TTW Structural Civil Traffic Façade

Structural SSDA Report

Mosman High School

Prepared for Multiplex Australasia / 30 March 2021

201635

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1.0 Introduction

TTW has been engaged by Multiplex Australasia to provide structural engineering services for the schematic design of the proposed facility at Mosman High School. The new facility has 3 storeys above ground floor, including an accessible roof. The proposed facility does not have a basement.

The building has multiples uses including areas for administration, multipurpose gym/hall, library, canteen, general and senior learning units, health and performing arts unit, learning support, amenities, and a roof top multi-court.

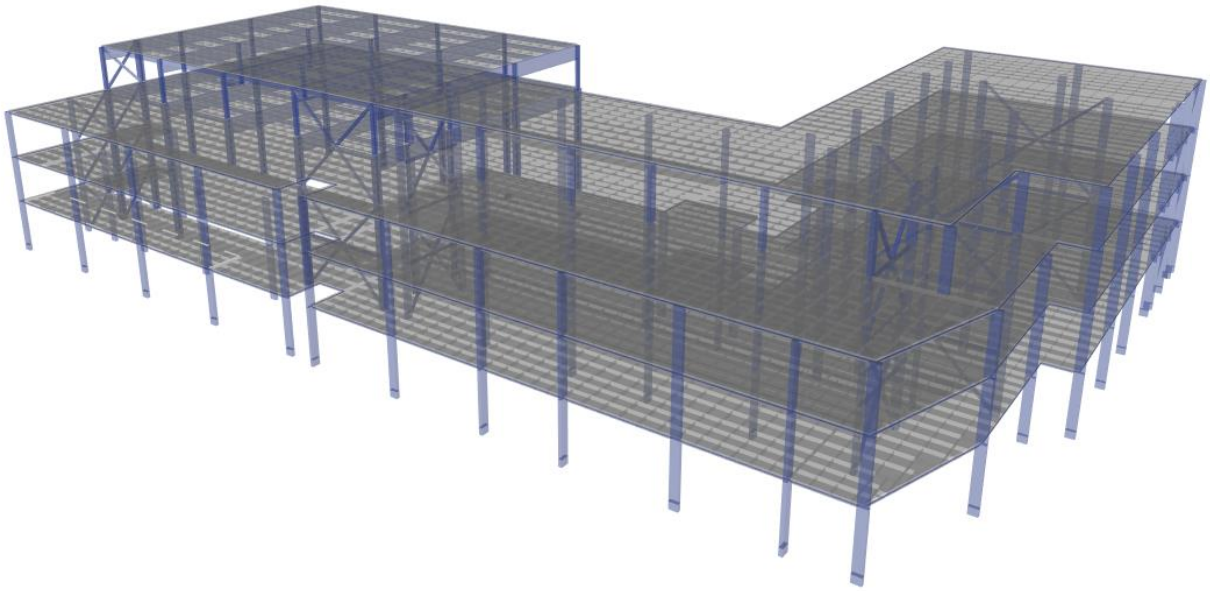

Figure 1 Analysis Model

The structural concepts presented in this SSDA Report and associated schematic design drawings enclosed in Appendix A have been developed in conjunction with Multiplex and the design team led by Woods Bagot (Architect).

2.0 Site Description

Mosman High School is located at 745 Military Road, LOT:1 DP: 1268793, Mosman, NSW and is bounded by Belmont Road and Avenue Road in the North-South direction, and by Military Road and Gladstone Avenue in the East-West direction. The high school facility currently contains a variety of brick buildings up to 3 storeys, playgrounds, and carpark areas.

The site is generally sloping approximately 3% to the west with the highest part of the site along Military Road, falling to the lowest section of site along Gladstone Avenue.

The works will require the demolition of existing Blocks, B, C, and partial demolition of Block E. Blocks A and D, are to be retained.

The construction of the new facility with be within a live school site. Careful staged planning of the works will be required to ensure daily functions of the school remain safely unhindered and with minimal disruptions.

The proposed area under development is a 3,000 m^2 site situated at the Eastern boundary along Military Road.

