SERVICES DA REPORT

TALLAWONG STATION PRECINCT SOUTH

ELECTRICAL & MECHANICAL SERVICES

JHA

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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 and Electrical Services to be provided for the client by JHA Consulting Engineers.

2 INTRODUCTION

Tallawong Station Precinct South is a mixed use precinct wide development consisting of multi-storey residential towers and an retail/ commerical precinct with a supermarket. The development is adjacent to the nearby Tallawong Metro 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:

1. Site 1: 2 - 12 Conferta Ave, Rouse Hill Legally known as Lot 294 / DP1213279
2. Site 2: 1 - 15 Conferta Ave, Rouse Hill Legally known as Lot 293 / DP1213279
3. Total of 987 residential apartments over both sites
4. Apartment mix
    - 1-bed: 252 26%
    - 2-bed: 682 69%
    - 3-bed: 53 5%
5. 9000m² of retail and commercial;;

Site Name	1 Bed Apt	2 Bed Apt	3 Bed Apt	Apartments
Site 1				
1A1	22	28	6	56
1A2	18	36	3	57
1B1	6	33	6	45
1B2	27	79	3	109
1B3	10	49	7	66
Site 2				
2A1	34	58	3	95
2A2	1	11	0	12
2A3	1	11	0	12
2A4	15	29	2	46
2D1	14	31	0	45

2D2	16	40	4	60
2D3	11	49	7	67
2B1	22	43	2	67
2C1	29	75	5	109
2C2	2	51	2	55
2E 1	24	59	3	86

2.1 REPORT QUALIFICATIONS

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

This report has also been completed in the absence of information such as a BCA report, Fire Engineering report, BASIX Report, and Hydraulic load requirements.

2.2 KEY CLIENT DECISIONS

The following Table outlines the key decisions that need to be considered at the next stage with regards to the above disciplines that may impact the current design philosophy.

The items listed in the following table should form key areas of discussion at the next stage of design in order to limit the risk of redesign, increased costs or programme

Implications at the next stage include, but are not limited to:

Discipline	Item	Key Decision	Notes
Electrical and Mechanical	Commercial tenancy splits	Confirmation of tenancy split per level.	Consideration of smoke exhaust and zone pressurisation systems should multiple tenancies be provided on each level.
Electrical	Retail/Commercial Tenancies	Load requirements	Confirmation of load requirements for each retail tenancy (i.e Food& Beverage, retail shops etc).
Mechanical	Retail kitchen hood exhaust	Confirmation on where exhaust hoods are required and required flow rates.	Hood exhaust sizes will also impact on outside air provision to each retail tenancy.

2.3 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

3 REGULATIONS

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

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 Standards and 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
	Information technology - Generic cabling for customer premises General requirements (ISO/IEC 11801-1:2017, MOD)	AS/NZS 11801.1:2019
	Information technology - Generic cabling for customer premises Single-tenant homes (ISO/IEC 11801-4:2017, MOD)	AS 11801.4:2019
	Information technology - Generic cabling for customer premises Distributed building services (ISO/IEC 11801-6:2017, MOD)	AS 11801.6:2019
	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/CA S008
	Installation requirements for customer cabling (Wiring Rules)	AS/CA 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
	Electrical installations - Periodic verification	AS/NZS 3019
	Energy Management Programs – Guidelines for definition & analysis of Energy	AS 3596
	Interior lighting - Circulation spaces and other general areas	AS 1680.2.1
	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

4.2 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 Greenstar points include:

1. Providing a free Wireless Local Area Network at every major activity centre in the project;
2. Reducing the peak demand by 25% when compared to a reference project;
3. The project site incorporates on-site renewable energy with a production capacity of at least 5% of the project's annual electrical and thermal energy demand.

4.3 PRECINCT ELECTRICAL ARRANGEMENTS

4.3.1 Maximum Demand

Preliminary maximum demand calculations have been undertaken for each stratum as denoted in the section above based on the latest architectural drawings revision S.

