



Doran Drive Precinct

2 Mandala Pde, Castle Hill

Electrical, Mechanical & ASP3 Services and Infrastructure Report



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1 EXECUTIVE SUMMARY

1.1 GENERAL DESIGN DOCUMENTS

This report is a document formalised to provide a reference to agreements between JHA and that of the Client and/or their representatives.

JHA, in developing the report, shall endeavour to provide value added advice, providing suitable solutions to cost benefits and build-ability.

The report is designed to achieve a summarized written description of the infrastructure services to be developed for the site. This document is not designed as a Specification or Bill of Materials. Nor is it intended to be a Return Brief or to provide detail of the equipment selection.

It is the intent of this document to represent a sign-off of the project's Mechanical, Electrical and Level 3 Services to be provided for the client by JHA Consulting Engineers.

2 INTRODUCTION

Doran Drive Precinct is a mixed-use precinct wide development consisting of multi-storey residential towers and a retail/commercial precinct with a supermarket. The development is adjacent to the nearby Hills Showground Station. The land used for this development was owned by Sydney Metro.

The development will be split into two separate sites with the building makeup and summary as follows per site:

Project address: 2 Mandala Parade, Castle Hill

1. Total of 431 residential apartments
2. 10,935m² of retail and commercial;

2.1 REPORT QUALIFICATIONS

This report finalises the Development Application for both Stage 1, 2 & 3 of the project for the Electrical, Mechanical and Dry Fire Services and is based on information from the design team including Deicorp Projects Showground Pty Ltd (Client) & Turner (Architect) drawings and documentation as well as other design consultants working on the project.

2.2 BUILDING SERVICES SYSTEMS

The following systems are included within the Commercial/Retail and residential scope of works and are described throughout this report.

- Electrical Systems
- Dry Fire Systems
- Mechanical Systems
- Level 3

3 STANDARDS & REGULATIONS

Australian Standards	Electrical Installation Wiring Rules	AS/NZS 3000
	Lightning Protection	AS/NZS 1768
	Electrical Installations – Classification of the Fire & Mechanical Performance of Wiring Systems Elements	AS/NZS 3013
	Telecommunications Installations – Commercial Installations	AS/NZS 3080
	Low-voltage switchgear and control gear assemblies - Particular requirements for low-voltage switchgear and control gear assemblies intended to be installed in places where unskilled persons have access for their use - Distribution boards	AS 61439.1 AS 61439.3
	Requirements for customer cabling products	AS/ACIF S008
	AS/ACIF S009:2006 Installation requirements for customer cabling (Wiring Rules)	AS/ACIF S009
	Interior lighting - Safe movement	AS/NZS 1680.0
	Interior and workplace lighting - Specific applications - Circulation spaces and other general areas	AS/NZS 1680.2.1
	Emergency evacuation lighting for buildings - System design, installation and operation	AS/NZS 2293.1
	In-service safety inspection and testing of electrical equipment	AS/NZS 3760
	Energy Management Programs – Guidelines for definition & analysis of Energy	AS 3596
	Interior lighting - Circulation spaces and other general areas	AS 1680.2.1
	Control of the obtrusive effects of outdoor lighting	AS 4282
	The use of ventilation and air conditioning in buildings Part 1: Fire and smoke control in multi-compartment buildings.	AS 1668.1:2015
	The use of ventilation and air conditioning in buildings Part 2: Mechanical ventilation in buildings.	AS 1668.2:2012
	Air Handling and Water Systems of Buildings	AS 3666
	Refrigerating Systems	AS/NZS 5149
	Ductwork for Air Handling systems in buildings	AS 4254
	Fire detection, warning, control and intercom systems – System design, installation and commissioning Part 1: Fire	AS 1670.1:2018
	Fire detection, warning, control and intercom systems – System design, installation and commissioning Part 4: Emergency warning and intercom systems	AS 1670.4:2018
	Electrical Installations, Selection of Cables	AS/NZS 3008
	Design for Access and Mobility	AS 1428

Authorities

National Construction Code	2019
NSW Service and Installation Rules	
NSW Fire Brigade	
National Broadband Network	
Fire Engineering Report	
Acoustic Report	
BASIX Report	
Endeavour Energy	

3.1 AUTHORITY REQUIREMENTS NATIONAL CONSTRUCTION CODE

The National Construction Code (NCC) 2019 Building Code of Australia is the current publication for design and building requirements, and as such, this DA Report is in accordance with this current standard.

4 ELECTRICAL SERVICES

4.1 DESIGN CRITERIA

In addition to the statutory standards and regulations, the Client will be required to adhere to the following design criteria:

- Greenstar Design
- Climate Change and Community Resilience Assessment
- Schedule 7

The below sections outline the exact requirements of each design criteria.

4.1.1 GREENSTAR – ELECTRICAL REQUIREMENTS

The Client is aiming to achieve a 5-star Greenstar rating for this development. Initiatives which the Client is aiming to achieve to gain as per Green Star Design and As Built Submission Guidelines v1.3, the targeted Greenstar points for this project include:

Credit Code	Requirement	Description
6.0	Metering	To qualify for this credit, it is a minimum requirement that accessible metering be provided to monitor building energy and water consumption including all energy and water common uses, major uses and sources. The metering is to be accurate and to inform energy consumption practices and reduced wasted energy.
6.1	Monitoring Systems	1 point is available where a monitoring strategy is addressed through a monitoring system, capable of capturing and processing data produced by the installed energy and water meters, and accurately and clearly presenting data consumption trends.
11.0	Minimum Lighting Comfort:	LED flicker free lighting provided throughout, ensuring a min CRI of 80.
11.1	11.1.1 & 11.1.2 General Illuminance & Glare Reduction	Best practice lighting levels for each task within each space type is defined as lighting with a maintained illuminance that meets the levels recommended in the relevant standard. Two options are provided for demonstrating compliance with this requirement, and a combination of methods can be used. The maintained illuminance values must achieve a uniformity of no less than defined in Table 3.2 of AS 1680.1:2006, with an assumed maintenance factor of 0.8. Refer to Green Star Design and As Built Submission Guidelines v1.3 for exact methods to achieve this.
11.2	Surface Illuminance	1 point is awarded where project teams can demonstrate that a combination of lighting and surfaces improve uniformity of lighting to give visual interest in the nominated area.
11.3	Localised Lighting Control	1 point is awarded where project teams can demonstrate that for 95% of the nominated area, occupants have the ability to control the lighting in their immediate environment. This includes turning the lights on and off and adjusting their light levels.

Credit Code	Requirement	Description
20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	<p>1 point is available where at least 95% (by cost) of all permanent formwork, pipes, flooring, blinds and cables in a project either:</p> <ul style="list-style-type: none"> - Do not contain PVC and have a recognised product declaration; or - Meet the GBCA Best Practice Guidelines for PVC <p>Where the cost of PVC products in the project is less than 1% of the Project Contract Value, this criterion is made "Not Applicable".</p>
27.0	Light Pollution to Neighbouring Bodies	<p>To qualify for points under this credit, project teams must demonstrate that all outdoor lighting on the project complies with AS 4282:1997 Control of the Obtrusive Effects of Outdoor Lighting.</p> <p>The conditions shall be applied to all boundaries, apart from boundaries with roads. The boundary shall be taken as the site boundary, with no setback and no consideration of the location of adjacent buildings (i.e. worst-case scenario).</p> <p>The following values from Table 2.1 of AS 4282:1997 must be applied:</p> <ul style="list-style-type: none"> - For Class 2 buildings (residential), the values in Columns 5A and B; or - For Class 3 to 9 buildings (non-residential), the values in Column 3.C. <p>The system must comply with both pre and post curfew requirements.</p>
27.1	Light Pollution to Night Sky	<p>1 point is awarded where it can be demonstrated that one of the following specified reductions in light pollution has been achieved by the project:</p> <ul style="list-style-type: none"> - Control of Upward Light Output Ratio (ULOR), in accordance with 27.1A; or - Control of Direct Illuminance, in accordance with 27.1B. <p>This credit covers all external lighting of a project. In addition to other types of external lighting, for the purposes of this credit, luminaires inside glazed atria and those on the uppermost (uncovered) deck of an outdoor car park are considered external.</p>

For complete details of each credit point, refer to Green Star Design and As Built Submission Guidelines v1.3.