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Figure 2 Site Plan

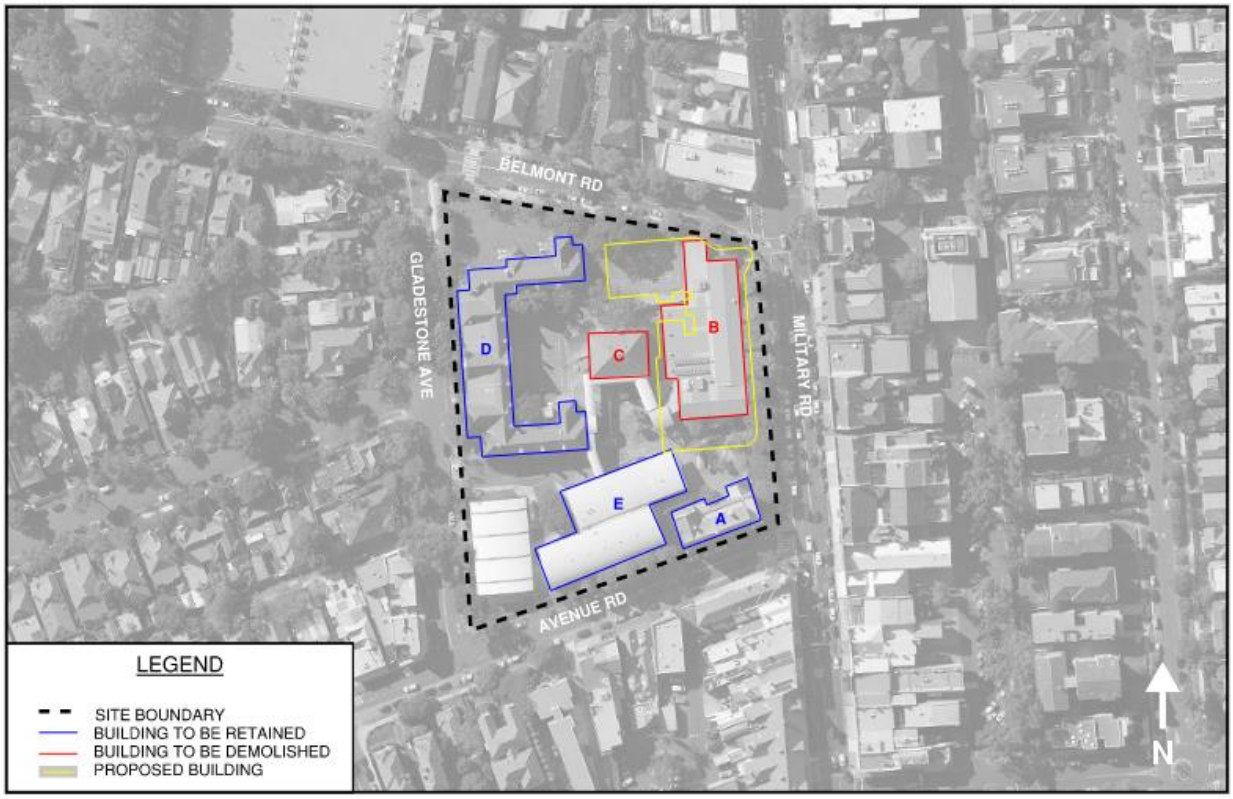

Figure 3 Proposed Demolition Plan

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3.0 Geotechnical

A geotechnical investigation has been carried out by Coffey Services Australia (Report 754-SYDGE233510), dated 28 August 2020. The investigation indicates that the site is classified as Class A based on AS1170 – 2011 “Residential Slabs and Footings”. The investigation encountered a subsurface profile comprising residual soil/fill layer to a depth of up to 0.9m; over weathered rock (Class V-IV) for a depth of up to 1.35m; over rock (Class III).

There was an absence of groundwater throughout the geotechnical investigation, and Coffey have suggested that the site will not encounter groundwater.

It is also suggested that the site has no known occurrence of acid sulfate soils, and that the soil aggressivity is non-aggressive and suitable for concrete or steel foundations.

4.0 Structure

4.1 Footings

All columns and walls need to be founded on similar materials to reduce the potential for differential settlement and consequential structural damage. Columns on ground floor supported by pad footings, founded on Class IV rock or better, is the proposed footing system. Any uplift forces at the base of the pad footings in bracing locations are proposed to be dealt with using rock anchors. Rock anchor requirements are to be confirmed in the next stage of the design. There is an option to pile under a number of columns, where deep excavations would be required to meet rock level.

There are no basements proposed for this project, so shallow excavations are required for the pad footings. Having no basement structure results in the elimination of permanent retaining walls for the building. However, some retaining walls may be required for landscaping, but will be confirmed in the next stage of the design.

Existing services and foundations of existing buildings are expected to be encountered on site. The anticipated services include, but are not limited to power, gas, fibre optic, water, sewerage, and telecommunications. Care must be taken to ensure no damage occurs to these services during or resulting from construction.

4.2 Gravity Load Resisting Systems

The gravity load resisting system comprises slab, beams, and columns.

4.2.1 Ground Floor Slab

Ground floor slab will be a conventional slab on ground (not suspended) and prepared in accordance with the recommendations in the geotechnical report. Any cast in fixings in the sports hall area are to be confirmed during the next stage of design.

4.2.2 Suspended Floors

The current schematic design provides post-tensioned concrete (PT) slab sizes, which is typically used throughout. Post-tensioned concrete usually becomes cost competitive for structures over 3 stories. PT is well suited to achieving fast and economical construction with floor structures of minimal thickness and minimal deflections. The flat plate has been used in design for is speed of construction, and ability for services reticulation.

The proposed Level 1 – Level 3 floors comprise 230mm – 320mm thick PT flat plate, supported on concrete columns. The gym/hall area is to be steel framed with steel-concrete composite slab, with a steel transfer truss below the library on Level 3.

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4.2.3 Roofs

The roof structure will consist of a 280mm thick PT flat plate for the basketball court featuring an additional acoustic slab to limit noise and vibration to the library area below. A light steel roof at the northern end for the PV panels supported on steel columns to the slab under.

4.2.4 Columns

In situ reinforced concrete columns are proposed but can be substituted with precast concrete columns with similar size. The columns would be either rectangular or square in shape, to suit architectural requirements.

Steel columns are proposed in the gym/hall area. These will support the steel-concrete composite slab, and support the large spanning steel truss.

Steel columns will be required at the bracing locations throughout the site.

Steel columns are proposed to support the walkway between the new development and the existing.

4.2.5 Transfer Truss over Sports Hall

A change in layout between floors and the requirement for large open space on ground floor necessitates a transfer element below the library floor, and above the sports hall. The open space, circa 20m span results in a steel truss being the most pragmatic solution.

