

Frasers Greencliff  
Developments Pty Ltd

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**Frasers Broadway -  
Block 2**

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Building Services PA  
Report

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Developments Pty Ltd

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Block 2**

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Building Services PA  
Report

September 2009

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It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party

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# 1 Introduction

## 1.1 The Project

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Arup has been commissioned by Frasers Greycliff Developments Pty Ltd to provide a multidisciplinary services design for the new mixed use building known as Block 2. The building is one of several which comprise the Frasers Broadway Precinct. The services disciplines comprise:

- Mechanical Services;
- Electrical Services;
- Fire and Hydraulic Services;
- Vertical Transportation Services;

The project involves the construction of a new thirty four (34) storey mixed use building designed by Ateliers Jean Nouvel. The total building GFA is approximately 67,000m<sup>2</sup> with 55,000m<sup>2</sup> residential and 12,000m<sup>2</sup> retail above a multi-level basement car park. The building will be constructed on the Frasers Broadway precinct development in Chippendale, Sydney, NSW.

## 2 Mechanical Services

### 2.1 Standards and Regulations

All work will meet all the requirements of national and local authorities and will be in accordance with the following in so far as they apply to the work:

- Building Code of Australia and Building Permit conditions;
- Australian/New Zealand Wiring Rules AS/NZS 3000:2000;
- SAA National Plumbing and Drainage Code AS 3500;
- WorkCover for NSW;
- Worksafe at Federal Level;
- OHS regulations;
- Environment Protection Authority for relevant state;
- Australian Communications Authority (ACA);
- Gas Board Regulations for the relevant state;
- Gas Installation Code AG 601 1998;
- All applicable Australian Standards, the most relevant of which are listed below. Note that this list is not intended to be exhaustive:

Ventilation	AS 1668.2-2002
Air Filtration	AS 1324.1-2002
Smoke Management	AS 1668.1-1998
Stair Pressurisation	AS 1668.1-1998

- All Health Authority Requirements;
- AS 2118 Sprinkler code;
- State Fire Brigade requirements;
- All Local Council regulations;
- Electricity Supply Authorities;
- PA Conditions.

### 2.2 Design Criteria

#### 2.2.1 External Design Conditions

<b>Site Location</b>	
City	Sydney
Country	Australia
Latitude	33° 52' South
Altitude	0 m
<b>Outdoor Design Conditions</b>	
Summer	32.5°C DB/23°C WB
Winter	7°C DB
Cooling Tower Design	24°C WB

## 2.2.2 Internal Design Conditions

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

Room	Room Occupancy (m <sup>2</sup> /Person)	Room Temp (°C)	Relative Humidity (%) <sup>*</sup>	Min. Outside Air (l/s/person)	Lighting Load (W/m <sup>2</sup> )	Small Power (W/m <sup>2</sup> )	Noise Level (NR)**
Retail	5.0	24°C summer maximum 21°C winter minimum	40-60	To AS1668.2 minimum	75 - combined lighting and small power (To be reviewed)		45
Residential Apartment	10	24°C summer maximum 21°C winter minimum	40-60	10	11	Varied ***	35
Residential Lobby	N/A	26°C summer maximum 19°C winter minimum	40-60	To AS1668.2 minimum	11	N/A	40
Gym	3.5	23°C summer maximum 20°C winter minimum	40-60	15	15	5****	45
Toilet	N/A	NC	N/A	N/A	N/A	N/A	50

NC Not controlled

\* No humidity control will be provided unless required to achieve Green Star rating. The relative humidity range is generally achieved as a result of mechanical cooling.

\*\* Noise criteria to be confirmed by Acoustic Consultant

\*\*\* Apartment small power load will be varied depending within each room. The final allowance will be determined upon architect confirmation of kitchen appliances.

\*\*\*\* Gym equipment loads to be assessed based on number of treadmills.

