

WATERLOO METRO QUARTER OVER STATION DEVELOPMENT

**Environmental Impact Statement
Appendix GG – Structural Design Report**

SSD-79307746 Central Precinct

Detailed State Significant Development
Development Application

Prepared for **WL Developer Pty Ltd**

30 September 2025

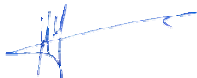
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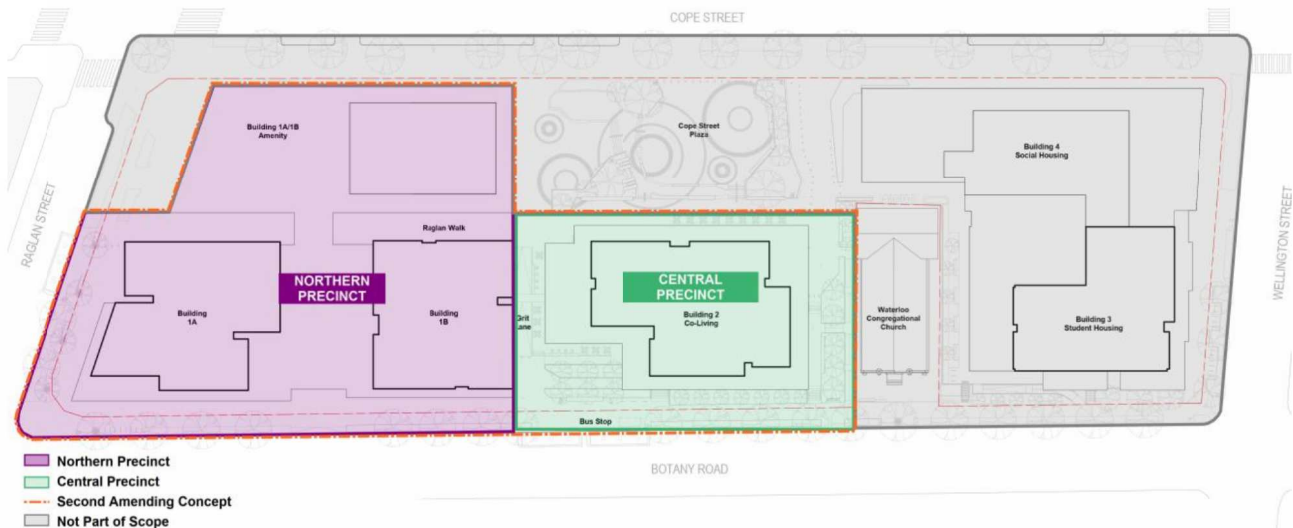
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WATERLOO METRO QUARTER SSD

Waterloo Metro Quarter - Central Precinct SSD-79307746

This report has been prepared by Robert Bird Group on behalf of WL Developer Pty Ltd (the applicant) to accompany a State Significant Development Application (SSDA) for the detailed Central Precinct SSD (SSD-79307746), located within the Waterloo Metro Quarter (WMQ) at 150 Cope Street, Waterloo. This SSD will replace the previous detailed approval applying to the Central precinct.

The figure below indicates the land to which this DA applies in relation to the overall WMQ site (shaded in Green).



This application seeks consent for the design, construction and operation of a 26 storey (including plant level) mixed use building within the Central Precinct (the site) of the WMQ estate. The proposal comprises a co-living housing tower above a three-storey podium containing retail and a community facility in the form of a childcare centre. Specially, the proposal comprises:

- Ground level retail tenancies and community facility, and childcare, co-living and shared basement access lobbies
- Community centre in the form of a childcare centre at level 1 and 2
- A co-living housing tower from Levels 3 to 24 comprising:
 - Self-contained co-living accommodation rooms across 20 levels, with capacity for around 500 rooms
 - Indoor and outdoor communal amenity at Levels 3 and 24
 - Communal space also provided on each accommodation level.
- Ground level vehicle access from Church Square shared zone to the shared basement, delivery of a pedestrian thoroughfare through the site, landscaping and public domain works.
- Indicative building signage zones

This application is submitted for concurrent assessment with a DA to amend the Waterloo Metro Over Station Development (OSD) Concept DA (SSD 9393) (the Concept DA) - referred to as the Second Amending Concept DA. The Second Amending Concept DA seeks consent to modify the existing concept approval as it relates to the Northern and Central Precincts, by amending the building envelopes to redistribute floor space to suit a new mix of land uses. This Central Precinct SSD will be consistent with the Concept DA as amended.

