevant founding material;
- For piles, there is intimate contact between the pile and foundation material (a clean socket roughness category of R2 or better);

- Potential soil and groundwater aggressivity will be considered in the design of piles and footings;
- Piles should be drilled in the presence of a Geotechnical Engineer prior to pile construction to verify that ground conditions meet design assumptions. Where groundwater ingress is encountered during pile excavation, concrete is to be placed as soon as possible upon completion of pile excavation. Pile excavations should be pumped dry of water prior to pouring concrete, or alternatively a tremmie system could be used;
- The bases of all pile, pad and strip footing excavations are cleaned of loose and softened material and water is pumped out prior to placement of concrete;
- The concrete is poured on the same day as drilling, inspection and cleaning.
- The allowable bearing pressures given above are based on serviceability criteria of settlements at the footing base/pile toe of less than or equal to 1% of the minimum footing dimension (or pile diameter).

4.7 Foundations

The subsurface conditions at the investigated locations have been grouped into three categories;

- Column footings founded on Unit 2, medium to high strength sandstone;
- Column footings requiring additional investigation; and
- Footings for the southern and south western retaining walls.

Recommendations are also provided for footings adjacent to the proposed vertical cuts in Unit 2 sandstone and new footings required for the proposed structural modifications.

4.7.1 Column Footings Founded on Medium to High Strength Sandstone

Based on the findings of our investigation, the footings for Column 7 (BH1), Column 24 (BH2), Column 31 (BH3), Column 65 (BH5), Column 88 (BH6M), Column 81 (BH7), Column 114 (BH8) and Column 154 (BH10) are founded upon sandstone bedrock of medium to high strength (Unit 2) and can be redesigned for an allowable bearing capacity of 3500kPa subject to serviceability. **Figure 3** provides an indicative cross section for the above column footings based on the encountered conditions at Column 24 (BH2).

4.7.2 Column Footings Requiring Additional Investigation

The findings of our investigation were inconclusive as to the founding conditions beneath the footings for Column 58 (BH4) and Colum 154 (BH10).

At the location of Column 58 (BH4), a concrete footing was encountered between 0.40m to 1.25m depth BEGL, underlain by a zone of core loss, inferred to be gravelly sand fill.

At the location of Column 154 (BH10), no footing was encountered, however medium and high strength sandstone was encountered at 0.90m depth BEGL.

In the central portion of the eastern boundary, reference Footing Plan – North (Sheet S2, Number in Set 64) identifies the approximate line of a rock shelf after bulk excavation to the east of Column 58 (BH4). There is a possibility that the footing for Column 58 is founded adjacent to the crest of this rock shelf and during drilling, BH4 has cut through a section close to the outer edge of the footing, hence the 1.55m of encountered fill is inferred to be directly adjacent to the footing. **Figure 4** provides a cross section of the inferred ground conditions beneath Column 58 (BH4). The presence of the Sandstone (of unknown strength) directly below the footing is inferred, as sandstone bedrock was not encountered in the borehole at the founding level of the footing.

EI recommends further investigation at Column 154 to obtain footing dimensions and further investigation in the vicinity of Colum 58 to identify the location of this rock ledge, as the footing location in regards to the rock ledge may affect the footings ability to take additional loads. Depending on the location of this rock ledge, this may impact other footings along the eastern portion of the site also.

4.7.3 Footings for Southern and South Western Retaining Walls

Boreholes BH9 and BH11M were drilled in the south western portion of site, to provide advice for the proposed footings for the southern and south western retaining walls.

Footings in the south western portion of site for the above mentioned retaining walls, founded on Unit 2 sandstone can be designed for an allowable bearing pressure of 3500kPa subject to serviceability.

Geotechnical inspections of foundations are recommended to determine that the required bearing capacity has been achieved and to determine any variations that may occur between the boreholes and inspected locations.

4.7.4 Footings Adjacent to Proposed or Existing Vertical Cuts in Sandstone

Footings founded in Unit 2, medium to high strength sandstone located at the crest of a vertical cut, such as adjacent to the proposed basement or along the eastern portion of site as mentioned in **Section 4.7.2** above, can be designed for half the allowable bearing capacity, subject to serviceability, as outlined in **Table 4-1** above.

Where new excavation is occurring, geotechnical inspection of the rock cut face directly below the footings is recommended after excavation to 1.0m to check for any adverse defects or weak seams. If adverse defects are encountered, stabilisation measures may comprise of rock bolts or dental treatment of thin weak seams using non-shrink grout, and this should be allowed for.

4.7.5 New Footings

Following bulk excavation to 3.00m BEGL, we expect Unit 2 material to be exposed at BEL.

It is recommended that all new footings for the building be founded within the sandstone bedrock of similar strength of at least Unit 2 or better to provide uniform support and reduce the potential for differential settlements.

Pad or strip footings founded within Unit 2 may be preliminarily designed for an allowable bearing capacity of 3500kPa, based on serviceability.

Geotechnical inspections of foundations are recommended to determine that the required bearing capacity has been achieved and to determine any variations that may occur between the boreholes and inspected locations.

4.8 Basement Floor Slab

Following bulk excavations for the proposed additional basement level, sandstone bedrock is expected to be exposed at the basement floor BEL.

Following the removal of all loose and softened materials, we recommend that underfloor drainage be provided and should comprise a strong, durable, single sized washed aggregate such as 'blue metal gravel'. Joints in the concrete floor slab should be designed to accommodate shear forces but not bending moments by using dowelled and keyed joints. The basement floor slab should be isolated from columns. The completed excavation should be inspected by the hydraulic engineer to confirm the extent of the drainage required.

In addition, a system of sub-soil drains comprising a durable single sized aggregate with perforated drains/pipes leading to sumps should be provided. The basement floor slab should be isolated from columns.

Permission may need to be obtained from the NSW Department of Primary Industries (DPI) and possibly Council for any permanent discharge of seepage into the drainage system. Given the subsurface conditions, we expect that seepage volumes would be low and within the DPI limits.

However, if permission for discharge is not obtained, the basement may need to be designed as a tanked basement.

5. Further Geotechnical Inputs

Below is a summary of the previously recommended additional work that needs to be carried out:

- Dilapidation surveys;
- Classification of all excavated material transported off site;
- Additional Investigation at the location of Column 154 (BH10) to determine the dimensions of the existing footing;
- Additional Investigation in the eastern portion of the site, near Column 58 (BH4) to determine the location of the sandstone rock ledge;
- Geotechnical inspections of rock faces during excavation by an experienced geotechnical professional at depth intervals of no greater than 1.0m or 1.5m as required within medium to high strength bedrock, if vertical cut are adopted;
- Geotechnical inspections of all new footings/piles by an experienced geotechnical professional before concrete or steel are placed to verify their bearing capacity and the in-situ nature of the founding strata; and
- Ongoing monitoring of groundwater inflows into the bulk excavation.

We recommend that a meeting be held after initial structural design has been completed to confirm that our recommendations have been correctly interpreted. We also recommend a meeting at the commencement of construction to discuss the primary geotechnical issues and inspection requirements.

6. Statement of Limitations

This report has been prepared for the exclusive use of Mr John Green and Sirius Developments Pty Ltd who is the only intended beneficiary of EI's work. The scope of the assessment carried out for the purpose of this report is limited to those agreed with Mr John Green and Sirius Developments Pty Ltd

No other party should rely on the document without the prior written consent of EI, and EI undertakes no duty, or accepts any responsibility or liability, to any third party who purports to rely upon this document without EI's approval.

EI has used a degree of care and skill ordinarily exercised in similar investigations by reputable members of the geotechnical industry in Australia as at the date of this document. No other warranty, expressed or implied, is made or intended. Each section of this report must be read in conjunction with the whole of this report, including its appendices and attachments.

The conclusions presented in this report are based on a limited investigation of conditions, with specific sampling and test locations chosen to be as representative as possible under the given circumstances.

EI's professional opinions are reasonable and based on its professional judgment, experience, training and results from analytical data. EI may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified by EI.

EI's professional opinions contained in this document are subject to modification if additional information is obtained through further investigation, observations, or validation testing and analysis during construction. In some cases, further testing and analysis may be required, which may result in a further report with different conclusions.

We draw your attention to the document "Important Information", which is included in **Appendix C** of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by EI, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

Should you have any queries regarding this report, please do not hesitate to contact EI.

References

AS1726:2017, *Geotechnical Site Investigations*, Standards Australia.

AS2159:2009, *Piling – Design and Installation*, Standards Australia.

AS3600:2009, *Concrete Structures,* Standards Australia

Safe Work Australia Excavation Work Code of Practice, dated August 2019 – WorkCover NSW

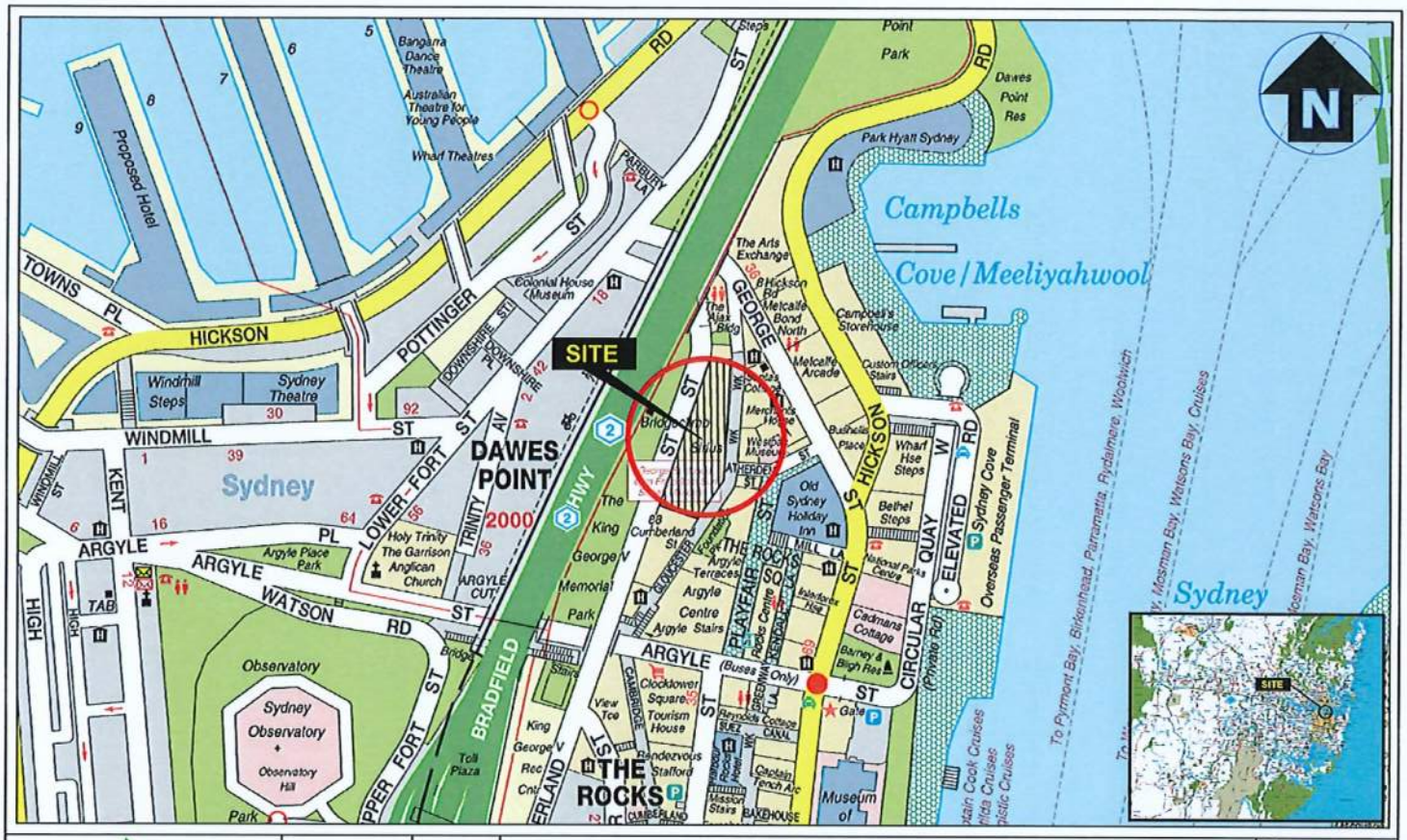
NSW Department of Finance and Service, Spatial Information Viewer, maps.six.nsw.gov.au.

NSW Department of Mineral Resources (1983) Sydney 1:100,000 Geological Series Sheet 9130 (Edition 1). Geological Survey of New South Wales, Department of Mineral Resources.

