

RESIDENTIAL BUILDING R4B SERVICES DA SUBMISSION

PROJECT NO. 160537

**PROJECT: BARANGAROO SOUTH – RESIDENTIAL
BUILDING R4B, STAGE 1B**

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ONE SYDNEY HARBOUR

BARANGAROO

Barangaroo Residential Building R4B Services DA Submission



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1.0 Introduction

This report has been prepared by Lendlease Design for Lendlease Building Pty Ltd (Lendlease) in support of a State Significant Development Application (SSD 6965) submitted to the Minister for Planning pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The Development Application (DA) seeks approval for construction of a residential flat building (known as Residential Building R4B) and associated works at Barangaroo South as described in the Overview of Proposed Development section of this report.

1.1 Overview of Proposed Development

The Residential Building R4B DA seeks approval for the construction and use of a 60 storey residential flat building comprising 297 apartments, ground floor retail, the allocation of car parking, services, plant and storage within the Stage 1B Basement (subject of a separate concurrent DA), and the construction of ancillary landscaping and temporary public domain.

Approval for the construction of Residential Building R4B's core and associated plant and services within the basement is being sought as part of the concurrent Stage 1B Basement DA and do not form part of this DA.

1.2 Site Location

Barangaroo is located on the north western edge of the Sydney Central Business District, bounded by Sydney Harbour to the west and north, the historic precinct of Millers Point (for the northern half), The Rocks and the Sydney Harbour Bridge approach to the east; and a range of new development dominated by large CBD commercial tenants to the south.

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Barangaroo Reserve, Barangaroo Central and Barangaroo South (Stage 1).

The R4B DA Site area is located within Stage 1B Barangaroo South. The DA Site is located on land generally known and identified in the approved Concept Plan as Block 4B.

R4B

1.3 Reference Drawings

This report is based on the following reference drawings:

Drawing No.	Drawing Title
BR4B_ASD_PA1_0000	R4B Title Sheet and Drawing List
BR4B_ASD_PA1_0001	R4B Context Plan
BR4B_ASD_PA1_0002	R4B Site Plan
BR4B_ASD_PA1_0004	R4B Site Plan Setting Out
BR4B_ASD_PA1_0005	R4B Thermal Performance Assessment
BR4B_ASD_PA1_1001	R4B Setout Plan Basement Level B4
BR4B_ASD_PA1_1002	R4B Setout Plan Basement Level B3
BR4B_ASD_PA1_1003	R4B Setout Plan Basement Level B2
BR4B_ASD_PA1_1004	R4B Setout Plan Basement Level B1
BR4B_ASD_PA1_1005	R4B Setout Plan Basement Level B0
BR4B_ASD_PA1_2000	R4B Plan Ground Floor Level 00
BR4B_ASD_PA1_2001	R4B Plan Podium Level P1
BR4B_ASD_PA1_2002	R4B Plan Podium Level P2
BR4B_ASD_PA1_3001	R4B Plan Lower Plate Level 01
BR4B_ASD_PA1_3002	R4B Plan Lower Plate Level 02-03
BR4B_ASD_PA1_3004	R4B Plan Lower Plate Level 04-19
BR4B_ASD_PA1_3020	R4B Plan Plant Level 20
BR4B_ASD_PA1_3021	R4B Plan Lower Plate Level 21-32
BR4B_ASD_PA1_3033	R4B Plan Mid Plate Level 33



BR4B_ASD_PA1_3034	Plan Mid Plate Level 34-38
BR4B_ASD_PA1_3039	Plan Mid Plate Level 39
BR4B_ASD_PA1_3040	Plan Mid Plate Level 40-48
BR4B_ASD_PA1_3049	R4B Plan Plant Level 49
BR4B_ASD_PA1_3050	R4B Plan Upper Plate Typical Level 50-55
BR4B_ASD_PA1_3056	R4B Plan Penthouse Level 56
BR4B_ASD_PA1_3057	R4B Plan Penthouse Level 57
BR4B_ASD_PA1_3058	R4B Plan Roof Level 58
BR4B_ASD_PA1_9000	R4B – GFA Calculation
BR4B_ASD_PA1_9001	R4B – GFA Calculation – Sheet 1
BR4B_ASD_PA1_9002	R4B – GFA Calculation – Sheet 2
BR4B_ASD_PA1_9003	R4B – GFA Calculation – Sheet 3
BR4B_ASD_PA1_9004	R4B – GFA Calculation – Sheet 4
BR4B_ASD_PA1_9005	R4B – GFA Calculation – Sheet 5
BR4B_ASD_PA1_9006	R4B – GFA Calculation – Sheet 6



2.0 Electrical Services

2.1 Infrastructure

Power to Barangaroo South Stage 1A development is provided by Ausgrid 33kV feeders originating at Pyrmont Switching Station. These feeders will be upgraded to service the additional load of the Barangaroo South Stage 1B development, subject to agreement with Ausgrid.