Separately, a Detailed SSDA for the detailed design, construction and operation of the Northern Precinct (SSD-79307758) and a Section 4.55 Modification Application to modify the approved detailed Basement SSDA (SSD 10438), will be concurrently submitted with this application.

1. DESIGN LOADS

All loadings and load combinations shall be in accordance with Australian standards AS1170 Parts 0 to 4. The relevant design loads are defined in Section 9.1.1 to 9.1.4 of this report.

1.1. PERMANENT ACTIONS – DEAD LOADS

Dead loads shall be the self-weight of the structure plus an allowance for toppings, partitions, ceilings and services. The additional dead loads are outlined below:

Table 1: Summary of permanent loads

Usage	Uniform distributed load (kPa)
Retail	2.0
Commercial	1.5
Co-living	1.5
Balconies	2.0
Outdoor terrace	4.0
Paved / Decked	Soil depth x 12 (assuming light-weight soil mix)
Planters	
Plantroom	1.5
Roof	3.0
Outdoor communal amenities	3.0

1.2. IMPOSED LOADS – LIVE LOADS

The design floor loadings are to be in accordance with the minimum provisions of AS1170.1 and are outlined below:

Table 2: Summary of Imposed loads

Usage	Uniform distributed load (kPa)	Concentrated Load (kN)
Retail	5.0	4.5
Commercial	3.0	2.7

Residential	1.5	1.8
Balconies	2.0	1.8
Outdoor Terrace/communal amenities	5.0	2.7
Plantroom	7.5	4.5
Roof	2.0	2.7
Co-living	2.0	1.8

1.3. WIND LOADS

Wind pressures are in accordance with AS1170.2 using the following parameters:

Table 3: Wind loading parameters

Criteria	Value
Location	Sydney NSW
Region	A2
Importance level	3
Design event for strength	1:1000
Design event for serviceability	1:25
V ₁₀₀₀	46m/s
V ₂₀	37m/s
M _s	1.0
M _t	1.0
Terrain Category	3
Design Wind Speed	Varies 44m/s to 52m/s

Design of façade elements and their connections shall make provision for local peak wind pressure effects calculated using local pressure factors given in AS1170.2.

1.4. EARTHQUAKE LOADS

Earthquake loadings are in accordance with AS1170.4 using the following parameters

Table 4: Seismic load parameters

Criteria	Value
Location	Sydney NSW
Importance level	3
Design event for strength	1:1000
Probability Factor K_p	1.3
Hazard Factor Z	0.08
Subsoil Class	C_e
Earthquake Design Category	EDC III
Performance Factor S_p	0.77
Ductility Factor μ	2

1.5. DEFLECTION CRITERIA

The deflection structural elements under service loads shall be controlled in accordance with the following criteria unless noted otherwise on Robert Bird Groups structural drawings:

Table 5: Deflection Criteria

Structural Element	Deflection Type	Limit
Overall Building Structure	Lateral sway from service wind load	Height/500
Overall Building Structure	Inter-storey drift from lateral sway due to ultimate earthquake load	Height/67
	Inter-storey drift from lateral sway due to serviceability wind loading	Height /500
	Inter-storey drift from lateral sway due to serviceability wind loading (for building envelope considerations)	Height/ 330
Floor Slabs: No Sensitive Partitions	Long term total deflection	Lesser of Span/250 or 25mm
Floor Slabs: Sensitive Partitions	Long term incremental deflection	Lesser of Span/500 or 25mm
Floor Slabs: Unitised façade curtain wall (building 2)	Long term incremental deflection	Lesser of 20 mm

1.6. FIRE RESISTANCE

Structural elements are to be designed in accordance with the Building Code of Australia and the relevant Australian Standards to satisfy the required FRL levels for fire.

1.7. DURABILITY

Structural elements will have a structural design life as nominated by their relevant Australian Standards. Concrete works will be designed for the relevant exposure classifications.