Abbreviations

AHD	Australian Height Datum
AS	Australian Standard
BEL	Bulk Excavation Level
BEGL	Below Existing Ground Level
BH	Borehole
DBYD	Dial Before You Dig
DP	Deposited Plan
EI	EI Australia
GI	Geotechnical Investigation
NATA	National Association of Testing Authorities, Australia
RL	Reduced Level
SPT	Standard Penetration Test
T-C	Tungsten-Carbide
UCS	Unconfined Compressive Strength

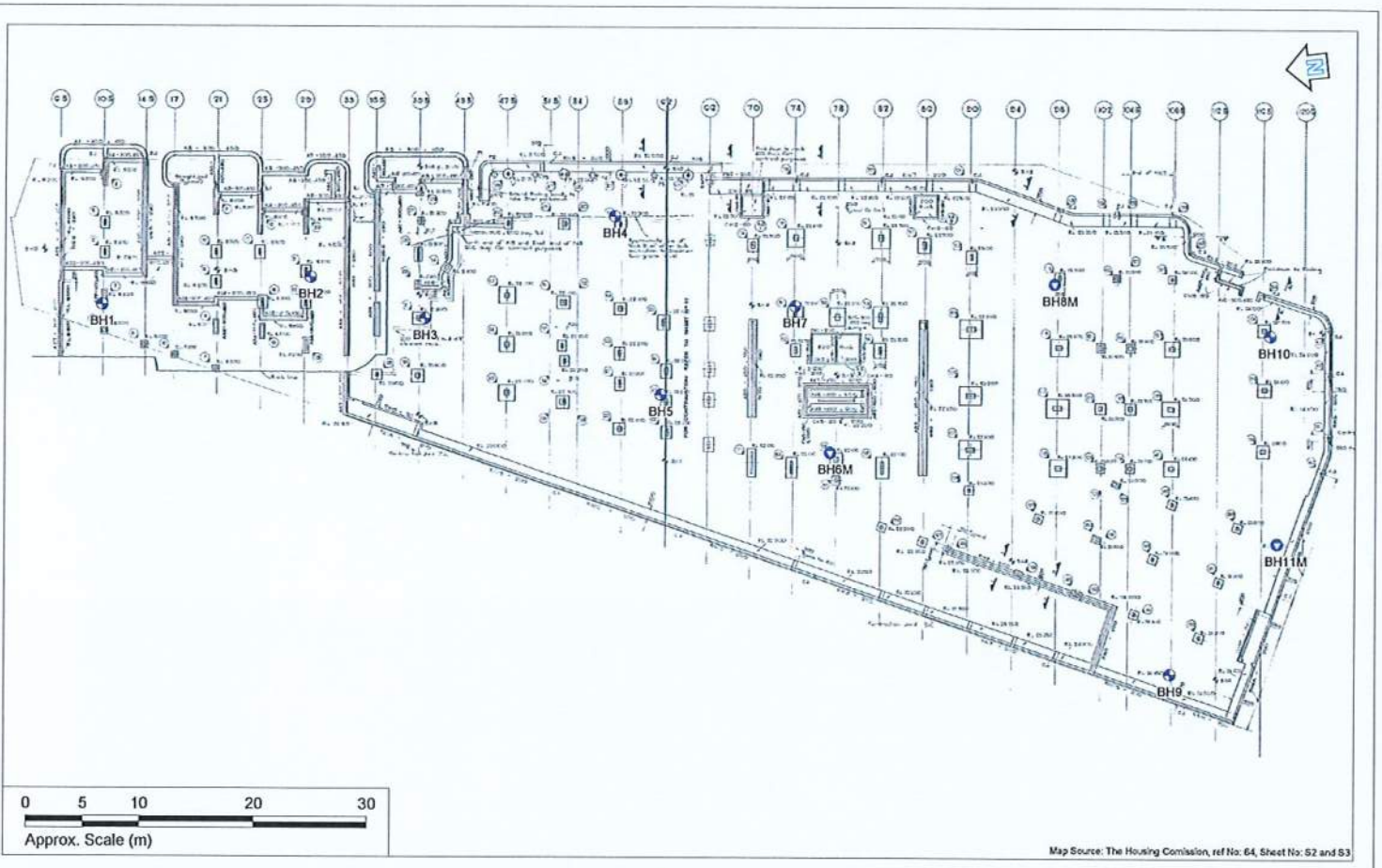
Figures



eiaustralia Contamination | Remediation | Geotechnical Suite 6.01, 55 Miller Street, PYRMONT 2009 Ph (02) 9516 0722 Fax (02) 9518 5088	Drawn:	AM.H.	**Sirius Developments Pty Ltd** Additional Geotechnical Investigation 2-60 Cumberland Street, The Rocks NSW Site Locality Plan
	Approved:	S.R.	
	Date:	15-06-20	
	Scale:	Not To Scale	

Figure: 1

Project: E24614.G03



Map Source: The Housing Comission, ref No: 64, Sheet No: S2 and S3

LEGEND

- Approximate borehole location
- Approximate borehole/monitoring well location

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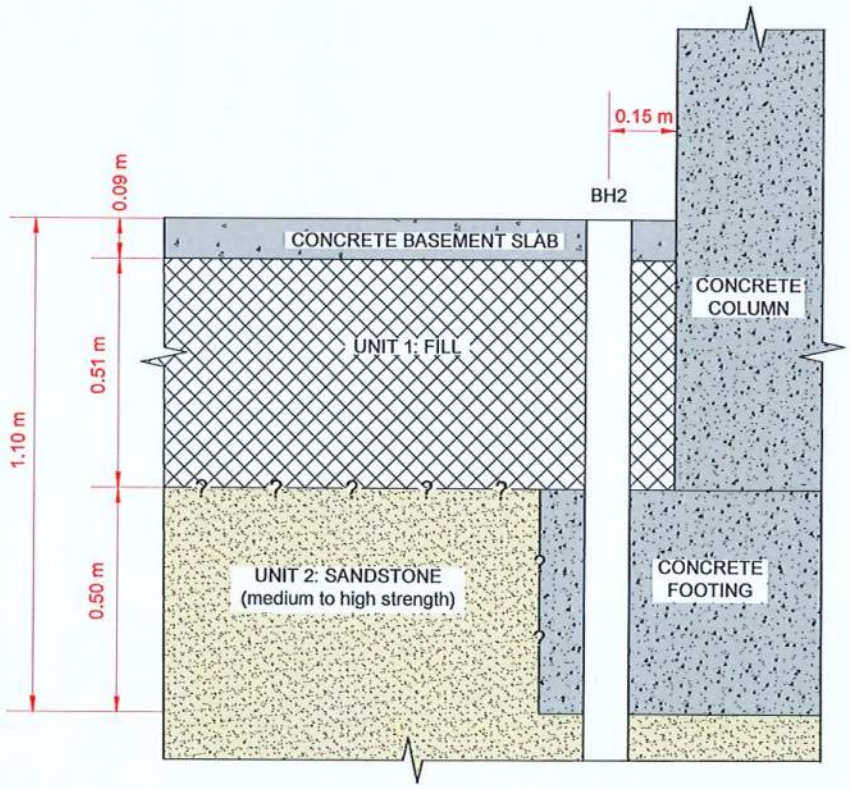
Sirius Developments Pty Ltd
Additional Geotechnical Investigation
2-60 Cumberland Street, The Rocks NSW
Borehole Location Plan

Figure: 2

Project: E24514.G03



LEGEND

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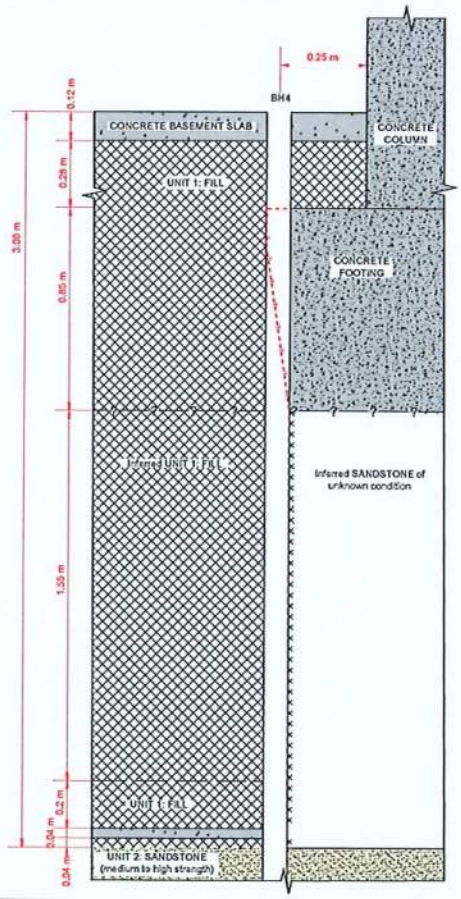
Sirius Developments Pty Ltd
Geotechnical Investigation
2-60 Cumberland Street, The Rocks NSW
Footing Cross Section at Column 24 (BH2)

Figure: 3

Project: E24514.G03



LEGEND

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Date:	26.6.20

Sirius Developments Pty Ltd
Geotechnical Investigation
2-60 Cumberland Street, The Rocks NSW
Footing Cross Section at Column 58 (BH4)

Figure: 4

Project: E24614.G03

Appendix A – Borehole Logs And Explanatory Notes

CORED BOREHOLE LOG

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BH NO. BH1

Project	Proposed Residential Development	**Sheet**	1 OF 1
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	02/06/2020
Position	Refer to Figure 2	**Date Completed**	03/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 02/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor	TJ Core Drilling	**Surface RL**	≈19.10 m AHD
Drill Rig	Hand Portable	**Inclination**	-90°

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	Average Defect Spacing (mm) (30, 100, 300, 1000, 3000)
HAND DT		-	-	0	0.00 19.10		CONCRETE; 100 mm thick concrete slab.	-			
		-	-				FILL: Gravelly SAND; fine to medium grained sand, grey, fine to coarse, angular to sub-angular sandstone gravels, with some sandstone cobbles, moist.				
					0.65 18.45		CONCRETE; 350 mm thick concrete footing.				
		100	-		1.00						
DT	0% RETURN	100	80	1	18.10		SANDSTONE; high strength, pale grey, fine to medium grained, pale grey, medium bedded, high strength, fresh.	FR			
		100	93	2							
		100	85	3							
				4	4.00 15.10		Borehole Terminated at 4.00 m, Target Depth Reached.				
				5							
				6							
				7							
				8							
				9							
				10							

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

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CORE PHOTOGRAPH OF BOREHOLE: BH1

Project	Proposed Residential Development			**Depth Range**	0.0m to 4.0m BEGL		
Location	2-60 Cumberland Street, The Rocks NSW			**Contractor**	TJ Core Drilling		
Position	See Figure 2	**Surface RL**	≈ 19.1m	**Drill Rig**	Hand portable		
Job No.	E24614.G04	**Inclination**	-90°	**Logged**	IW	**Date**	02 / 06 / 2020
Client	Sirius Developments Pty Ltd	**Box**	1 of 1	**Checked**	SK	**Date**	15 / 06 / 2020

CORED BOREHOLE LOG

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BH NO. BH2

Project	Proposed Residential Development	**Sheet**	1 OF 1
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	04/06/2020
Position	Refer to Figure 2	**Date Completed**	05/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 04/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor	TJ Core Drilling	**Surface RL**	≈19.10 m AHD
Drill Rig	Hand Portable	**Inclination**	-90°

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	Average Defect Spacing (mm) (30, 100, 300, 1000, 3000)
HAND DT		-	-	0	0.00		CONCRETE; 90 mm thick concrete slab.	-			
					19.01		FILL: Sandy GRAVEL; fine to medium, angular to sub-angular gravels, grey-pale brown, moist.				
		-	-		0.40 18.70						
					0.60 18.50		FILL: Gravelly SAND; fine to coarse grained sand, grey, with some wood and metal fragments, moist.				
							CONCRETE; 500 mm thick concrete footing.				
		100	100	1	1.10 18.00		SANDSTONE; fine to medium grained, pale grey, medium bedded, high strength, fresh.	FR			
DT	0% RETURN	100	100	2							
		100	100	3							
		100	100	4	4.24 14.86		Borehole Terminated at 4.24 m, Target Depth Reached.				
				5							
				6							
				7							
				8							
				9							
				10							

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

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CORE PHOTOGRAPH OF BOREHOLE: BH2

Project	Proposed Residential Development			**Depth Range**	0.0m to 4.24m BEGL		
Location	2-60 Cumberland Street, The Rocks NSW			**Contractor**	TJ Core Drilling		
Position	See Figure 2	**Surface RL**	≈ 19.1m	**Drill Rig**	Hand portable		
Job No.	E24614.G04	**Inclination**	-90°	**Logged**	IW	**Date**	04 / 06 / 2020
Client	Sirius Developments Pty Ltd	**Box**	1-2 of 2	**Checked**	SK	**Date**	15 / 06 / 2020

CORED BOREHOLE LOG

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BH NO. BH3

Project	Proposed Residential Development	**Sheet**	1 OF 1
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	04/06/2020
Position	Refer to Figure 2	**Date Completed**	05/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 04/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor TJ Core Drilling **Surface RL** ≈22.60 m AHD
Drill Rig Hand Portable **Inclination** -90°

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	Average Defect Spacing (mm) (30, 100, 300, 1000, 3000)
DT		-	-	0	0.00 0.15 22.45		CONCRETE; 150 mm thick concrete slab.	-			
HAND		-	-				FILL: Gravel; fine to medium, angular to sub-angular blue metal gravels, moist.				
					0.95						
		100	-	1	21.65		CONCRETE; 1130 mm thick concrete footing.				
				2	2.08 20.52		SANDSTONE; fine to medium grained, pale grey, thinly bedded, medium strength, fresh.	FR			
DT	0% RETURN	78	77								
		100	51	3							
		100	80								
		100	88	4							
					4.82 17.78		Borehole Terminated at 4.82 m, Target Depth Reached.				
				5							
				6							
				7							
				8							
				9							
				10							

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

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CORE PHOTOGRAPH OF BOREHOLE: BH3

Project	Proposed Residential Development			**Depth Range**	0.0m to 4.82m BEGL		
Location	2-60 Cumberland Street, The Rocks NSW			**Contractor**	TJ Core Drilling		
Position	See Figure 2	**Surface RL**	≈ 22.6m	**Drill Rig**	Hand portable		
Job No.	E24614.G04	**Inclination**	-90°	**Logged**	IW	**Date**	04 / 06 / 2020
Client	Sirius Developments Pty Ltd	**Box**	1-2 of 2	**Checked**	SK	**Date**	15 / 06 / 2020

CORED BOREHOLE LOG

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BH NO. BH4

Project	Proposed Residential Development	**Sheet**	1 OF 1
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	05/06/2020
Position	Refer to Figure 2	**Date Completed**	05/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 05/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor	Geosense Drilling	**Surface RL**	≈22.40 m AHD
Drill Rig	Tight Access	**Inclination**	-90°

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	Average Defect Spacing (mm) (30, 100, 300, 1000, 3000)
HAND DT		-	-	0	0.00 22.40		CONCRETE; 120 mm thick concrete slab.	-			
		-	-		0.12 22.28		FILL: Sandy GRAVEL; fine to medium, angular to sub-angular blue metal gravels, moist, sand is fine to medium grained.				
					0.40 22.00		CONCRETE; 850 mm thick concrete footing.				
		100	-	1							
					1.25 21.15		NO CORE; 1550 mm thick, inferred to be gravelly sand fill.				
NMLC	0% RETURN	15	0	2							
					2.80 19.60		FILL: Gravelly SAND; fine to medium grained sand, with metal fragments.				
				3	3.00 19.32		CONCRETE; 40 mm thick concrete slab.	FR			
		100	75				FILL: Sandy GRAVEL; fine to medium, angular to sub-angular gravels, sand is fine to medium grained.				
							SANDSTONE; fine to medium grained, pale grey, medium bedded, medium to high strength, fresh.				
		100	0	4	4.00 18.40		Borehole Terminated at 4.00 m, Target Depth Reached.				
				5							
				6							
				7							
				8							
				9							
				10							

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

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CORE PHOTOGRAPH OF BOREHOLE: BH4

Project	Proposed Residential Development			**Depth Range**	0.0m to 4.0m BEGL		
Location	2-60 Cumberland Street, The Rocks NSW			**Contractor**	TJ Core Drilling		
Position	See Figure 2	**Surface RL**	≈ 22.4m	**Drill Rig**	Hand portable		
Job No.	E24614.G04	**Inclination**	-90°	**Logged**	IW	**Date**	05 / 06 / 2020
Client	Sirius Developments Pty Ltd	**Box**	1 of 1	**Checked**	SK	**Date**	15 / 06 / 2020

CORED BOREHOLE LOG

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BH NO. BH5

Project	Proposed Residential Development	**Sheet**	1 OF 1
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	04/06/2020
Position	Refer to Figure 2	**Date Completed**	05/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 04/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor Geosense Drilling **Surface RL** ≈22.60 m AHD
Drill Rig Tight Access **Inclination** -90°