The Barangaroo South Stage 1B development R4B will be provided with incoming power from the Barangaroo South Stage 1A private high voltage embedded network infrastructure, which will be carried out under the Stage 1B Basement DA. A substation will be established on the podium level of Building R4A in Stage 1B (as part of Stage 1B Basement DA) to service the residential buildings, retail and associated uses, including Residential Building 4B, subject to design development.

Low voltage electrical supplies to the residential building will originate from the precinct main switchroom for Stage 1B (part of Stage 1B Basement DA), located adjacent to the Stage 1B substation in Building R4A.

The building will have its own consumer's mains and main switchroom located in the podium (subject to design development), providing cabling and distribution to retail tenants and apartments, as well as house services loads. Fire rated consumer's mains will be provided as required by the NCC and AS3000.

The main switchboards will be designed to accommodate the full load of the consumer's mains capacity, plus 20% spare capacity. A minimum of 20% spare space in the main switchroom will be provided for future use. The main switchboards will be of Form 4b construction complying with AS3439, with submain protection provided by circuit breakers.

The building's main switchboards will be designed for a 100kA fault level, which will allow future embedded generation to be connected.

Limited standby generation will be provided for the basement as part of the Stage 1B Basement DA. Additional capacity will be provided in this generator to provide standby power to one lift per rise in the building and essential lift safety systems to facilitate evacuation of the building in the event of an extended power interruption.

Power factor correction equipment will be installed where required to maintain the house services to a minimum power factor of 0.9 at all times.

2.2 Distribution Board

The proposed House Distribution Boards (DB's) will be located throughout the building in readily accessible locations, situated in main switchrooms, riser cupboards or plant rooms depending on their location. Outgoing circuits will be protected by circuit breakers. A minimum of 20% spare poles will be provided for future use.

Apartment DBs will be located within apartment cupboards/joinery.

2.3 Lighting

All lighting will be LED, fluorescent or other discharge type lighting of type suited to the task. Lighting will be provided in all areas of the development, including: corridors, stairs and lift lobbies, plant rooms, riser cupboards, rooms, toilets, cleaner's rooms, store rooms and external areas on and surrounding the building.

External building feature lighting may be installed to provide interest and to highlight architectural features. No light beam will be directed beyond the site boundaries or upwards without falling directly on a surface to minimise light pollution and impacts on residents. Lighting will be controlled by photoelectric cells and/or time switches.

A programmable lighting control system will be provided for the common areas including external building lighting. Residential apartments lighting will be energy efficient, dimmable and/or locally switched to Green Star and BASIX requirements

Emergency and evacuation and exit signs complying with the requirements of the NCC and AS2293.1 will be provided to the house/common areas. The emergency and exit lighting system will be a computer addressable system utilising mains injected technology. Emergency lighting and exit signs will utilise LED type fixtures. Emergency lighting provisions to AS2293.1 will be provided for shell and core retail tenancies. Modifications to the emergency lighting and general fitout lighting for the retail areas are the responsibility of the tenants.

2.4 Photovoltaic Array

A solar photovoltaic (PV) array is proposed to provide renewable electricity in line with the precinct commitments. The PV array will be connected to the building electrical system via inverters and dedicated electrical infrastructure.

The solar PV array will be connected to the base building supply and be separately metered.

2.5 Power

Power outlets will be provided to plant rooms, common areas for cleaning, electrical/communications risers, services equipment and plant etc.

In apartments, power outlets will be provided throughout to service typical domestic usage such as kitchen appliances, cleaning, entertainment devices and other general purposes.

Submains will be provided to serve apartments, house services including lighting and power, mechanical, hydraulic, fire and lifts etc. A minimum of 10% spare capacity will be provided for each submain.



2.6 Lightning Protection and Surge Protection

Lightning protection for each building is to be provided in accordance with AS/NZS 1768.

This will include features such as:

- Surge Protection at the building's main switchboard;
- Bonding of metallic elements on the roof;
- Finials on the roof, which may be approximately 3 metres in length;
- Use of the steel reinforcing in the concrete as a down conductor, and
- Use of the basement steel reinforcing in the concrete as the earth electrode

2.7 Audible Smoke Alarms

Audible smoke alarms will be provided to the residential apartments to AS3786 Smoke Alarms

Further detail of the building fire alarm and protection system in other areas is contained in the Fire section.

3.0 Communications

3.1 Infrastructure

The Barangaroo South Stage 1B precinct will be serviced with incoming telecommunications services by Telecommunications Service Providers (TSPs) via connections included in the Stage 1B Basement DA. Lead-in cabling will enter the site via a bank of ducts sufficient for the TSP's service requirements. The TSPs selected to service the residential building will be agreed by the stakeholders. The sizing, quantity and configuration will be agreed with the stakeholders and proposed carriers.