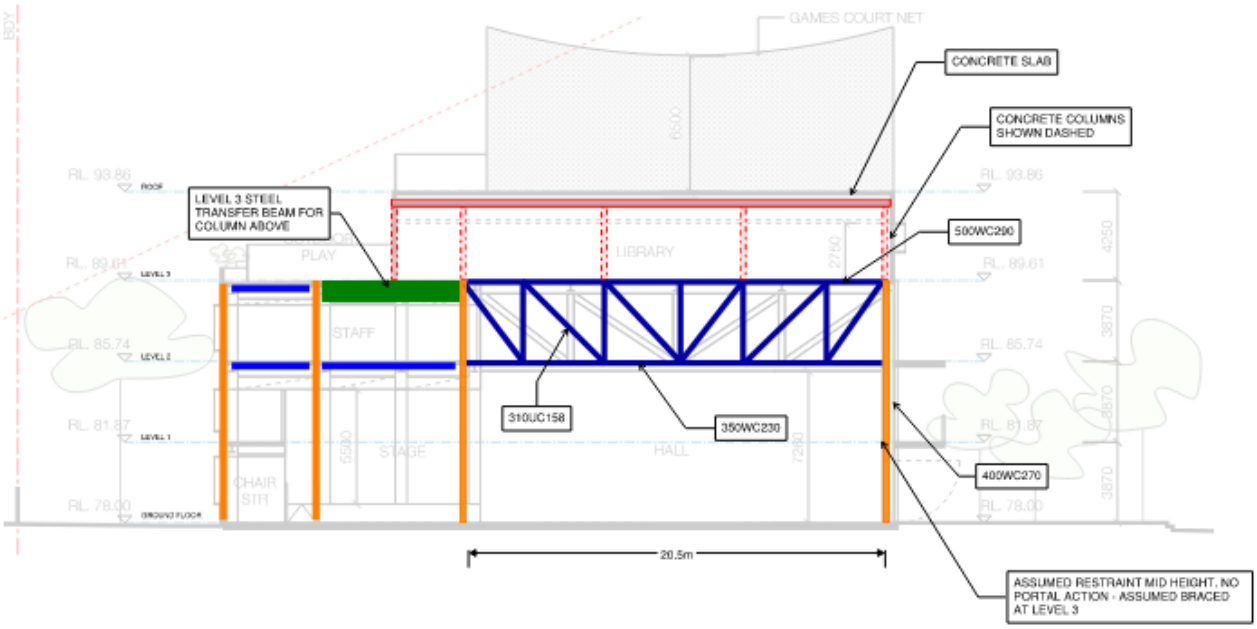

Figure 4 - Transfer Truss

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4.2.6 Stairs

The stairs are to be constructed from either steel, reinforced concrete with conventional formwork, or reinforced concrete with permanent formwork – stair form system or similar. The construction of the stairs is to be confirmed in the next design stage.

4.2.7 Walkways

The walkways are to be constructed either from in situ concrete, or steel concrete composite. The construction of the walkways is to be confirmed in the next design stage.

4.2.8 Interface with Existing Structures

A site survey is required for the interface between the new and existing structures. This is particularly important around the walkway between the new construction (Block G), and Block E.

4.3 Lateral Load Resisting Systems

The structure is required to withstand wind and earthquake loads through the lateral force resisting system. The proposed bracing system is a concentrically braced steel frame comprising of steel beams, braces, and columns on each level of structure and connected into the foundations. Attention must be paid to the interface details between the concrete slab and the steel bracing.

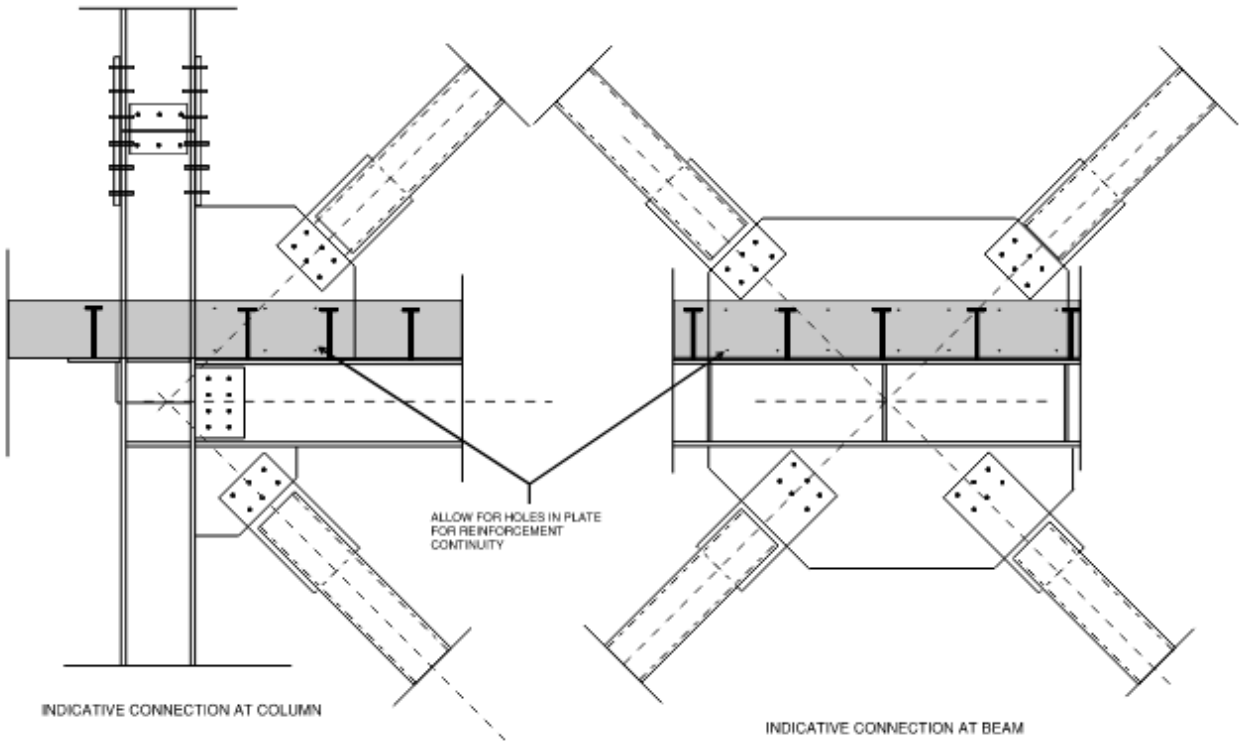

Figure 5 Indicative Connection

Holes in the steel plates will be require for reinforcement to pass through, in addition the shear studs along the top flange of the steel beam to ensure full transfer of force through the system.

A concentrically braced steel frame has been proposed in lieu of conventional reinforced concrete shear walls due to the recent changes to AS 3600 “Concrete Structures”. Conventional reinforced concrete walls can be used, but these will require additional reinforcement and thicker walls to be structurally viable.

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Typical location of the bracing on ground floor is shown in the following image. These locations continue generally up the height of the building.