Drilling						Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	Average Defect Spacing (mm) (30, 100, 300, 1000, 3000)
HAND DT		-	-	0	0.00 22.60		CONCRETE; 140 mm thick.	-			
		-	-		0.14 22.46		FILL: GRAVEL; fine to medium, angular to sub-angular blue metal gravels, grey, moist.	-			
					0.39 22.21		CONCRETE; 450 mm thick concrete footing.	-			
		100	-		0.84						
		100	100	1	21.76		SANDSTONE; fine to medium grained, pale grey-pale brown, medium bedded, medium strength, slightly weathered to fresh.	FR		0.84: JT, 70°, Clay, UN, VR	
					1.35 21.25		From 1.35 m, grading to high strength.				
NMLC	90% RETURN	100	82	2				SW		2.29: BP, 5°, Clay, PR, RF, 5 mm	
					2.72 19.88		From 2.72 to 2.92 m, dark grey, distinctly weathered, very low strength shale layer.	DW FR			
		100	92	3						3.48: BP, 5°, Clay, PR, RF, 5 mm 3.61: BP, 5°, Clay, PR, RF, 5 mm	
					3.69 18.91		Borehole Terminated at 3.69 m, Target Depth Reached.				
				4							
				5							
				6							
				7							
				8							
				9							
				10							

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

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CORE PHOTOGRAPH OF BOREHOLE: BH5

Project	Proposed Residential Development			**Depth Range**	0.0m to 3.69m BEGL		
Location	2-60 Cumberland Street, The Rocks NSW			**Contractor**	Geosense Drilling		
Position	See Figure 2	**Surface RL**	≈ 22.6m	**Drill Rig**	Tight Access		
Job No.	E24614.G04	**Inclination**	-90°	**Logged**	IW	**Date**	04 / 06 / 2020
Client	Sirius Developments Pty Ltd	**Box**	1 of 1	**Checked**	SK	**Date**	15 / 06 / 2020

CORED BOREHOLE LOG

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BH NO. BH6M

Project	Proposed Residential Development	**Sheet**	1 OF 1
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	04/06/2020
Position	Refer to Figure 2	**Date Completed**	05/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 04/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor	Geosense Drilling	**Surface RL**	≈22.70 m AHD
Drill Rig	Tight Access	**Inclination**	-90°

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	Average Defect Spacing (mm) (30, 100, 300, 1000, 3000)
HAND DT		-	-	0	0.00 0.18 0.38 0.55 22.40		CONCRETE; 190 mm thick concrete slab.	-			
		-	-		22.15		FILL: GRAVEL; fine to medium, angular to sub-angular blue metal gravels, with some fine to medium sand, moist.	-			
		100	-	1	1.24		FILL: Gravelly SAND; fine to coarse grained, pale brown, moist, gravel is fine to coarse, angular to sub-angular, sandstone gravels. CONCRETE; 690 mm thick concrete footing.	-			
NMLC	90% RETURN	100	84		21.46		SANDSTONE; fine to medium grained, pale brown, medium bedded, high strength, slightly weathered.	SW			
		100	65	2						2.30: JT, 80°, Clay, UN, VR 2.82: JT, 40°, Clay, UN, VR	
		100	55	3	3.10 19.60		From 3.1 m, medium strength, thinly bedded.			3.09: JT, 30°, Clay, PR, VR 3.39: JT, 40°, Clay, PR, VR 3.58-3.60: XWS, Clay, 20 mm	
	0% RETURN	100	99	4	3.70 19.00		From 3.7 m, grading to high strength, medium bedded, fresh.	FR		3.65-3.67: XWS, Sand, 20 mm	
		100	99	5						5.00-5.02: XWS, Clay, 20 mm	
				6	6.82					6.48-6.49: XWS, Clay, 10 mm	
				7	15.88		Borehole Terminated at 6.82 m, Target Depth Reached.				
				8							
				9							
				10							

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

MONITORING WELL LOG

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MW NO. BH6M

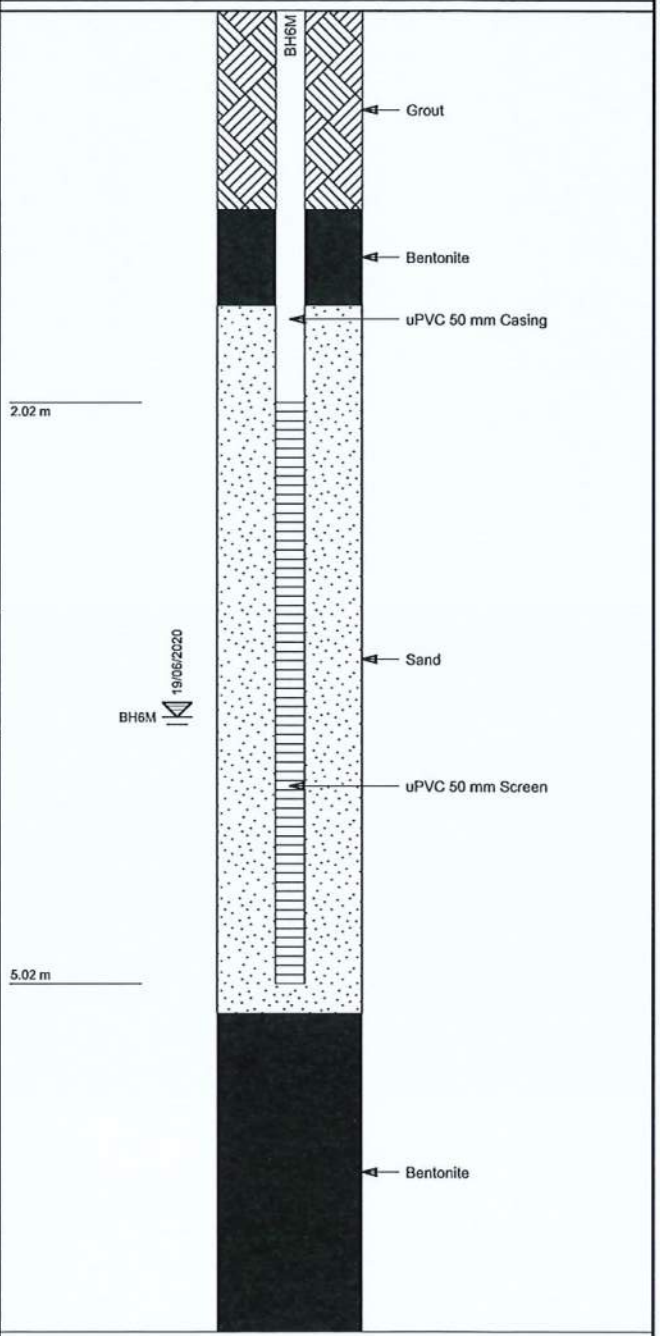
Project	Proposed Residential Development	**Sheet**	1 of 2
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	04/06/2020
Position	Refer to Figure 2	**Date Completed**	05/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 04/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor	Geosense Drilling	**Surface RL**	≈22.70 m AHD
Drill Rig	Tight Access	**Inclination**	-90°

METHOD	WATER	DEPTH (m)	RL (m AHD)	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION
DT / HAND / NMLC	19/06/20	0	22		CONCRETE; 190 mm thick concrete slab.
					FILL: GRAVEL; fine to medium, angular to sub-angular blue metal gravels, with some fine to medium sand, moist.
					FILL: Gravelly SAND; fine to coarse grained, pale brown, moist, gravel is fine to coarse, angular to sub-angular, sandstone gravels.
		1			CONCRETE; 690 mm thick concrete footing.
			21		SANDSTONE; fine to medium grained, pale brown, medium bedded, high strength, slightly weathered.
		2			
			20		
		3			From 3.1 m, medium strength, thinly bedded.
			19		From 3.7 m, grading to high strength, medium bedded, fresh.
		4			
			18		
		5			
			17		
		6			
			16		
		7			Borehole Terminated at 6.82 m, Target Depth Reached.

PIEZOMETER CONSTRUCTION DETAILS

ID	Type	Stick Up & RL	Tip Depth & RL	Installation Date Static Water Level
BH6M	Standpipe	0.12 m 22.58 m	5.02 m 17.68 m	



This well log should be read in conjunction with EI Australia's accompanying standard notes.

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CORE PHOTOGRAPH OF BOREHOLE: BH6M

Project	Proposed Residential Development			**Depth Range**	0.0m to 6.82m BEGL		
Location	2-60 Cumberland Street, The Rocks NSW			**Contractor**	Geosense Drilling		
Position	See Figure 2	**Surface RL**	≈ 22.70m	**Drill Rig**	Tight Access		
Job No.	E24614.G04	**Inclination**	-90°	**Logged**	IW	**Date**	04 / 06 / 2020
Client	Sirius Developments Pty Ltd	**Box**	1-2 of 2	**Checked**	SK	**Date**	15 / 06 / 2020

CORED BOREHOLE LOG

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BH NO. BH7

Project	Proposed Residential Development	**Sheet**	1 OF 1
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	05/06/2020
Position	Refer to Figure 2	**Date Completed**	05/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 05/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor Geosense Drilling **Surface RL** ≈22.80 m AHD
Drill Rig Tight Access **Inclination** -90°

Drilling						Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	Average Defect Spacing (mm) (30, 100, 300, 1000, 3000)
DT		-	-	0	0.00 0.14 22.66		CONCRETE; 140 mm thick concrete slab.				
HAND		-	-				FILL: Sandy GRAVEL; fine to medium grained, angular to sub-angular blue metal gravels, with metal fragments, moist, sand is fine to medium grained.				
					0.80 22.00		CONCRETE; 680 mm thick concrete footing.				
		-	-	1	*1.48* 21.32		SANDSTONE; fine to medium grained, pale grey, medium bedded, high strength, fresh.	FR			
NMLC	100% RETURN	100	75								
		100	94	2							
				3	*3.65* 19.15		From 3.65 m, thinly bedded.				
		100	67	4	*4.05* 18.75		From 4.05 m, medium bedded.			4.63: BP, 5°, Clay, PR	
					4.90 17.90		Borehole Terminated at 4.90 m, Target Depth Reached.				
				5							
				6							
				7							
				8							
				9							
				10							

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

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CORE PHOTOGRAPH OF BOREHOLE: BH7

Project	Proposed Residential Development			**Depth Range**	0.0m to 4.9m BEGL		
Location	2-60 Cumberland Street, The Rocks NSW			**Contractor**	Geosense Drilling		
Position	See Figure 2	**Surface RL**	≈ 22.8m	**Drill Rig**	Tight Access		
Job No.	E24614.G04	**Inclination**	-90°	**Logged**	IW	**Date**	05 / 06 / 2020
Client	Sirius Developments Pty Ltd	**Box**	1-2 of 2	**Checked**	SK	**Date**	15 / 06 / 2020

CORED BOREHOLE LOG

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BH NO. BH8M

Project	Proposed Residential Development	**Sheet**	1 OF 1
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	03/06/2020
Position	Refer to Figure 2	**Date Completed**	03/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 04/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor Geosense Drilling **Surface RL** ≈23.60 m AHD
Drill Rig Tight Access **Inclination** -90°

Drilling						Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $I_{S(50)}$ MPa (VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	Average Defect Spacing (mm) (30, 100, 300, 1000, 3000)
HAND DT		-	-	0	0.00 0.15 23.45		CONCRETE; 150 mm thick concrete slab.	-			
		-	-		0.49 23.11		FILL: GRAVEL; fine to medium, angular to sub-angular blue metal gravels, with some sand, brick and sandstone fragments, moist.	-			
		100	-	1	1.23		CONCRETE; 740 mm thick concrete footing.	-			
		100	100		22.37		SANDSTONE; pale grey-pale brown, medium bedded, medium strength, slightly weathered.	SW		1.44: BP, 5°, Clay, PR, RF, 2 mm	
		100	94	2							
		100	89	3	3.20 20.40		From 3.2 m, pale grey, fresh.	FR		3.74-3.77: XWS, Clay, 30 mm 3.90-3.92: XWS, Clay, 20 mm	
NMLC	03/06/20	100	89	4						4.34-4.38: XWS, Clay, 40 mm	
				5	5.48 18.12		From 5.48 m, thinly bedded.				
		100	45	6	5.85 17.75		From 5.85 m, high strength.				
					6.45 17.15		Borehole Terminated at 6.45 m, Target Depth Reached.				
				7							
				8							
				9							
				10							

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

MONITORING WELL LOG

MW NO. BH8M

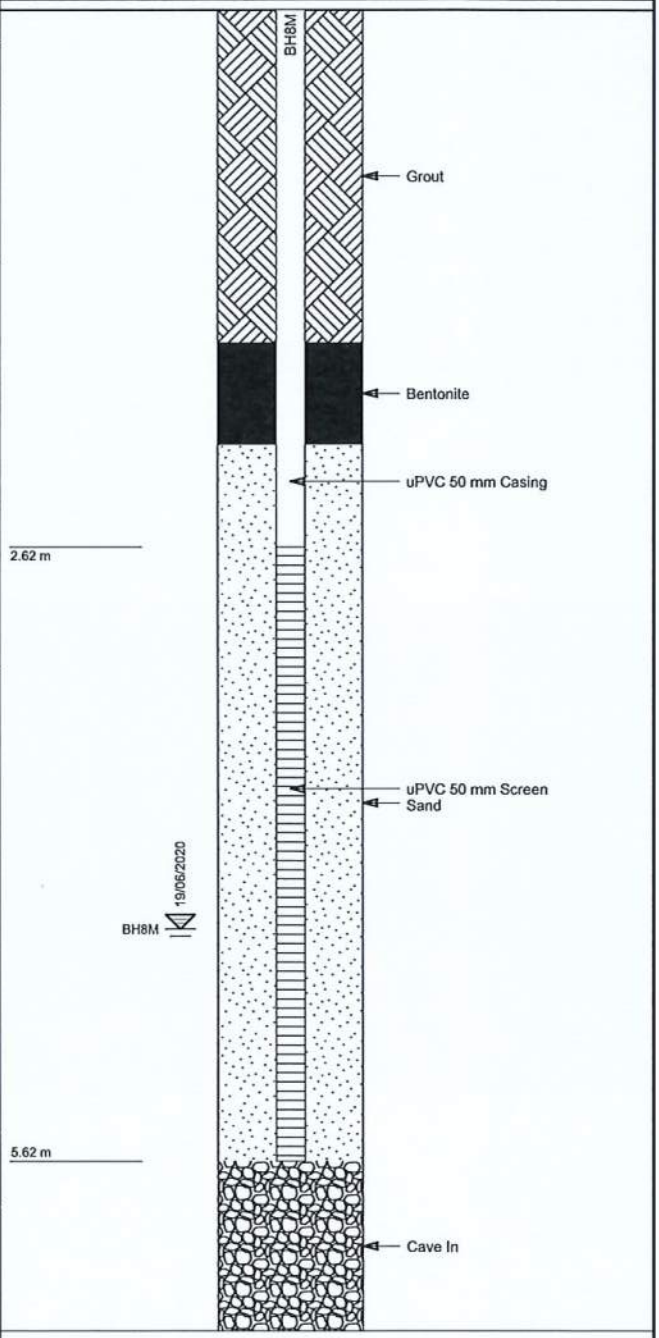
Project	Proposed Residential Development	**Sheet**	1 of 2
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	03/06/2020
Position	Refer to Figure 2	**Date Completed**	03/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 04/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor Geosense Drilling **Surface RL** ≈23.60 m AHD
Drill Rig Tight Access **Inclination** -90°

METHOD	WATER	DEPTH (m)	RL (m AHD)	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION
DT / HAND / NMLC	19/06/20	0	23		CONCRETE; 150 mm concrete slab.
					FILL: GRAVEL; fine to medium, angular to sub-angular blue metal gravels, with some sand, brick and sandstone fragments, moist.
		1			CONCRETE; 740 mm thick concrete footing.
			22		SANDSTONE; pale grey-pale brown, medium bedded, medium strength, slightly weathered.
		2			
			21		
		3			
					From 3.2 m, pale grey, fresh.
			20		
		4			
			19		
		5			
			18		From 5.48 m, thinly bedded.
					From 5.85 m, high strength.
		6			
			17		Borehole Terminated at 6.45 m, Target Depth Reached.
		7			

PIEZOMETER CONSTRUCTION DETAILS

ID	Type	Stick Up & RL	Tip Depth & RL	Installation Date Static Water Level
BH8M	Standpipe	0.08 m 23.52 m	5.62 m 17.98 m	



This well log should be read in conjunction with EI Australia's accompanying standard notes.

