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14 November 2014 121204

Health Infrastructure
Level 6, 77 Pacific Highway
North Sydney NSW 2060

Attention: Mr Geoff Ong

LISMORE BASE HOSPITAL
SUPPLEMENTARY REPORT FOR STAGE 3B
STRUCTURAL ENGINEERING

Dear Geoff,

1. INTRODUCTION

During 2013, a State Significant Development submission was made for Stage 3A of the Lismore Base Hospital Redevelopment.

As part of this submission, Taylor Thomson Whitting (NSW) Pty Ltd prepared two reports relating to Structural and Civil Engineering elements:

1. Lismore Base Hospital
   Stage 3a Redevelopment SSD
   Civil Engineering Design Report
   20 August 2013

2. Lismore Base Hospital Stage 3A
   Structural SSD Application Report
   15 May 2013.

The reports addressed specific structural and civil engineering issues relating to the current construction of a 6 level building that will house outpatients, Emergency Department, space for new operating theatres and plant areas.

As part of the overall masterplan for the site, it is proposed to construct as Stage 3B an additional four levels plus helipad above the current Stage 3A works, and additional 4 levels to the north of the current Stage 3A. This additional space will accommodate operating theatres, back of house works, imaging, maternity, inpatients units and CSSD, and additional plant space at roof level of each new area. No structural modifications or alterations are proposed for the Stage 3A works.

2. STRUCTURAL ENGINEERING WORKS

As part of the masterplan design, TTW were required to design the Stage 3A structure to accommodate the future extension proposed by the Stage 3B works. This included provision for additional column, earthquake and wind loads in accordance with the relevant Australian Standards.

TTW
TaylorThomsonWhitting

Structural
Civil
Traffic
Facade
Engineers

We confirm that the existing Stage 3A works have been designed to accommodate the additional loadings that will be applied by the Stage 3B works, in accordance with the relevant Australian Standards.

We note it will provide a significant reduction in disruption to the hospital operations if the Stage 3B structure above the current stage 3A,is able to be built continuously in a conventional manner, as an extension of the current works. This removes the requirement for potential backpropping and running of services (in particular hydraulic services) through the newly commissioned Stage 3A.

In general, the design philosophy for Stage 3B structure will follow that of Stage 3A, as outlined in the report of 15 May 2013. Reference should be made to this report for specific detail relating to loadings, design philosophies and structural systems.

3. CIVIL ENGINEERING WORKS

Civil engineering issues in relation to stormwater and access for loading docks are addressed in a separate civil engineering report prepared by TTW.

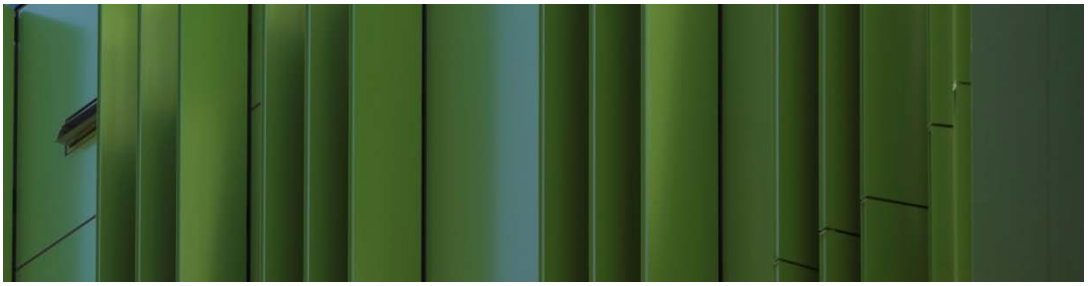
Prepared and Authorised by:
TAYLOR THOMSON WHITTING (NSW) PTY LTD

R MACKELLAR
Director

P:\2012\1212\121204\Reports\TTW\141141 LBH Supplementary Report for Stage 3B (struct).rm.doc

Structural

TaylorThomsonWhitting



LISMORE BASE HOSPITAL – STAGE
STRUCTURAL SSD APPLICATION REPORT

For HEALTH INFRASTRUCTURE NSW

15 May 2013

121204

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TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

1.1 General Conditions

The existing Lismore Base Hospital site contains 14 buildings on a nearly 3 hectare site that falls steeply from the Southwest corner at the Uralba Street and Little Uralba Street intersection to the Northeast corner near the intersection of Hunter Street and Orion Street.

1.2 Geotechnical Conditions

Ground conditions on the site have been reviewed by Coffey Geotechnics, including a desktop survey of previous geotechnical reports and a detailed investigation in January 2013, many of which have been carried out by Coffey. In general the site consists of

- A variable depth soil and fill profile, over
- An underlying rock material of two basalt flow layers separated by a soil layer

The upper basalt layer is up to 12m thick, and is distinctly weathered and fractured. Deep cuts in this material will require shoring or stabilising.

1.3 Preferred Option

The Key Structural Items for the Phase 3A building works are as follows;

Bulk Excavation and Shoring

Where possible it is proposed to batter excavations rather than provide some shoring. Relatively deep cuts around the new lift core area will require shoring along the Little Uralba street boundary.

Foundations

Foundations are proposed to be single, large diameter bored piers on higher strength Basalt. They will be designed for a degree of future expansion

Structural Systems

Structural systems for slabs are proposed to be banded concrete slab systems. Columns are proposed to be on an 8.4m by 8.4m grid in accordance with Health Infrastructure design guidelines. Columns and Core Walls are to be of reinforced concrete construction.

Building Phasing

The redevelopment is proposed to occur in two stages. Stage 3A will include Emergency, Renal and a shell space for future theatres, in a building fronting Uralba Street.

Additional allowance is made in the design of Stage 3A for future flexibility and expansion.