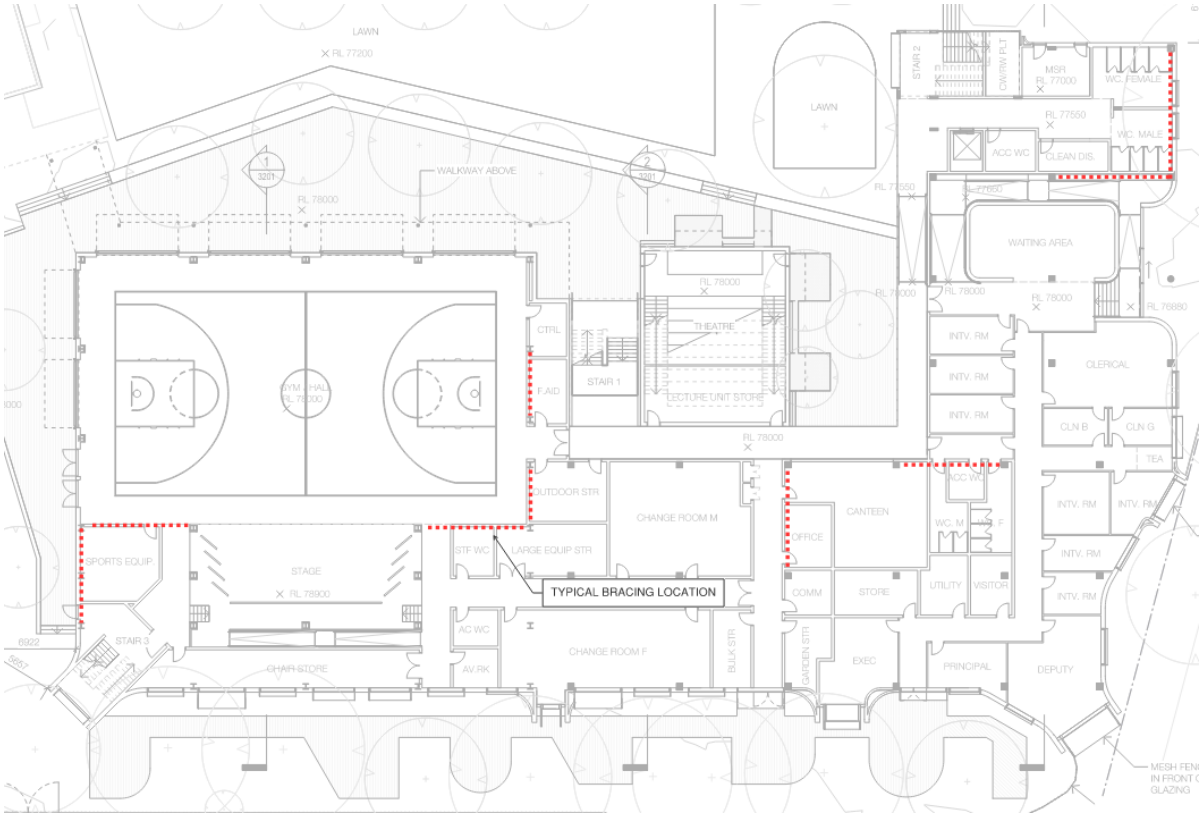

Figure 6 Typical Bracing Locations

5.0 Future Coordination Items

The following list outlines some items that require coordination in the next design stage.

- Stair construction method
- Stair transition details
- Walkway construction and finishes
- Set downs for balcony and wet areas
- Floor and roof build-up
- Façade details
- Operable walls, folding or top hung doors along hall
- Construction of theatre including acoustic requirements
- Stage requirements
- Cast ins for gym/hall
- Planter zones
- Connection to existing walkways
- Roof top sub faming, netting and equipment requirements
- Roof plant area – steel platforms
- Retaining walls for landscaping

Please note this list is not exhaustive and other elements not listed will require coordination.

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Director

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Appendix A

Schematic Structural Drawings

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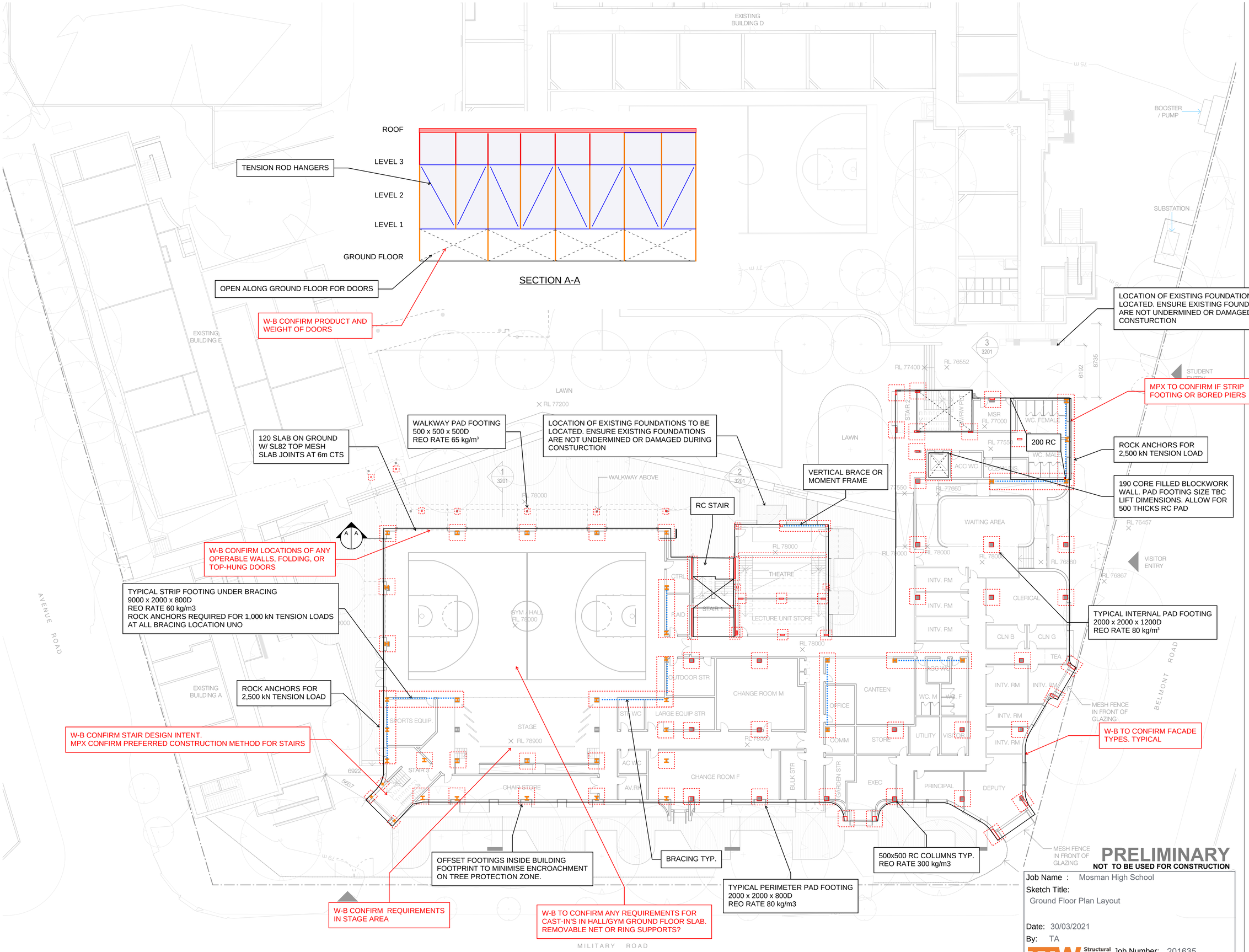