4.1.2 CLIMATE CHANGE AND COMMUNITY RESILIENCE ASSESSMENT

As part of the Climate Change and Community Resilience Assessment, the following requirements are to be incorporated within the design:

Assessment Type	Variable	Adaptation and resilience actions (planned and recommended)
Climate Change Risk Assessment	Extreme heat	Space should be allocated for combined services (such as Solar PV) on the roof. Explore options for onsite battery storage to support decentralised energy solutions.
Climate Change Risk Assessment	Extreme heat	Ensure that procurement of equipment (e.g. HVAC, cables) caters to higher operating temperatures and extreme heat events (e.g. design to 2030 temperatures).
Climate Change Risk Assessment	Solar radiation	Ensure that critical equipment / plant is not sited with direct solar exposure and if required, that they can account for projected future increases in ambient temperature (e.g. design rating for 2030 temperatures).
Climate Change Risk Assessment	Extreme rainfall	Ensure that critical systems are housed either on the roof or if required in the basement that appropriate flood protection is provided (e.g. elevating critical infrastructure, providing flood barriers).
Climate Change Risk	Bushfire	Overhead power lines have been buried as part of reconstruction

Assessment Type	Variable	Adaptation and resilience actions (planned and recommended)
Assessment		efforts which will help build resilience and reduce opportunity for bushfire spark.
Community Resilience Assessment	Power	Connections to multiple electrical mains / substations are possible and should be encouraged during detailed design to help build redundancy and resilience within the system in the event of an outage
Community Resilience Assessment	Power	Consider the incorporation of back-up power supply (e.g. generator, battery storage) to support critical services during a power outage.

4.1.3 SCHEDULE 7

As part of Schedule 7, the following requirements are to be incorporated within the design as per Landcom requirements:

Requirement	Objective
C2. Onsite Energy Production	Project to include onsite renewable energy production system capable of generating at least 5% of total predicted energy demand of the Project (once completed and occupied).
G1. EV Charge Stations	Project to include shared Electric Vehicle (EV) charging points or fast-charge stations on the basis that the total number of EV charging points or fast-charge stations to be at least 10% of the total number of parking spaces provided in the Project.

4.2 EXISTING AUTHORITY ELECTRICAL INFRASTRUCTURE

4.2.1 EXISTING HIGH VOLTAGE NETWORK & EXISTING SUBSTATIONS

Existing Endeavour Energy High Voltage network cabling (at the time of this report) reticulates below ground along Carrington Road between existing padmount substation 8821 to the east, and existing padmount substation 35424 to the west.

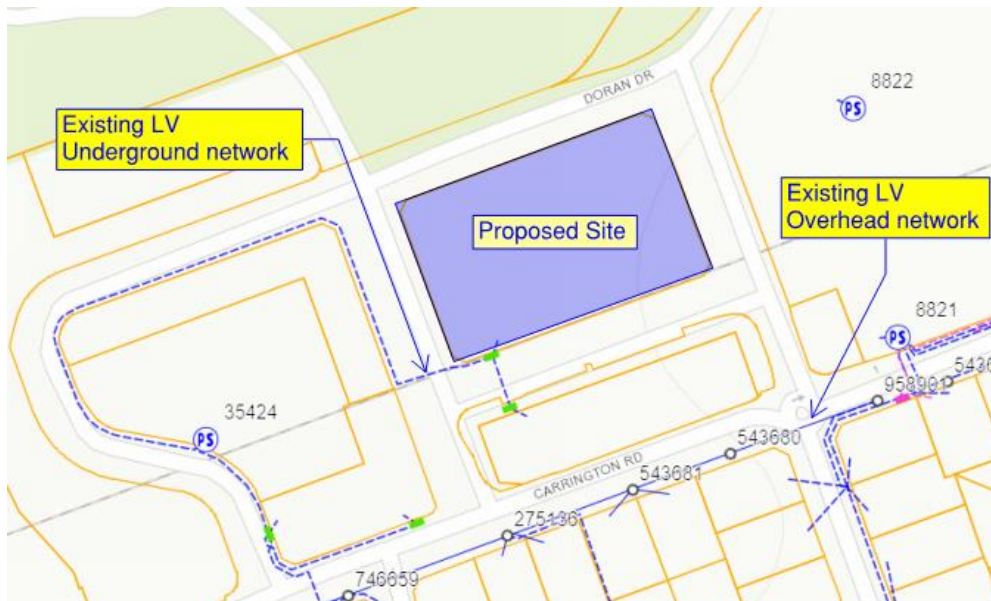


Endeavour Energy Existing High Voltage Network

4.2.2 EXISTING LOW VOLTAGE NETWORK

Existing Endeavour Energy Low Voltage network cabling (at the time of this report) reticulates below ground along Carrington Road supplying the surrounding properties and interconnecting substations. The low voltage network in the surrounding area is supported by existing substations in the area.

The existing lots to be redeveloped are currently supplied directly from the existing Endeavour Energy Low Voltage network from existing network pillars in the street. As part of site preparation works, any existing supplies or network infrastructure within the development lot boundaries are intended to be disconnected and removed, if not to be used for construction power (subject to site works staging).



Endeavour Energy Existing Low Voltage Network

4.3 PROPOSED PRECINCT ELECTRICAL ARRANGEMENTS

4.3.1 MAXIMUM DEMAND

Preliminary maximum demand calculations have been undertaken based on the latest architectural drawings dated 23.03.2021.

The preliminary maximum demand as included below provides a breakup of the theoretical electrical demand as expected for operation. The below table summarises the calculations:

	Maximum Demand (Amps)	Maximum Demand (kVA)
Residential	3072 A	2208 kVA
Retail/ Childcare/Medical Centre	1273 A	1430 kVA
Supermarket	791 A	548 kVA
Common Areas	1309 A	613 kVA
Total Maximum Demand	6445 A	4798 kVA
Diversity Factor	0.8	0.8
Diversified Maximum Demand	5314 A	3839 kVA

Table 1: Preliminary Maximum Demand

The following assumptions were taken for the above calculation:

- Residential A/C rated at 15A/phase per unit
- F&B Retail load on Ground Floor rated at 250VA/m²
- Retail load on Levels 1&2 rated at 100VA/m²
- Supermarket load rated at 200VA/m² based on Woolworth brief 2013
- Supermarket load is undiversified in the maximum demand calculations
- Residential communal areas load rated at 50VA/m²
- Ground floor, Level 1, and Level 2 communal areas load rated at 10VA/m²

- Lifts Load is 32A/ph
- 10A EV chargers in 10% of residential carpark.
- Radiology will require 630 amps due to X-Ray and MRI equipment (TBC with the tenant)

The above calculations were assessed on a kVA/apartment and VA/m² for the basement areas and are in accordance with AS3000 Table C3 and Endeavour Energy standards.

We have assessed the most recent drawings (the latest architectural drawings dated 23.03.2021) and an A/C load of 15 Amps per apartment (advised by mechanical consultant). We have applied a diversity factor of 0.8 which is generally a conservative diversity factor for residential loads.

By adjusting the diversity factor, it limits the flexibility of increasing the electrical load of final selection of equipment and architectural changes.

4.3.2 APPLICATION FOR POWER CONNECTION

An Application for Connection has been submitted to the supply authority Endeavour Energy to initiate the power application process.