2.0 GEOTECHNICAL CONDITIONS

A desktop review of available data and previous reports has been carried out by Coffey Geotechnics in addition to a detailed site investigation in January 2013.

2.1.1 Existing Ground Conditions

A summary report has been undertaken by Coffey Geotechnics on the works which have been carried out on site. Generally on site, the existing conditions are found to exist.

Geotechnical Unit	Materials	Depth Interval	Consistency
Clay Soils	Residual soil and extremely weathered materials	Generally less than 1m depth near the south east of the site and deepens to approximately 7m or deeper towards the north west of the master planning area towards Block N and Block D	Stiff to very stiff clay
Upper Fractured Basalt	Highly to distinctly weathered basalt	Extends between around 1.5m to 7m depth and 2m to 14m in depth	Highly fractured rock mass, generally very low to medium rock strength
Interflow Tephra	Stiff to very stiff clay soils derived from weathering of Tephra and other basaltic materials	Observed between 7m to 18m depth. Generally the base of the unit is between 11.7m and 14m depth.	Soil strength to very low rock strength generally stiff to very stiff
Lower Basalt Unit	Moderately to fresh basalt	Generally the top of the unit is between 11.7 and 14m depth though may be as deep as 18.8m	Generally high to very high strength basalt though lower strength intervals recorded.

2.1.2 Ground Contamination

A Stage 1 Environmental Site Assessment report carried out by Coffey Geotechnical Engineers in January 2013 to look at the presence of any past or present contaminants on the site of 3A. From the findings of the report, there were no areas highlighted as areas for concern.

3.0 PREFERRED OPTION

3.1 Substructure

3.1.1 Proposed Foundations

It is proposed that the foundations for the new structure be constructed through single large diameter concrete piles which are bearing in the lower basalt strata.

It is anticipated that the pile size will vary between 900mm diameter and 1200mm diameter depending on the extent of building above. From the existing borehole information available, it is likely that the length of the piles is around 12m from the base excavation level. As part of the continuing design development of the project, a shallow foundation option will be assessed as part of the design.

3.1.2 Shoring Structures

As part of the works package for phase 3A, it is proposed that a shoring wall is built along Little Uralba Street to allow the building to be constructed close to the existing boundary. The height of the wall will vary with the existing ground levels but is expected to be retaining a maximum of 4-5m. To limit the size of the shoring wall, it is proposed that the wall be tied back using a series of temporary ground anchors which anchor under Little Uralba Street. These ground anchors will be removed following the construction of Stage 3A. In the permanent case, the shoring wall will be propped back to the Stage 3A structure.

It is likely that some smaller shoring and retaining structures will be required around the site to support existing stairs and retaining walls.

3.2 Superstructure

3.3 Design Principles

The structure has been designed to ensure the greatest amount of future flexibility whilst also keeping overall structural economy as one of the higher design considerations. To achieve this, a relatively large grid has been selected to better suit clinical layouts in accordance with HI requirements.

This grid provides greater planning flexibility and also reduces the likelihood of costly transfer structure in the scheme. By avoiding transfers, the building height can be kept to a minimum which has positive benefits for the facade and services reticulation. Transfers are only required to provide sufficient clearance within the Ambulance drop off area along Uralba Street.

Design loading on the building has been aimed at future flexibility whilst special design measures such as a small amount of sacrificial topping also improve flexibility. All structural design loadings and requirements comply with the BCA and all relevant HI design requirements.

Where possible, external ground loading on the structure has been reduced through measures such as battering to minimise lateral loads and reduce the need for shear walls.

3.3.1 Structural Scheme

The structure of Phase 3A is a basic structural form with columns located on an 8.4m x 8.4m grid. The structural grid has been developed to work with clinical layouts. At present, there are no major transfers in the design of the floor structure with the exception of the structure directly above the ambulance bay.

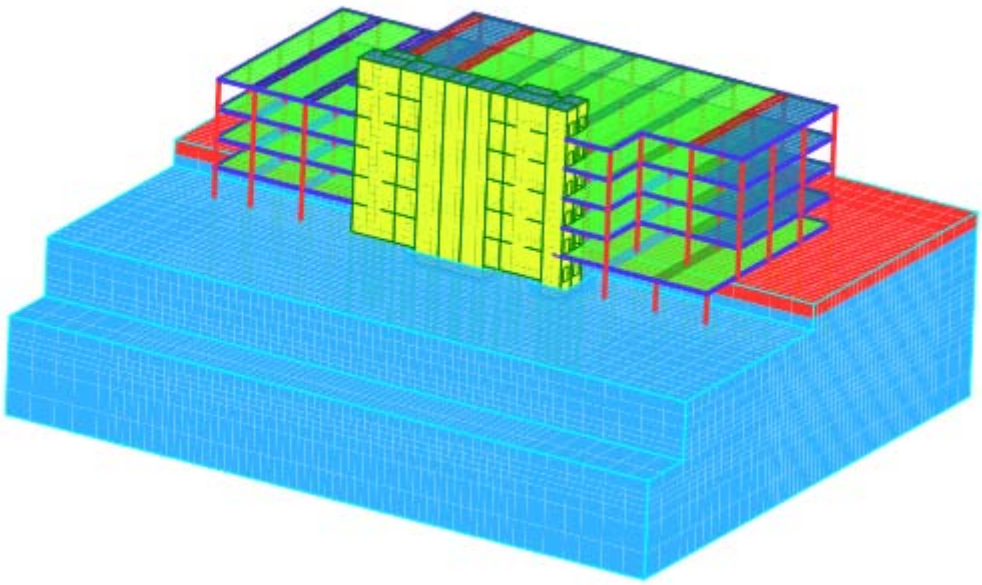
A central core provides vertical circulation within the building in addition to services

reticulation and provides the majority of the lateral stability for the building.