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

	Maximum Demand (Amps)	Maximum Demand (kVA)
Site 1A	1624 A	1300 kVA
Site 1B	3689 A	2576 kVA
Site 2A	1277 A	886 kVA
Site 2B/2C/2E	2324 A	1613 kVA
Site 2D	1296 A	899 kVA
Total Maximum Demand	8933 A	7141 kVA
Diversity Factor	0.8	0.8
Diversified Maximum Demand	7146 A	5713 kVA

Table 1: Preliminary Maximum Demand

The following assumptions were taken for the above calculation:

- Residential A/C rated at 13A/phase per unit
- Retail load rated at 200VA/m2
- Supermarket load rated at 1000 Amps
- Communal Lighting rated at 15VA/m2
- Lift Load is 32A/ph

The above calculations were assessed on a kVA/apartment and VA/m^2 for the basement areas and are in accordance with AS3000 Table C3 and Endeavour Energy standards.

We have assessed the most recent drawings (from Rev S of the latest architectural drawings) and an A/C load of 13 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 CONSUMERS MAINS CABLING DISTRIBUTION

The Consumer Main Cables are the main power cables to supply the building main switchboards from the onsite new substations (by others).

4.3.3 MAIN SWITCHBOARD

A main switchboard is proposed for each individual stratum to serve the residential and/or retail loads within that stratum. Switchboards will be located in their individual switch-rooms within the Basement level. The switchboards will be sized to accommodate the immediate load plus allocation of spare capacity. The switchboards will be segregated into general services (essential and non-essential) and life safety services.

Typically, the switchboard will be utilised to supply power to:

- Residential apartments
- Retail/Commercial tenancies (where applicable)
- Residential stratum
- Retail/Commercial stratum (where applicable)
- Shared services stratum (where applicable)
- Lifts
- Basement carparks

Each building's house services bulk metering would be installed within the building's dedicated main switchboard. Apartments' metering will be combined in meter panels that will be installed in dedicated electrical cupboards on the Buildings' different floors. 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.

4.3.4 COMMUNICATIONS INFRASTRUCTURE

Main Communication Rooms will be located in the basement level of each individual site and will house all the head end communications equipment. Refer to the attached spatial mark ups for indicative locations.

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

4.3.4.1 TELECOMMUNICATIONS PROVIDER

The Client will not go with NBN. Thus 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.

4.3.5 INTERNAL LIGHTING

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

4.3.6 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.

4.3.7 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 entirely by fixed solar photovoltaics. Refer to Sustainability and BASIX Report for 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). It is proposed to install a solar PV system per stratum which is less than 100 kWp to avoid the requirement to register as a power plant (renewable generation exceeding 100 kW are only eligible for Large Generation Certificates). By keeping the PV system under 100 kWp, the Client is eligible for Small Technology Certificates (STCs) which can be claimed upfront from the Clean Energy Council.

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

4.3.8 ELECTRIC VEHICLE CHARGERS

Electric vehicle chargers are proposed for the development. Indicative proposal is for 10% (103 spaces) of car spaces within the precinct development to have EV chargers installed. EV chargers will be freestanding within the basement 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.

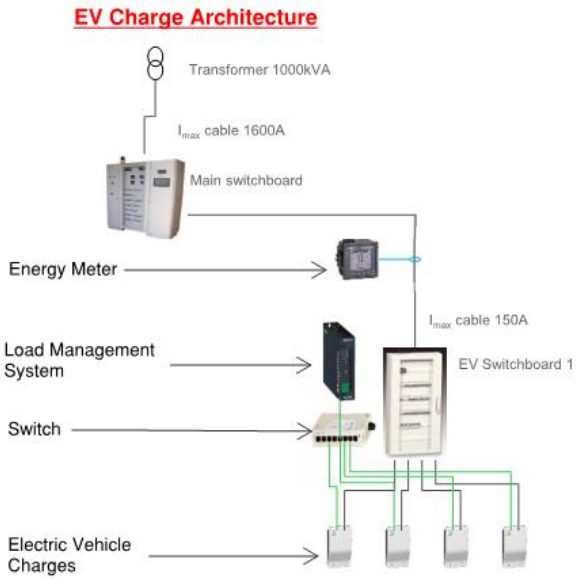

Figure 2: Typical EV Charger Schematic

4.3.9 STRATUM METERING STRATEGY

Deicorp's subdivision and stratum document will form the basis for the metering strategy of house services. A dedicated common area meter will be allocated for each stratum to enable accurate billing for that particular stratum only.

4.3.10 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.