## 2.2.3 Exhaust Rates

Generally-

In accordance with AS1668.2

Toilets -

The greater of 10L/s.m<sup>2</sup> floor area or 25L/s/fixture

Grease arrestor -

5 L/s.m<sup>2</sup> floor, 100 L/s min.

Cleaner cupboard -	5 L/s.m <sup>2</sup>
Garbage room -	5 L/s.m <sup>2</sup> , 100 L/s min.
Plantroom / storage room -	5 L/s.m <sup>2</sup> or sufficient to remove heat generated, 100 L/s min.
Commercial Kitchen exhaust -	3,500L/s
Residential Laundry -	30 L/s.room (150% of AS1668.2)
Residential Bathroom -	50 L/s/room** (200% of AS1668.2)
Residential Kitchen Exhaust -	105 L/s*
Spa Pools -	5 L/s.m <sup>2</sup> floor
Swimming Pools -	2.5 L/s.m <sup>2</sup> floor

\* Residential kitchen exhaust air volume is based on Smeg P52-2 standard exhaust rangehood and may need to be revised dependant upon final rangehood and stove-top selected by architect.

\*\* Includes bath, shower, water closet and hand basin in one compartment.

#### 2.2.4 Minimum Outdoor Air Rates

Residential Corridors -	1 L/s.m <sup>2</sup> floor
Saunas -	4 L/s/person
Swimming Pool (deck and pool area) -	10 L/s.m <sup>2</sup> floor
Main Switch Rooms -	4 L/s.m <sup>2</sup>

#### 2.2.5 Noise and Vibration

All mechanical equipment and/or plant areas will be provided with acoustic attenuation and vibration isolation to ensure noise levels do not exceed the requirements of AS2107, the requirements of Local Council and EPA and the Green Star criteria. Acoustic consultant to advise of detailed performance requirements.

### 2.3 Retail

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#### 2.3.1 Retail Air Conditioning

The retail tenancies are assumed to be a Shell and Core arrangement with space provision for air conditioning and ventilation only.

The air conditioning option currently under consideration for the retail tenancies is ducted, chilled water fan coil units in a shell and core arrangement (Four pipe chilled and heating hot water flow and return);

Units will be located in dedicated cupboards or ceiling-mounted. Valved chilled / heating hot water take-offs will be provided to each tenancy for connection by the tenant. Chilled and heating hot water is provided from the central energy plant (CEP).

Number of units per tenancy to be confirmed pending fitout. Units will have minimum fresh air ducted from the external façade. It is intended that future fan coil units will be connected to the BMCS to allow central monitoring and control.

Consideration will be given to providing operable windows and doors to allow each tenancy to operate in mixed mode, i.e. natural ventilation during suitable weather and air conditioning during hotter and colder days.

### 2.3.2 Retail Arcade Ventilation

Mixed mode ventilation with the provision of tempered minimum outside air will be considered for the Ground Floor and Level 1 circulation arcade, including the potential for hydronic underfloor heating within the arcade. Additionally, the arcade will be tempered via spill air from adjacent retail tenancies.

### 2.3.3 Retail Kitchen Exhaust

Dedicated systems to provide kitchen exhaust serving each retail kitchen on the Retail Floors will be provided.

Typically provision ranges from 1,500 l/s small kitchen/café to 8,000 l/s large kitchen. Shaft size varies from 800 x 600 to 1200 x 1200, fire rated from tenancy to roof.

Final requirements to be confirmed by Kitchen Consultants.

Exhaust hoods to be ducted to fire rated risers, from the retail floors to the roof and connected to fans with vertical discharge.

Blanked-off fire rated ductwork connections for future use by retailers will be provided directly above the tenancies (not the common arcade spaces).

Make up air is typically provided by louvres on the façade of the tenancy, ducted to a tenants' air handling unit.

Size of louvres will vary with size of kitchen exhaust (flow rate 80 to 90% of exhaust).

### 2.3.4 Level 2 Food Court

Air conditioning will be via on-floor, central chilled water air handling unit(s). Fresh air is to be introduced to the plantroom from the external façade on that level. Minimum fresh air to be in accordance with AS1668.2. The use of 100% outside air air-to-air heat exchangers for heat recovery will be explored.

Provision will be made for operable windows and doors to allow these areas to operate in mixed mode, i.e. natural ventilation during suitable weather and air conditioning during hotter and colder days.

Some relief air from the Level 2 Food Court will temper the central atrium void.

### 2.3.5 Level 4 Commercial Gym

Air conditioning will be via on-floor, central chilled water air handling unit(s). Fresh air is to be introduced to the plant room from the external façade on that level. Minimum fresh air to be in accordance with AS1668.2. The use of 100% outside air air-to-air heat exchangers for heat recovery will be explored.