Endeavour Energy has since provided a Design Brief indicating that Level 3 design for substation infrastructure will be required to facilitate the required electrical load of the new development. The Brief also indicates that the solution for the future permanent supply of the site can be moulded to best fit the Client's needs whilst complying with Endeavour Energy's standards and in accordance with the Terms and Conditions of the Model Standing Offer for a Standard Connection Services.

4.3.3 PROPOSED NEW 3 x 1500kVA CHAMBER SUBSTATION

To cater for the new electrical load expected for the development, new substation infrastructure is proposed to be installed within the confines of the property boundary along Andalusian Way incorporated into the proposed building envelope at ground level.

Preliminary substation spatial designs have been undertaken by the JHA Level 3 Team to provide planning advice and consideration to the surrounding building elements.

A complete Level 3 design and subsequent certification of the design by the Endeavour Energy will be conducted at later stages of the project.

- Basement non-essential Services

Main Switchboard 3 will be utilised to supply power to:

- Retail tenancies

Each building's essential and non-essential house services bulk metering would be installed within the building's dedicated main switchboard as detailed above. Apartments' metering will be combined in meter panels that will be installed in dedicated electrical cupboards on the Buildings' different floors. Retail metering will be combined on meter panels that will be installed in the two main switch-rooms. Meters will be arranged to the requirements of the supply authority and also the requirements stipulated within the NSW services and installation rules.

Private sub-metering will be configured to monitor all loads as stipulated by NCC2019.

The main switchboards will also require a space provision for a bus-tie arrangement to help build redundancy and resilience in the event of an outage.

A generator link box will also need to be provisioned for, fed from the main switchboards to enable future temporary generator connections.

4.3.6 COMMUNICATIONS INFRASTRUCTURE

One main Communication Room will be located in basement 01 level and will house all the head end communications equipment. Refer to the attached spatial mark up for indicative locations.

To accommodate for the long distances from racks in the main communications room to the high levels in each of the four building, it is proposed to install a small rack in the communications cupboards of each building at Basement 01 level.

Common phone lines will be derived from the NBN network or alternative supplier.

A secondary Communications room is proposed in Basement 01 subject to final security and communication strategy.

4.3.6.1 TELECOMMUNICATIONS PROVIDER

The Client will not go with NBN. An alternative supplier will be used as the communications provider for the site. A fibre to the building (FTTP) connection is proposed for the building, with the required head end infrastructure provided in the main communications room located in B1.

4.3.7 INTERNAL LIGHTING

The buildings will be provided artificial lighting to the requirements of NCC2019 and that of the Australian standards.

All luminaries will require LED flicker free drivers with a minimum CRI of 80.

To meet Greenstar requirements 11.1, the internal lighting will meet the required lighting levels as defined by AS 1680. The maintained illuminance values must achieve a uniformity of no less than defined in Table 3.2 of AS 1680.1:2006, with an assumed maintenance factor of 0.8.

4.3.8 EXTERNAL LIGHTING

The park will be provided with external lighting to meet lighting levels as per council, Greenstar and/or client requirements to be defined later in the project. Lighting will likely be designed to a designated P-category as defined by council and in accordance with AS 1158.

To meet Greenstar requirements, all external lighting will meet the obtrusive lighting requirements as per AS 4282 and ensure an upward light waste ratio of no higher than 5%.

4.3.9 LIGHTING CONTROL

Lighting control to allow occupants to turn lights on/off and adjust the light levels will be provided to meet Greenstar credit 11.3. This will be in the form of 240V light switches and dimmers within apartments.

Motion detectors with time clock will be installed in common areas to meet NCC Section J requirements.

All external lighting will be controlled by photoelectric cell / timeclock.

4.3.10 SOLAR

The development has committed to producing 5% of the project's energy demand (upon completion) for onsite renewable energy sources. Currently this is planned to be met with a power purchase agreement (PPA) for the site which will ensure electricity supplied to the development is from a renewable source. Refer to Schedule 7 for further details.

Solar photovoltaic (PV) systems will be installed on the roof of each building to reduce the development energy demand as described in the ESD report (prepared by ESD consultant). There is 1400m² of available roof space for solar PV panels in order to contribute to the 5% energy reduction. The solar PV panels will supplement the 5% reduction requirement given the amount of available roof space to satisfy Schedule 7 requirements. The main method to satisfy Schedule 7 is through a PPA from a renewable source.

If the total 1400m² of available roof space was used for solar, a 180 kWp system could be installed. This would generate approximately 229,860 kWh/year.

Solar panels shall be oriented towards north as much as possible to maximize electricity generation during the middle of the day. The solar panels should also be located away from objects which may cause shading.

The solar PV system shall be connected back to the main switchboard via a sub-main to the common area section. The voltage rise between the solar PV system and the MSB must be no greater than 1% of the voltage.

The solar system will also have an independent monitoring system (such as Solar Analytics) to provide real time monitoring data. Communications shall be via a standalone 3G/4G connection with SIM card.



Figure 1: Example Solar PV Panels

4.3.11 ELECTRIC VEHICLE CHARGERS

Electric vehicle chargers are proposed for the development. Indicative proposal is for 10% (43 spaces) of the residential car spaces within the precinct development to have EV chargers installed. EV chargers will be freestanding within the basement residential car park.

Due to the number of electric vehicle chargers, a load management system (LMS) will be required as part of the installation. The LMS monitors the power consumption of the chargers and limits the impact on the electric installation by distributing the available energy between all the connected vehicles. If the available energy is not enough for all connected vehicles, the system allocates priorities by turning the charging on and off the vehicles simultaneously. This measure will help limit the maximum demand of the site if a significant number of EV chargers are installed.

The electric vehicle charging system will be arranged that a third-party operator will be able to adopt the EV infrastructure and billed via a revenue meter located in the switchroom. The operator would then be able to generate revenue via the individual EV charger units.

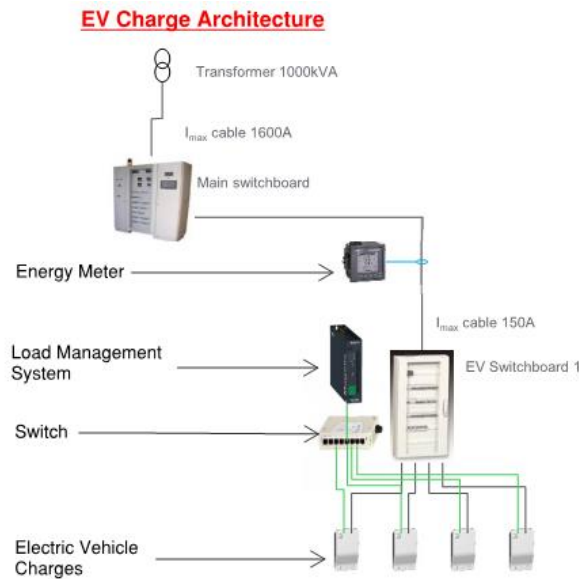


Figure 2: Typical EV Charger Schematic

4.3.12 EMBEDDED NETWORK

This site is proposed to be set up as an embedded network through an embedded network service provider. The developer will be required to engage an embedded network service provider to manage the billing, maintenance and servicing of the electrical infrastructure which form the embedded network. The embedded network service provider is entitled to on-sell electricity to tenants at a competitive rate. It is proposed for each site's main switchboard to be designed with a gate meter.

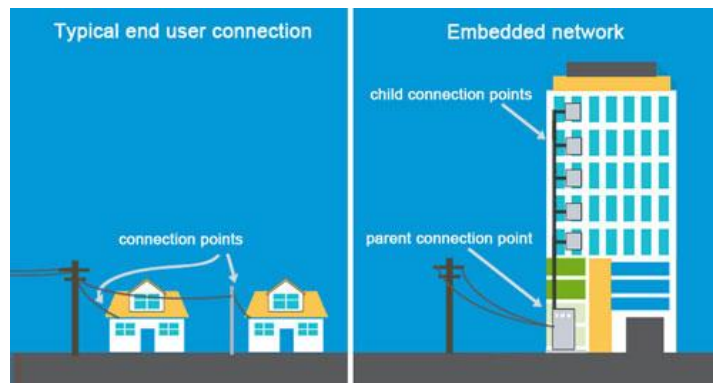


Figure 3: Embedded Network Arrangement

4.3.13 METERING ARRANGEMENTS

Two types of electrical metering will be provided:

- Electricity revenue grade metering, to enable billing by the electricity retailer/embedded network service provider;
- Private multi-function digital metering, to enable private monitoring of energy use in accordance with the requirements of NCC-BCA Part J8.