The building is founded on the lower basalt layer generally through the use of large diameter bored piles.

3.4 Lateral Stability

Overall lateral stability for stages 3A will be provided by reinforced concrete stair and lift core walls. Currently, the core is located on the northern side of Stage 3A. The core is to be designed and detailed in such a way in 3A to allow for future vertical and horizontal expansion.



Additional stability and building stiffness is provided by the perimeter edge beams which support the slab on each floor which work with the concrete columns to form a stiffening frame action. This effect will reduce the buildings sole reliance on one lateral load resisting element.

3.5 Structural Floor System

The structural grid selected has a strict limitation on the service performance of the floors. For the 8.4m x 8.4m grid selected, there are multiple options available for the construction of the floor system. A banded slab is traditionally the most cost effective option for the construction of a floor plate and sub options of this are explored in this section.

3.5.1 Floor Design Considerations

Health Infrastructure NSW has issued design guidance for their requirements of floor design on major projects. These requirements are outlined below.

Service Performance

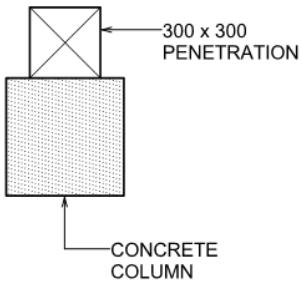
Floor service requirements are outlined in section 2.3 of the Report

Set down Flexibility

In order to provide flexibility for the provision of future set downs, a 40mm sacrificial topping is being incorporated into the design of the floors. The topping is poured integrally with the concrete slab but has the ability to be modified over the life of the building.

Penetration Requirements

At all levels in the new structure a 300 x 300 penetration zone will be allowed for on one side of each internal column for service risers as shown on the sketch below.



Additional to this penetration is the requirement for a further penetration of 300mm x 300mm in the same line. This requirement limits the minimum size of the band to 2400mm in width.

Post tensioning tendons will be kept clear of the penetration zone and any zones that are not used as part of this development will be marked on the slab soffit so that the extent of the possible future penetrations is clear.

Appendix A: Structural Drawings

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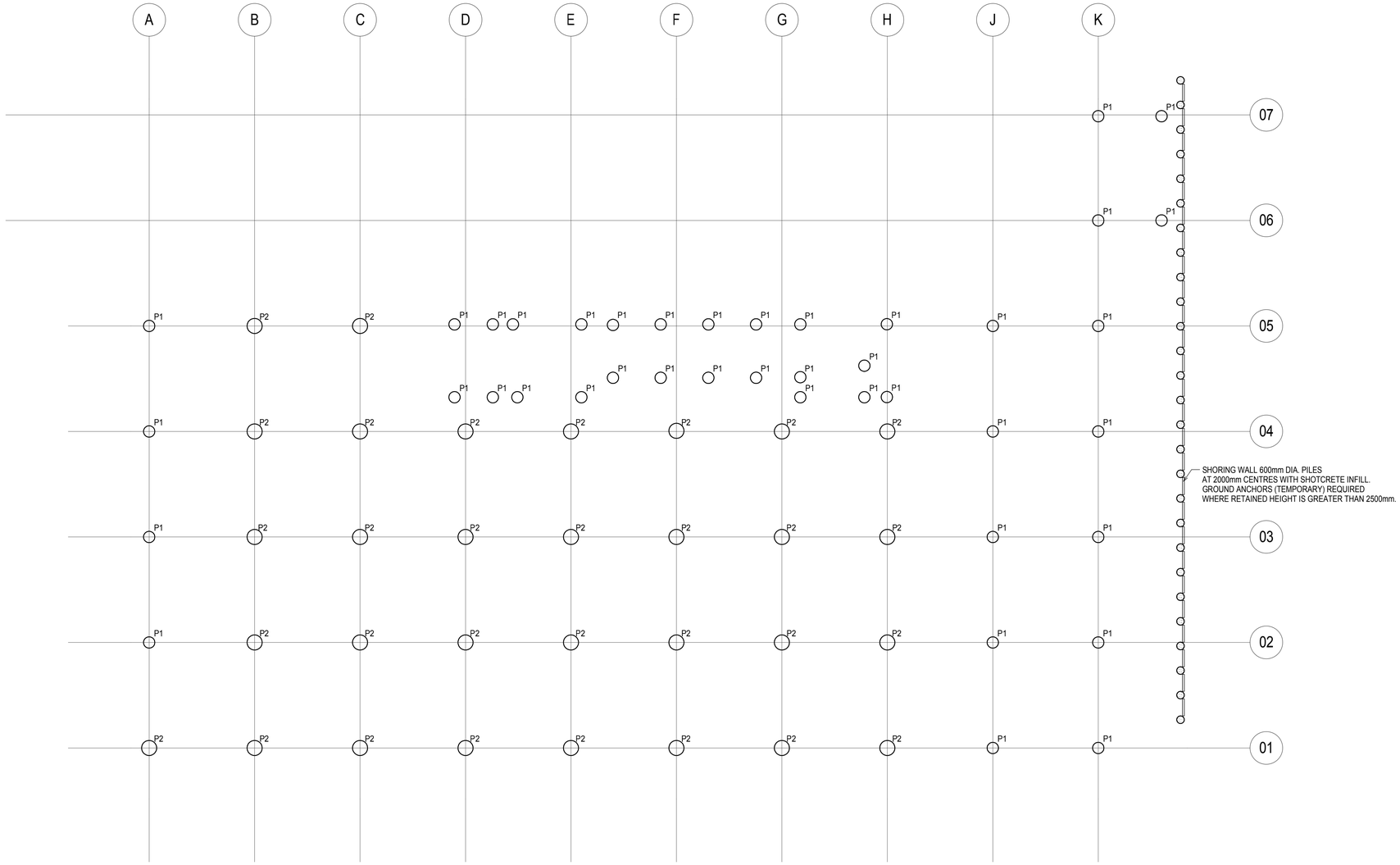