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CORE PHOTOGRAPH OF BOREHOLE: BH8M

Project	Proposed Residential Development			**Depth Range**	0.0m to 6.45m BEGL		
Location	2-60 Cumberland Street, The Rocks NSW			**Contractor**	Geosense Drilling		
Position	See Figure 2	**Surface RL**	≈ 23.6m	**Drill Rig**	Tight Access		
Job No.	E24614.G04	**Inclination**	-90°	**Logged**	IW	**Date**	03 / 06 / 2020
Client	Sirius Developments Pty Ltd	**Box**	1-2 of 2	**Checked**	SK	**Date**	15 / 06 / 2020

CORED BOREHOLE LOG

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BH NO. BH9

Project	Proposed Residential Development	**Sheet**	1 OF 1
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	02/06/2020
Position	Refer to Figure 2	**Date Completed**	04/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 02/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor TJ Core Drilling **Surface RL** ≈24.80 m AHD
Drill Rig Hand Portable **Inclination** -90°

Drilling						Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	Average Defect Spacing (mm) (30, 100, 300, 1000, 3000)
DT	0% RETURN	-	-	0	0.00		CONCRETE; 150 mm thick concrete slab.	-			
		-	-		0.15						
					0.22		FILL: GRAVEL; fine to medium, angular to sub-angular blue metal gravels, with some fine to medium grained sand, moist.	SW			
		100	100		24.53		SANDSTONE; fine to medium grained, pale brown, medium bedded, medium strength, slightly weathered.				
				1							
		100	79								
					1.95						
				2	22.85		From 1.95 m, high strength.				
					3.01						
				3	21.77		NO CORE; 30 mm thick.	-			
		98	88					SW			
				4						3.94: JT, 70°, Clay, PR, VR	
					4.40						
					4.55		From 4.4 m, thinly bedded.				
					20.25		From 4.45 to 4.47 m, dark grey shale band.	-			
					4.82		NO CORE; 270 mm thick.				
		72	31	5	19.98			SW			
					5.39			-			
					5.50		From 5.5 to 5.58 m, very low strength, distinctly weathered, dark grey shale band.	DW			
					19.16			-			
					19.16		NO CORE; 60 mm thick.	FR			
		100	23	6	6.15		From 5.64 m, grading to pale grey, medium strength, fresh.				
					18.60		NO CORE; 50 mm thick.	- FR			
										6.48: JT, 90°, UN, VR	
		100	30	7						7.20: JT, 90°, UN, VR	
		100	87	8							
					8.20						
					16.60		Borehole Terminated at 8.20 m, Target Depth Reached.				
				9							
				10							

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

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CORE PHOTOGRAPH OF BOREHOLE: BH9

Project	Proposed Residential Development			**Depth Range**	0.0m to 8.2m BEGL		
Location	2-60 Cumberland Street, The Rocks NSW			**Contractor**	Geosense Drilling		
Position	See Figure 2	**Surface RL**	≈ 24.8m	**Drill Rig**	Tight Access		
Job No.	E24614.G04	**Inclination**	-90°	**Logged**	IW	**Date**	02 / 06 / 2020
Client	Sirius Developments Pty Ltd	**Box**	1-2 of 2	**Checked**	SK	**Date**	15 / 06 / 2020

CORED BOREHOLE LOG

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BH NO. BH10

Project	Proposed Residential Development	**Sheet**	1 OF 1
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	02/06/2020
Position	Refer to Figure 2	**Date Completed**	03/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 02/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor Geosense Drilling **Surface RL** ≈24.90 m AHD
Drill Rig Tight Access **Inclination** -90°

Drilling						Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	Average Defect Spacing (mm) (30, 100, 300, 1000, 3000)
DT		-	-	0	0.08 24.75		CONCRETE; 150 mm thick concrete slab.				
		-	-				FILL: Sandy GRAVEL; pale brown, fine to coarse sandstone gravels, with concrete fragments and sandstone cobbles, moist, sand is fine to medium grained.				
				1	0.90 24.00		SANDSTONE; fine to medium grained, pale brown to red-brown, medium bedded, medium strength, slightly weathered.	SW			
NMLC	90% RETURN	100	85							1.83-1.86: XWS, Clay, 30 mm	
				2	2.15 22.75		From 2.15 m, high strength.				
		100	89								
				3						2.89: JT, 50°, Clay, IR, VR	
		100	88								
				4							
				5						4.72: BP, 5°, Clay, PR, 2 mm	
		100	81								
					5.70 19.20		From 5.7 m, grading to pale grey, fresh.	FR		5.84: JT, 70°, PR, VR 5.95: BP, 5°, Clay, PR, 1 mm	
				6							
		100	62		6.48 18.42		From 6.48 m, thinly bedded.				
				7	7.15 17.75		Borehole Terminated at 7.15 m, Target Depth Reached.				
				8							
				9							
				10							

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

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CORE PHOTOGRAPH OF BOREHOLE: BH10

Project	Proposed Residential Development			**Depth Range**	0.0m to 7.15m BEGL		
Location	2-60 Cumberland Street, The Rocks NSW			**Contractor**	Geosense Drilling		
Position	See Figure 2	**Surface RL**	≈ 24.9m	**Drill Rig**	Tight Access		
Job No.	E24614.G04	**Inclination**	-90°	**Logged**	IW	**Date**	02 / 06 / 2020
Client	Sirius Developments Pty Ltd	**Box**	1-2 of 2	**Checked**	SK	**Date**	15 / 06 / 2020

CORED BOREHOLE LOG

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BH NO. BH11M

Project	Proposed Residential Development	**Sheet**	1 OF 1
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	02/06/2020
Position	Refer to Figure 2	**Date Completed**	03/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 02/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor Geosense Drilling **Surface RL** ≈24.80 m AHD
Drill Rig Tight Access **Inclination** -90°

Drilling						Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	Average Defect Spacing (mm) (30, 100, 300, 1000, 3000)
DT		-	-	0	0.00 24.80		CONCRETE; 160 mm thick concrete slab.	-			
HAND		-	-		0.16 24.64						
DT					0.28 24.52		FILL: GRAVEL; fine to medium, angular to sub-angular blue metal gravels, moist.	SW			
					0.40 24.40						
					0.50 24.30		SANDSTONE; fine to medium grained, pale brown to red-brown, medium bedded, high strength, slightly weathered.				
		100	87	1							
		100	83	2						1.44-1.50: XWS, Clay, 60 mm	
		100	98	3							
				4							
NMLC					4.88 19.92		From 4.88 m, grading to pale grey, fresh.	FR		4.93: BP, 10°, Clay, PR, VR, 10 mm	
	02/06/20	100	97	5	5.28 19.52		From 5.28 to 5.43 m, medium strength, distinctly weathered, dark grey, shale layer.			5.41-5.44: XWS, Clay, 30 mm	
				6						6.34: JT, 0 - 40°, Clay, CU, VR	
		100	71	7							
		100	86	8	8.47 16.33		Borehole Terminated at 8.47 m, Target Depth Reached.				
				9							
				10							

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

MONITORING WELL LOG

MW NO. BH11M

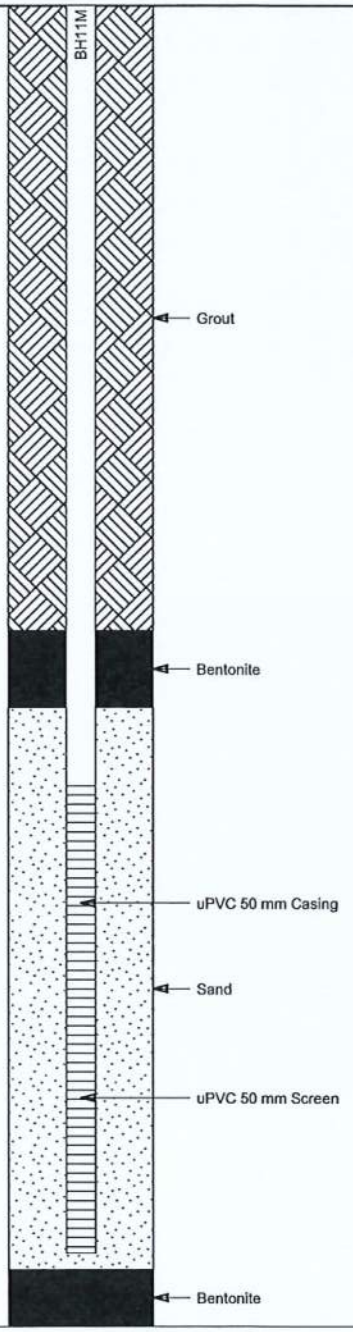
Project	Proposed Residential Development	**Sheet**	1 of 2
Location	2-60 Cumberland Street, The Rocks NSW	**Date Started**	02/06/2020
Position	Refer to Figure 2	**Date Completed**	03/06/2020
Job No.	E24614.G04	**Logged By** IW	**Date** 02/06/2020
Client	Sirius Developments Pty Ltd	**Reviewed By** SK	**Date** 15/06/2020

Drilling Contactor	Geosense Drilling	**Surface RL**	≈24.80 m AHD
Drill Rig	Tight Access	**Inclination**	-90°

METHOD	WATER	DEPTH (m)	RL (m AHD)	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION
DT/ANDT		0	24		CONCRETE; 160 mm thick concrete slab.
					FILL: GRAVEL; fine to medium, angular to sub-angular blue metal gravels, moist.
		1	23		SANDSTONE; fine to medium grained, pale brown to red-brown, medium bedded, high strength, slightly weathered.
		2	22		
		3	21		
NMLC	19/06/20	4	20		
		5	19		From 4.88 m, grading to pale grey, fresh.
		6	18		From 5.28 to 5.43 m, medium strength, distinctly weathered, dark grey, shale layer.
		7	17		
		8	16		
		9			Borehole Terminated at 8.47 m, Target Depth Reached.

PIEZOMETER CONSTRUCTION DETAILS

ID	Type	Stick Up & RL	Tip Depth & RL	Installation Date	Static Water Level
BH11M	Standpipe	0.10 m 24.70 m	8.00 m 16.80 m		



This well log should be read in conjunction with EI Australia's accompanying standard notes.

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CORE PHOTOGRAPH OF BOREHOLE: BH11M

Project	Proposed Residential Development			**Depth Range**	0.0m to 8.47m BEGL		
Location	2-60 Cumberland Street, The Rocks NSW			**Contractor**	Geosense Drilling		
Position	See Figure 2	**Surface RL**	≈ 24.8m	**Drill Rig**	Tight Access		
Job No.	E24614.G04	**Inclination**	-90°	**Logged**	IW	**Date**	02 / 06 / 2020
Client	Sirius Developments Pty Ltd	**Box**	1-2 of 2	**Checked**	SK	**Date**	15 / 06 / 2020

EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT LOGS

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DRILLING/EXCAVATION METHOD

HA	Hand Auger	**ADH**	Hollow Auger	**NQ**	Diamond Core - 47 mm
DT	Diatube Coring	**RT**	Rotary Tricone bit	**NMLC**	Diamond Core - 52 mm
NDD	Non-destructive digging	**RAB**	Rotary Air Blast	**HQ**	Diamond Core - 63 mm
AD*	Auger Drilling	**RC**	Reverse Circulation	**HMLC**	Diamond Core - 63 mm
***V**	V-Bit	**PT**	Push Tube	**EX**	Tracked Hydraulic Excavator
***T**	TC-Bit, e.g. AD/T	**WB**	Washbore	**HAND**	Excavated by Hand Methods

PENETRATION RESISTANCE

L	**Low Resistance**	Rapid penetration/ excavation possible with little effort from equipment used.
M	**Medium Resistance**	Penetration/ excavation possible at an acceptable rate with moderate effort from equipment used.
H	**High Resistance**	Penetration/ excavation is possible but at a slow rate and requires significant effort from equipment used.
R	**Refusal/Practical Refusal**	No further progress possible without risk of damage or unacceptable wear to equipment used.

These assessments are subjective and are dependent on many factors, including equipment power and weight, condition of excavation or drilling tools and experience of the operator.

WATER

Standing Water Level — **Partial water loss**

Water Seepage — **Complete Water Loss**

GWNO	GROUNDWATER NOT OBSERVED - Observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave-in of the borehole/ test pit.
GWNE	GROUNDWATER NOT ENCOUNTERED - Borehole/ test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/ test pit been left open for a longer period.