The following embedded network metering is proposed to consist of:

- Gate meter per MSB;
- Apartment sub-meters;
- Common area house meters as per strata plan;
- Retail meters;
- Supermarket meter

Private digital metering will generally be included on the outgoing supplies for the following load types in accordance with Section J of the NCC:

- Lifts;
- Mechanical Plant;
- Hydraulic Plant;
- Lighting circuits;
- Small general power circuits;
- Additional areas as defined in Part J8 of NCC-BCA.

All meters will be accessible and capable of monitoring building consumption as per Greenstar requirements.

An energy management system capable of capturing and processing data produced by the installed energy and water meters, and accurately and clearly presenting data consumption trends will be installed to meet Greenstar requirements.

4.3.14 LIGHTNING PROTECTION

A lightning protection system shall be provided in accordance with local standards as required from the lightning protection assessment as required.

4.3.15 ELECTRONIC ACCESS CONTROL

An electronic access control system shall be provided interlinked to the intercom system.

Main control panels shall be located in the building main communications room.

The system shall use proximity cards of the HID type and strategically located in the following areas:

- Lift call buttons
- Garbage room
- Communications rooms
- Switch rooms
- Residential entries/building entrances (main entrance of each building)
- Lobby entrances
- Strata/Building Managers office
- Residential Car park entrance

The system shall be capable of access for residents, building staff and residential cleaning services. Logging of entry against Key numbers shall be provided.

The access control systems shall be provided with an interface to all access controlled:-

- Auto doors
- Roller doors/shutters
- Any other door of the like
- Lifts

4.3.16 CCTV SURVEILLANCE

An IP Closed Circuit Television (CCTV) system shall be provided to the development. The system shall be a colour system with digital recording of events up to 30 Days. Headend CCTV hardware shall be located within the building main communications room.

All internal cameras shall be within domed housings semi recessed to the ceilings. External cameras shall be in weatherproof anti-vandal enclosures.

Camera locations proposed shall be -

- Vehicle Entries
- Main Buildings' Entrances

- General carpark
- Lift Lobbies on Basement Levels
- Lift Lobbies on each building entrance floor.
- Through site link
- Pedestrian pathways

4.3.17 BASE BUILDING SMOKE DETECTION SYSTEM

The Main Fire Indicator Panel (MFIP) will be located centrally with the Alarm Signalling Equipment (ASE). The ASE will have multiple outputs to ensure the fire brigade are notified which building to attend to prior attending the site.

A Sub Fire Indicator Panel (SFIP) will be provided to each tower located on the ground floor lobbies and the supermarket.

A smoke detection system will comprise of a site wide network connected to each Fire Indicator Panel (FIP) located within the main lobby area of each tower. All SFIP's will be networked back to the MFIP.

The smoke detection system will interface with mechanical, electrical and security systems to provide signals that initiate operation of the respective hazard management systems e.g. equipment shutdown, BMS, door security.

The fire alarm system will interface with wet fire system components to provide monitoring and annunciation functions per the requirements of the relevant respective Australian Standards.

4.3.18 EMERGENCY WARNING & INTERCOM SYSTEM (EWIS)

The Emergency Warning and Intercom Systems (EWIS) will be controlled by a Master Emergency Control Panel co-located with the MFIP.

Sub Emergency Warning and Intercom System Panels will be provided to each building and supermarket networked back to the MECP.

Occupant warning speakers will be provided throughout the buildings in accordance with AS 1670.4-2018 including throughout sole occupant units to provide sound pressure levels and speech intelligibility in accordance with code requirements.

Warden Intercommunication Phones (WIPs) will be provided throughout to each alarm zone.

4.4 APARTMENT ELECTRICAL ARRANGEMENTS

4.4.1 SUBMAINS AND METER PANELS

Apartment metering will be located within the electrical riser cupboard on a meter panel per floor. Sub-mains for each apartment will be sized to meet the apartment load and will originate reticulation from the meter panel. Reticulation of sub-mains is to be through the ceiling space to each apartment's local consumer unit.

4.4.2 APARTMENT LIGHTING AND POWER

Each apartment shall be provided with lighting and power circuitry from a local consumer unit. All general power and lighting circuits shall be fitted with RCD protection to the requirements of AS/NZS 3000:2007.

Lighting will be provided for all interior and exterior spaces and will be designed to coordinate and enhance any architectural features as required. Each room in the unit will have suitable light points provided.

A single point of isolation shall be provided within each consumer unit for the local apartment mechanical system (i.e.: AC unit and exhaust fans) to comply with AS3000.

4.4.3 APARTMENT COMMUNICATION

Provision by way of conduits, ducts and cable paths are proposed for the cabling system for the alternative supplier. The NTD would permit connection of internet media and connection of phones.

4.4.4 MATV AND FOXTEL / PAY TELEVISION

A Foxtel compliant cabling system will be proposed for all buildings.

4.4.5 AUDIO INTERCOM

An audio digital intercom, IP-backbone system will be installed to each apartment

4.4.6 DRY FIRE

Each unit will be cabled with smoke alarms to the requirements of the BCA and AS3786.

5 TENANCY ELECTRICAL PROVISIONS

5.1 RETAIL TENANCY PROVISIONS

Retail tenancies will have provisions for a cold shell fit-out. A cold-shell provisions for the basic essential services connected to the base building (minimum safety circulation lighting, emergency lighting, smoke detection and emergency sounds system). This will enable a tenant to complete their fit-out at a later date once the base building has reached practical completion.

5.1.1 ELECTRICAL

Retail tenancies will be provisioned with a 100A 3 phase supply from the retail switchboard. This may be increased depending on size of the tenancy and will be finalized at a later stage in the project. Supply Authority metering will be installed on combined retail meter panels located within the switchrooms. Metered power supply will be provided/ terminated onto dedicated distribution boards located within the Retail tenancies.

Basic exit sign, emergency lighting, and lighting for safe movement will be provided to each cold shell tenancy.

5.1.2 COMMUNICATION

A separate fibre connection and associated NTD's will be allowed for each of the future Retail tenancies. Location of the NTD's for these tenancies will be determined at later stage of the project.

5.1.3 SECURITY

Conduit to tenant entry door concealed within wall for future electric strike installation. Day 1 to have keylock only.

5.1.4 FIRE

Fire detection system will be provided and zoned to each tenancy. The zone can be isolated from the fire indicator panel to prevent false alarms or trips to the network during construction of the fitout. The FIP will have 25% extra capacity for additional detectors if required for future fit outs. The individual smoke detectors will be provided with a 3m tail coiled up at high-level for future relocation.

5.2 FOOD AND BEVERAGE TENANCY PROVISIONS

Food and Beverage tenancies will have provisions for a cold shell fit-out. A cold-shell provisions for the basic essential services connected to the base building (minimum safety circulation lighting, emergency lighting, smoke detection and emergency sounds system). This will enable a tenant to complete their fit-out at a later date once the base building has reached practical completion.

5.2.1 ELECTRICAL

Food and beverage tenancies will be provisioned with a minimum 100A 3 phase supply from the retail switchboard. This may be increased depending on the size of the food and beverage tenancy and will be finalised at a later stage in the project. Supply Authority metering will be installed on combined retail meter panels located within the switchrooms. Metered power supply will be provided/ terminated onto dedicated distribution boards located within the Food and Beverage Retail tenancies.