Residential Building R4B will be serviced from the from the Barangaroo South Stage 1B Precinct Entrance/Campus Distribution Room (CDR) located in the basement, provided under the Stage 1B basement DA.

The building will have its own Building Distribution Room (BDR) located in the basement (suitable for installation of passive and active equipment), providing cabling and distribution of communications services to the retail and residential apartments, and to life safety systems, including fire indicator panels and lifts.

An Internet Protocol (IP)-based Integrated Communications Network (ICN) will be established to support base-building systems data transfer between devices and systems. This will be an extension of the Basement ICN system with all associated head-end equipment accommodated within the CDR. ICN equipment will generally be provided in the CDR, BDR, riser or plant rooms housed within dedicated panels or 19" communications racks.

It is proposed that an integrated Passive Optical Network (xPON) solution is provided to service the residential apartments and retail tenants in addition to the ICN. A separate conventional active switched ethernet network may also be provided for the ICN, dependent on the final service provider selection.

A Network Termination Device (fibre) or Punch-down Blocks (copper) will be provided within each retail tenancy and residential apartment for distribution of telecommunications services.

Horizontal cabling within the residential apartments and for all ICN connected building service equipment will be provided with a minimum performance of Cat6 Class E.

No horizontal cabling will be provided within the retail tenancies.



3.2 Reticulation and Cable Management

Each retail tenant or residential apartment will be provided with a dedicated incoming communication service cable (fibre and/or copper).

The proposed residential building contains one core, with each core containing a communications riser accessible from the lift lobbies at each level. These risers will contain cabling and distribution equipment to service apartments and retail tenants in addition to house/common area requirements.

These communications risers will also accommodate Master Antenna Television (MATV) and In-building Mobile Coverage (IBC) distribution cabling and equipment.

3.3 MATV

A single dedicated clear space will be provided for an antenna and Foxtel satellite dish located above the roof top plant room on one of the towers to service the entire Barangaroo South Stage 1B Precinct. The final tower to be utilised for the head-end will be confirmed subject to an assessment of the wind loads, signal strength and visibility of relevant transmission towers and satellites.

The system will be suitable for Freeview digital television and radio and Foxtel Pay TV service in compliance with Foxtel requirements including FD-T-E-2325 -Transparent Digital Transmodulator (TDT) Network Specification.

Where a private xPON TSP is selected the xPON equipment will be required to be suitable for Radio Frequency over Glass (RFoG) operating on the common telecommunications fibre infrastructure to carry the MATV signal around the Stage 1B precinct. However should a copper or public provider (e.g. NBNCo.) be selected, a separate conventional MATV system will be provided.

3.4 In-building Mobile Coverage

In-building mobile coverage (IBC) will be provided to 100% of the floor area and lifts.

The IBC will operate over a distributed antenna system (DAS) with antennas located, wherever possible, external to any residential apartment or retail tenancy.

The performance of the IBC will conform to the requirements of the Mobile Carriers Forum (MCF) Guidelines.

A lead carrier will be required to be identified and consulted to ensure compliance of the system during design development, prior to the installation of the system.

The head-end equipment is proposed to be located in the basements in a "hotel" style arrangement where a single head-end services remote antennas in Residential Building R4B, as well as proposed adjacent Residential Buildings R4B and R5 and Basement (the subject of separate DAs).

3.5 Standards and Design

The communications services installation will be developed in accordance with the following standards:

- AS/NZS HB 252 Communications cabling manual - Module 3: Residential communications cabling handbook
- AS/CA S008 Requirements for customer cabling products
- AS/CA S009 Installation requirements for customer cabling (Wiring Rules)
- AS/NZS ISO/IEC 14763.3 Telecommunications installations - Implementation and operation of customer premises cabling - Testing of optical fibre cabling (ISO/IEC 14763-3:2011, MOD)
- AS/NZS ISO/IEC 15018 Information technology—Generic cabling for homes
- AS/NZS ISO/IEC 24702 Telecommunications installations—Generic cabling—Industrial premises
- AS/NZS 3080 Information technology - Generic cabling for customer premises (ISO/IEC 11801:2011, MOD)
- AS/NZS 3084 Telecommunications installations—Telecommunications pathways and spaces for commercial buildings
- AS/NZS 3085.1 Telecommunications installations—Administration of communications cabling systems—Basic requirements
- AS/NZS IEC 61935.1 Specification for the testing of balanced and coaxial information technology cabling—Installed balanced cabling as specified in ISO/IEC 11801 and related standards (IEC 61935-1, Ed.3.0 (2009) MOD)
- AS/NZS IEC 61935.2 Testing of balanced communication cabling in accordance with ISO/IEC 11801—Patch cords and work area cords
- Mobile Carrier Forum DAS Design Specification (includes installation instructions) - 2014
- AS/NZS 1367
- AS 1417.1
- AS 1417.1(Int)
- AS/NZS 3000
- AS/NZS 4053
- AS/NZS 4540
- AS 4599.1
- AS 4933.1
- ITU-T G.984
- ITU-T G.987
- AS/NZS CISPR 13
- AS/NZS CISPR 20
- Foxtel Installation Manual for Multi Dwelling Units, Multi Residential Estates and Commercial Installations – most current edition
- Foxtel Installer Handbook Satellite Multi Dwelling Units & Commercial – most current edition
- FD-T-E-2325 -Transparent Digital Transmodulator (TDT) Network Specification
- Australian Communications and Media Authority (ACMA) and Telecommunications Service Provider Guidelines
- Mobile Carrier Forum (MCF) Guidelines