PILE PLAN

SCALE 1:200

1. PILE CUTOFF LEVELS VARY REFER PLANS FOR BUILDING EXTENT.

PILE SCHEDULE

PILES	DIAMETER	
P1	900	FINAL LENGHTS TO BE CONFIRMED FOLOWING GEOTECHNICAL INVESTIGATION.
P2	1200	

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Project
LISMORE BASE HOSPITAL REDEVELOPMENT

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PILE PLAN

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Approver

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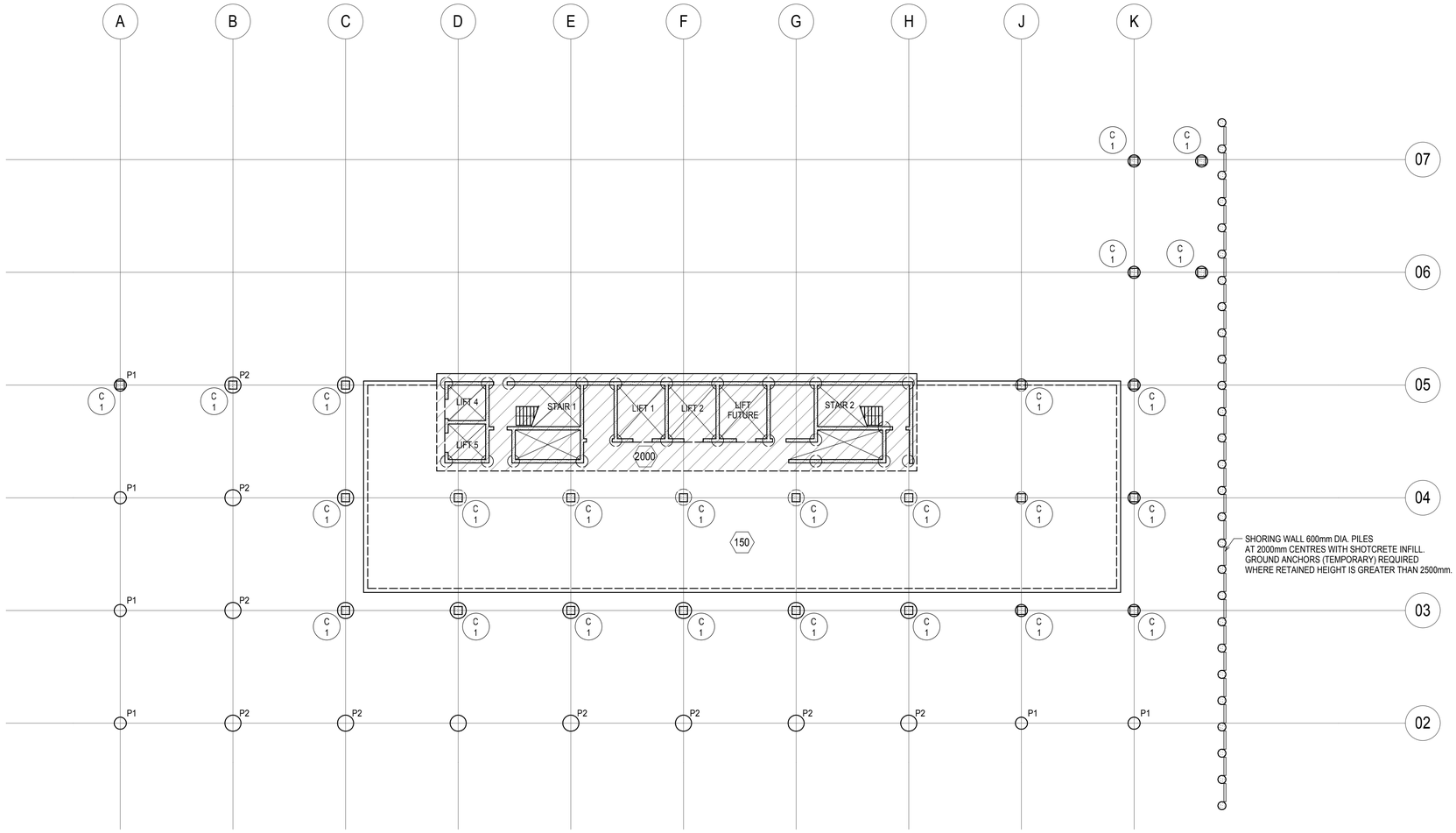

LEVEL 3 PLAN - 150 SLAB ON GROUND U.N.O.

SCALE 1:200

1. SLABS ON GROUND TO BE CAST ON 150 mm COMPACTED HARDCORE ON 2 LAYERS OF FORTICON & 2 LAYERS OF 2L72 MESH.
2. SAW CUTS AT 8.4m c/c
3. ALLOW 300x300 SLAB THICKENING.
4. ALL WALLS SHOWN 250mm REINFORCED CONCRETE.
5. ALL COLUMNS 600x600mm U.N.O.

Design Assumptions

1. LL = 3.0 kPa
   SDL = 1.8 kPa
2. SLAB THICKNESSES INDICATED INCLUDE AND 40mm INTERGRAL TOPPING.
3. VIBRATION CRITERIA RFI HAS BEEN DESIGNED FOR.
4. THE CONTRACTOR SHALL ALLOW FOR THE FALLING AND WRAPING OF FORMWORK TO ACHIEVE THE FALLS AS SHOWN ON THE ARCHITECTS DRAWINGS.