SAMPLING AND TESTING

SPT	Standard Penetration Test to AS1289.6.3.1-2004
4,7,11 N=18	4,7,11 = Blows per 150mm. N = Blows per 300mm penetration following a 150mm seating drive
30/80mm	Where practical refusal occurs, the blows and penetration for that interval are reported, N is not reported
RW	Penetration occurred under the rod weight only, N<1
HW	Penetration occurred under the hammer and rod weight only, N<1
HB	Hammer double bouncing on anvil, N is not reported
Sampling	
DS	Disturbed Sample
ES	Sample for environmental testing
BDS	Bulk disturbed Sample
GS	Gas Sample
WS	Water Sample
U50	Thin walled tube sample - number indicates nominal sample diameter in millimetres
Testing	
FP	Field Permeability test over section noted
FVS	Field Vane Shear test expressed as uncorrected shear strength (sv= peak value, sr= residual value)
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket Penetrometer test expressed as instrument reading in kPa
WPT	Water Pressure tests
DCP	Dynamic Cone Penetrometer test
CPT	Static Cone Penetration test
CPTu	Static Cone Penetration test with pore pressure (u) measurement

GEOLOGICAL BOUNDARIES

———— = Observed Boundary (position known)

– – – – – – – – – – = Observed Boundary (position approximate)

– –?– –?– –?– – = Boundary (interpreted or inferred)

ROCK CORE RECOVERY

TCR=Total Core Recovery (%)

$$= \frac{Length\ of\ core\ recovered}{Length\ of\ core\ run} \times 100$$

RQD = Rock Quality Designation (%)

$$= \frac{\sum Axial\ lengths\ of\ core > 100mm}{Length\ of\ core\ run} \times 100$$

METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT LOGS

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FILL

COUBLES or BOULDERS

GRAVEL (GP or GW)

ORGANIC SOILS (OL, OH or Pt)

SILT (ML or MH)

CLAY (CL, CI or CH)

SAND (SP or SW)

Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay

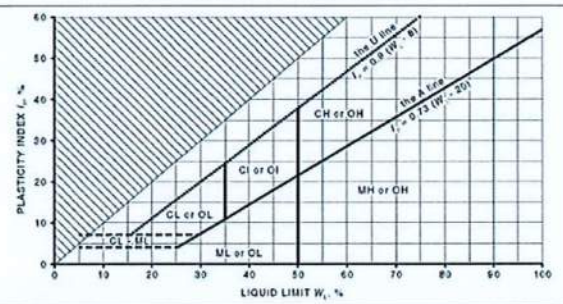
CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS 1726:2017, Section 6.1 – Soil description and classification.

PARTICLE SIZE CHARACTERISTICS

Fraction	Components	Sub Division	Size mm
Oversize	BOULDERS		>200
	COBBLES		63 to 200
Coarse grained soil	GRAVEL	Coarse	19 to 63
		Medium	6.7 to 19
		Fine	2.36 to 6.7
	SAND	Coarse	0.6 to 2.36
		Medium	0.21 to 0.6
		Fine	0.075 to 0.21
Fine grained soil	SILT		0.002 to 0.075
	CLAY		<0.002

PLASTICITY PROPERTIES



GROUP SYMBOLS

Major Divisions		Symbol	Description
COARSE GRAINED SOILS More than 65% of soil excluding oversize fraction is greater than 0.075mm	GRAVEL More than 50% of coarse fraction is >2.36mm	GW	Well graded gravel and gravel-sand mixtures, little or no fines, no dry strength.
		GP	Poorly graded gravel and gravel-sand mixtures, little or no fines, no dry strength.
		GM	Silty gravel, gravel-sand-silt mixtures, zero to medium dry strength.
		GC	Clayey gravel, gravel-sand-clay mixtures, medium to high dry strength.
	SAND More than 50% of coarse fraction is <2.36 mm	SW	Well graded sand and gravelly sand, little or no fines, no dry strength.
		SP	Poorly graded sand and gravelly sand, little or no fines, no dry strength.
		SM	Silty sand, sand-silt mixtures, zero to medium dry strength.
		SC	Clayey sand, sandy-clay mixtures, medium to high dry strength.
FINE GRAINED SOILS More than 35% of soil excluding oversized fraction is less than 0.075mm	Liquid Limit less < 50%	ML	Inorganic silts of low plasticity, very fine sands, rock flour, silty or clayey fine sands, zero to medium dry strength.
		CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, medium to high dry strength.
		OL	Organic silts and organic silty clays of low plasticity, low to medium dry strength.
	Liquid Limit > than 50%	MH	Inorganic silts of high plasticity, high to very high dry strength.
		CH	Inorganic clays of high plasticity, high to very high dry strength.
		OH	Organic clays of medium to high plasticity, medium to high dry strength.
Highly Organic soil		PT	Peat muck and other highly organic soils.

MOISTURE CONDITION

Symbol	Term	Description
D	Dry	Non- cohesive and free-running.
M	Moist	Soils feel cool, darkened in colour. Soil tends to stick together.
W	Wet	Soils feel cool, darkened in colour. Soil tends to stick together, free water forms when handling.

Moisture content of cohesive soils shall be described in relation to plastic limit (PL) or liquid limit (LL) for soils with higher moisture content as follows: Moist, dry of plastic limit (w < PL); Moist, near plastic limit ($w \approx$ PL); Moist, wet of plastic limit (w < PL); Wet, near liquid limit ($w \approx$ LL), Wet, wet of liquid limit (w > LL),

CONSISTENCY

Symbol	Term	Undrained Shear Strength (kPa)	SPT "N" #
VS	Very Soft	≤ 12	≤ 2
S	Soft	>12 to ≤ 25	>2 to ≤ 4
F	Firm	>25 to ≤ 50	>4 to 8
St	Stiff	>50 to ≤ 100	>8 to 15
VSt	Very Stiff	>100 to ≤ 200	>15 to 30
H	Hard	>200	>30
Fr	Friable	-	

DENSITY

Symbol	Term	Density Index %	SPT "N" #
VL	Very Loose	≤ 15	0 to 4
L	Loose	>15 to ≤ 35	4 to 10
MD	Medium Dense	>35 to ≤ 65	10 to 30
D	Dense	>65 to ≤ 85	30 to 50
VD	Very Dense	>85	Above 50

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material. # SPT correlations are not stated in AS1726:2017, and may be subject to corrections for overburden pressure, moisture content of the soil, and equipment type.

MINOR COMPONENTS

Term	Assessment Guide	Proportion by Mass
Add 'Trace'	Presence just detectable by feel or eye but soil properties little or no different to general properties of primary component	Coarse grained soils: ≤ 5% Fine grained soil: ≤ 15%
Add 'With'	Presence easily detectable by feel or eye but soil properties little or no different to general properties of primary component	Coarse grained soils: 5 - 12% Fine grained soil: 15 - 30%
Prefix soil name	Presence easily detectable by feel or eye in conjunction with the general properties of primary component	Coarse grained soils: >12% Fine grained soil: >30%

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TERMS FOR ROCK MATERIAL STRENGTH AND WEATHERING

CLASSIFICATION AND INFERRED STRATIGRAPHY

Rock is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS1726 – 2017, Section 6.2 – Rock identification, description and classification.

ROCK MATERIAL STRENGTH CLASSIFICATION

Symbol	Term	Point Load Index, $Is_{(50)}$ (MPa) #	Field Guide
VL	Very Low	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30 mm can be broken by finger pressure.
L	Low	0.1 to 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	0.3 to 1	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	1 to 3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow; rock rings under hammer.
VH	Very High	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	>10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

 # Rock Strength Test Results

▼ Point Load Strength Index, $Is_{(50)}$, Axial test (MPa)

● Point Load Strength Index, $Is_{(50)}$, Diametral test (MPa)

Relationship between rock strength test result ($Is_{(50)}$) and unconfined compressive strength (UCS) will vary with rock type and strength, and should be determined on a site-specific basis. However UCS is typically 20 x $Is_{(50)}$.

ROCK MATERIAL WEATHERING CLASSIFICATION

Symbol		Term	Field Guide
RS		Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
XW		Extremely Weathered	Rock is weathered to such an extent that it has soil properties - i.e. it either disintegrates or can be remoulded, in water.
DW	HW	Distinctly Weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores. In some environments it is convenient to subdivide into Highly Weathered and Moderately Weathered, with the degree of alteration typically less for MW.
	MW		
SW		Slightly Weathered	Rock slightly discoloured but shows little or no change of strength relative to fresh rock.
FR		Fresh	Rock shows no sign of decomposition or staining.

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ABBREVIATIONS AND DESCRIPTIONS FOR ROCK MATERIAL AND DEFECTS

CLASSIFICATION AND INFERRED STRATIGRAPHY
Rock is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS1726 – 2017, Section 6.2 – Rock identification, description and classification.

DETAILED ROCK DEFECT SPACING

Defect Spacing		Bedding Thickness (Stratification)	
Term	**Description**	**Term**	**Spacing (mm)**
Massive	No layering apparent	Thinly laminated	<6
		Laminated	6 – 20
Indistinct	Layering just visible; little effect on properties	Very thinly bedded	20 – 60
		Thinly bedded	60 – 200
Distinct	Layering (bedding, foliation, cleavage) distinct; rock breaks more easily parallel to layering	Medium bedded	200 – 600
		Thickly bedded	600 – 2,000
		Very thickly bedded	> 2,000

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT TYPES

Defect Type	Abbr.	Description
Joint	JT	Surface of a fracture or parting, formed without displacement, across which the rock has little or no tensile strength. May be closed or filled by air, water or soil or rock substance, which acts as cement.
Bedding Parting	BP	Surface of fracture or parting, across which the rock has little or no tensile strength, parallel or sub-parallel to layering/ bedding. Bedding refers to the layering or stratification of a rock, indicating orientation during deposition, resulting in planar anisotropy in the rock material.
Contact	CO	The surface between two types or ages of rock.
Sheared Surface	SSU	A near planar, curved or undulating surface which is usually smooth, polished or slickensided.
Sheared Seam/ Zone (Fault)	SS/SZ	Seam or zone with roughly parallel almost planar boundaries of rock substance cut by closely spaced (often <50 mm) parallel and usually smooth or slickensided joints or cleavage planes.
Crushed Seam/ Zone (Fault)	CS/CZ	Seam or zone composed of disoriented usually angular fragments of the host rock substance, with roughly parallel near-planar boundaries. The brecciated fragments may be of clay, silt, sand or gravel sizes or mixtures of these.
Extremely Weathered Seam/ Zone	XWS/XWZ	Seam of soil substance, often with gradational boundaries, formed by weathering of the rock material in places.
Infilled Seam	IS	Seam of soil substance, usually clay or clayey, with very distinct roughly parallel boundaries, formed by soil migrating into joint or open cavity.
Vein	VN	Distinct sheet-like body of minerals crystallised within rock through typically open-space filling or crack-seal growth.

NOTE: Defects size of <100mm SS, CS and XWS. Defects size of >100mm SZ, CZ and XWZ.

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT SHAPE AND ROUGHNESS

Shape	Abbr.	Description	Roughness	Abbr.	Description
Planar	PR	Consistent orientation	Polished	POL	Shiny smooth surface
Curved	CU	Gradual change in orientation	Slickensided	SL	Grooved or striated surface, usually polished
Undulating	UN	Wavy surface	Smooth	SM	Smooth to touch. Few or no surface irregularities
Stepped	ST	One or more well defined steps	Rough	RO	Many small surface irregularities (amplitude generally <1mm). Feels like fine to coarse sandpaper
Irregular	IR	Many sharp changes in orientation	Very Rough	VR	Many large surface irregularities, amplitude generally >1mm. Feels like very coarse sandpaper

Orientation: **Vertical Boreholes –** The dip (inclination from horizontal) of the defect.
Inclined Boreholes – The inclination is measured as the acute angle to the core axis.

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT COATING			DEFECT APERTURE		
Coating	**Abbr.**	**Description**	**Aperture**	**Abbr.**	**Description**
Clean	CN	No visible coating or infilling	Closed	CL	Closed.
Stain	SN	No visible coating but surfaces are discoloured by staining, often limonite (orange-brown)	Open	OP	Without any infill material.
Veneer	VNR	A visible coating of soil or mineral substance, usually too thin to measure (< 1 mm); may be patchy	Infilled	-	Soil or rock i.e. clay, silt, talc, pyrite, quartz, etc.

Appendix B - Laboratory Certificates

POINT LOAD STRENGTH INDEX REPORT

Client:	EI Australia	**Moisture Content Condition:**	As received
Address:	Suite 6.01, 55 Miller Street, Pyrmont, NSW 2009	**Storage History:**	Core boxes
Project:	48 Cumberland Street The Rocks (E24614 G03)	**Report No:**	S60678-PL
Job No:	S20263-1	**Date Tested:**	10/06/2020

Test Procedure: ☑ AS4133 4.1 Rock strength tests - Determination of point load strength index

Sampling: Sampled by Client - results apply to the sample as received **Date Sampled:** 9/06/2020

Preparation: Prepared in accordance with the test method

Sample Number	Sample Source	Sample Description	Test Type	Average Width (mm)	Platen Separation (mm)	Failure Load (kN)	Point Load Index Is (MPa)	Point Load Index $Is_{(50)}$ (MPa)	Failure Mode
S60678	BH1 1.01 - 1.10m	Sandstone	Axial	44.7	38.0	2.65	1.23	1.19	1
S60679	BH1 2.45 - 2.54m	Sandstone	Axial	46.1	34.0	3.09	1.55	1.47	1
S60680	BH1 3.70 - 3.80m	Sandstone	Axial	45.6	35.0	1.98	0.97	0.93	1
S60681	BH2 1.13 - 1.21m	Sandstone	Axial	45.7	34.0	2.52	1.27	1.21	1
S60682	BH2 2.64 - 2.74m	Sandstone	Axial	45.3	41.0	3.27	1.38	1.37	1
S60683	BH2 4.13 - 4.23m	Sandstone	Axial	45.8	37.0	2.60	1.21	1.17	1
S60684	BH3 2.15 - 2.23m	Sandstone	Axial	45.8	32.0	1.51	0.81	0.76	1
S60685	BH3 3.63 - 3.72m	Sandstone	Axial	44.7	38.0	1.96	0.91	0.88	1
S60686	BH4 3.15 - 3.23m	Sandstone	Axial	52.1	40.0	2.15	0.81	0.82	1
S60687	BH4 3.75 - 3.85m	Sandstone	Axial	51.9	41.0	2.90	1.07	1.09	1

Failure Modes

1 - Fracture through fabric of specimen oblique to bedding, not influenced by weak planes.

2 - Fracture along bedding.

3 - Fracture influenced by pre-existing plane, microfracture, vein or chemical alteration.

4 - Chip or partial fracture.