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Job Name : Mosman High School
Sketch Title:
Ground Floor Plan Layout

Date: 30/03/2021
By: TA

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Job Number: 201635
Sketch No. : SK-210330-1

Recent revision history

#	Status	Description	Date

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MOSMAN HIGH SCHOOL

Client
SCHOOL INFRASTRUCTURE NSW

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Checked Checker
Approved Approver
Sheet size A1
Scale 1 : 200

Sheet title
GROUND FLOOR PLAN

Sheet number DA-2201
Revision
Status PRELIMINARY

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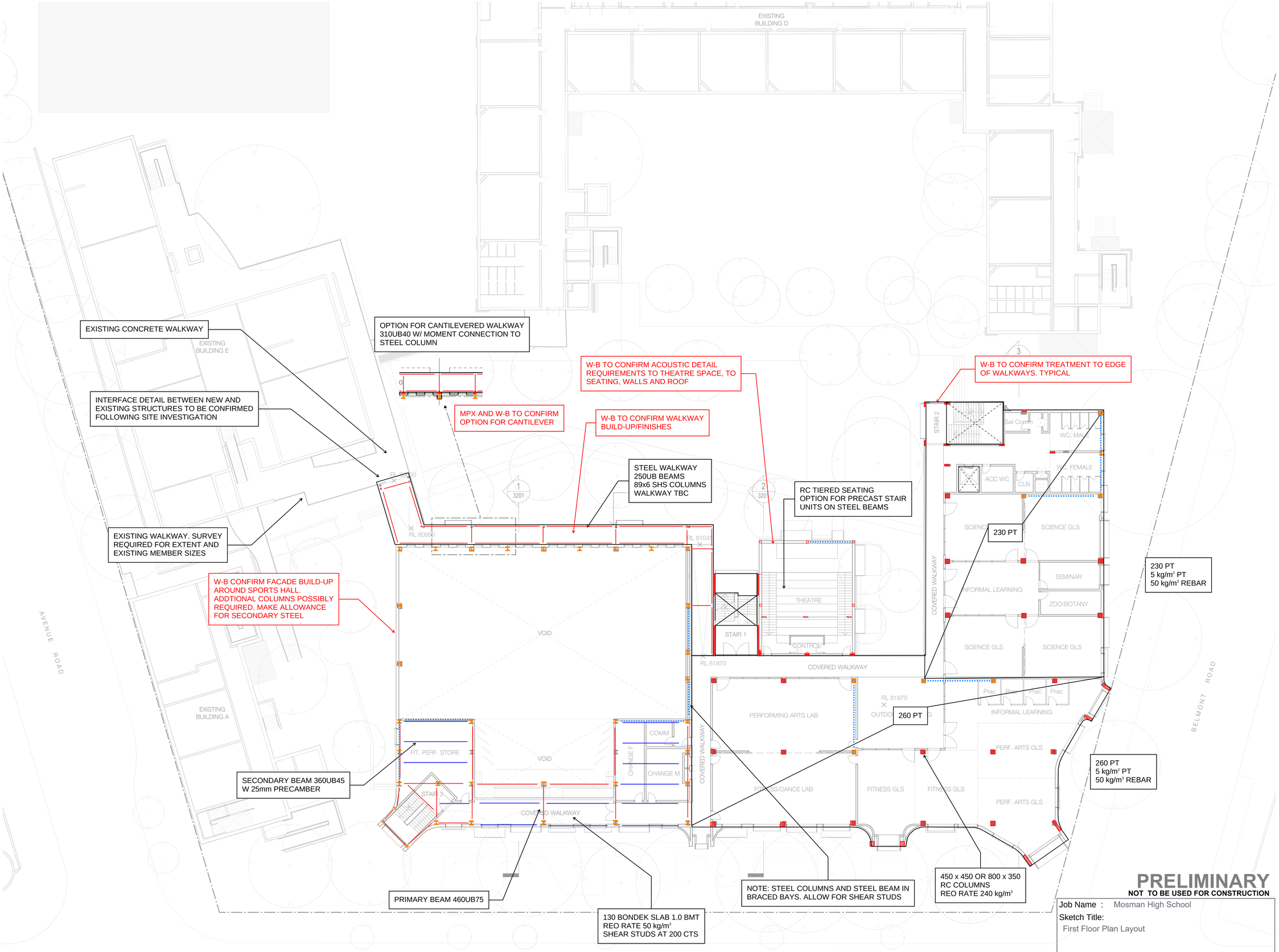