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Sheet Subject
LEVEL 3 CONCRETE OUTLINE PLAN

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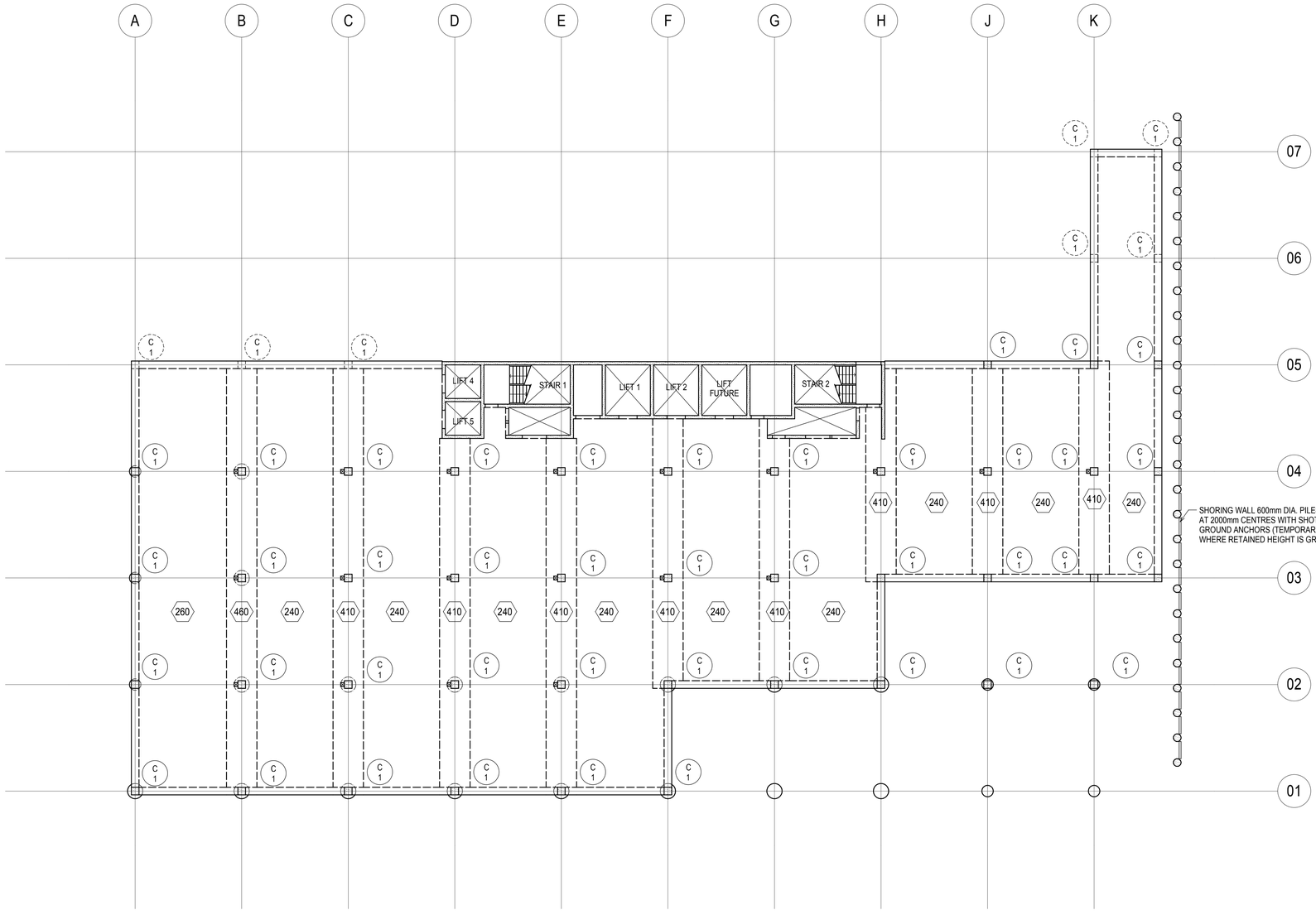

LEVEL 4 PLAN - 240 SLAB U.N.O.

SCALE 1:200

1. ALL BANDS 2400 x 410 THICK U.N.O.
2. EDGE BEAM 600 x 900mm.
3. ALL WALLS SHOWN 250mm REINFORCED CONCRETE.
4. ALL COLUMNS 600 x 600mm U.N.O.

Design Assumptions

1. LL = 3.0 kPa
   SDL = 1.8 kPa
2. SLAB THICKNESSES INDICATED INCLUDE AND 40mm INTERGRAL TOPPING.
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Sheet Subject
LEVEL 4 CONCRETE OUTLINE PLAN