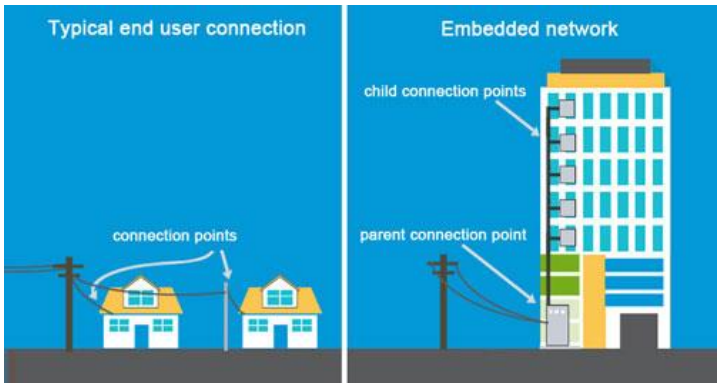

Figure 3: Embedded Network Arrangement

4.3.11 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;
- Commercial meters;
- Office 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.

4.3.12 LIGHTNING PROTECTION

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

4.3.13 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 comms room.

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

- Lift call buttons
- Garbage room
- Communications room
- Main switch room
- Residential entries building entrances (to ground floor main entrance of each building)
- Lobby entrances
- Building Managers office
- Car park entrances

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

4.3.14 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 Building Entrances
- General carpark
- Lift Lobbies on Basement Levels
- Lift Lobbies on Ground floor.
- Through site link
- Pedestrian pathways

4.3.15 BASE BUILDING SMOKE DETECTION SYSTEM

The Main Fire Indicator Panel (MFIP) will be located centrally within each individual stratum 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.

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 per stratum. All SFIP's will be networked back to the MFIP.

The smoke detection system will interface with mechanical, electrical and security systems for each stratum 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.

4.3.16 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 per stratum.

Sub Emergency Warning and Intercom System Panels will be provided to each building for each stratum 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 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 VIDEO 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. Unmetered power supply will be provided/terminated onto a dedicated distribution boards located within the Commercial/Retail tenancies. Supply Authority metering will be integrated into these distribution boards for each of the Commercial/Retail tenancies as required.

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 COMMERCIAL TENANCY PROVISIONS

Commercial 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

Commercial tenancies will be provisioned with a 100A 3 phase supply. Unmetered power supply will be provided/terminated onto a dedicated distribution boards located within the Commercial tenancies. Supply Authority metering will be integrated into these distribution boards for each of the Commercial/Retail tenancies as required.

5.2.2 SECURITY

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

5.2.3 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 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.

5.3.1 ELECTRICAL

Food and beverage tenancies will be provisioned with a minimum 200A 3 phase supply. 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. Unmetered power supply will be provided/terminated onto a dedicated distribution boards located within the Food and Beverage tenancies. Supply Authority metering will be integrated into these distribution boards for each of the Food and Beverage tenancies as required.

5.3.2 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.

5.3.3 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 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.

5.4.1 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.

5.4.2 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.

5.4.3 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.

5.5 OFFICE TENANCIES PROVISIONS

Office 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.

5.5.1 ELECTRICAL

Office tenancies will be provisioned with a 100A 3 phase supply Unmetered power supply will be provided/terminated onto a dedicated distribution boards located within the Office tenancies. Supply Authority metering will be integrated into these distribution boards for each of the Office tenancies as required.

5.5.2 COMMUNICATION

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

5.5.3 SECURITY

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

5.5.4 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.

5.6 PARK PROVISIONS

The park between site 1A and 1B will require power provision for lighting. Other power circuits required for example power outlets and irrigation controllers will be confirmed later within the project. The dedicated park switchboard enclosure housing the distribution board, time clock, fuses and authority metering will be provided for the park. This switchboard will be supplied from either site 1A or 1B main switchboard (to be confirmed at a later stage of the project).

6 MECHANICAL SERVICES

6.1 SUSTAINABILITY TARGET

6.1.1 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.