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Sketch No. : SK-210330-2

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LEVEL 1 FLOOR PLAN

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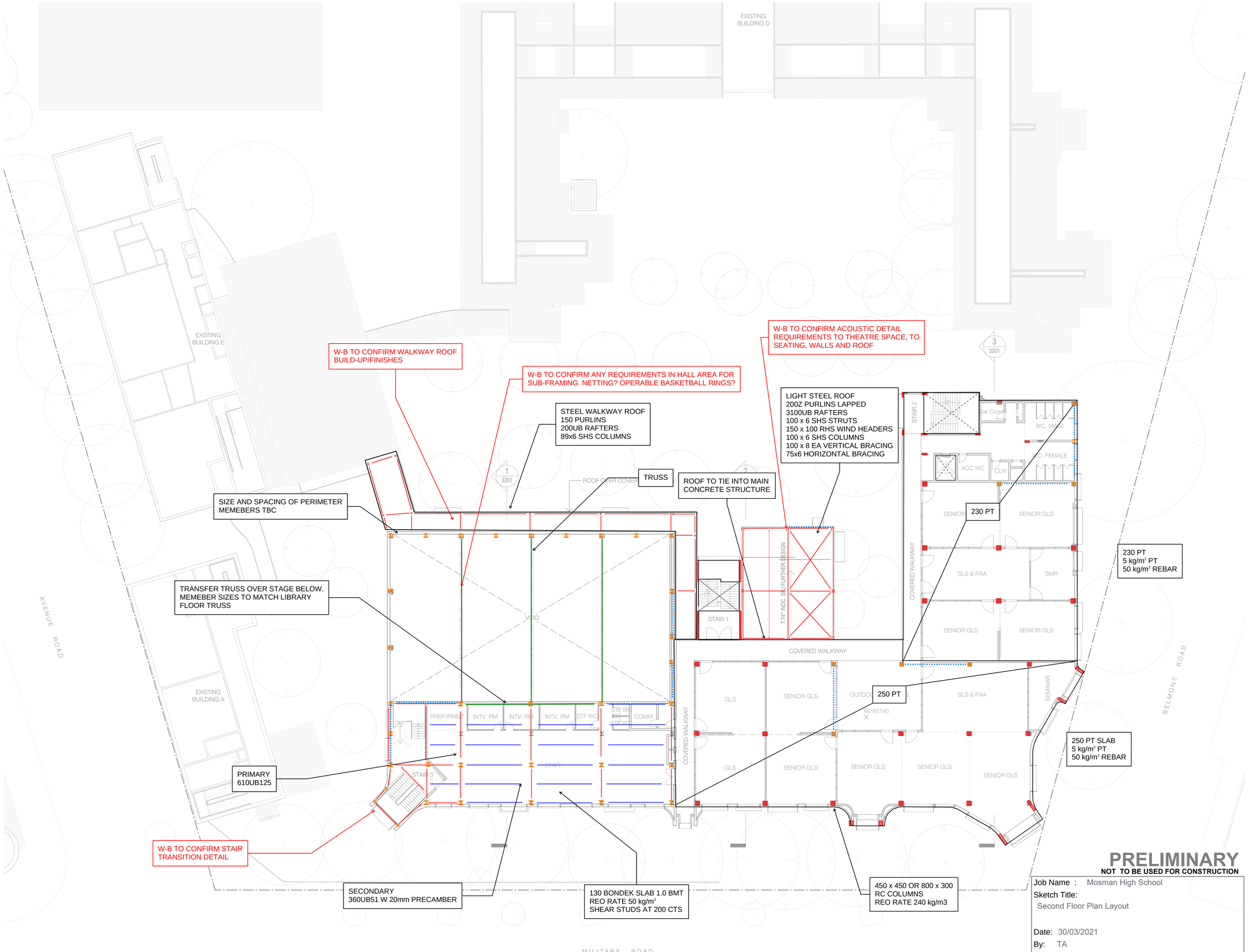

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By: TA
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Sketch No. : SK-210330-3

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Sheet title
LEVEL 2 FLOOR PLAN

Sheet number DA-2203
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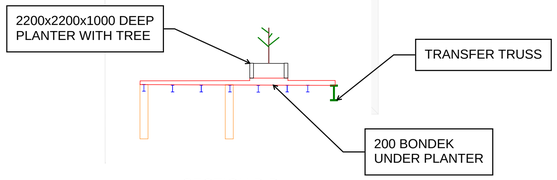

SECTION B-B

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Job Name : Mosman High School
Sketch Title:
Third Floor Plan Layout

Date: 30/03/2021
By: TA

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Job Number: 201635
Sketch No. : SK-210330-4

Project number 121468
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Approved Approver
Sheet size A1
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Sheet title
LEVEL 3 FLOOR PLAN

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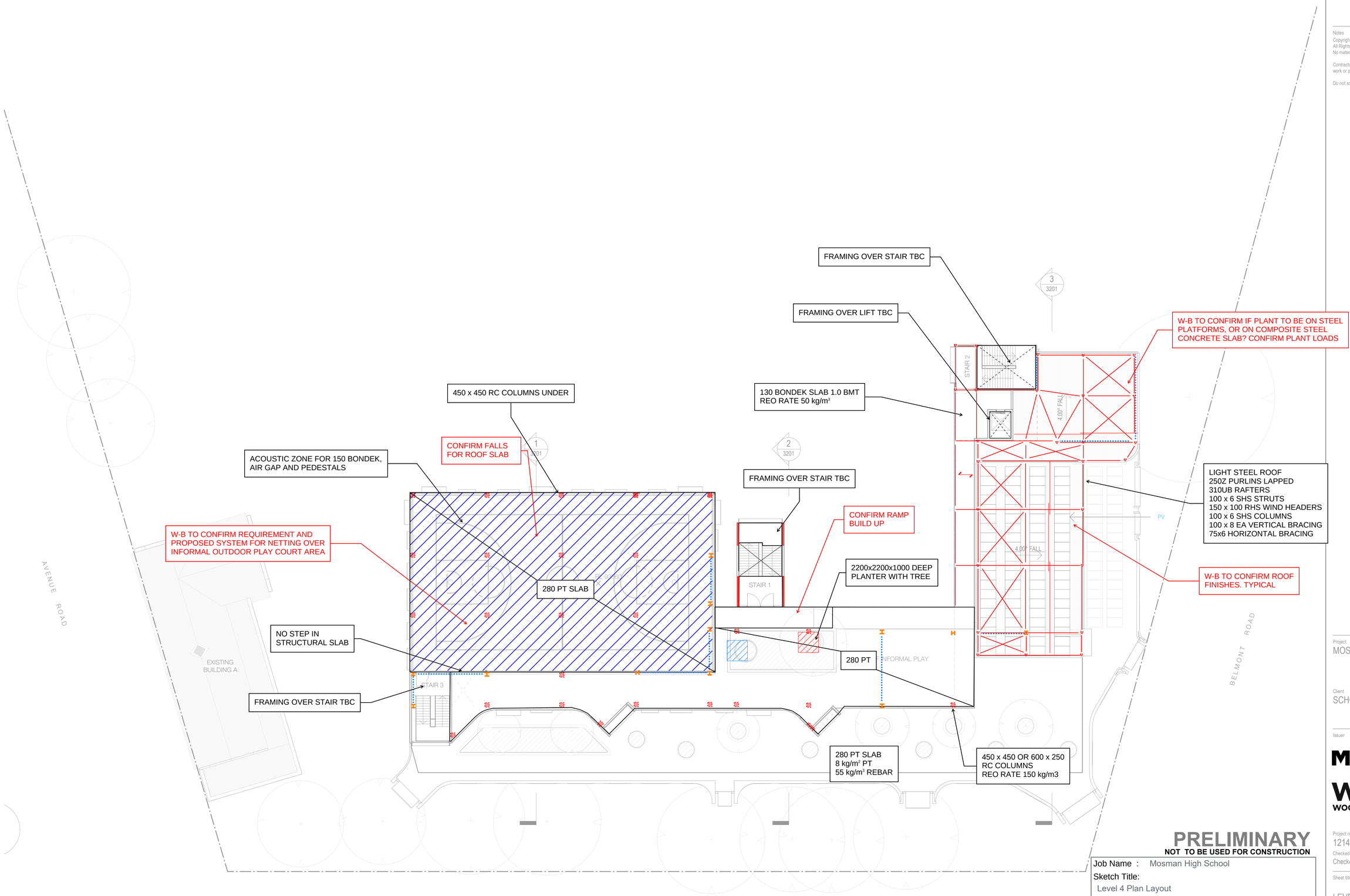