The swimming pools, changing and locker rooms will be mechanically exhausted in accordance with AS1668.2. Final Design brief to be confirmed by Gym tenant.

## 2.4 Residential

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### 2.4.1 Residential Apartment Air Conditioning

The air conditioning option currently proposed for the residential apartments consists of ducted, chilled water fan coil units (Four pipe chilled and heating hot water flow and return);

Where possible, fan coil units will be located in dedicated cupboards, with preference for access from the external corridor, out of the occupied apartment. Otherwise, units will be floor-mounted in dedicated cupboards with access from within the apartment or ceiling-mounted above the bathrooms.

Number of units per apartment to be confirmed pending agreed zoning. Ductwork and air diffusion will be internally insulated for supply air to each space. Return air grilles will be in ceiling or bulkheads, including insulated transfer ducts where necessary. Units will have

minimum fresh air ducted from the external façade, including fresh air fan complete with non return damper and fire dampers. Fresh air fan to serve this A/C unit will be interlocked.

Provision will be made for operable windows and doors to allow each apartment to operate in mixed mode, i.e. natural ventilation during suitable weather and air conditioning during hotter and colder days.

#### 2.4.2 Residential Central Heating and Cooling Plant

Chilled water will be supplied from the central energy plant (CEP), reticulated to the building as part of the infrastructure works. Heat exchangers including associated pumps and controls will be provided, located at basement level, to provide chilled water to the AHU plant.

Heating hot water will be supplied from the central energy plant (CEP), reticulated to the building as part of the infrastructure works. Heat exchangers including associated pumps and controls will be provided, located at basement level, to provide heating hot water to the AHU plant.

Heating hot and chilled water will be reticulated to various parts of the building via variable flow circuits. Pumps will be fitted with variable speed drives (for variable flow systems only) and high or premium efficiency motors.

#### 2.4.3 Residential Apartment Exhaust Ventilation

Mechanical bathroom / laundry exhaust ventilation will be via dedicated fan(s) for each apartment, including fire dampers and volume control dampers to commission the system, connecting to fire-rated risers discharging vertically at roof level;

Mechanical kitchen exhaust ventilation will be via kitchen range hood for each apartment, including fire dampers and volume control dampers to commission the system, connecting to fire-rated risers discharging vertically at roof level.

Make-up air to both the bathroom / laundry and kitchen rangehood exhaust systems will be via the air conditioning unit(s) and external corridor.

#### 2.4.4 Residential Lobbies and Corridors Air Conditioning

Tempered minimum outside air will be supplied to the floor-by-floor corridors and Ground Floor lobbies will be fully air conditioned via central chilled water air handling unit(s). This air handling plant will be located at basement level with air reticulating "bottom up" to serve the building. Fresh air is to be introduced to the plantroom from the 1<sup>st</sup> floor façade.

Minimum fresh air to be in accordance with AS1668.2

Lobby air to partially act as make-up air for kitchen range hood and toilet extract in each apartment. The apartments will be negatively pressurised with respect to the adjacent corridors to minimise odour migration from the apartments to corridors.

#### 2.4.5 Residential Apartment Air Conditioning and Ventilation Control

Each residential apartment will be provided with the following facilities:

- Programmable timers will be provided for the operation of the air conditioning with separate wall mounted controllers with LCD screens for the living area and bedroom zones;
- Occupant temperature set point control;
- Occupant control of heating or cooling mode;
- Occupant fan speed control;
- LED indication of air conditioning status at wall mounted controllers;
- Toilet exhaust to be controlled on a 365 day, 24 hour timer for on/off control;

- Residential kitchen range hood exhaust fan to be variable speed to adjust exhaust volume according to usage within the apartment.

Additional facilities that will be considered during the design phase are:

- Toilet exhaust to be interlocked to light operation and will continue to operate for a fixed period after lights are turned off for energy saving.
- Day / night mode and hotel-style door key card control of air conditioning units.
- Use of wireless remote controllers for occupant control.
- Integration with Building Management System (BMS) and provision of centralised home automation system for each apartment.