Basic exit sign, emergency lighting, and lighting for safe movement will be provided to each cold shell tenancy.

5.2.2 COMMUNICATION

A separate fibre connection and associated NTD's will be allowed for each of the future Food and Beverage tenancies. Location of the NTD's for these tenancies will be determined at later stage of the project.

5.2.3 SECURITY

Conduit to tenant entry door concealed within wall for future electric strike installation. Day 1 to have keylock only.

5.2.4 FIRE

Fire detection system will be provided and zoned to each tenancy. The zone can be isolated from the fire indicator panel to prevent false alarms or trips to the network during construction of the fitout. The FIP will have 25% extra capacity for additional detectors if required for future fit outs. The individual smoke detectors will be provided with a 3m tail coiled up at high-level for future relocation.

5.3 SUPERMARKET PROVISIONS

The supermarket tenancy will have provisions for a cold shell fit-out. A cold-shell provisions for the basic essential services connected to the base building (minimum safety circulation lighting, emergency lighting, smoke detection and emergency sounds system). This will enable a tenant to complete their fit-out at a later date once the base building has reached practical completion.

5.3.1 ELECTRICAL

The supermarket will be provisioned with a 1000A 3 phase supply from the retail switchboard with supply authority CT metering within the main switch-room. If the supermarket brief requests an essential supply, a separate dedicated sub-main will be installed from the essential section of the main switchboard to the supermarket.

Allowance for generator space will be provided to the supermarket outside the supermarket footprint in an accessible location for fuelling and maintenance.

5.3.2 COMMUNICATION

A separate fibre connection and associated NTD's will be allowed for the future supermarket tenancy. Location of the NTD's for these tenancies will be determined at later stage of the project.

5.3.3 SECURITY

Conduit to tenant entry door concealed within wall for future electric strike installation. Day 1 to have keylock only.

5.3.4 FIRE

Fire detection system will be provided and zoned to each tenancy. The zone can be isolated from the fire indicator panel to prevent false alarms or trips to the network during construction of the fitout. The FIP will have 25% extra capacity for additional detectors if required for future fit outs. The individual smoke detectors will be provided with a 3m tail coiled up at high-level for future relocation.

5.4 RADIOLOGY PROVISIONS

The radiology tenancy will have provisions for a cold shell fit-out. A cold-shell provisions for the basic essential services connected to the base building (minimum safety circulation lighting, emergency lighting, smoke detection and emergency sounds system). This will enable a tenant to complete their fit-out at a later date once the base building has reached practical completion. Supply Authority metering will be installed on combined retail meter panels located within the switchrooms. Metered power supply will be provided/ terminated onto the MSB of the radiology.

5.4.1 ELECTRICAL

The radiology will be provisioned with a 400A 3 phase supply from the retail switchboard with supply authority CT metering within the main switch-room. Final supply arrangements to be confirmed with the incoming radiology tenant.

5.4.2 COMMUNICATION

A separate fibre connection and associated NTD's will be allowed for the future radiology tenancy. Location of the NTD's for these tenancies will be determined at later stage of the project.

5.4.3 SECURITY

Conduit to tenant entry door concealed within wall for future electric strike installation. Day 1 to have keylock only.

5.4.4 FIRE

Fire detection system will be provided and zoned to each tenancy. The zone can be isolated from the fire indicator panel to prevent false alarms or trips to the network during construction of the fitout. The FIP will have 25% extra capacity for additional detectors if required for future fit outs. The individual smoke detectors will be provided with a 3m tail coiled up at high-level for future relocation.

1 MECHANICAL SERVICES

1.1 SUSTAINABILITY TARGET

1.1.1 BASIX

Mechanical services to the residential portion of the development shall meet the requirements as identified within the site specific BASIX report (by others). And will incorporate, but not limited to the following;

- Air conditioning systems serving apartments to match or exceed the minimum star rating as identified within the BASIX report;
- Air conditioning to be provided to both Living area and bedrooms;
- Mechanical ventilation to bathrooms/laundries and kitchen hood;
- Supply ventilation to be provided to lobbies;
- Air conditioning to Comms rooms;
- Main switchroom to be provided with mechanical ventilation;
- Garbage rooms and loading dock to be provided with mechanical ventilation and
- Car park ventilation system to be provided with VSD's and CO monitoring.

1.1.2 GREENSTAR

The Client is aiming to achieve a Greenstar Communities rating for this development. Initiatives which the Client is aiming to achieve specific to Mechanical Services include:

Credit Code	Requirement	Description
6.0	Metering	To qualify for this credit, it is a minimum requirement that accessible metering be provided to monitor building energy and water consumption including all energy and water common uses, major uses and sources. The metering is to be accurate and to inform energy consumption practices and reduced wasted energy.
6.1	Monitoring Systems	1 point is available where a monitoring strategy is addressed through a monitoring system, capable of capturing and processing data produced by the installed energy and water meters, and accurately and clearly presenting data consumption trends.
9.1	Exhaust or Elimination of Pollutants	For this option, specified sources of pollutants shall be exhausted directly to the outside of the project in accordance with a recognised Standard; and/or physically separated from occupants.
20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1 point is available where at least 95% (by cost) of all permanent formwork, pipes, flooring, blinds and cables in a project either: <ul style="list-style-type: none">- Do not contain PVC and have a recognised product declaration; or- Meet the GBCA Best Practice Guidelines for PVC Where the cost of PVC products in the project is less than 1% of the Project Contract Value, this criterion is made "Not Applicable".

1.1.3 CLIMATE CHANGE AND COMMUNITY RESILIENCE ASSESSMENT

As part of the Climate Change and Community Resilience Assessment, the following requirements are to be incorporated within the design:

Assessment Type	Variable	Adaptation and resilience actions (planned and recommended)
Climate Change Risk Assessment	Extreme heat	Ensure that procurement of equipment (e.g. HVAC, cables) caters to higher operating temperatures and extreme heat events (e.g. design to 2030 temperatures).
Climate Change Risk Assessment	Solar radiation	Ensure that critical equipment / plant is not sited with direct solar exposure and if required, that they can account for projected future increases in ambient temperature (e.g. design rating for 2030 temperatures).
Climate Change Risk Assessment	Extreme rainfall	Ensure that critical systems are housed either on the roof or if required in the basement that appropriate flood protection is provided (e.g. elevating critical infrastructure, providing flood barriers).

1.2 Design Criteria

1.2.1 EXTERNAL DESIGN CONDITIONS

Location: Castle Hill, NSW

Summer: 37.5 °C dry bulb, 23.5 °C wet bulb

Winter: 1.0°C dry bulb

Climate Zone: 5

1.2.2 INTERNAL DESIGN CONDITIONS

The following values will be applied to the design, with assessment for modification as noted. These have been prepared in the absence of room data sheets being available. Table simplified to suit general primary areas.