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

11/06/2020

Date

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Alexandria NSW

POINT LOAD STRENGTH INDEX REPORT

Client:	EI Australia	**Moisture Content Condition:**	As received
Address:	Suite 6.01, 55 Miller Street, Pyrmont, NSW 2009	**Storage History:**	Core boxes
Project:	48 Cumberland Street The Rocks (E24614 G03)	**Report No:**	S60688-PL
Job No:	S20263-1	**Date Tested:**	10/06/2020

Test Procedure: ☑ AS4133 4.1 Rock strength tests - Determination of point load strength index

Sampling: Sampled by Client - results apply to the sample as received **Date Sampled:** 9/06/2020

Preparation: Prepared in accordance with the test method

Sample Number	Sample Source	Sample Description	Test Type	Average Width (mm)	Platen Separation (mm)	Failure Load (kN)	Point Load Index Is (MPa)	Point Load Index $Is_{(50)}$ (MPa)	Failure Mode
S60688	BH5 1.00 - 1.09m	Sandstone	Axial	51.9	41.0	1.66	0.61	0.62	1
S60689	BH5 2.16 - 2.24m	Sandstone	Axial	51.9	41.0	2.96	1.09	1.11	1
S60690	BH5 2.84 - 2.90m	Shale	Axial	52.5	38.0	0.08	0.03	0.03	1
S60691	BH5 3.32 - 3.42m	Sandstone	Axial	52.0	42.0	4.09	1.47	1.51	1
S60692	BH6 1.30 - 1.40m	Sandstone	Axial	52.0	40.0	2.69	1.02	1.03	1
S60693	BH6 2.68 - 2.76m	Sandstone	Axial	52.1	41.0	2.72	1.00	1.02	1
S60694	BH6 3.46 - 3.55m	Sandstone	Axial	52.1	40.0	1.50	0.57	0.57	1
S60695	BH6 4.54 - 4.63m	Sandstone	Axial	51.9	32.0	3.30	1.56	1.50	1
S60696	BH6 5.52 - 5.61m	Sandstone	Axial	52.1	45.0	4.12	1.38	1.44	1
S60697	BH7 1.62 - 1.69m	Sandstone	Axial	51.8	41.0	2.95	1.09	1.11	1

Failure Modes

1 - Fracture through fabric of specimen oblique to bedding, not influenced by weak planes.

2 - Fracture along bedding.

3 - Fracture influenced by pre-existing plane, microfracture, vein or chemical alteration.

4 - Chip or partial fracture.

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Authorised Signatory:

Chris Lloyd

11/06/2020

Date

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U7/8 10 Bradford Street
Alexandria NSW

POINT LOAD STRENGTH INDEX REPORT

Client:	EI Australia	**Moisture Content Condition:**	As received
Address:	Suite 6.01, 55 Miller Street, Pyrmont, NSW 2009	**Storage History:**	Core boxes
Project:	48 Cumberland Street The Rocks (E24614 G03)	**Report No:**	S60698-PL
Job No:	S20263-1	**Date Tested:**	10/06/2020

Test Procedure: ☑ AS4133 4.1 Rock strength tests - Determination of point load strength index

Sampling: Sampled by Client - results apply to the sample as received **Date Sampled:** 9/06/2020

Preparation: Prepared in accordance with the test method

Sample Number	Sample Source	Sample Description	Test Type	Average Width (mm)	Platen Separation (mm)	Failure Load (kN)	Point Load Index Is (MPa)	Point Load Index $Is_{(50)}$ (MPa)	Failure Mode
S60698	BH7 2.24 - 2.34m	Sandstone	Axial	52.1	43.0	3.40	1.19	1.23	1
S60699	BH7 3.52 - 3.62m	Sandstone	Axial	51.5	45.0	3.13	1.06	1.10	1
S60700	BH8 1.23 - 1.33m	Sandstone	Axial	52.0	38.0	1.93	0.77	0.77	1
S60701	BH8 2.48 *- 2.58m	Sandstone	Axial	51.9	40.0	2.15	0.81	0.82	1
S60702	BH8 3.39 - 3.49m	Sandstone	Axial	52.0	41.0	1.58	0.58	0.59	1
S60703	BH8 4.16 - 4.26m	Sandstone	Axial	52.2	44.0	2.47	0.84	0.87	1
S60704	BH8 6.14 - 6.23m	Sandstone	Axial	52.1	35.0	4.35	1.87	1.84	1
S60705	BH9 0.28 - 0.37m	Sandstone	Axial	44.6	40.0	1.83	0.81	0.79	1
S60706	BH9 1.46 - 1.55m	Sandstone	Axial	45.3	38.0	2.22	1.01	0.98	1
S60707	BH9 2.33 - 2.41m	Sandstone	Axial	45.4	37.0	3.80	1.78	1.71	1

Failure Modes

1 - Fracture through fabric of specimen oblique to bedding, not influenced by weak planes.

2 - Fracture along bedding.

3 - Fracture influenced by pre-existing plane, microfracture, vein or chemical alteration.

4 - Chip or partial fracture.

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11/06/2020

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Alexandria NSW

POINT LOAD STRENGTH INDEX REPORT

Client:	EI Australia	**Moisture Content Condition:**	As received
Address:	Suite 6.01, 55 Miller Street, Pyrmont, NSW 2009	**Storage History:**	Core boxes
Project:	48 Cumberland Street The Rocks (E24614 G03)	**Report No:**	S60708-PL
Job No:	S20263-1	**Date Tested:**	10/06/2020

Test Procedure: ☑ AS4133 4.1 Rock strength tests - Determination of point load strength index

Sampling: Sampled by Client - results apply to the sample as received **Date Sampled:** 9/06/2020

Preparation: Prepared in accordance with the test method

Sample Number	Sample Source	Sample Description	Test Type	Average Width (mm)	Platen Separation (mm)	Failure Load (kN)	Point Load Index Is (MPa)	Point Load Index $Is_{(50)}$ (MPa)	Failure Mode
S60708	BH9 3.24 - 3.33m	Sandstone	Axial	45.4	40.0	4.24	1.83	1.80	1
S60709	BH9 4.09 - 4.18m	Sandstone	Axial	45.2	40.0	2.32	1.01	0.99	1
S60710	BH9 5.50 - 5.57m	Shale	Axial	45.1	30.0	0.13	0.08	0.07	1
S60711	BH9 5.80 - 5.90m	Sandstone	Axial	45.4	32.0	1.86	1.00	0.94	1
S60712	BH9 7.43 - 7.53m	Sandstone	Axial	46.0	40.0	2.22	0.95	0.93	1
S60713	BH10 1.00 - 1.10m	Sandstone	Axial	52.0	33.0	1.43	0.65	0.64	1
S60714	BH10 2.57 - 2.67m	Sandstone	Axial	51.9	41.0	3.50	1.29	1.32	1
S60715	BH10 3.30 - 3.40m	Sandstone	Axial	52.1	40.0	2.46	0.93	0.94	1
S60716	BH10 4.32 - 4.41m	Sandstone	Axial	51.9	41.0	3.07	1.13	1.15	1
S60717	BH10 5.42 - 5.52m	Sandstone	Axial	51.9	36.0	3.97	1.67	1.65	1

Failure Modes

1 - Fracture through fabric of specimen oblique to bedding, not influenced by weak planes.

2 - Fracture along bedding.

3 - Fracture influenced by pre-existing plane, microfracture, vein or chemical alteration.

4 - Chip or partial fracture.

NATA

Accredited for compliance with ISO/IEC 17025 - Testing.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

11/06/2020

Date

MACQUARIE GEOTECH

Macquarie Geotechn
U7/8 10 Bradford Street
Alexandria NSW

POINT LOAD STRENGTH INDEX REPORT

Client:	EI Australia	**Moisture Content Condition:**	As received
Address:	Suite 6.01, 55 Miller Street, Pyrmont, NSW 2009	**Storage History:**	Core boxes
Project:	48 Cumberland Street The Rocks (E24614 G03)	**Report No:**	S60718-PL
Job No:	S20263-1	**Date Tested:**	10/06/2020

Test Procedure: ☑ AS4133 4.1 Rock strength tests - Determination of point load strength index

Sampling: Sampled by Client - results apply to the sample as received **Date Sampled:** 9/06/2020

Preparation: Prepared in accordance with the test method

Sample Number	Sample Source	Sample Description	Test Type	Average Width (mm)	Platen Separation (mm)	Failure Load (kN)	Point Load Index Is (MPa)	Point Load Index $Is_{(50)}$ (MPa)	Failure Mode
S60718	BH10 6.37 - 6.47m	Sandstone	Axial	51.9	40.0	3.75	1.42	1.44	1
S60719	BH11 0.42 - 0.50m	Sandstone	Axial	51.8	36.0	3.24	1.36	1.35	1
S60720	BH11 2.53 - 2.63m	Sandstone	Axial	51.9	40.0	3.34	1.26	1.28	1
S60721	BH11 4.52 - 4.60m	Sandstone	Axial	51.9	42.0	3.16	1.14	1.17	1
S60722	BH11 5.30 - 5.38m	Shale	Axial	52.0	34.0	0.73	0.32	0.32	1
S60723	BH11 6.52 - 6.62m	Sandstone	Axial	51.8	38.0	3.97	1.58	1.58	1
S60724	BH11 8.31 - 8.39m	Sandstone	Axial	52.0	43.0	4.42	1.55	1.60	1

Failure Modes

1 - Fracture through fabric of specimen oblique to bedding, not influenced by weak planes.

2 - Fracture along bedding.

3 - Fracture influenced by pre-existing plane, microfracture, vein or chemical alteration.

4 - Chip or partial fracture.

NATA

Accredited for compliance with ISO/IEC 17025 - Testing.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

12/06/2020

Date

MACQUARIE GEOTECH

Macquarie Geotechn
U7/8 10 Bradford Street
Alexandria NSW

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Ian Watts
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	ian.watts@eiaustralia.com.au
Project	**E24614 48 Cumberland StreetThe Rocks**
Order Number	**E24614**
Samples	13

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE207287A R0**
Date Received	10/6/2020
Date Reported	17/6/2020

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES

Dong LIANG
Metals/Inorganics Team Leader

Shane MCDERMOTT
Inorganic/Metals Chemist

pH in soil (1:5) [AN101] Tested: 15/6/2020

PARAMETER	UOM	LOR	BH3_2.45-2.49 SOIL - 4/6/2020 SE207287A.003	BH7_0.35-0.45 SOIL - 5/6/2020 SE207287A.008
pH	pH Units	0.1	6.5	6.8

Conductivity and TDS by Calculation - Soil [AN106] Tested: 15/6/2020

PARAMETER	UOM	LOR	BH3_2.45-2.49 SOIL - 4/6/2020 SE207287A.003	BH7_0.35-0.45 SOIL - 5/6/2020 SE207287A.008
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	8	190

Soluble Anions (1:5) In Soil by Ion Chromatography [AN245] Tested: 16/6/2020

PARAMETER	UOM	LOR	BH3_2.45-2.49 SOIL - 4/6/2020 SE207287A.003	BH7_0.35-0.45 SOIL - 5/6/2020 SE207287A.008
Chloride	mg/kg	0.25	2.6	11
Sulfate	mg/kg	5	7.4	510

METHOD SUMMARY

SE207287A R0

METHOD	METHODOLOGY SUMMARY
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, sediments and sludges, an extract with water (or 0.01M CaCl2) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract of as received sample with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Salinity can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. Reference APHA 2510 B.
AN245	Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

Appendix C – Vibration Limits

German Standard DIN 4150 – Part 3: 1999 provides guideline levels of vibration velocity for evaluating the effects of vibration in structures. The limits presented in this standard are generally considered to be conservative.

The DIN 4150 values (maximum levels measured in any direction at the foundation, OR, maximum levels measured in (x) or (y) directions, in the plane of the uppermost floor), are summarised in **Table A** below.

It should be noted that peak vibration velocities higher than the minimum figures in **Table A** for low frequencies may be quite 'safe', depending on the frequency content of the vibration and the actual conditions of the structures.

It should also be noted that these levels are 'safe limits', up to which no damage due to vibration effects has been observed for the particular class of building. 'Damage' is defined by DIN 4150 to include even minor non-structural cracking in cement render, the enlargement of cracks already present, and the separation of partitions or intermediate walls from load bearing walls. Should damage be observed at vibration levels lower than the 'safe limits', then it may be attributed to other causes. DIN 4150 also states that when vibration levels higher than the 'safe limits' are present, it does not necessarily follow that damage will occur. Values given are only a broad guide.

Table A **DIN 4150 – Structural Damage – Safe Limits for Building Vibration**

Group	Type of Structure	Peak Vibration Velocity (mm/s)			
		At Foundation Level at a Frequency of:			Plane of Floor of Uppermost Storey
		Less than 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	All Frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 and 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Note: For frequencies above 100 Hz, the higher values in the 50 Hz to 100 Hz column should be used.

Appendix D – Important Information

Important Information

SCOPE OF SERVICES

The geotechnical report ("the report") has been prepared in accordance with the scope of services as set out in the contract, or as otherwise agreed, between the Client And EI Australia ("EI"). The scope of work may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

RELIANCE ON DATA

EI has relied on data provided by the Client and other individuals and organizations, to prepare the report. Such data may include surveys, analyses, designs, maps and plans. EI has not verified the accuracy or completeness of the data except as stated in the report. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations ("conclusions") are based in whole or part on the data, EI will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to EI.

GEOTECHNICAL ENGINEERING

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared for a specific client, for a specific project and to meet specific needs, and may not be adequate for other clients or other purposes (e.g. a report prepared for a consulting civil engineer may not be adequate for a construction contractor). The report should not be used for other than its intended purpose without seeking additional geotechnical advice. Also, unless further geotechnical advice is obtained, the report cannot be used where the nature and/or details of the proposed development are changed.

LIMITATIONS OF SITE INVESTIGATION

The investigation programme undertaken is a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions. The data derived from the site investigation programme and subsequent laboratory testing are extrapolated across the site to form an inferred geological model, and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite investigation, the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. The engineering logs are the subjective interpretation of subsurface conditions at a particular location and time, made by trained personnel. The actual interface between materials may be more gradual or abrupt than a report indicates.

SUBSURFACE CONDITIONS ARE TIME DEPENDENT

Subsurface conditions can be modified by changing natural forces or man-made influences. The report is based on conditions that existed at the time of subsurface exploration. Construction operations adjacent to the site, and natural events such as floods, or ground water fluctuations, may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report. EI should be kept appraised of any such events, and should be consulted to determine if any additional tests are necessary.

VERIFICATION OF SITE CONDITIONS

Where ground conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of the report that EI be notified of any variations and be provided with an opportunity to review the recommendations of this report. Recognition of change of soil and rock conditions requires experience and it is recommended that a suitably experienced geotechnical engineer be engaged to visit the site with sufficient frequency to detect if conditions have changed significantly.

REPRODUCTION OF REPORTS

 Where information from the accompanying report is to be included in contract documents or engineering specification for the project, the entire report should be included in order to minimize the likelihood of misinterpretation from logs.

REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the Client and no other party. EI assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of EI or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

OTHER LIMITATIONS

EI will not be liable to update or revise the report to take into account any events or emergent circumstances or fact occurring or becoming apparent after the date of the report.