- National Construction Code (NCC)

4.0 Security

4.1 Infrastructure

Residential Building R4B and the associated basement will be provided with standalone access control, intruder detection and Closed Circuit Television (CCTV) services.

The building's security system headend will be housed in a dedicated security control room located within the basement, with any necessary data gathering panels distributed within the building risers, which will be monitored. Generally intercoms, CCTV and access control/intruder detection panels will be Internet Protocol (IP) based.

4.2 Access Control

The residential building will be provided with an access control system, which will control access by proximity card to:

- Lifts
- Car Parks
- Main Entries

Each card type (and format) will be coordinated and be as per the rest of the Barangaroo South Development and the development in Stage 1B including Building 4B, and will utilise "HID MultiClass SE" readers for consistency across the development.

A fire stair re-entry system will be provided in accordance with NCC requirements.

Apartment access control systems within the individual apartments will be the responsibility of the apartment owner (with the exception of podium level and penthouse apartments which will be provided with residential grade security alarm systems).

4.3 CCTV

The building will be provided with a CCTV surveillance system. CCTV cameras will provide coverage of:

- Building perimeter
- All entries and exits to/from publicly accessible spaces
- Main Lobbies and Mail Rooms
- Car park entrance and Loading Docks (through precinct system)

The cameras will be Internet Protocol (IP) based, High Definition (minimum 1MP) and connected to a digital recording system; either through Digital Video Recorders (DVR's) or hard drive Local Area Network (LAN) based system. The system will have the capability to be monitored at both the security control room within the building and from a central security facility.

4.4 Intruder Detection

All perimeter doors, fire stair doors, plant room doors and access controlled doors will be monitored via reed switches, with monitoring and alarms via the standalone security head end system.

Podium and penthouse apartments will be provided with security alarm systems.

Security alarm systems in other apartments will be the responsibility of the owner or tenant.

Where fire stairs are secured to prevent re-entry, intercoms and/or warning systems will be provided to meet the requirements of the NCC and these systems will be connected to the intruder detection system for monitoring.

4.5 Intercommunication System

Building entry points will be provided with IP based video intercom call stations which will allow communication to the apartment which is called. Lifts will have intercom interface provisions and the carpark entry will be provided with a video intercom interfaced to the building and precinct systems.

4.6 Standards and Design

The Barangaroo South Stage 1B security services installation will be developed in accordance with the following standards, or the current relevant Standards:

- AS/NZS 2201
- AS 4806

5.0 Vertical Transport

5.1 Design Criteria

The lift design for the Stage 1B Residential Tower 4B will achieve a level of service commensurate with similar developments.

The criteria for the lift design will be based on peak two way traffic representing afternoons when residents are returning to their apartment and going to dinner (inter-floor not considered as few residents are likely to visit other floors than their own).

Indicative Performance Guidelines	
Occupancy	1.5 persons/ bedroom
Lift Dispatcher	Conventional Collective
Lift Traffic Type	Two way – no interfloor.
Interval	<60s seconds at lobby
Handling Capacity	10% of population in 5 minutes

Apartment passenger lifts will be 18 passenger 1350kg, clear internal car dimensions 1450w x 2000d x 2500h, 2 panel centre opening doors 1100w x 2100h.

The towers will utilize one of the passenger lifts in each rise as a part time goods lift, this lift has been increased from 18 passenger to 21 passenger to assist with furniture handling.

Apartment passenger / goods lifts will be 1600kg, clear internal car dimensions 1650w x 2000d x 2500h, 2 panel centre opening doors 1100w x 2100h.

5.2 Lift Strategy

The proposed lift strategy for the residential towers is as follows:

Low Rise				
	No.	Capacity	Speed	Landing Served
Tower 4b	3	2@18 & 1@21	3m/s	B4-B1, G,P1-P2, 1-19, 21-37
High Rise				
Tower 4b	3	2@18 & 1@21	6m/s	B4-B1, G,P1-P2, 30-48, 50-56

Apartment passenger lifts are to be able to stop at all levels of the podium to enable direct apartment to amenities access.