Room	Occupancy (m ² /person)	Internal Design Temp (Cooling Mode °C)**	Relative Humidity (%)	Min. Outside Air (l/s/person)	Exhaust Air L/s)	Lighting and Small Power (W/m ²)****
Residential Units	Number of bedrooms +1	23 ± 2.0	Typically 40 – 60	10L/s per person or natural ventilation	N/A	20
Apartment Laundry cabinet	N/A	NC	NC	N/A	40 L/s	N/A
Apartment Bathrooms	N/A	NC	N/C	N/A	35 L/s	N/A
Apartment Kitchens	N/A	NC	N/C	N/A	Subject to range hood used.	N/A
Communal Kitchens	N/A	NC	NC	To match Kitchen Exhaust	1250 L/s per kitchen	N/A
General WC	N/A	NC	NC	N/A	10 l/s/m ² or 25 l/s per fixture	N/A
Corridors, foyer, lobbies and general circulation	N/A	NC	NC	Higher of 1L/s per m2 area or 20L/s when gas meter cupboards are opening to lobby	N/A	N/A
End Of Trip Facilities	As per furniture layout	22.5 ± 1.0	Typically 40 – 60	10	10 l/s/m ² or 25 l/s per fixture	25
Commercial Tenancies	10 or as per furniture layout	22.5 ± 1.0	Typically 40 – 60	10	N/A	25
Commercial Tenancy Kitchen Exhaust Allocations	-	-	-	To match Kitchen Exhaust	2500 L/s per kitchen	-
Retail Tenancies	1.5 or as per furniture layout	22.5 ± 1.0	Typically 40 – 60	10 or to match Kitchen Exhaust if required	2500 L/s per food tenancy	20
Plant Rooms Generally	N/A	NC	NC	N/A	5 l/s/m ² (TBC depending on equipment	N/A

					type)	
Garbage Rooms	N/A	NC	NC	N/A	5 l/s/m ² (100 l/s min.)	N/A
Comms Room	1	22.5 ± 1.0	Typically 40 – 60	10	N/A	TBC
Switchroom	N/A	TBC	NC	5 l/s/m ²	N/A	TBC
Fire Pump Room	N/A	TBC	NC	TBC	TBC	TBC
Loading Dock	N/A	NC	NC	N/A	3000 L/s	N/A

NC = Not Controlled

- No humidity control will be provided. The relative humidity range is generally achieved as a result of mechanical cooling.
- Temperature control range relates to temperature at the point of control.
- Air conditioning sizing is based on the upper limit of the range i.e. 23 + 2 = 25 degrees. On design days in summer the internal temperature is expected to be up to 25 degrees.
- Lighting allowances only applicable to the mechanical system capacity and are not reflective of actual lighting design.
- Acoustic requirements as per acoustic consultant's report.
- Ventilation of plant rooms (including switchrooms) will be further assessed when the equipment contained within them is advised. This will also determine requirement for air conditioning.
- Ventilation of fire pump room is subject to the final pump selection.

1.2.3 FABRIC PERFORMANCE

The Building Fabric is required to be designed and installed to meet or exceed the requirements of BCA section J. Details to be confirmed by the architectural team for the purpose of heat load calculation. Recommendations from the BASIX report are to be taken into consideration

1.3 SMOKE CONTROL

1.3.1 STAIR PRESSURISATION AND LOBBY RELIEF

Stair pressurisation will be provided to main fire isolated scissor stairwell serving the residential portions of the buildings and all stairwells serving the basement car parking that extend more than 2-storeys below ground.

Lobby relief will be provided to serve the Residential portion of the buildings where stair pressurisation is to be provided.

JHA notes that to comply with AS1668.1, the stair pressurisation system serving the Residential portion of the buildings has to be tested with all doors to a single fire compartment and one adjacent fire compartment being open and doors to the fire compartment tested achieving air velocities of 1m/s averaged across the door.

With regards to the car park stair pressurisation systems JHA notes that to comply with AS1668.1, the system requires to be tested with all fire exit doors open to the fire compartment tested achieving air velocities of 1m/s averaged across the door. It is noted that large air flow rates will be required to satisfy this requirement. A Fire Engineer's recommendation will be required and identified within their report that an alternative solution can be provided, limited to the system

being tested with all doors to a single fire compartment and one adjacent fire compartment being open and doors to the fire compartment

Associated Stair pressurisation and lobby relief fans will be located at roof level of each tower. Dedicated riser shafts will extend through each building to serve the stairs to basement car parking level and within the Residential portions of the buildings to ground level for stair pressurisation and level 1 for lobby relief. Lobby relief risers to be provided with sub-ducts at each level, with the exception of the lowest level. Location of lobby relief air intakes shall be located away from the stairwell point of discharge.

Car park exhaust system and garbage collection room exhaust system are to operate during the fire event and provide relief for stair pressurisation systems. Therefore, these systems have to be designed as smoke spill systems, including but not limited to fire separation to any other space and system, with the exception of the space they serve.

1.3.2 SMOKE CONTROL / ZONE PRESSURISATION

Smoke exhaust/zone pressurisation system is required to serve the podium levels serving containing retail and commercial tenancies; due to the difficulties in providing the spatial provisions for these systems a Fire Engineered solution is likely to be provided to rationalise the need for zone pressurisation / smoke control.

Dedicated smoke exhaust fans will be located at building roof level serving each commercial/retail level via a dedicated fire rated riser. Smoke exhaust will be discharged vertically above roof level of the building served at a minimum horizontal distance of 8m from any air intakes, building or natural ventilation openings to comply with the requirements of AS1668.1.

At the SSDA stage the fire engineer has indicated that the large central void above the travelators serving the basement level car parks will be required to be provided with a smoke exhaust system as part of a fire engineering solution. Motorised dampers and/or baffles will be installed as per the intent of the fire engineering solution for the podium shopping mall. 2-off dedicated riser shafts have been allocated for the provision of smoke exhaust from this void. Make-up air is nominated to be provided by operable/ motorised louvres on the façade of the podium mall, supplemented by the air conditioning systems serving the podium level retail and commercial tenancies.

Finalised smoke exhaust flow rates and operational requirements will be as per the Fire Engineers report and recommendations.

The toilet exhaust system will shut down automatically in fire mode and any outside air relief dampers fully close on all commercial/retail floors.

1.3.3 SMOKE CONTROL – CHILDCARE TENANCY

The large childcare commercial tenancy will likely require a smoke purge system.

A dedicated smoke exhaust fans will be located at building roof level serving the tenancy via a dedicated fire rated riser. Smoke exhaust will be discharged vertically above roof level of the building served at a minimum horizontal distance of 8m from any air intakes, building or natural ventilation openings to comply with the requirements of AS1668.1.

Finalised smoke exhaust flow rates will be as per the Fire Engineers report and recommendations.

1.3.4 SMOKE/FIRE DAMPERS

Smoke/fire dampers will be documented in compliance with AS1668.1.

1.3.5 FIRE FAN CONTROL PANEL

Fire Fan Control Panel is commonly part of Fire Indicator Panel (FIP) and designed by Dry Fire Services Consultant. This will be covered as part of Dry Fire Services design, with all the input information on fans and mode of operation provided by Mechanical Consultant.

Where required fire control room will be provided with a dedicated outside air supply and exhaust, ensuring the supply exceeds the exhaust rate.

1.4 MECHANICAL SYSTEMS DESCRIPTION

1.4.1 APARTMENTS

1.4.1.1 Air conditioning

Air conditioning will be provided for all apartments and to serve the Living room as a minimum and shall comply with BASIX report.

Air conditioning will be provided for all apartments and include the following;

1. All studio and 1, 2 & 3-bed units will be provided with bulkhead mounted multi-split air conditioning units to serve the Livingroom and Master bedroom. Units to be located within bulkheads located above the Kitchen and bedroom robe. Access will be provided for maintenance to each unit.
2. Affordable Housing Units to have a DX wall mounted split system within the living room only. Indoor unit will be located on a wall within the living area – final location to be determined with proposed furniture layout

The associated outdoor air conditioning units will be located on the balcony of the unit served and set back away from the balustrade to minimise climbing risk/hazard (final location to be reviewed and approved by PCA).

Refrigerant pipework between indoor and outdoor unit to be reticulated within the ceiling space or wall. It is not expected that bulkheads will be required for this installation, however, this is subject to detailed design. Condensate discharge for the outdoor unit to run to a floor waste located beneath the unit. Condensate discharge for indoor unit is proposed to either be reticulated back to the balcony to a tundish or provide a tundish within the apartment in one of the wet areas. Connection between condensate drain and the tundish has to be accessible for inspection purposes. Design intent is to have gravity run for condensate, without using pumps. Floor wastes and tundishes to be designed by hydraulic consultant and installed by hydraulic trade. It is responsibility of the hydraulic consultant to confirm whether or not the local Council allows discharge of condensate into storm water system or if discharge to sewer is required.