## 2.5 Other Areas

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### 2.5.1 Mechanical Ventilation

All mechanically ventilated areas including toilets, tearooms, cleaner's rooms, garbage room, plantrooms, grease arrestor room and storerooms will be ventilated in accordance with the current AS1668.2.

### 2.5.2 Smoke Hazard Management

The smoke hazard management strategy for both the low and high-rise residential towers, including the podium level and atrium is to be resolved as a fire engineered solution. The smoke control systems will meet the requirements of an alternative fire engineered solution.

Smoke spill / relief air shafts will be provided, with fan discharge above roof level. A fire isolated exit pressurisation system for all fire isolated exits will be provided where required. These systems will be designed in accordance with Australian Standard AS1668.1.

### 2.5.3 Car Park Ventilation

To be documented by others.

### 2.5.4 Substation Ventilation

The new substations will be ventilated in accordance with the requirements of Energy Australia.

## 2.6 Reference Documents

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Refer to Site-Wide Infrastructure Services PA Report issued by Lincolne Scott for details of Basement Carpark ventilation system.

Refer to Site-Wide Infrastructure Services PA Report issued by Lincolne Scott for details of Building Monitoring and Control System (BMCS).

Refer to ESD PA Report issued by Arup for ESD requirements and BASIX assessment information.

### 3 Electrical Services

#### 3.1 Regulations and Authorities

The whole works will be done in accordance with the requirements of:

- Energy Australia Network Standards and Conditions of Supply
- Australian Communications and Media Authority
- EPA (Environmental Protection Authority)
- Sydney City Council
- Building Code of Australia
- AS/NZS 3000:2007. SAA Wiring Rules and AS/NZS 3008
- The Building Sustainability Index (BASIX)

#### 3.2 Electrical Installation

##### 3.2.1 Electricity Supply

The prime electricity supplies to the service apartment tower and west wing of podium levels will be derived from a basement substation comprise with 3 x 1500kVA transformers located at B1 Lower Ground grid 37/BB.

The prime electricity supplies to the residential apartment tower and east wing of podium levels will be derived from a basement substation comprise with 3 x 1500kVA transformers located at Upper Ground level grid 37/BM.

##### 3.2.2 Consumer Mains

Consumer’s mains will be provided between the substation and the main switchboards. The consumer mains will be rated to the full output rating of 1500kVA to serve the house and tenant loads. Consumer mains will be fire rated or within a fire rated enclosure.

##### 3.2.3 Main Switchboards

At this stage it is envisaged that one main switchboard will be required for each tower plus two main boards for retails. Each main switchboard will comply with the following:

Standard	AS 3439.1
Form of segregation	Form 3B with limited fault containment and venting as specified in Appendix EE.
Form of construction	Free standing, back connected.
Fault rating	To be determined.
Capacity	Fully rated to the output from the substations.
Spare space	25% for additional outgoing circuits spread across the switchboard.
Earthing	M.E.N.
Degree of protection.	IP42
Indicating instruments.	Volt meters, ammeters, digital monitoring in consumers mains, house services.

The outgoing circuits / sub mains from the main switchboards will be protected by circuit breakers.

The main switchboards will be provided with 25% spare space including poles for separate sub mains for connection of future tenant UPS sub mains or computer room A/C units.

Surge protection will be provided to all main switchboards.

#### 3.2.4 Power Monitoring

The main switchboards and tenant distribution boards will be provided with power recording meters to enable ABGR metering functionality. All outgoing submains from the main switchboard will be monitored. BMS integration will be provided.

#### 3.2.5 Power Factor Correction

Power factor correction equipment will be installed to maintain the power factor of house services to a minimum of 0.95 at all times.

Space provision for tenant power factor correction equipment will be provided.

#### 3.2.6 Metering

House services will be metered separately to tenant services.

Check metering will be provided to allow apportionment of energy costs and to enable the validation of the energy model.

Metering will be provided to all residential apartments, retails, house services and safety services.

The meters location will be strategically positioned to authority's requirement

Private sub-meters to be provided for cost allocation. All two (2) key apartments to have a sub-meter for the studio component.

#### 3.2.7 Submains

Submains cables will be designed to AS3008.1.

All cables will be copper. Reduced sized neutrals will not be used.