Lifts with speeds above 4m/s will be suitably streamlined to achieve premium ride quality.

The lift drive system will be equipped with permanent magnet motors and regenerative braking technology to minimise the energy use of the lift system.

Lift pits are to be accessible horizontally from the same level.

In R4 a Class A 1600kg retail goods lift will be separate and act independently to the Residential Tower Lifts serving loading dock and ground for access to the R4B ground floor tenants.

6.0 Fire Services

6.1 Key Design Criteria

The buildings fire protection systems are to be designed and installed in accordance with the National Construction Code (NCC) and all relevant Australian Standards, codes and authorities requirements.

The building will be fully sprinkler protected in accordance with AS2118.

Hydrants and hose reels installed throughout in accordance with AS2419 and AS2441 respectively. Fire hydrants will form part of a combined sprinkler and hydrant system.

Water supply will be grade 1 and will be derived from the central site wide fire pump and storage tank room located in the Stage 1A Basement.

A Fire Brigade Booster valve assembly will be located at street level of the building, to allow the Fire Brigade to boost the sprinkler and hydrant system during firefighting operations.

A smoke detection system in accordance with AS1670 and AS1668.

Smoke hazard management will be in accordance with AS1668 and fire engineered solution.

The building will have a dedicated Fire Control Room located in the Stage 1B basement to house the main fire control panels and will act as the centre of operations for the fire brigade. A fully addressable fire indicating panel will be provided to indicate the specific individual detector or device that has alarmed.

The building system will have an Evacuation Warning System designed to AS 1670.4 including Warden Intercom Phones and Break Glass Alarms throughout the building.

Portable fire extinguishers will be provided in all common areas and plant rooms in accordance with AS 2444.

6.2 Automatic Sprinkler System

The entire building is to be protected by an automatic sprinkler installation complying with the requirements of the NCC and relevant Standards.

Water supply will be a grade 1 supply provided from the central fire pump and tank room located in basement 1A.

The overall system will be a combined sprinkler/hydrant system, in accordance with AS2118.6

Sprinklers will be wet type with the following classification and hazard ratings:

- i. Residential levels - Light hazard
- ii. Basement Parking Areas – Ordinary Hazard 2
- iii. Retail Areas – Ordinary Hazard 3.

Accordingly, the density of sprinkler heads will be designed to suit the hazard classification as required by AS 2118 – 1999.

All heads in ceiling voids, plant rooms and basements are brass finish type with no escutcheon.

All heads fixed to the underside of suspended ceilings in residential and podium levels are semi-recessed sprinklers with two piece white escutcheon plates.

Sprinkler heads are positioned in accordance with AS2118.

Individual floors will be monitored by individual floor isolation valves and flow switches.

A Fire Brigade booster valve assembly will be provided at ground level near the main entry to the building or as determined in consultation with the relevant authorities.

Fire system test water will be collected and reused on site.

6.3 Fire Hydrant, Hose Reel System

A Fire Hose Reel and internal fire hydrant system supply service will be provided to the buildings in accordance with the NCC requirements.

The system will form part of the combined sprinkler/hydrant system in accordance with AS2118.6 and will be a pressurized system, fed from the main fire pumps in Basement 1A.

Pressure reducing valve sets will be included where necessary to limit the maximum pressure to that allowed by the Fire Brigade.

Hydrants will be located within the fire stairs on each floor level throughout, using 65mm hydrant valves with plastic cap and chains or, as required by the fire engineering solution.

Hose reels will be provided on each floor level adjacent to the fire stairs using 36 metre hose reels or as required by fire engineering.

Hose reels will be part of a separate system fed and pressurized from the domestic water supply.

6.4 Fire Detection System

The fire indicator panel/fire control panels will be compatible with the addressable smoke detection system to be provided and will be located in the individual building's Fire Control Room. The system will interface with the following:

- The central detection and alarm system located in the Stage 1A basement main Fire Control Centre.
- The interface will be in the form of fibre optic network link
- Individual building addressable smoke detection system
- Mechanical ventilation and smoke control system within each individual building
- Fire sprinkler system monitoring
- Sound System and Intercom System for Emergency Purposes
- Building Management and Control System (BMCS) and Building Information System for monitoring purposes and information and alarm status display only
- The Fire Indicator Panel (FIP) will provide an additional 25% space to allow the capability to receive additional inputs (25% per floor) for tenant installed systems such as MASDS or sub-FIP's
- The system is to be capable of accepting and interfacing with alternative suppression systems, i.e. gas suppression and or pre-action for tenant communications rooms in localized areas.
- Smoke detectors will be provided in accordance with AS1670/1668, pending finalization of a fire engineered solution during detailed design.