AC units are to be controlled via either a wireless remote controller, including a cradle installed on the wall for storing the controller or a wired wall mounted controller. The controller shall allow the end user to select temperature, mode and fan speed as minimum, but can include timer, fin control and other functions if required.

Internal blinds

The use of internal blinds to reduce solar loads is recommended however the air conditioning unit sizing will assume that internal blinds are not deployed. It is noted however that the use of internal blinds is crucial to allow building occupants to maximise their comfort levels. Occupants exposed to direct sun will feel warmer due to the radiative effects of the sun. These effects are not offset by air conditioning.

1.4.1.2 Kitchen / Kitchenette exhaust in Apartments

It is proposed that ducted kitchen exhaust with horizontal discharge with individual fan per dwelling will be provided. It is advised that exhaust discharges are horizontally mounted to minimise the effects of wind pressure on the upper levels. Depending on the duct run and the effects of wind pressure on upper levels, additional booster fan may be required for the exhaust, interlocked with the kitchen hood. It's up to the kitchen hood supplier to provide connection on the hood for this fan.

It is very likely that lowered ceilings and/or bulkheads will be required for installation of the systems.

1.4.1.3 Toilet/Laundry Exhaust in Apartments

The bathrooms and ensuites will be provided with ducted extract with horizontal discharge to the facade of each apartment. It is advised that exhaust discharges are horizontally mounted to minimise the effects of wind pressure on the upper levels.

Toilet extract ducting will be combined with laundry exhaust (as allowed by AS1668.2)

Where applicable, a single fan will be provided for the whole system, with dedicated grilles within each enclosure served (toilet/bathroom/laundry). There will be a separate on/off switch within each enclosure served by the system to start and stop the fan.

No interlocks with lights or driers or run-on-timer will be provided for the system.

Toilets/bathrooms will not be air conditioned.

It is very likely that lowered ceilings and/or bulkheads will be required for installation of the systems.

1.4.1.4 Outdoor air to apartments

Outside air will be provided to apartments if requested by the Acoustic Consultant; otherwise apartments will be naturally ventilated through the use of operable windows and balcony doors.

Where a dedicated outside air system is to be provided, the system will include an intake grille on the façade, acoustic ductwork, fan and supply air grille within the apartment. The full amount of the outside air for the apartment (to meet AS1668.2 compliance) will be supplied in the living room. Undercuts or transfer grilles will allow this air to spread to bedrooms as required. Where ducted air conditioning systems are provided, outside air will be supplied directly into the air conditioning unit.

The fan shall be controlled manually, with on/off switch located within the living area where air conditioning systems comprise of wall mounted DX or bulkhead mounted multi-split units. Interlocks will be provided to the ducted air conditioning units only. No run-on-timers will be provided.

It is very likely that lowered ceilings and/or bulkheads will be required for installation of the systems.

1.4.1.5 Outdoor air to Lift lobbies

Where natural ventilation to lobbies cannot be provided, outside air will be provided via a dedicated system serving all lobbies that open to the same lift, with fan on the roof or within the lobby ceiling space of the top floor and vertical duct riser. Air will be distributed to each lift lobby via ceiling grilles.

To allow for make-up air for gas meter cupboards exhaust and still keep lobbies on positive pressure, some supply air quantities are increased to minimum 20L/s per floor.

Where there is an opportunity to naturally ventilate lobbies, a minimum opening area of 5% of the floor area will be provided through the use of an operable window or door.

1.4.2 COMMERCIAL TENANCIES

1.4.2.1 WCs

Toilets and bathrooms will be provided with a ducted exhaust system with discharge on the façade or roof level.

Ventilation fan operation will be via a pre-programmed time schedule.

1.4.2.2 Outside Air

Outside air supply is proposed to be through façade via weatherproof louvres. Duct will be connected to each AC unit serving its corresponding commercial tenancy.

1.4.2.3 Air Conditioning

Each tenancy will be air conditioned via water cooled packaged fan coil units (FCU's). Fan coil units will be located and capacities sized on perimeter and centre/south zones. Outside air will be ducted directly to each fan coil unit. Localised after-hours switching will be provided to each tenancy.

Main plant will serve both the Commercial and Retail portions of the buildings. Cooling towers, boilers, associated pumps and equipment shall be located at roof level within dedicated plant enclosures. Condenser and heating hot water pipework shall reticulate from roof level to serve FCU's within dedicated fire rated risers. Each tenancy will be provided with condenser and heating hot water metering for energy and billing purposes.

1.4.2.4 Comms room

Comms room will be ventilated in accordance with minimum Code requirements. Depending on the equipment load, this amount of air may be increased to allow for heat rejection of the equipment, with relief into car park. Alternatively, and for very high equipment loads, an air-cooled split system may be provided for cooling 24/7, with wall mounted indoor unit and condenser unit in the car park.

1.4.2.5 General Exhaust

Provision for general exhaust will be provided to ensure flexibility of use of the tenancy. General exhausts will discharge at the façade.

1.4.3 COMMUNAL FACILITIES

1.4.3.1 WCs

Toilets and bathrooms will be provided with a ducted exhaust system with discharge on the façade or roof level.

Ventilation fan operation will be via a pre-programmed time schedule.

1.4.3.2 Kitchen

Each communal kitchen will be provided with dedicated kitchen hood exhaust provision. Dedicated fire rated risers will be provided and extend from retail levels to discharge above roof level. Associated kitchen exhaust fans will be located at roof level.

1.4.4 RETAIL TENANCIES

1.4.4.1 WCs

Toilets and bathrooms will be provided with a ducted exhaust system with discharge on the façade or roof level.

Ventilation fan operation will be via a pre-programmed time schedule.

1.4.4.2 Outside Air

Ducted outside air will be provided to each individual tenancy to comply with the requirements of AS1668.2 and to provide make-up air for the kitchen exhaust system. Outside air will be ducted directly from individual tenancy facades.

1.4.4.3 Kitchen Exhaust

Each food tenancy will be provided with dedicated kitchen hood exhaust provision. Dedicated fire rated risers will be provided and extend from retail levels to discharge above roof level. Associated kitchen exhaust fans will be located at roof level.

1.4.4.4 Drycleaners

The basement level drycleaners shall be provided with dedicated exhaust and make-up air provisions. A Dedicated fire rated riser will be provided and extend through the retail levels to discharge above roof level. Dedicated make-up air provisions shall be reticulated from the façade on the retail levels above.

1.4.4.5 Air Conditioning

Each tenancy will be air conditioned via water cooled packaged fan coil units (FCU's). Fan coil units will be located and capacities sized on perimeter and centre/south zones. Outside air will be ducted directly to each fan coil unit. Localised after-hours switching will be provided to each tenancy.

Main plant will serve both the Commercial and Retail portions of the buildings. Cooling towers, boilers, associated pumps and equipment shall be located at roof level within dedicated plant enclosures. Condenser and heating hot water pipework shall reticulate from roof level to serve FCU's within dedicated fire rated risers. Each tenancy will be provided with condenser and heating hot water metering for energy and billing purposes.

1.4.5 RADIOLOGY PROVISIONS

1.4.5.1 Air Conditioning

The radiology tenancy shall be air conditioned via water cooled packaged fan coil units (FCU's). Fan coil units will be located and capacities sized on perimeter and centre/south zones. Outside air will be ducted directly to each fan coil unit. Localised after-hours switching will be provided to the tenancy.

Air conditioning provisions will come from the same base building plant as retail and commercial tenancies.

1.4.5.2 Specialist Equipment

Allowances are to be made for the installation of the following equipment:

- Ultrasound;
- CT Scanner;
- X-Ray, and
- MRI Scanner.