Cable riser reticulation will be via vertical risers through the cores.

Apartment submains will be a rising mains system of cables with tee offs.

#### 3.2.8 Cable Management

The building cores will contain a number of risers and associated riser cupboard spaces specifically to assist in the management of 'House' and 'Tenant' Services. These include:

- Electrical risers
- House communications / BMCS /Fire/EWIS risers

Dependent on core development, some initial runs of in-ceiling cable tray/conduit will be provided for power and communications cabling to be run/managed.

#### 3.2.9 Distribution Boards

Distribution boards (DB's) will be form 1, of the dead front type, totally enclosed with insulated busbars. Outgoing circuits will be protected by miniature circuit breakers.

One (1) House DB will be located on every third floor and serving at least three levels and will be located within the core.

Provided in accordance with Australian Standard requirements.

### 3.2.10 General Purpose Outlets

In all house areas like toilet areas, lobbies, store rooms, amenities, etc for equipment, cleaning, GPO's will be provided.

Earth leakage protection will be provided in accordance with Australian Standard requirements.

### 3.2.11 Lighting

Lighting will comply with the following:

- AS 1680 – Interior Lighting and the Visual Environment
- Building Code of Australia
- Green Star criteria
- BASIX

### 3.2.12 External Lighting

Lighting control will be by photoelectric cells or time switches interfaced with the BMCS.

External building feature lighting will be installed to provide interest, highlighting architectural features. No light beam will be directed beyond the site boundaries or upwards without falling directly on a surface to minimise light pollution.

### 3.2.13 Exit and Emergency Lighting

Emergency and evacuation and exit signs complying with the requirements of the BCA and AS2293.1 will be provided.

Testing facilities will be a computer monitored system.

### 3.2.14 Lightning Protection

Lightning protection will be provided in accordance with AS1768.

### 3.2.15 Earthing

Earthing will comply with AS 3000 for an M.E.N. System of earthing

### 3.2.16 Retail provisions

It is proposed that each Retail tenancy will be provided with a distribution board and one socket outlet for inspection and construction purposes.

Chain suspended fluorescent battens will be provided for general lighting in the Retail area to serve each retail unit switched from a point adjacent to the distribution board. Retail fit-out lighting by the tenant.

Single point emergency evacuation and exit lighting with a test switch at the distribution board will be provided.

A telephone FDF would be provided in a suitable location within each tenancy.

## 3.3 Communications

### 3.3.1 Incoming Service

Lead-in cable routes will be provided from Telstra/Optus or other services network provider to the Precinct Distributor Rooms which will be documented by site-infrastructure consultant.

Multi core copper or fibre optic lead-in cables will be reticulated from Precinct Distribution Room to Block 2 Building Distribution Rooms.

Cat 6 UTP data cable will be distributed throughout the project from Building Distribution Rooms to each intermediate distribution frame at communications cupboards and 20 pair cable will be provided to each of the retail / commercial units.

Communications risers will be provided in the building for communications cabling to residential units. Intermediate distribution frames will be established in the risers at each level to provide two by 4-pair Cat 6 UTP data cable to each apartment.

A master antenna TV system will be provided. It will derive free to air signal from a high quality antenna installation on the roof. A head end amplifier will provide a digital signal to MATV cables in the communications riser to provide two TV points in each living unit. This system will also provide with provision of Pay TV channels/Satellite signal to residential living units. The Pay TV signal may be distributed through services providers or from Satellite dish location in each tower and subject to future agreement with communication services provider.

The system will also extend to cover the retail areas.

### 3.3.2 Building Distributor Rooms

Building Distributor Room will be provided for the presentation of carrier services. The room will have spatial provision for future air-conditioning by DX split and suitable for electronic equipment.

### 3.3.3 Communications Risers

A house communication riser will be provided. The riser will be of sufficient size for main building backbone cabling, data/communications incoming fibre-optic cabling, MATV, security, fire and BMCS wiring.

### 3.3.4 Mobile Phone reception

100% 2G, 3G, 3.5G and CDMA mobile phone coverage will be provided to the following areas,

- Residential units;
- Lobby / circulation spaces;
- Retail spaces;
- Courtyard;
- Carpark.