- Smoke detectors will be generally photo optical type. Use of specialized early warning smoke detection devices such as multipoint aspirated detectors, will be as required by the fire engineering for the project during detailed design

6.5 Sound System and Intercom System for Emergency Purposes

A Sound System and Intercom System for Emergency Purposes (SSISEP) will be provided throughout the individual buildings in accordance with the NCC and relevant codes to an open plan layout on the office floors and to address other specialised spaces such as plant rooms, lift motor rooms etc.

The SSISEP will provide ordered, staged evacuation of the building in the event of a fire alarm.

A master evacuation control panel will be located with the FIP in the Fire Control Room.

The system will incorporate Break Glass Alarm points and Warden Intercom Phones on every level to communicate back to the Fire Control Room.

PA Facility will be at the Main Evacuation Control Panel (MECP) to allow announcements either floor by floor or whole of building.

The individual building systems will be interfaced via a fibre optic network to allow full monitoring and subsequent control from the main Fire Control Centre in the Stage 1A Basement.

6.6 System Operation and Interfaces

In the event of fire, the fire sprinkler system will automatically carry out the following functions:

- Provide water discharge (at the required density)
- Interface with the Fire indicator Panel
- Interface with the SSISEP system via the master fire indicator panel
- Interface with the BMS system via the master Fire Indicator Panel and security system
- Activate the local audible alarm
- Activate transmission of an alarm to the Fire Station
- Cause the air-conditioning and mechanical systems to operate in fire mode

7.0 Hydraulic Services

7.1 Design Certificate

The design criteria will include but will not necessarily be limited to the following:

- Rainwater roof drainage will be based on rainfall intensity for a 1:100 year average recurrence interval for a storm event of 5 minute duration.
- A complete sanitary system will be provided to residential areas of the building only.
- A complete domestic hot/warm and cold water system will be provided to residential areas of the building only. All retail areas of the development will be provided with domestic cold water capped valves for future fit out.
- Recycled water from the Barangaroo South Centralised Waste Water Treatment Plant will be provided to apartments and retail areas for flushing. A recycled water connection for washing machines in the residential apartments will also be provided in addition to a conventional potable water connection.

7.2 Water Conservation

Water conservation measures to be incorporated into the building will include the following:

- Reducing Sydney Water main potable water usage throughout the development.
- Building integration with central sewer recycling water treatment plant for water reuse for flushing purposes.

Reducing water usage by the use of:

- Dual flush toilets
- Low flow tapware
- Hot water system management

7.3 Rainwater Plumbing

The rainwater plumbing system will extend from tower roof areas of the building discharging to the rainwater collection and reuse tank within the building. Rainwater will be used for irrigation of the podium and lower level planted areas. Rainwater overflow will connect to the stormwater drainage system located at ground level.

An overflow system will be provided to the roof area by duplication of the siphonic system to achieve 100% overflow. Two rainwater drain points will be provided to each balcony.

7.4 Stormwater Drainage

The stormwater drainage system will collect runoff from the podium areas including landscaped areas and balconies for discharge to the civil stormwater drainage system to be located in Waterman's Quay and Barangaroo Avenue.

Civil site stormwater drainage is provided under the Basement DA. Refer to the Stormwater and Infrastructure report prepared by Cardno.

7.5 Sanitary Drainage & Plumbing

The sanitary drainage system will convey wastes above ground level from basins, baths, showers, toilets, sinks etc. to the central Barangaroo South recycled water treatment plant located in Stage 1A (separately approved) which will have an overflow discharge via gravity to the local authority sewer main in Hickson Road. An over flow relief gully will be provided at the ground floor. Sanitary Plumbing will comply with AS3500 and NCC requirements.

7.6 Potable Cold Water Service

The standard potable cold water supply will be provided from the Sydney Water main and reticulated throughout the buildings. Water services will comply with AS3500 and NCC requirements.

The potable cold water reticulation will extend from the water meter rooms located in a plant room within the building with 24/7 authority access to the water meter and backflow prevention. After metering the water service reticulation will pass through a backflow prevention device for zone protection of the building before being filtered and boosted by triplex variable speed pumps to the upper plant rooms. Mid and high level water storage tanks will provide emergency back-up supply. Gravity and pump assisted cold water supplies will extend from the storage tanks to supply the risers and droppers to the core areas of the buildings.

Pumps will be sized as a duty/duty/standby arrangement whereby each pump has the capacity to provide 70% of the required duty, therefore providing redundancy to the system in the event of a single pump failure. A water supply will extend to the retail areas via separate meters and mains pressure system.

From the cold water booster pump set, the reticulation will extend up through the buildings in hydraulic services risers attached to each core.

Common areas will be provided with a water meter and reticulation system for separate billing purposes.

Individual cold water meters to each apartment will be located within a common cupboard on each level with 24/7 access available to Sydney Water Corporation.

7.7 Potable Hot Water System

The building will be served by gas-fired hot water plants located in the plant rooms at mid-level and at high level. The residential levels located above the upper level plant room will be supplied from a separate hot water plant fed from the domestic cold water pump assisted system which serves the upper levels.