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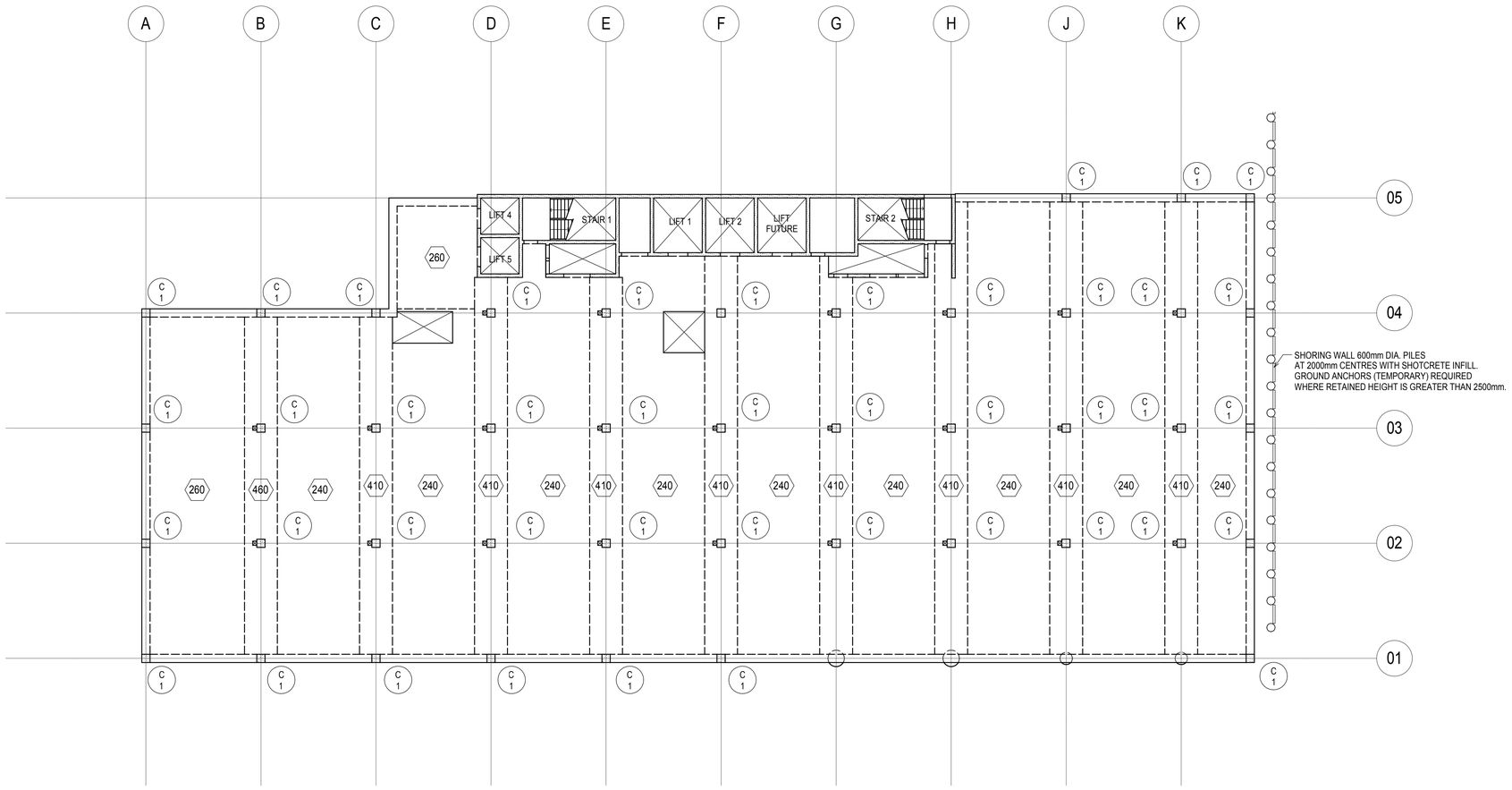

LEVEL 5 PLAN - 240 SLAB U.N.O.

SCALE 1:200

1. ALL BANDS 2400 x 410 THICK U.N.O.
2. EDGE BEAM 600 x 900mm.
3. ALL WALLS SHOWN 250mm REINFORCED CONCRETE.
4. ALL COLUMNS 600 x 600mm U.N.O.

Design Assumptions

1. LL = 3.0 kPa
   SDL = 1.8 kPa
2. SLAB THICKNESSES INDICATED INCLUDE AND 40mm INTERGRAL TOPPING.
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Sheet Subject
LEVEL 5 CONCRETE OUTLINE PLAN

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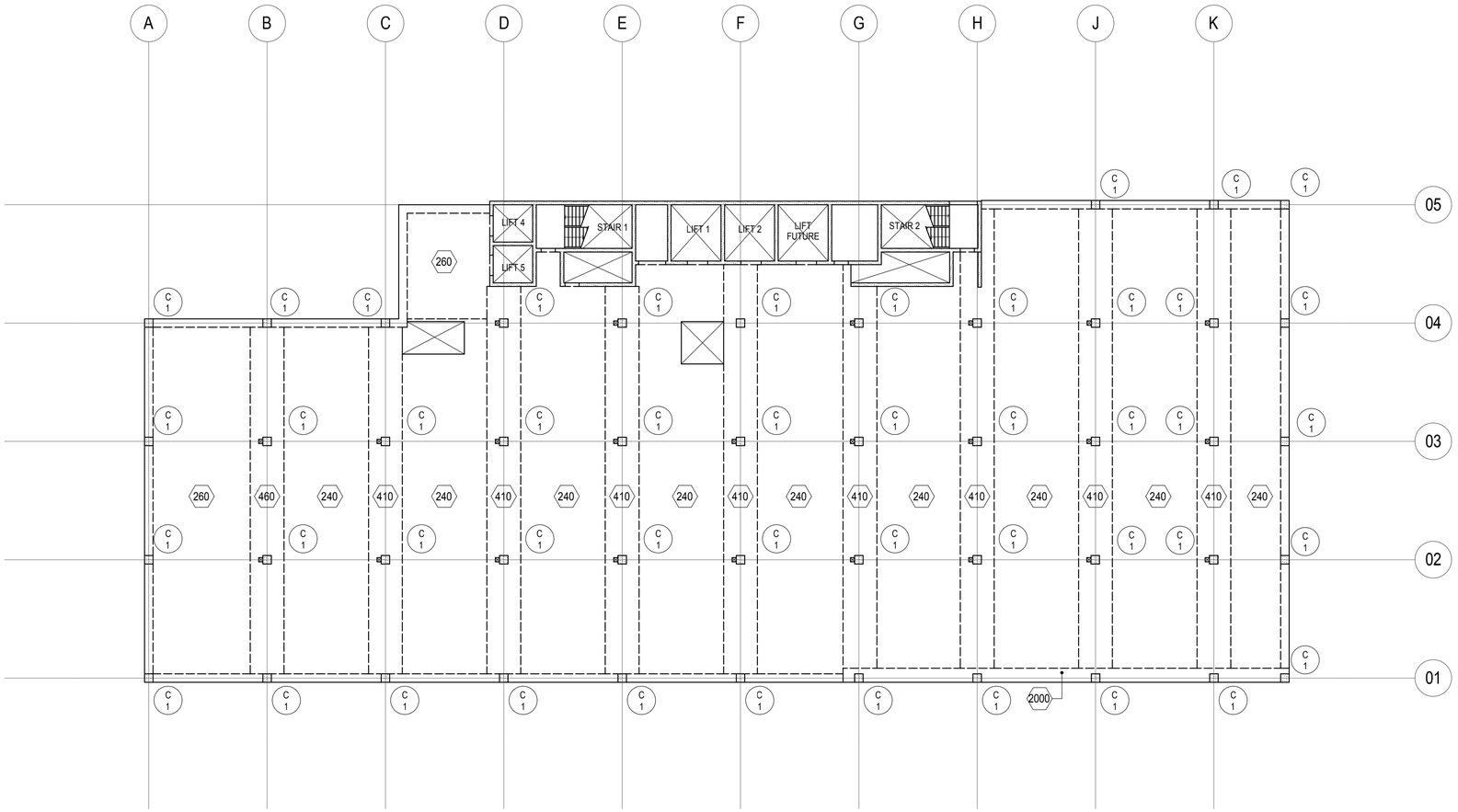