2. STRUCTURAL DESIGN OVERVIEW

2.1. GENERAL DESCRIPTION OF BUILDING 2 STRUCTURE (CENTRAL PREICINCT)

This part of the development comprises a 26-storey building on top of two basement levels. Building 2 is designated as co-living building from levels 3 to level 24, communal rooftop space on level 24 and plant room on level 25. Podium levels are designated retail spaces on ground floor and two levels of childcare on level 1 and 2.

Beneath the podium are two basement levels, which are shared with Buildings 1A and 1B. These basement levels house essential services including car parking, bicycle storage, and plant rooms for all three buildings (1A, 1B and 2). The basement is subject to a separate SSDA (SSD-10438) and does not form part of this application. A section 4.55 Modification Application to modify the approved detailed Basement SSDA will be concurrently submitted.

2.2. OVERALL STRUCTURAL LAYOUT AND CORE DESIGN

Building 2 structure incorporates a central reinforced concrete core extending from the lower basement to the roof, serving as the primary lateral stability system for the building.

Gravity loads from dead and live loads are supported by columns that are predominantly continuous throughout the building's height, except for the tower columns along the eastern elevation within the main tower column grid, which are transferred at Level 01. Above the podium level (Level 03), the column grid transitions to optimise the commercial layout below and co-living units above.

Reinforced concrete transfer beams and drop panels have been designed to accommodate this change in column configuration, providing an efficient structural solution while maintaining architectural flexibility.

In the co-living levels (Levels 04 and above), tower columns have been positioned between units, utilising slender blade columns to maximise usable space. In contrast, columns within the podium and basement levels adopt a more compact, circular or square form to integrate seamlessly with the commercial floor layouts.

A post-tensioned flat slab system is utilised for the superstructure above ground level, offering enhanced structural efficiency and reduced floor-to-floor height. The basement and ground floors employ a conventional reinforced concrete slab system, suitable for their functional and loading requirements.

2.2.1. Structural delineation between Building 1A, 1B, 2 and Waterloo Metro Station

Although the basement is shared by Buildings 1A, 1B, and 2, the three building structures are separated by a single permanent movement joint separating buildings 1A/1B and 2. The movement joint is required to mitigate tensile stresses within the slabs and to isolate lateral diaphragm actions between the towers. At Basement Level P1 and Ground Level, an East/West movement joint separates Buildings 1B and 2. This joint terminates at the existing waler slab on the eastern side of the basement, where differential core movement is not expected to generate significant tensile forces.

At Basement Level P2, no movement joint is provided in the hydrostatic slab to ensure water tightness and structural integrity. At P1, the new reinforced concrete slabs will be tethered to the existing waler slabs, forming a continuous and integrated slab system.

In the current building 2 tower arrangement, columns on eastern elevation bear directly onto existing buttress walls. To accommodate these loads, the ends of the buttress walls will be locally strengthened by jacketing the ends in the form of a hammer head column. The proposed strengthening detail aims for selective augmentation of part of the buttress wall that is directly supported by a foundation pile. Loads from the tower will be directed through the stiffened column directly to the foundation piles. The affected piles have been assessed and confirmed to have adequate capacity to support the tower loads.

2.2.2. Design life

All new structural elements are designed for a 50-year design life in accordance with relevant codes and standards. It is noted that some of these new structures interface with existing elements that were originally designed for a 100-year design life. Appropriate detailing will be adopted at the interface zones to ensure compatibility and durability over the intended service life.

2.3. STRUCTURAL SYSTEM

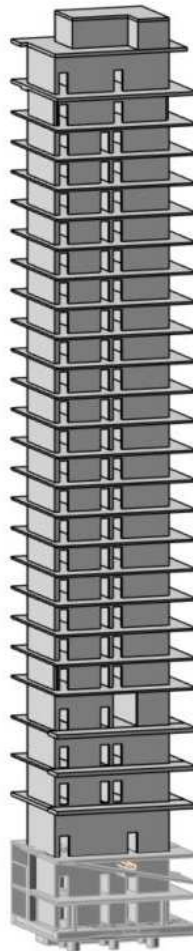
2.3.1. Lateral stability system

The lateral stability system for Building 2 consists of a central reinforced concrete core extending continuously from the foundation to the roof. This core provides the primary resistance to wind and seismic actions.

At the current design stage, wind loads have been estimated in accordance with the Australian code-based methods. However, given the height of the towers, dynamic wind effects are expected to be significant. To accurately assess these effects, a wind tunnel test will be undertaken.