The hot water reticulation will extend from the plant, rising and dropping through the hydraulic services risers attached to the each core. The hot water reticulation system will be a flow and return system through the central core risers and a “Dead Leg” run out from central core services risers to individual apartments.

The potable hot water reticulation within the apartments will be installed within walls and ceiling spaces as required for connection to the following fixtures:

- Basins
- Showers
- Baths
- Kitchen Sinks
- Laundry tub

Thermostatic mixing valves will be provided in services cabinets to reduce the draw off temperature to apartments to 50°C. The “Dead Leg” system will be electrically heat traced and lagged to maintain temperatures within the system.

Individual hot water meters to each apartment will be located within a common cupboard on each level providing 24/7 access by the gas supply authority. The hot water meters will be linked to the incoming gas meter to the gas-fired hot system for billing purposes.

7.8 Non-Potable Cold Water System

A centralised recycled water treatment plant (RWTP) will be provided in the Stage 1A Basement of the Barangaroo South development. This will treat waste water as a minimum to relevant Australian recycled water guidelines where it will be distributed across the development including the proposed residential building. The central non-potable water supply will minimise the potable water demand of the building.

The non-potable cold water supply reticulation will extend from the non-potable water meter located in water meter room located in the basement. After metering the non-potable water service will reticulate to a pump room at the basement level where it will be boosted by triplex variable speed pumps to mid and high level storage tanks. Gravity and pump assisted services will provide recycled supply to each apartment.



Pumps will be sized as a duty/duty/standby arrangement whereby each pump has the capacity to provide 70% of the required duty, therefore providing redundancy to the system in the event of a single pump failure.

Individual recycled water meters to each apartment will be located within a common cupboard on each level providing 24/7 access by the recycled water retailer.

7.9 Natural Gas System

Engagement has commenced between Lendlease and Jemena Gas Networks to provide site wide infrastructure for the natural gas service distribution network to service the proposed development and adjacent proposed buildings. It is proposed to service the site with a 3.5kPa supply.

The natural gas service will extend from the Jemena Gas main located in Waterman's Quay to metering points and usage points throughout the building. Main isolation valves will be installed within the street 225mm outside the building boundary and within the building meter room. Stage 1B will be serviced independent of Stage 1A.

The gas reticulation will extend from the meter/regulator assembly through the building. Individual gas meters to each apartment will be located within a common cupboard on each level providing 24/7 access by the gas supplier. Risers will extend through the building to the plant rooms and apartment meter sets.

The gas installation will comply with AS5601 and Jemena requirements.

8.0 Mechanical Services

8.1 District Cooling Plant

The Barangaroo South precinct is supplied with chilled water from District Cooling Plant (DCP) located in the Barangaroo South Stage 1A Basement. The DCP utilises the harbour water for rejecting the heat from the district. Chilled water generated by the DCP will be distributed to an Energy Transfer Station (ETS) located in the basement of the building.

The DCP, associated Harbour Heat Rejection (HHR) Plant and chilled water distribution system is sized to serve the whole of the Barangaroo South development.

The DCP primary chilled water system will be extended from Barangaroo South Stage 1A to a Remote Pumping Station (RPS) located in the Stage 1B Basement. Chilled water will then be reticulated to ETS generally located below the buildings served.

Cooling provided by the DCP is transferred from its (primary) cooling circuit to the buildings (secondary) chilled water circuit via heat exchangers in the ETS. The R4B building variable speed pumps are utilised to circulate chilled water from the ETS to the podium level air handling plant and the residential fan coil units.

There will typically be one chilled water circuit serving the podium and low rise levels and one chilled water circuit serving the medium and high rise levels. The apartment-related podium areas and apartments will be served by a dedicated pump set. The retail tenancies will be provided with their own secondary pump set and energy metering.

All chilled water utilised in the building will be metered with each apartment and retail tenancy provided with a chilled water energy meter.

8.2 Design Criteria

The following external ambient design conditions used for the Sydney CBD:

- Summer: 32°C Dry Bulb, 23°C Wet Bulb
- Winter: 7°C Dry Bulb

The following internal values will be applied to the design for the residential apartments, with assessment for modification as noted.

- Summer 23.0°C Dry Bulb $\pm$ 1.5°C
- Winter 21.0°C Dry Bulb $\pm$ 1.5°C

Humidity will not be controlled. However the air conditioning systems, when operating, should limit the internal relative humidity to 65% under most ambient conditions and remain above 35% for most of the year.

Lobbies are to be supplied with tempered outside air.

Outside air will generally be provided to meet the requirements of the National Construction Code (NCC).

Mechanical ventilation will generally be provided to AS1668.2:2012.