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Sketch Title: Level 4 Plan Layout

Date: 30/03/2021
By: TA

TTW Structural Civil Traffic Façade
Job Number: 201635
Sketch No. : SK-210330-5

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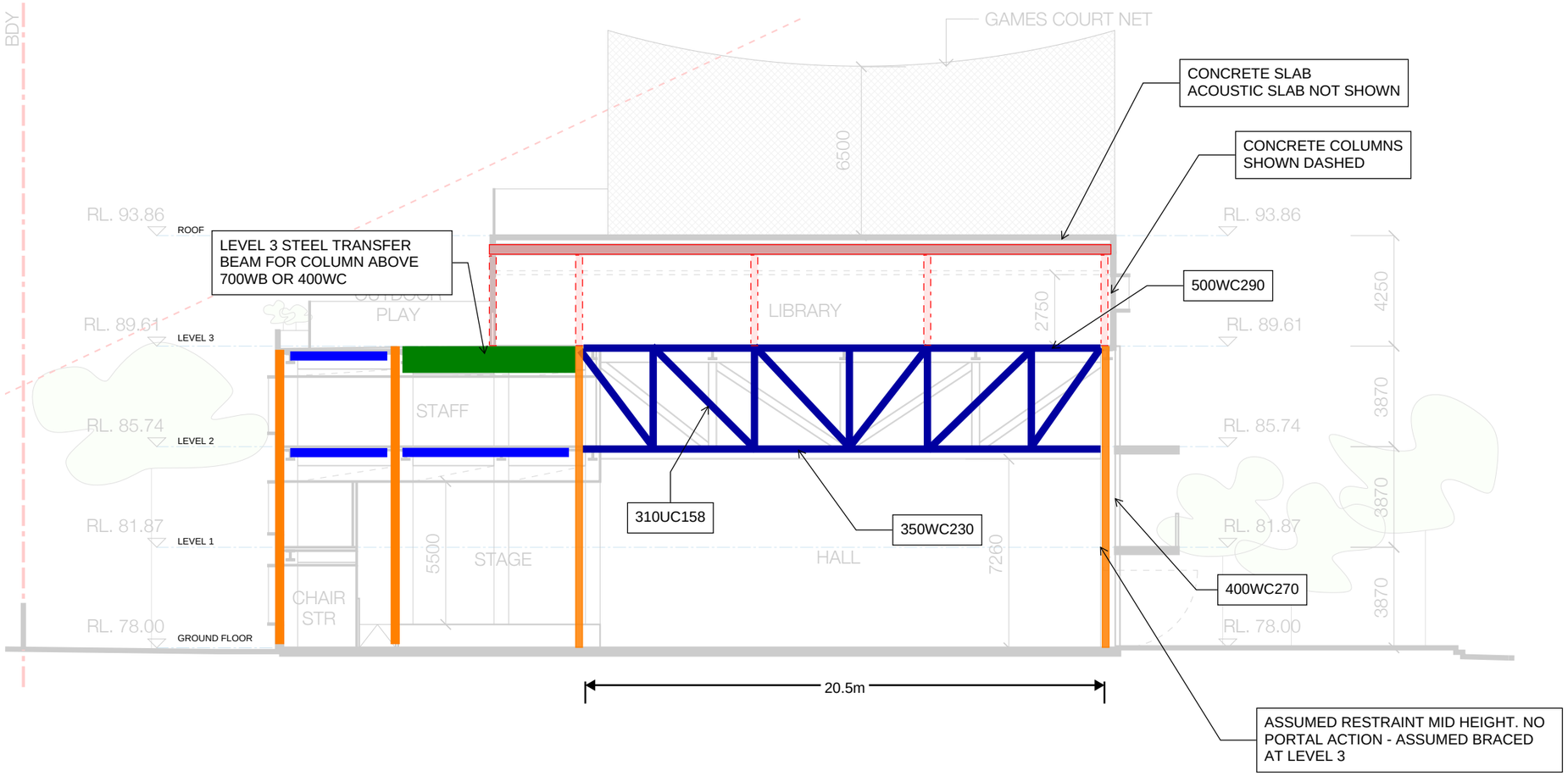

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Date: 30/03/2021

By: TA

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Job Number: 201635

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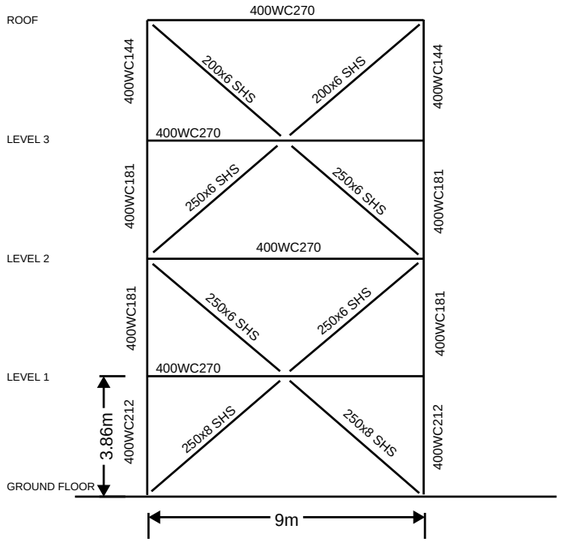