The mobile phone coverage, where deemed necessary via assessment, will consist of a roof mounted repeater array (not a base station) and distributed cable network to floor antennas. The mobile phone coverage will not be service provider specific.

### 3.3.5 EMF interference

The electrical installation will be designed to limit the effect of electromagnetic interference EMF.

## 4 Hydraulic Services

### 4.1 Technical Objectives

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The hydraulic systems proposed must demonstrate reliability/performance to achieve an appropriate standard of service, incorporating the following design principles:

- To provide an energy efficient systems;
- To provide water efficient systems;
- To provide water reuse systems.
- To provide material selection based on environmentally sustainable manufacturing practices and "project budget".

### 4.2 Proposed Systems

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The scope of the works will include the following:

- Sanitary plumbing and drainage;
- Trade wastes;
- Grease interceptor system for commercial kitchen waste;
- Stormwater roof drainage;
- Rainwater harvesting
- Domestic cold water supply;
- Domestic non-potable water supply;
- Domestic hot water supply;
- Natural gas supply;
- Sanitary fixtures, tapware and outlets;

### 4.3 Codes and Standards

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The sanitary plumbing, drainage and water supply systems will be designed to comply with all requirements of the following, where practicable:

- Australian Standards
- Local Authorities
- BCA
- Green Star
- EPA
- Workcover
- Building Surveyor
- Manufacturer's Guidelines

### 4.4 Design Criteria

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

- Stormwater roof drainage will be based on a rainfall intensity for a 1:100 year average recurrence interval for a storm event of 5 minute duration.

- In order to maximize on gravity discharge and head height clearances within the basement areas multiple property sewer drainage connections to authority mains will be considered for both sewer and stormwater drainage.
- Complete sanitary system will be provided to base building areas only. All fitout, retail “shell and core” components of this development will only be provided with capped waste and vents branch for future fitout connection/s (inclusive of trade waste points).
- Town mains water supply availability and pressure and flow is to be further investigated.
- Complete domestic hot/warm and cold water system will be provided to base building only. All fitout, retail “shell and core” components of this development will only be provided with valved and capped potable water points for future fitout connection/s.
- Domestic hot water generation delivered at 60 – 65 °C to temperature control devices within areas served.
- Temperature control of the domestic hot water delivery at respective outlets will be capable of a maximum temperature setting of:
  - Base Building Areas
    - Male/Female Toilets 50 °C
    - Disable toilets 45 °C
    - Cleaner’s room Min 60 °C
    - Garbage wash down Min 60 °C
- Thermal lagging to pipework to maintain required water supply temperatures to hot/warm water.
- Acoustic treatment to all pipework services running within sound sensitive areas with parameters to be dictated by the acoustic consultant.
- All services passing through fire zones will be protected against the spread of fire through the use of fire collars.

#### 4.5 Water Conservation

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Water conservation strategies will include:

- Reducing town’s main water supply;
  - Reuse of fire test drain water,
  - Harvesting rainwater,
  - Black water treatment by centralised plant,
- Reducing water usage in toilets by the use of:
  - Dual flush WCs
  - Waterless urinals or alternatively low flow urinals with timed operation;
- Reducing water usage by utilising water pressure reducing devices where appropriate;
- Reducing water usage in basins, sinks, showers etc by utilising low flow tapware and outlets;

- Hot water system management and minimisation of deadlegs.

#### 4.6 Sewer and Sanitary System

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The sanitary drainage system for Block 2 is anticipated to collect the soil and waste water from all points and convey the waste water discharge extension via gravity system to the site wide black water treatment plant. There will be alternative connections via boundary traps complying with the requirements of the statutory codes and Sydney Water to the municipal sewer system.

Fully vented modified sanitary systems are anticipated to be incorporated requiring stacks and vent piping. All stack systems will be sound attenuated within sensitive areas.

Capped drain points will be provided to tenancies.

The site infrastructure will contain a central black water treatment plant.

#### 4.7 Trade Waste System

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Grease arrestors will be provided for greasy kitchen waste discharge and consideration given to their maintenance and pump out.

Fully vented modified sanitary trade waste systems are anticipated to be incorporated requiring stacks and vent piping complying with the requirements of the statutory codes and Sydney Water before draining to the sewer drainage system.