The results of the wind tunnel study will be used to refine the design parameters, which may include reviewing and adjusting the core wall thicknesses during the next design stage.

Figure 1: Isometric view of the core



2.3.2. Vertical Load Path and Transfer Strategies

Different floor plate systems have been adopted throughout the development to suit the functional requirements of each level. The structural systems vary between residential, childcare, retail, and basement areas to optimise

performance, cost-efficiency, and architectural integration. The following table summarises the floor plate systems used across the development:

Figure 2: Isometric view of a typical floor slab

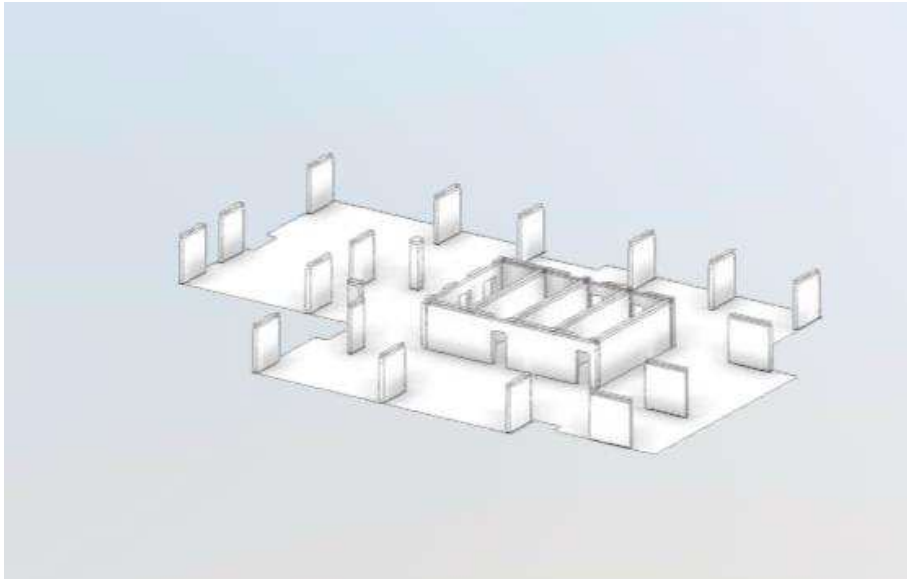


Table 6: Structural slab systems

Structural Element	Deflection Type	Limit
Level	Usage	Floor Plate System
L25	Plant area	Post-tensioned flat slab
L24	Communal space	Post-tensioned flat slab
L3 to 23	Co-living	Post-tensioned flat slab
L1 to L2	Childcare/commercial	Post-tensioned flat slabs
Ground floor	Retail/Lobby	Reinforced concrete flat slab (conventional)
Basement P1	Carpark/bike storage and plant	Reinforced concrete flat slab (conventional)
Basement P2	Carpark/bike storage and plant	Reinforced concrete hydrostatic flat slab (conventional)

2.3.3. Gravity load System

The gravity vertical load system comprises reinforced concrete columns that support the vertical loads to the supporting foundation piles below basement 2 (P2). Blade column configuration has been adopted for typical tower levels (L4-roof). Squat columns (square and circular in shape) are detailed for the lower podium and basement levels which better suits architectural floor use.

2.3.4. Co-living column layout

To optimise both the commercial and car parking layouts in the podium and basement levels, and the co-living apartment configurations above, two distinct column grids are adopted. In the residential levels, columns are sized and positioned to suit architectural requirements. Some columns are slender and elongated to fit within partition spaces between units or rooms, while others are square or blade-shaped and located intermediate locations (within rooms). Slender blade columns are sized using higher-strength concrete and high reinforcement content to compensate lean column geometry. At the interface between the typical levels and the podium levels, change in column configuration occurs gradually over three levels (levels 4,5 and 6) to reduce the impact of eccentricity on the columns and slabs.