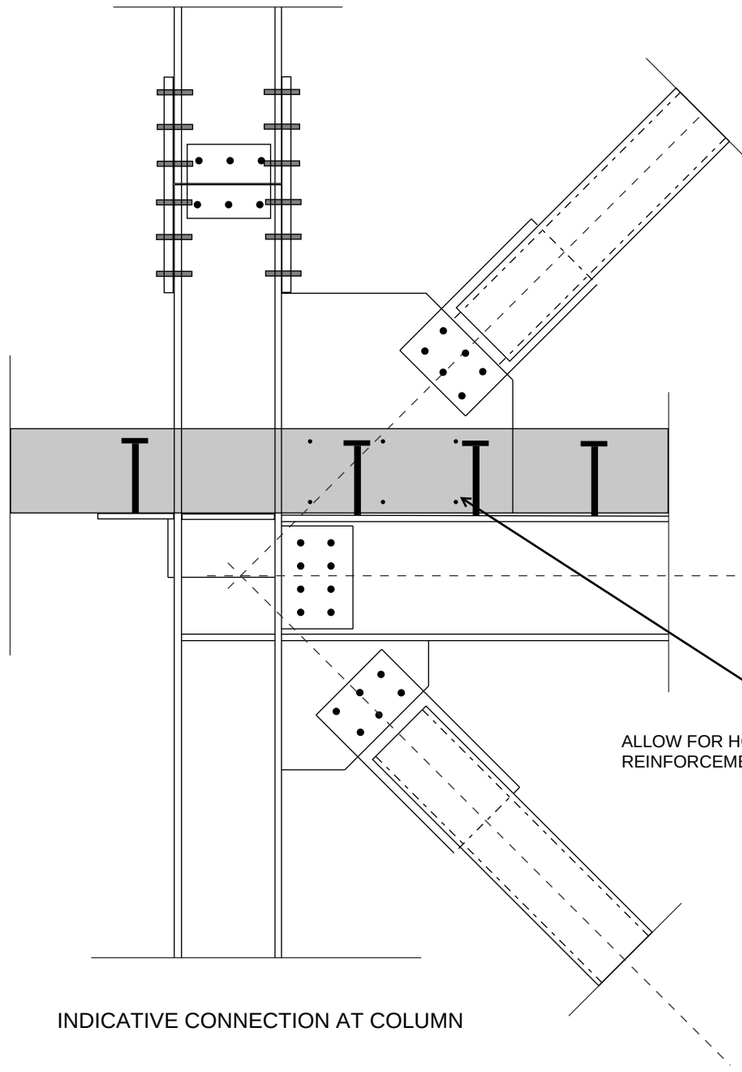

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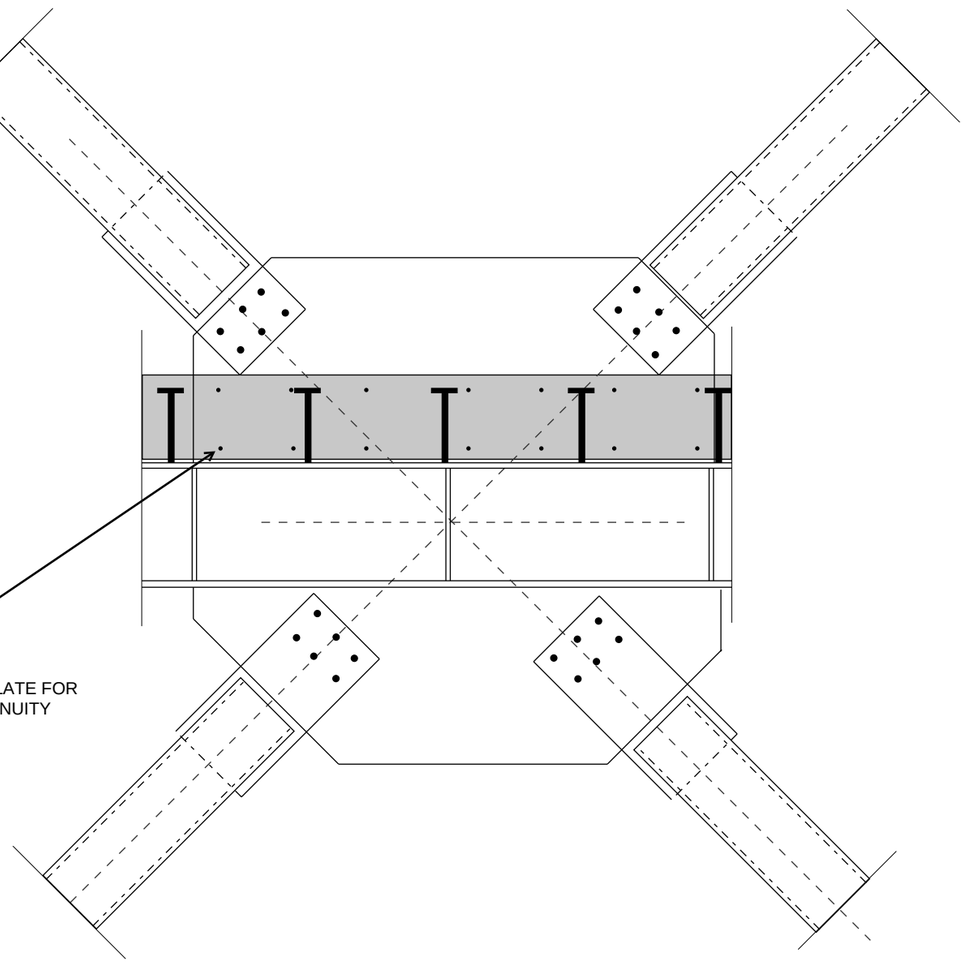

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PRELIMINARY

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Job Name : Mosman High School

Sketch Title:
Bracing Elevation

Date: 30/03/2021

By: TA

TTW Structural Civil Traffic Façade

Job Number: 201635

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