Capped trade waste points will be provided to tenancies.

Insulation and trace heating of stacks and longer runs may be required to convey waste to the grease arrestors.

#### 4.8 Stormwater Roof Drainage System

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Roof drainage design will entail conventional gravity roof downpipe systems complete with connections to the authority mains. Siphonic systems will be considered where appropriate.

The downpipes will be sound attenuated within sound sensitive areas throughout the building.

Rainwater will be routed to rainwater harvesting tanks for reuses where the water will be utilised as part of the central black water plant. Overflow connections will be made to the municipal storm water drainage system.

#### 4.9 Domestic Cold Water System

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The domestic cold water service will connect from a Sydney water main and pass through a water meter and backflow prevention device to the requirements of the statutory codes and Sydney Water.

The domestic cold water will serve all base building fixtures requiring potable water, fixtures within the retail and residential tenancies. Control valves will be installed so that fixture groups may be shut down without affecting adjacent fixtures;

Water to each tenancy and apartment will be individually metered via water sub meters and monitored by the BMCS.

Pressure reducing valves will be installed as required to protect against over pressure.

#### 4.10 Non-Potable Cold Water System

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Non-potable water will be distributed to WCs, urinals and washing machines and for irrigation and wash-down use from the site wide infrastructure. The non-potable water supply comes from the central black water treatment plant.

#### 4.11 Domestic Hot Water System

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Hot water is to be generated from the site wide LTHW infrastructure.

There are several options for Hot water distribution which will be investigated further these include:

For residential areas supply an LTHW main to all floors with distributed heat exchangers which generates domestic hot water for local use.

Hot water use in each apartment and tenancy will be individually metered via water sub meters and monitored by BMCS. These meters will incorporate volume flow metering to allow charging. Each apartment will have a control valve at the meter for shut down to isolate supply for maintenance. All hot water thermostatic valves and meters will be located in the bottom of the apartment's laundry cupboard. Where these do not fit a joinery cupboard is to be used above the laundry tub.

Minimum storage temperature will be at 60 - 65°C. Hot water delivery at each outlet will be controlled by temperature control device. The pipework will be insulated against heat loss and allow for adequate expansion.

The hot water circulation will not extend downstream of the meter, instead trace heating if required will be provided downstream of the meter to maintain the temperature of water within the hot water pipe. This will minimise 'dead legs' reducing waiting time at fixtures for hot water to arrive.

Thermostatic mixing valves will be provided at ablution fixtures in accordance with the statutory codes to prevent scalding.

Hot water for retail areas is subject to further development but will likely be provided by the tenants themselves via the LTHW circuit.

#### 4.12 Natural Gas Service

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A new metered natural gas service will be provided for Block 2 complete with a regulator. Natural Gas will be provided to all gas fired appliances including the hot water plant.

Gas will be reticulated throughout the building. Each apartment or tenancies will be separately metered and will be designed to the requirements of the statutory codes and AGL there will be a control valve at the meter for shut down to isolate supply for maintenance.

#### 4.13 Swimming Pool Plant

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Where swimming pools are located appropriate filtration and treatment plants will be located adjacent to the swimming pools. The potential to heat these pools via solar panels will be investigated further.

#### 4.14 Sanitary Fixtures and Tapware

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The proposal is to provide low flow tapware to minimise water use within the property

All fixtures and tapware selected for use on the project will be high quality commercial (★★★★) water efficiency rating or better.

All fixtures and taps will form part of the architectural documentation.

#### 4.15 Sub-Metering

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Domestic cold water, Domestic hot water and gas sub-meters (pulse type) will be provided to measure consumption of each major user, apartment and tenancy and logged in the BMCS. These will be owned by building management and allow them to charge apartments or tenancies for consumption in accordance with metering codes and regulations.

## 5 Fire Services

### 5.1 General

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The objectives of the provisions of the Building Code of Australia (BCA) for fire fighting equipment and services are to:

- Safeguard occupants from illness or injury while evacuating during a fire and
- Provide facilities for occupants and the fire brigade to undertake fire-fighting operations and
- Prevent the spread of fire between buildings.

The fire fighting equipment and services will be provided to meet the minimum deemed-to-satisfy provisions for this proposed building or otherwise as determined by a separate Fire Engineered Solution.