Figure 3: Schematic representation of gradual column transition

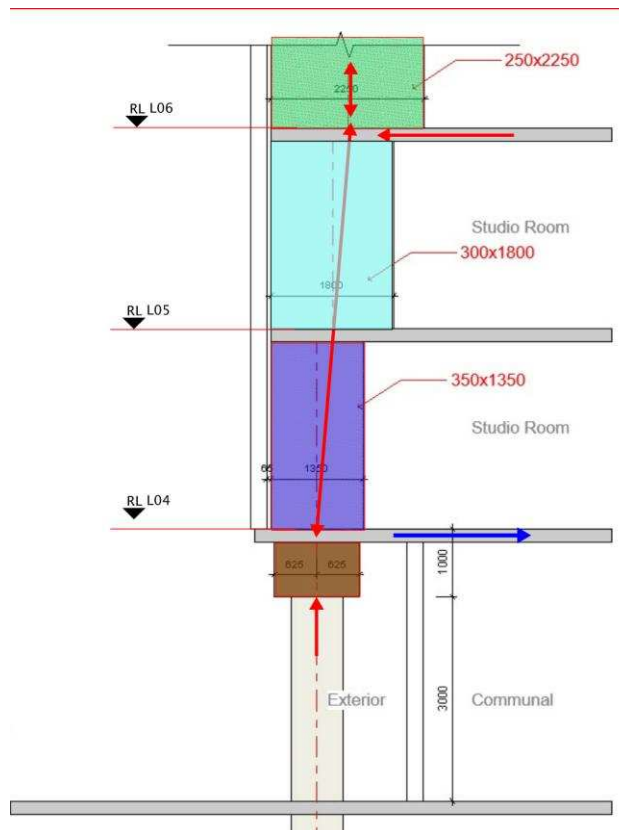
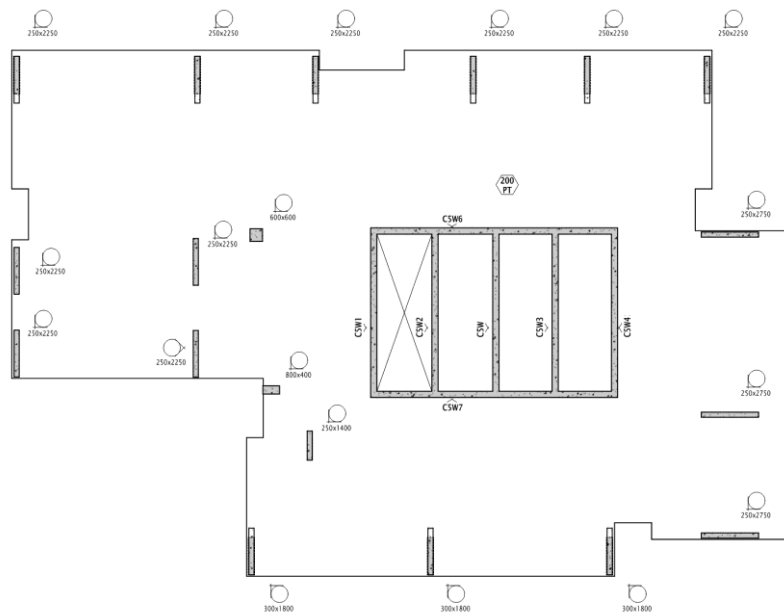


Figure 4 Typical tower floor column and wall arrangement



2.3.5. Podium and Basement Column Grids

In the podium and basement levels, the column grid is more regular, with typical centre-to-centre spacing ranging from 7 to 8.5 metres. Column sizes are maintained through the basement and the podium area with some columns terminating at the underside of ground floor slab.

2.3.6. Gravity Transfer Structure

Level 01 is dedicated as the transfer level where a combination of transfer columns/walls and post-tensioned beams are sized to accommodate column offset between the tower and the podium.

2.3.7. Integration with Existing Buttress Walls and Waler Slab

Along the eastern edge of the podium, several columns carrying the co-living floor loads are supported directly on existing buttress walls and waler slabs in the basement. These columns are carefully positioned over the existing buttress walls to transfer podium loads to the support piles. Tower columns are also landing on the ends of the buttress walls. Buttress wall ends will be strengthened (jacketed) to receive additional loads from the tower structure. The supporting foundation piles have been checked and confirmed capacity to receive the additional loads.

3. CONCLUSION

Robert Bird Group have provided advice and input to inform architectural design by producing structural sketches. Review of the SSD architectural drawings confirms the structural scheme has been incorporated in the architectural design.

The structural design is compliant to the relevant design and planning criteria as outlined in this report. Preliminary coordination with other engineering consultants has been undertaken. Further design development will be required for Construction Certificate.

Appendix

Preliminary structural drawing set.