Appendix J ACSE Practice Note

Assessment of Existing Building Structures for Global Stability

1. Introduction

Designing new buildings and structures for earthquake actions has been a requirement for Structural Engineers in Australia for many years. The current Australian Standard AS1170.4 – 2007: Structural Design Actions Part 4 – Earthquake Actions in Australia, gives guidance on the earthquake actions and general detailing requirements for the use in the design of structures subject to earthquake.

The requirements for the assessment and strengthening of existing buildings is undefined in the current Building Code of Australia (BCA) or other current Australian Standards with the basis and parameters of any assessment left up to the individual Structural Engineer reviewing the building and any works that are proposed to it.

This Practice Note aims to give guidance on requirements for assessment of existing building structures and procedures that are available for assessment of their ability to withstand earthquake loads during a design event that can be used as a basis for reporting on possible strengthening requirements to building owners, developers and other stakeholders for consideration in the initial stages of a project.

2. Design Codes and Requirements

New buildings are designed and constructed in Australia in accordance with the relevant revision of the BCA – National Construction Code (NCC). This Code sets out the “technical provisions for the design and construction of buildings and other structures”. Design and construction may be carried by a performance based solution or by deemed-to satisfy solution. Commonly the building structure is designed using the deemed-to-satisfy requirements, incorporating the requirements of the various Australian Standards eg Loading AS1170, Concrete AS3600 etc.

In the case of existing buildings subject to alterations and additions, the structural requirements of new works are covered by the requirements of the BCA, however existing building structure compliance is not required.

Alteration and addition works subject to a Development Approval (DA) may be subject to conditions in the approval with respect to structural adequacy of the existing structure or upgrade works – each Council/ Approval authority has differing requirements, but the most onerous condition requires a full upgrade to the building to BCA compliance (refer attached sample City of Sydney DA condition), and this potentially requires full compliance with AS1170.4. In this case the requirement of the structural engineer with regards to earthquake compliance is quite prescriptive.

City of Sydney Council sometimes however only requires structural certifications that “the proposed additional loads and/or alterations must not cause a decrease in the existing structural performance of the building including its performance under earthquake actions (AS1170.4)”.

Sometimes there are no DA conditions requiring any checks or certifications of the structural capacity of existing buildings subject to new works, even if the works are quite substantial. A common condition limits certification to “verifying that the existing structure can adequately support the proposed new loads…”.

While these types of DA conditions could imply that no assessment of a buildings adequacy is required in some cases, there may be an obligation to carry out a basic risk assessment as part of an engineer’s obligations under the safety in design provisions of the current WHS legislation.

Work Place Health and Safety (WHS) requirements (Safety in Design), set outs the legal requirements and duties of designers to carry out risk assessments of any designs they are involved with and take steps to mitigate these risks where practicable.

It may be therefore that, “where practicable”, a structural assessment is required regardless of any authority requirements or development approval conditions.

In identifying any risks associated with structural inadequacies in an existing building, and reporting those risks/ deficiencies to the client/ building owner should be sufficient to discharge the designer’s obligations with respect to Safety in Design and the WHS requirements. Whether the building owner/ client acts to mitigate the residual risk highlighted in any report is beyond the control of the Structural Engineer.

Obviously, the level of assessment will vary from project to project, and will depend on the age, size and construction type of the project, the nature of the works and type of building structure involved.

It is common knowledge that unreinforced masonry buildings (URM’s) are particularly susceptible to earthquake damage, and this is compounded in those with timber floors where there is often little engagement between the walls and floors to generate suitable load paths.

Alternatively it is likely that a properly designed modern multi-storey building has been designed for wind loads at least and therefore has some inherent capacity to withstand lateral loads.

For example, it would be unreasonable and impracticable to expect a structural engineer to carry out an assessment of a large multi-storey reinforced concrete building when only small localised modifications are being made on one floor say, but it would not be unreasonable for a structural engineer to consider and report on the adequacies of a low rise URM undergoing a major re-fit, even with limited structural works.

3. Guidelines for Assessments

The process below can be used when considering the need for strengthening an existing building structure for seismic and other lateral load. It includes a number of excerpts from the BCA and standards that the BCA references:

It is a legal requirement that all new Structures in Australia should be built in accordance with the BCA.

Assessment of Existing Building Structures for Global Stability

BCA Conformance:
NCC 2015 BCA Volume 1, part B1 clause B1.1 states that *"The resistance of structure must be greater than the most critical action effect resulting from different combinations of actions where;*

a) The most critical action…… contained in AS/NZS 1170
b) The resistance of a building or structure is determined in accordance with B1.4.

Note: NNC 2015 BCA Volume 1, part B1 clause B1.4 discusses Australian Materials codes

AS1170 Conformance:
AS1170.0: General principals – Commentary (supplement to AS/NZS 1170.0:2002, Section C1 SCOPE AND GENERAL, C1.1 SCOPE, item (E) references AS3826, ISO 13822 as the publication to reference for *"assessment of existing structures"*

AS3826 Conformance:
AS3826-1998- Appendix B2.1 deems an assessment be made if:

1. An alteration, which will reduce the strength or performance characteristics of the building
2. An addition, which will add mass and increase the earthquake response
3. A change in use, which will increase the occupant density of the building
4. Other changes due to the building in its unaltered condition being considered unsafe.

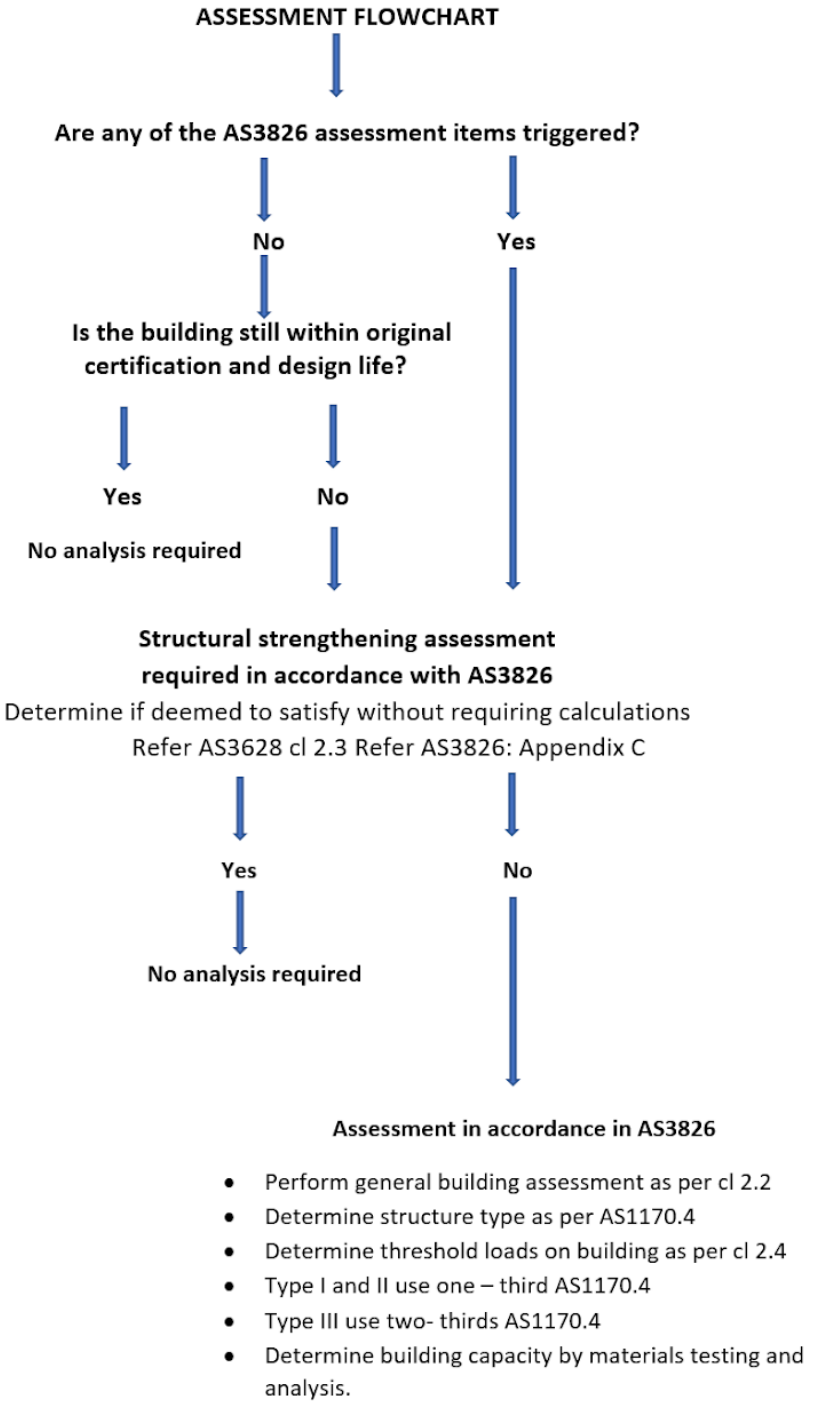
ACSE Discussion on AS3826 conformance:
1. <u>An alteration, which will reduce the strength or performance characteristics of the building:</u>
Constitutes: removal of any core structure, structural bracing, perimeter framing or any proposed structural element
Does not constitute: alteration/ modification to an individual element if existing strength and stiffness are maintained. Cutting of holes in diaphragms if general load paths maintained.

2. <u>An addition, which will add mass and increase the earthquake response</u>
ACSE suggest that the engineer calculate the building mass before and after intended modification, If changes by more than 5% (floor by floor and overall) then it could be deemed to trigger this requirement.

3. <u>A change in use which will increase the occupant density of the building</u>
An assessment is made into the structure use to determine if this clause is triggered, if general use remains the same then this is deemed not to be triggered.

4. <u>Other changes due to the building in its unaltered condition being considered unsafe.</u>"…
Assessment if building is inherently unsafe in unaltered state. The engineer needs to follow a systematic review of the building to highlight any potential issue with the structure.

Assessment of Existing Building Structures for Global Stability



More detailed information on building assessments, procedures and strengthening options can be found in the following documents and publications.

AS ISO 13822- 2005 – Basis for design of structures – Assessment of Existing Structures is a Standard that gives general guidance on the assessment of existing structures for safety and

serviceability. The Standard gives advice on procedures to be adopted in any assessment, and these could be modified for earthquake assessments of existing structures.

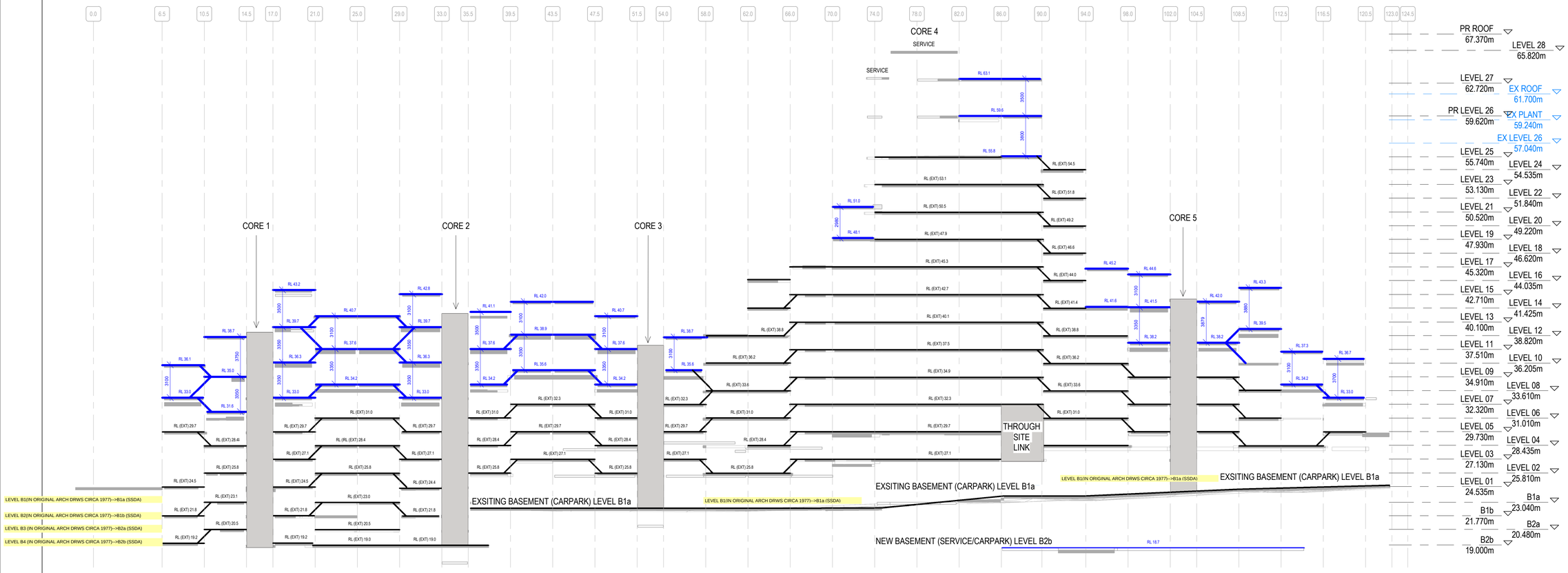
AS3826 – 1998 – Strengthening Existing Buildings for Earthquake is not referenced in the BCA as it is not applicable to new buildings, but is a good basis for an assessment procedure, and specifically deals with earthquake. The code provides guidance on methodologies for assessment of existing buildings, and highlights the types of buildings that are particularly at risk (e.g. multi-storey masonry structures), and types of structural deficiencies that may affect the buildings ability to withstand earthquake loads (eg lack of defined load path, poor floor/ wall connection/ soft storeys).

New Zealand - MBIE – The Seismic Assessment of Existing buildings B – This document has been produced as part of the new system for managing earthquake-prone buildings in NZ. It gives a procedures for the seismic assessment of buildings http://www.eq-assess.org.nz/

ASCE/SEI 41-17 – Seismic Evaluation and Retrofit of Existing Buildings – This large ACSE Standard (576p) give requirements for seismic evaluation, acceptance and retrofit of most building types and materials. http://www.asce.org/booksandjournals

The NZ and American standards provide a tiered approach to carrying out assessments, ranging from initial assessment to a detailed and exhaustive building analysis incorporating material testing and verification.

Appendix K Sirius Levels Diagram



1 LEVEL
00-00-00-00-00

EXISTING SSL

NEW ADDITION LEVELS (PODS / BASEMENT)

B1 (existing architecture drawings)--->B1a (SSDA architecture drawings): including existing carpark level
B2 (existing architecture drawings)--->B1b (SSDA architecture drawings)
B3 (existing architecture drawings)--->B2a (SSDA architecture drawings)
B4 (existing architecture drawings)--->B2b (SSDA architecture drawings): this level also for new North excavation basement

NOTE:

Relative Levels (RLs) indicated may be within 150mm of final levels, due to survey discrepancies and allowing for building tolerances.