8.3 Heating Plant

A de-centralised natural gas fired heating hot water generator system will be located within a high rise plant room in the residential tower to provide heating hot water to the apartments fan coil units, podium level and retail air handling units for space heating.

Heating Hot water from the high level heating hot water generator plantroom will be reticulated to a set of heat exchangers located in the low rise plantroom. Heating hot water will then be distributed from the low rise plant heat exchangers to the low rise apartments and podium floors.

Energy meters will be provided to measure and record heating hot water usage in each residential apartment and retail tenancy. Common areas will be grouped where possible, with each grouping provided with an energy meter.

8.4 Heating and Cooling Strategy

Chilled water pipework will reticulate from the basement heat exchanger and chilled water pump room throughout the building via chilled water pipe risers located as follows:

- Apartments – Multiple pipe risers on each level, serving either one or two apartments (not accessible from the lift cores). Riser access will be limited to shut off valves and energy meters dedicated for that apartment via a ceiling access panel.
- Retail Tenancies– Via ceiling space in that tenancy, with main risers proposed to be outside of the retail tenancy.
- Podium Common Areas – Via ceiling space in the area, with main risers proposed to be outside of the area served.
- High and Medium Rise Main Chilled Water – Located in a riser accessible from the lift core.

Heating hot water pipework will reticulate from the hot water generator plant room, located in the high-level plantroom. The Heat hot water pipe distribution arrangement and access will be similar to the chilled water system. Generally the heating hot water piping, valves and energy meters will be located in the same riser and adjacent to the chilled water pipework.

Each apartment will be conditioned by low profile fan coil units (FCUs) located in the ceiling space, generally above amenities areas, walk-in wardrobes and above kitchen areas within localised bulk



heads. Conditioned air will be distributed to the space via insulated sheet metal ductwork, flexible ductwork and grilles. All FCU's will be provided with filters and trays drained to a tundish.

The lift lobbies are proposed to be served by common AHUs located in the plantrooms. The AHUs will be utilized to provide tempered air to the lift lobby and corridor served. Local on-floor fans will provide additional filtered make-up air for the apartment's ventilation systems via the corridor, acoustically treated above the door with make-up ducts complete with non-return dampers.

Air conditioned podium common areas and retail tenancies will be served by dedicated or suitably zoned fan coil units. The conditioned air will be mixed with outside air, filtered then ducted to the space served via insulated ductwork and grilles. These units will generally be controlled by the BMCS and provided with economy cycle.

Lift Motor Rooms will be conditioned to Australian Standard requirements.

8.5 Mechanical Ventilation

The residential apartments will be provided with a centralised toilet exhaust system. Typically each apartment will be provided with one or more toilet exhaust systems depending on its layout, complete with fan, controls and ductwork to a toilet exhaust riser. Toilet exhaust will serve the bathrooms, powder rooms and laundries. Toilet exhaust will be ducted to an exhaust fan in the plantroom and then horizontally discharged at plantroom level.

A general exhaust system comprising of exhaust risers serving multiple apartments kitchen range hood will be provided. The exhaust will be ducted to the plantroom where it is filtered from grease and treated for odours prior to discharge to outside. All kitchen exhaust systems will be provided with fully seal ductwork joints.

Both centralised toilet exhaust and domestic kitchen exhaust systems will be variable speed fan systems, controlled to maintain a preset minimum negative pressure with the central exhaust shafts.

Tempered and filtered outdoor air will be transferred from each lift lobby into each residential apartment via an acoustic transfer duct and fire damper to provide make-up air for the apartments mechanical exhaust systems. A non-return damper will be provided to limit the infiltration of air from the apartment back to the lobby.

Plant, stairs and other areas will be ventilated or pressurised to Australian Standard requirements.



8.6 Smoke Hazard Management

The smoke hazard management systems will operate in accordance with the requirements of the NCC, the Fire Engineering Report and the relevant Australian Standards.

The fire stairs located within the core of the building will be provided with stair pressurisation systems to suit the system shut down strategy.

The mechanical system will operate during Fire Mode and comprise of stair pressurisation shafts to serve each of the scissor stairs. Air will be relieved from the affected corridors via the stair pressurisation relief / supply air shaft and discharge to atmosphere.

8.7 Mechanical Noise and Vibration

The mechanical systems, including all plant, will be assessed by the acoustic engineer and treated if required to meet the acoustic performance criteria stated in the Acoustic Report and AS 2107.

8.8 Building Management and Control System

A computerised Building Management and Control System (BMCS) will be used to automatically control, monitor and provide alarms for the nominated building services.



9.0 Conclusion

The proposed Building R4B at Barangaroo South Stage 1B will be serviced either from connections to the existing Stage 1A infrastructure or from new dedicated connections from external gas, water and telecommunications utilities' infrastructure. The building will be serviced using modern but proven building services engineering techniques which will result in a comfortable and energy and water efficient outcome.