6.1.2 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:

1. Silver certification in Liveable Housing Australia certification;
2. Car park ventilation systems controlled via carbon monoxide monitoring; all associated ventilation fans to be complete with VSD's to help minimise energy consumption;
3. Installation of SMART meters to allow monitoring and interrogation of energy and water consumption;
4. Energy efficient mechanical systems to meet or exceed BASIX and/or Section J requirements and
5. Minimise potable water consumption where possible

6.2 Design Criteria

6.2.1 EXTERNAL DESIGN CONDITIONS

Location: Tallawong, NSW

Summer: 37.5 ^{o}C dry bulb, 23.5 ^{o}C wet bulb

Winter: 1.0^{o}C dry bulb

Climate Zone: 5

6.2.2 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
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
Commercial Tenancies	10 or as per furniture layout	22.5 ± 1.0	Typically 40 – 60	10	N/A	25
Retail Tenancies	1.5 or as per furniture layout	22.5 ± 1.0	Typically 40 – 60	10	N/A	20
Plant Rooms Generally	N/A	NC	NC	N/A	5 l/s/m^2 (TBC depending on equipment type)	N/A
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.

6.2.3 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

6.3 SMOKE CONTROL

6.3.1 STAIR PRESSURISATION AND LOBBY RELIEF

Stair pressurisation will be provided to main fire isolated scissor stairwell serving the Residential portion 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 has 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 risers 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.

6.3.2 SMOKE CONTROL / ZONE PRESSURISATION

Smoke exhaust/zone pressurisation system is likely to be needed to serve the Commercial/Retail tenancies; due to the difficulties in providing the spatial provisions for these systems a Fire Engineered solution could be provided to rationalise or remove 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 each level, motorised smoke dampers will be provided within the vertical section of the riser; sub-ducts will be installed into the riser at each level, with the exception of the lowest commercial/retail tenancy where a sub-duct is not required.

Grilles will be installed evenly across each floor plate to allow for smoke to be exhausted from the ceiling void. Finalised smoke exhaust flow rates will be as per the Fire Engineers report and recommendations.

As part of the zone pressurisation system, outside air will also be provided to each level complete with motorised dampers at each level.

In fire mode, the motorised smoke dampers on the smoke exhaust system will close, apart from on the fire affected floor which will fully open. Outside air dampers will remain open, apart from on the fire affected floor which will fully close to ensure the required 20Pa pressure difference between the fire affected and non-fire affected floor.

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

6.3.3 SMOKE/FIRE DAMPERS

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

6.3.4 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 provide with a dedicated outside air supply and exhaust, ensuring the supply exceeds the exhaust rate.

6.4 MECHANICAL SYSTEMS DESCRIPTION

6.4.1 APARTMENTS

6.4.1.1 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 are 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.

6.4.1.2 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.

6.4.1.3 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.

6.4.1.4 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.

6.4.1.5 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.

6.4.2 COMMERCIAL TENANCIES

6.4.2.1 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.

6.4.2.2 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.

6.4.2.3 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.

6.4.2.4 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.

6.4.2.5 General Exhaust

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

6.4.3 RETAIL TENANCIES

6.4.3.1 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.

6.4.3.2 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.

6.4.3.3 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.

6.4.3.4 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.

6.4.4 SUPERMARKET

6.4.4.1 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.

6.4.4.2 Kitchen Exhaust

Dedicated kitchen hood exhaust provisions shall be provided to suit the cooking requirements of the supermarket. 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.

6.4.4.3 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 at mezzanine level. 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.

6.4.4.4 Smoke Exhaust

A smoke exhaust system will be provided to serve the Supermarket only. Dedicated smoke exhaust fans will be located either at podium level (directly above Supermarket) or at roof level. Smoke exhaust will discharge vertically above podium level and at a minimum height of 3m above trafficable areas or at roof level. Both options discharge shall be 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, dedicated fire rated shafts/risers will be provided from supermarket to roof level.

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

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

6.4.5 BASEMENT

6.4.5.1 Garbage Rooms and Grease Arrestor

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

6.4.5.2 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.

6.4.5.3 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.

6.4.5.4 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.

6.4.5.5 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.

6.4.5.6 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 pe. Additional H2S sensors will be installed at basement levels 3, 4 & 5 to control the carpark environment not to exceed the H2S concentration limit.

Supply air fan will be located within the basement 1 plantroom, supply air will be from the façade at high level of ground floor. 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.

Car park exhaust fan will be located within the carpark exhaust plantroom located at basement 1 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.

6.4.5.7 BMCS

There is no provision for dedicated BMCS for the system. All mechanical services will be locally controlled and not monitored. A centralised controller will be considered to monitor and control the VRV/VRF air conditioning systems associated with the commercial tenancy spaces.

The exception is potentially gas meter cupboards exhaust, which requires either shut down 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.

6.4.6 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