FOR INFORMATION
BVN 200827

C:\REVIT_LOCAL2019\AR_1712011_SIR_SIRIUS_2019_sqiu.rvt 27/08/2020 11:14:54 AM

BVN

NSW ARCHITECTS REGISTRATION BOARD / NOMINATED ARCHITECTS
6501 ABBIE GALVIN
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7053 MATTHEW BLAIR
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NOTE

CONTRACTOR TO CHECK AND VERIFY ALL DIMENSIONS ON SITE PRIOR TO COMMENCEMENT OF WORK OR PREPARATION OF SHOP DRAWINGS. DO NOT SCALE THIS DRAWING

ISSUE	DATE	FOR
1	27.08.20	FOR INFORMATION

CONSULTANT

CONSULTANT

CONSULTANT

CONSULTANT

PROJECT MANAGER
DEDICO

CLIENT

JDH CAPITAL
CLIENT NUMBER

PROJECT

SIRIUS
2-60 CUMBERLAND ST, THE ROCKS
BVN PROJECT NUMBER

1712011
DRAWING KEY

TRUE NORTH PROJECT NORTH

GRAPHIC SCALE
0 2000 5000
SCALE

As indicated@A1
STATUS

FOR INFORMATION
DRAWING

ADG PART 2C - LEVELS DIAGRAM

AR-T-20-02 | ISSUE 1

Appendix L Documentation Checklist

Required 2 weeks before Issuing of Certificate of Construction Compliance

PROJECT Sirius, 36-50 Cumberland Street, The Rocks

DATE

General – SCP to be issued with all returned and signed

Engineering Inspection Reports signed off by builder that all rectification work listed has been actioned and completed.

ITEM	RECEIVED
Footings	
Copies of all inspection reports by geotechnical engineer, including compaction testing to AS3798 and CBR Certification	
Copies of certification of bearing pressures by geotechnical engineer	
Copy of concrete mix design	
Copies of all concrete cylinder test results	
Certificate for reinforcement stating grade	
For D & C Piles and/or shoring, certification that all piles and/or shoring, have been designed and installed to support the loads nominated on the SCP drawings and all settlement and design life parameters are satisfied	
Concrete Slabs on Ground	
Copy of Sub-Base Compaction Tests and Reports	
Copy of Mix Design for Approval	
Copy of All Concrete Cylinder Test Results	
Copy of Shrinkage Test Results	
Details of Curing Compound applied including Compliance with Standards	
Details of Jointing Material used in Expansion Joints, Key Joints	
Certificate for any reinforcement stating grade (ACRS Certificate)	
Structural Steelwork	
Copies of Fabrication Inspection Reports including extent of NDE	
Copy of Paint Records and Testing/Galvanizing Records	
Copy of Applicators Warranty on Paint System/Galvanizing	
Copy of Inspection Reports of Paint System	
Copy of Certificates of steel grade and certification that bolts comply with AS 1252	
Details of grout used	

ITEM	RECEIVED
Suspended Concrete Work	
Copy of Mix Design for Approval	
Copy of all Concrete Cylinder Test Results	
Copy of any Shrinkage Test Results	
Details of Curing Compound Used	
Certificate for any Reinforcement Stating Grade	
Details of Post-Tensioning Extensions (where SCP has documented PT & Reinforcement)	
For D&C Post Tensioning, Certification that all slabs have been Designed and Installed to carry the nominated loads on the SCP Drawings and Design Brief	
Precast Concrete	
Copy of Certification from the precast supplier that the panels have been constructed and erected in accordance with approved Shop Drawings	

Consultant Safety in Design Register

REF NO	DATE RAISED	ACTIVITY AND HAZARD	LOCATION	RISK	CONSEQ	PROBABILITY	RANKING	RISK MITIGATION PROCESS	RESPONSIBILITY	DESIGN RESOLUTION	RESIDUAL HAZARD	DATE ACTIONED
1	**STRUCTURAL**											
1.1		Rock Anchor installation - Tendon Failure	Shoring wall work face	Tension Failure	4	3	High	Design and installation to relevant code of practice. Prepare work method statement	Contractor			
1.2		Lifting heavy elements with Cranes	Entire site	Objects Fall from height	3	3	Moderate	Construction risk need to be addressed by construction team and prepare safe work method statement	Contractor			
1.3		Working near moving plant	Loading Bays, Bulk Excavation	Collision between traffic and construction personnel / plant	3	3	Moderate	Construction risk need to be addressed by construction team and prepare safe work method statement	Contractor			
1.4		Excavation	Entire site	Risk of ground collapse	3	4	High	Design and install all temporary supporting system as required. Arrange Geotechnical Engineer inspection before each stage of excavation	Contractor			
1.5		Working with hand-held vibrating tools	Entire site	Hand arm vibration syndrome	3	3	Moderate	Construction risk need to be addressed by construction team and prepare safe work method statement	Contractor			
1.6		Working near the public	Site boundary	Injury to public due to construction activities	2	3	Moderate	Construction risk need to be addressed by construction team and prepare safe work method statement	Contractor			
1.7		Workers walking on reinforcement	All concrete pours across the site	Risk of falling between reinforcement	3	3	Moderate	Provide SL72 top mesh for beams 450 deep or deeper	Contractor			
1.8		Manual handling	Entire site	Handing heavy items / awkward & strenuous positions	3	3	Moderate	Construction risk need to be addressed by construction team and prepare safe work method statement	Contractor			
1.9		Lifting and hauling plant operating in street	Surrounding public roads	Dust blowing onto public, hazard to the Public Large machinery loading the earth retention walls. Delays/fines if failing to meet Council and RMS application requirements (public works near a major road)	4	2	Moderate	(traffic) Submission of Construction traffic management plan to Council for CC approval. Submission of Road Occupancy Licence for any occupation of road (allow 10-14 days). Submission of Works Zone permit to Council if Works Zone parking condition is required	Contractor			

REF NO	DATE RAISED	ACTIVITY AND HAZARD	LOCATION	RISK	CONSEQ	PROBABILITY	RANKING	RISK MITIGATION PROCESS	RESPONSIBILITY	DESIGN RESOLUTION	RESIDUAL HAZARD	DATE ACTIONED
1.10		Temporary Support - Falsework Scaffold, formwork	Entire site	Risk of premature removal of temporary propping	2	4	Moderate	Construction risk need to be addressed by construction team and prepare safe work method statement. Follow relevant coded and drawings. Builder's engineer to design and inspect the all temporary works	Contractor			
1.11		Site Welding	Entire site	Risk of burns and eye damage	3	3	Moderate	Construction risk need to be addressed by construction team and prepare safe work method statement	Contractor			
1.12		Construction sequencing	Entire site	Workers working in unsafe locations	3	4	High	Construction risk need to be addressed by construction team and prepare safe work method statement	Contractor			
1.13		Structural steelwork - temporary works	Roof and Canopy Structures	structure not fully braced during construction	3	3	Moderate	Construction risk need to be addressed by construction team and prepare safe work method statement. Follow relevant coded and drawings. Builder's engineer to design and inspect the all temporary works	Contractor			
1.14		Structural steelwork - Access	Roof and Canopy Structures	Difficult access to connection points - Fall hazard	4	3	High	Construction risk need to be addressed by construction team and prepare safe work method statement	Contractor			
1.15		Structural steelwork - Temporary supports	Roof and Canopy Structures	Temporary loading to scaffold	3	3	Moderate	Construction risk need to be addressed by construction team and prepare safe work method statement. Follow relevant coded and drawings. Builder's engineer to design and inspect the all temporary works	Contractor			
1.16		Working in confined spaces	Water tanks/OSD	Injury to person	3	3	Moderate	Construction risk need to be addressed by construction team and prepare safe work method statement	Contractor			
1.17		Driving construction vehicles on the floors where not designed for construction loading	All Floors	structural failure or overload floor	3	3	Moderate	Floors design loads to be clearly nominated on the drawings. Provided additional back propping under floors as directed by structural Engineer	Structural engineer / Contractor			
1.18		Loading roof plant	Roof plant	Overloading plant platform	3	3	Moderate	Plant room design loads to be clearly nominated on the drawings. Verify and confirm all	Structural engineer / Contractor			

REF NO	DATE RAISED	ACTIVITY AND HAZARD	LOCATION	RISK	CONSEQ	PROBABILITY	RANKING	RISK MITIGATION PROCESS	RESPONSIBILITY	DESIGN RESOLUTION	RESIDUAL HAZARD	DATE ACTIONED
								plant loads requirement before construction				
1.19		Loss of vehicle control at heights	Whole building, particularly roof parking and ramp	Vehicle falls from height, serious injury/fatality to driver and others, serious potential for property damage	2	5	High	Install crash barriers along the perimeter of trafficable decks where the lower leave is greater than 600mm below. Crash barriers should be at least 1.3 metres in height when adjacent to parking. Structurally designed and installed in accordance with AS1170.1 and structural engineering specifications	Contractor			
2	**CIVIL**											
2.1		Hazards created by existing live services or services not identified on as-built drawings	Site	Incidents during construction works	3	2	Moderate	Determine and clearly mark all existing services within the site and surrounding footpaths. Site induction to include presenting of a site plan with clearly marked up all existing services. Site induction to include safety procedures	Contractor			
2.2		High traffic area (vehicles and pedestrians)	Site	Incidents during construction works	4	3	High	Determine and delineate internal construction vehicle routes from pedestrian routes. Post vehicle spotters on-site to safely guide vehicles. Site induction to include truck access/egress safety and movement procedures, and respective pedestrian procedures	Contractor			
2.3		Water Ingress during Civil works	Excavation areas	De-Stabilising of Civil Works and increased costs	3	3	Moderate	Construct pump out pit at the base of excavation works, Construct perimeter mound/barrier to prevent surface water running into the excavation area	Contractor			
2.4		Health issues related to contaminated soil	Excavation areas	Working with contaminated soil	2	2	Low	Review geotechnical report related to the site contamination and geotechnical recommendations related to removal, or treatment of contaminated soils. Site induction to include a plan of work with contaminated soil	Contractor			
2.5		Construction on boundary adjacent to existing footpaths and public roads	Boundary	Incidents during construction works	4	2	Moderate	Fence off the site and areas of works adjacent to the site boundary/within public footpath. Post vehicle spotters on public	Contractor			

REF NO	DATE RAISED	ACTIVITY AND HAZARD	LOCATION	RISK	CONSEQ	PROBABILITY	RANKING	RISK MITIGATION PROCESS	RESPONSIBILITY	DESIGN RESOLUTION	RESIDUAL HAZARD	DATE ACTIONED
								roads to safely guide vehicles. Provide safe pathways for pedestrians around the proposed works areas. Site induction to include construction area safety and movement procedures, and respective pedestrian procedures				
2.6		Maintenance staff may need to enter OSD tank and stormwater pits to perform maintenance, checks or repairs. Hazards include manual handling of heavy covers, contaminated air, vehicle hazards, fall potential, slips & trips, fall from ladders, drowning	Drainage pits and OSD Tank	Confined space access and ease of maintenance requirements. Incidents with vehicles if in roadway, risks of injury/damage associated with falls/collision with open pits	4	1	Low	Place high-vis traffic cones to redirect vehicles away from any pits in use. Place temporary fencing around pits. Ensure service provider is appropriately qualified, with a safety management strategy in place for such works in roadways	Contractor and Operator			
2.7		Customer access in and out of the carpark	External carpark	Incidents during operation of the Dealership	2	2	Low	Delineate pedestrian pathways, and provide signage for the drivers to inform them of the location of the pedestrian pathways crossings	Architect, Civil engineer			
2.8		Hazards associated with external works, connection of stormwater drainage to street drainage system, construction of kerbs, footpaths, external pavement	External works	Incidents during construction works	4	2	Moderate	Fence off the areas of works. Prepare traffic management plan for the external works. The plan must be approved by Council/RMS and implemented. Provide safe pathways for pedestrians around the proposed works areas. Site induction to include construction area safety and movement procedures, and respective pedestrian procedures	Contractor and Traffic Engineer			
3	**HYDRAULIC**											
3.1		Confined space	Hydraulic Pits	High Risk of asphyxiation, low oxygen or exposure to concentrated hazardous gases				Use proper tools and working platforms, wear PPE. Follow appropriate maintenance methodology by trained personnel.	Operator			
3.2		Confined Space - Trench collapse	In ground services					Wear PPE, follow appropriate construction methodology.	Contractor			

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3.3		Manual handling - Rrisers	Risers	Risk of strains, sprains, breaks etc				Wear PPE, follow appropriate construction methodology.	Contractor			
3.4		Sump Pump Access and Maintenance	Fire Control Room	High Risk of asphyxiation, low oxygen or exposure to concentrated hazardous gases				Use proper tools and working platforms, wear PPE. Follow appropriate maintenance methodology by trained personnel.	Operator			
3.5		Brigade Booster/Fixed Relay Pump Maintenance	Fire Control Room	Risk of strains, sprains, breaks etc				Provide appropriate clearances. Use proper tools and working platforms, wear PPE. Follow appropriate maintenance methodology by trained personnel	Designer / Operator			
3.6		Rain Water Pump Stations Maintenance	Rain Water storage tank	High Risk of asphyxiation, low oxygen or exposure to concentrated hazardous gases				Use proper tools and working platforms, wear PPE. Follow appropriate maintenance methodology by trained personnel	Operator	Fixing points		
3.7		Access to solar hot water system	Roof	Risk of fall from height				Provide appropriate safety rails surrounding plantroom. Use proper tools and working platforms, wear PPE. Follow appropriate maintenance methodology by trained personnel	Designer / Operator	Tempered water valves to protect people from hot water		
3.8		Hot water system	Entire Building	Risk of burns				Provide thermostatic mixing valves. Proper maintenance required by the Operator	Designer / Operator			
3.9		Hot water system	Entire Building	Risk of legionella growth in warm water systems				Proper maintenance required by the Operator	Operator			
3.10		Cleanout of pits	Pits	Risk of injury								

Risk Rating Matrix

CONSEQUENCE					
PROBABILITY	**1 Negligible**	**2 Minor**	**3 Medium**	**4 Major**	**5 Severe**
5 Almost Certain	Moderate	High	High	Extreme	Extreme
4 Likely	Low	Moderate	High	High	Extreme
3 Moderate	Low	Moderate	Moderate	High	High
2 Unlikely	Low	Low	Moderate	Moderate	High
1 Rare	Low	Low	Low	Low	Moderate

RANKING	
Extreme	Immediate attention required, cease activity
High	Immediate attention required, to reduce risk to moderate or below
Moderate	Maximum acceptable level of risk, additional controls may be implemented to improve
Low	Risks managed by routine procedures