LEVEL 6 PLAN - 240 SLAB U.N.O.

SCALE 1:200

1. ALL BANDS 2400 x 410 THICK U.N.O.
2. EDGE BEAM 600 x 900mm.
3. TRANSFER BEAM 1000 x 2000mm.
4. ALL WALLS SHOWN 250mm REINFORCED CONCRETE.
5. ALL COLUMNS 600 x 600mm U.N.O.

Design Assumptions

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LEVEL 6 CONCRETE OUTLINE PLAN

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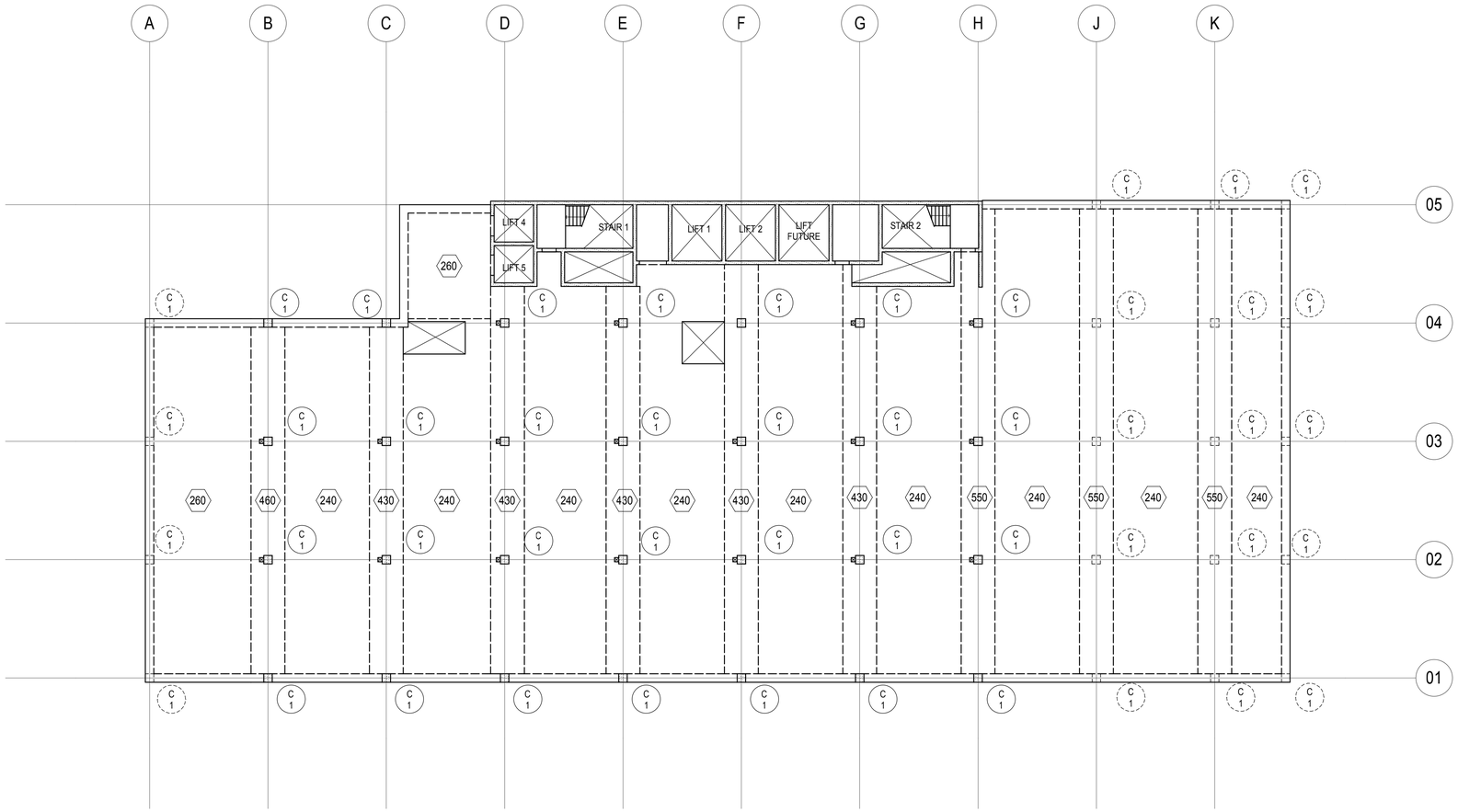

LEVEL 7 PLAN - 240 SLAB U.N.O.