The MRI scanner will have dedicated chiller plant for the cooling of both the equipment and control room. Three scenarios are proposed:

- A dedicated air-cooled chiller located on the development roof with chilled water pipework reticulated to the radiology tenancy via a dedicated riser. CHW pumps shall be located on the roof adjacent to chiller plant;
- A dedicated water-cooled chiller shall be located locally to the tenancy, with a dedicated cooling tower located on the development roof, with condenser water pipework reticulated to the chiller via a dedicated riser. CW pumps shall be located on the roof adjacent to the cooling tower plant, or
- A dedicated water-cooled chiller shall be located locally to the tenancy, with a condenser water provisions provided from the base building condenser water loop. This approach requires the base building condenser water plant (cooling towers and pumps) to operate on a time schedule to match the required hours of the radiology tenancy.

Provisions are also required for the discharge of the quench pipe from the MRI scanner. The quench pipe is proposed to discharge at the façade of the radiology tenancy and the discharge pipe cannot be located behind a grille/ louvre. The quench pipe shall discharge a minimum 4000mm above the adjacent finished ground level.

1.4.6 SUPERMARKET

1.4.6.1 Outside Air

Ducted outside air will be provided to the supermarket to comply with the requirements of AS1668.2 and to provide make-up air for the kitchen exhausts and smoke exhaust systems. Outside air will be ducted directly from the supermarket facades.

1.4.6.2 Kitchen Exhaust and General Exhausts

Dedicated kitchen hood exhaust provisions shall be provided to suit the cooking requirements of the supermarket. General exhaust systems shall also be provided for functional spaces such as the deli and sushi bar. Dedicated fire rated risers will be provided and extend from the supermarket level to discharge above roof level. Associated kitchen exhaust fans will be located at roof level.

1.4.6.3 Air Conditioning

Air conditioning to the Supermarket will be provided through the use of chilled and heating hot water air handling units (AHU) to the main retail area and ducted FCU's to all other ancillary spaces. AHU shall be located within a dedicated plantroom adjacent to the loading dock. Fan coil units will be located within ceilings and capacities sized on perimeter and centre/south zones and supermarket brief. Outside air will be ducted directly to each fan coil unit.

Chilled and heating hot water plant and associated equipment shall be located within a dedicated plant enclosure at roof level. Chilled and heating hot water pipework shall reticulate from roof level to serve AHU's and FCU's within dedicated fire rated risers.

The supermarket AC system shall be capable of providing an airside economy cycle with the required outside air drawn in from the building façade on street level (utilising space above retail tenancies).

1.4.6.4 Smoke Exhaust

Allocations have been made for the provision of dedicated smoke exhaust systems to serve the supermarket shop floor and the supermarket BOH area. Dedicated smoke exhaust fans will be located at roof level. At the SSDA stage the fire engineer has indicated that a duty/standby arrangement will be required for the smoke exhaust fans serving the supermarket shop floor as part of a fire engineering solution.

Smoke exhaust will discharge vertically at roof level. Smoke exhaust shall discharge at a minimum horizontal distance of 8m from a building/natural ventilation openings or air intakes to comply with the requirements of AS1668.1.

Where smoke exhaust fans are located at roof level, A dedicated fire rated shaft/riser will be provided from supermarket to the roof level. The supermarket BOH smoke exhaust system is proposed to share a shaft/ riser with the basement car park driveway/ ramp exhaust riser. In 'fire' mode the system shall operate as the BOH smoke exhaust system, with motorised damper positions failing to provide BOH smoke exhaust.

Make-up air shall be provided from the façade and at low level via operable louvres.

Finalised smoke exhaust flow rates will be as per the Fire Engineers report and recommendations.

1.4.6.5 Loading Dock

The supermarket loading dock will be mechanically ventilated with Carbon Monoxide (CO) control to reduce fan speed based on CO sensing. A single inline exhaust fan system shall discharge at the same location to the main carpark exhaust adjacent to the townhouses located on the podium of the development.

Make-up air will be provided via a perforated main entry roller shutter door entry.

Exhaust discharges will be via dedicated shaft up to ground level and in accordance with AS1668.2:2012 and 2.5m above trafficable areas.

1.4.7 BASEMENT

1.4.7.1 End of Trip Facilities

End of trip facilities shall be provided with amenity exhaust systems in accordance with minimum code requirements which shall discharge at roof level of the development. The change areas shall be provided with air conditioning via the use of reverse cycle DX type systems. Respective condenser units shall be located within the B1 level car park.

1.4.7.2 Garbage Rooms and Grease Arrestor

The garbage rooms and grease arrestors that are located in the basement levels will be mechanically exhausted and discharged through a dedicated shaft riser up to roof level.

1.4.7.3 Plant Room Ventilation

Plant rooms will be ventilated in accordance with minimum Code requirements or based on equipment load. Hot water heater plants will be provided with the minimum outside air requirement for combustion purposes and based on the proposed hot water equipment.

1.4.7.4 Switchroom

Switchroom will be ventilated in accordance with minimum Code requirements. Depending on the equipment load, this amount of air may be increased to allow for heat rejection of the equipment, with relief into car park. Alternatively, and for very high equipment loads, an air-cooled split system may be provided for cooling 24/7, with wall mounted indoor unit and condenser unit in the car park.

1.4.7.5 Fire pump Room

Fire pump room will be mechanically ventilated to allow for heat rejection from the fire pumps and make up air for combustion for diesel pumps. Final airflow is to be confirmed based on the pumps selection. Outside and exhaust air will be ducted from roof level. Ductwork to be fire rated when crossing outside of the pump room fire compartment; no fire dampers to be installed on supply or exhaust ductwork.

1.4.7.6 Lift ventilation/pressurisation

Lift shafts will not be pressurised. Lift shaft vents shall be located away from exhaust outlet locations by more than 6 metres (less than 6 metres need to be assessed based on the exhaust type and associated flow rates). Lift shaft vents shall be documented by the architect and installed by the builder based on drawings provided by the lift supplier.

1.4.7.7 Carpark Exhaust

The carparks will be mechanically ventilated with Carbon Monoxide (CO) control to reduce fan speed based on CO sensing. Exhaust and supply ventilation plantrooms will be provided and connect into car park supply and exhaust plenums located around the perimeter of the carpark level. Additional duct runs may be required in sections to ensure code compliant distribution of air.

Multiple supply air plantrooms shall be provided on each level of the basement carpark, each connected to the single supply air plenum which draws air in from the podium level of the development. Additional make-up air will be provided via a perforated main entry roller shutter door and supply ventilation to various spaces located within the basement level.

Multiple car park exhaust plant rooms will be located on each level of the carpark, each containing multiple fans. Exhaust discharges will be via dedicated shaft up to the podium level where the system shall discharge adjacent to the townhouses located on the podium of the development.

A dedicated car park exhaust system shall be provided for the carpark entry ramp, with make-up air drawn from the car park entry ramp onto the street. The system shall discharge via a dedicated fire rated riser at the roof level.

Exhaust discharges will be via dedicated shaft up to ground level and in accordance with AS1668.2:2012 and 2.5m above trafficable areas.

Apartment storage areas (including bicycle racks) are considered part of the carpark and will not be individually vented. It is assumed that separation of each storage area will be via open steel security mesh which allows free air movement.

1.4.7.8 BMCS

A BMCS shall be provided for base building water cooled air conditioning and hot water plant to ensure the tenant systems are able to controlled and monitored as per the operator's requirements. Base building ventilation fans shall be capable of being controlled and monitored from the BMCS. Metering and monitoring shall be provided as per Green Star requirements.

Gas meter cupboards, require either the shutdown of the gas system in case of fan failure or an alarm that can be deactivated from the location only. The final solution is to be confirmed.

1.4.8 ACOUSTIC

Acoustic requirements will be specified elsewhere by the Acoustic consultant. The Mechanical design and documentation will reflect the requirements as detailed by the acoustic consultant and will include as a minimum:

- Vibration isolation mounts on all plant
- Internally insulated ductwork
- Equipment attenuators where required
- Acoustic insulation/wrapping of equipment
- Appropriately sized ductwork and grilles