SCALE 1:200

1. ALL BANDS 2400 x 430 THICK U.N.O.
2. EDGE BEAM 600 x 900mm.
3. TRANSFER BEAM 1000 x 2000mm.
4. ALL WALLS SHOWN 250mm REINFORCED CONCRETE.
5. ALL COLUMNS 600 x 600mm U.N.O.

Design Assumptions

1. LL = 7.5 kPa
   SDL = 1.8 kPa
2. SLAB THICKNESSES INDICATED INCLUDE AND 40mm INTERGRAL TOPPING.
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LISMORE BASE HOSPITAL REDEVELOPMENT

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LEVEL 7 CONCRETE OUTLINE PLAN

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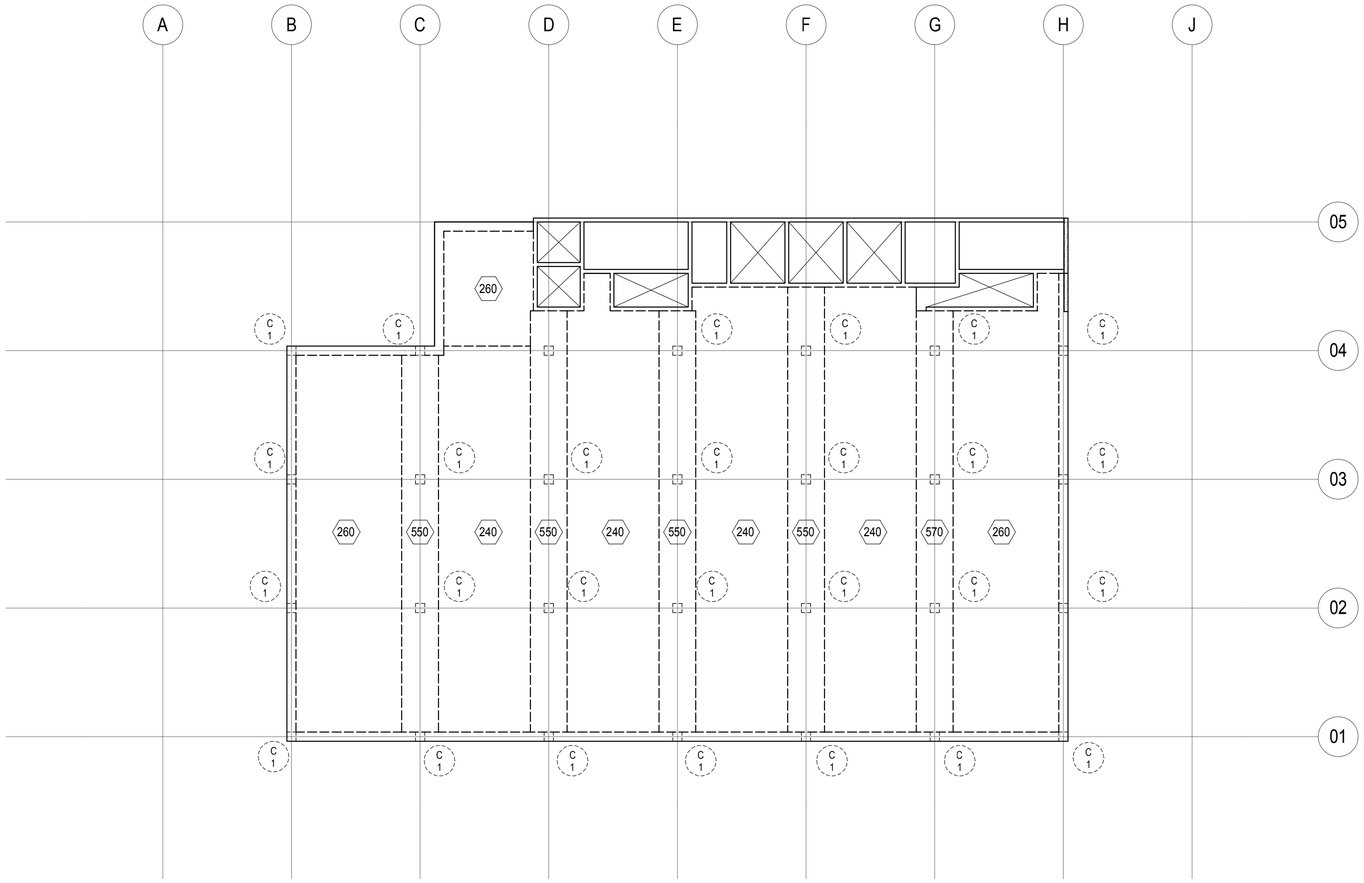

ROOF LEVEL PLAN - 240 SLAB U.N.O.

SCALE 1:200

1. ALL BANDS 2400 x 550 THICK U.N.O.
2. EDGE BEAM 600 x 900mm.
3. ALL WALLS SHOWN 250mm REINFORCED CONCRETE.

Design Assumptions

1. LL = 10.0 kPa
   SDL = 1.8 kPa
2. SLAB THICKNESSES INDICATED INCLUDE AND 40mm INTERGRAL TOPPING.
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LISMORE BASE HOSPITAL REDEVELOPMENT

Sheet Subject
ROOF LEVEL CONCRETE OUTLINE PLAN

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