In general the fire detection, emergency warning and fire protection systems for the building will be designed and installed in accordance with the BCA and all relevant standards.

The design will be co-ordinated with the Fire Engineering solution which may lead to modifications to the parameters outlined in this brief.

A central fire services system is proposed serving Blocks 2, 5 and 9 with pumps and tanks located within the Block 2 basement.

### 5.2 Fire Hydrant System

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A fire hydrant system will be installed in accordance with the requirements of the BCA, AS2419.1-2005, Sydney Water and the NSW Fire Brigade. Fire hydrants will be provided in fire stairs.

The system will be supplied with water from a central Grade 1 water supply connected to the town's water supply. Automatic fire pumps will elevate the water up the building.

Fire Brigade Booster connection points will be installed and located in compliance with AS2419.1-2005, AS2118.1-1999 and the NSW Fire Brigade requirements.

A central hydrant storage tank will be provided with sufficient storage.

A water supply test tank will be provided to supply water to the pump sets for testing purposes. The water will be recirculated from the test lines back to the tank. Valves will be installed to isolate the town's main from the pumps for the testing purposes.

The test drains for the hydrant riser will be connected to the test water tank.

### 5.3 Fire Hose Reels

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A fire hose reel service will be installed to comply with the deemed to satisfy provisions of Clause E1.4 of the Building Code of Australia, AS2441-2005 and the requirements of Sydney Water.

Fire hose reels will be located adjacent to fire stairs and exits to provide effective coverage for fire fighting operations.

### 5.4 Fire Sprinkler System

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A fire sprinkler system will be installed throughout the building. The system will be designed to comply with the requirements of the BCA and AS2118.1. The water supply for the sprinklers will be Grade 1.

A central sprinkler tank will be provided with sufficient storage.

Each level of the building will be fitted with a stop valve, flow switch and remote flow switch test facility on the branch from the riser.

All devices will be monitored by the Fire Indicator Panel.

The maximum hazard classification on a floor will determine the design density for that floor, for example:

- Retail - Ordinary Hazard 3
- Residential - Light Hazard
- Plant – Ordinary Hazard 2

The design flow rate for the sprinkler system will match the most onerous sprinkler demand.

### 5.5 Fire Pump Sets

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Fire pumps will be installed for the sprinkler and hydrant system and comply with the requirements of the BCA, AS2941-2002, Sydney Water and the NSW Fire Brigade requirements. The pumps will be designed and installed to provide the required water flow and pressures for the various stages of the hydrant and sprinkler systems in the building.

The pumps will have all control and monitoring equipment as required by the AS2941 and connected to remote controls in the Fire Control Room. A pump running signal will raise an alarm at the FIP.

Fire hydrant relay pumps will be required every 50m of vertical lift.

Diesel pumps may be required to provide emergency operation and with consideration to exhaust location.

### 5.6 Fire Control Room

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A fire control room is to be provided in accordance with the BCA, accessible via two paths of travel, one from the front entrance of the building and one direct from a public space or fire isolated passage way which leads to a public place and has a door with a FRL of not less than -/120/30.

The Fire Control Room will contain the FACP, EWIS panel and FFCP.

### 5.7 Fire Detection and Alarm System

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A fire detection system will be installed within the building as per the requirements of the BCA, AS1670.1-2004, AS1670.4-2004, AS1668.1-2002 and the NSW Fire Brigade.

The detection system will monitor all devices connected to the fire hydrant, fire sprinkler and fire pump systems.

The Fire Alarm Control Panel will be located in the Fire Control Room. The system will be a programmable analogue addressable type. All devices will be compatible with the Fire Alarm Control Panel. The system will utilise Data Gathering Panels located at regular intervals up the building.

A graphic display panel will be installed in the Security control room indicating alarms and faults as they occur. System control will only be available from the main FACP.

### 5.8 Emergency Warning and Intercom System

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An Emergency Warning and Intercom System (EWIS) will be installed throughout the building. The EWIS will be designed and installed in compliance with the requirements of the BCA, AS1670.1-2004, AS1670.4-2004 and the NSW Fire Brigade.

The EWIS control panel will be located in the Fire Control Room.

A manual voice announcement facility will be provided in the security control room.

#### 5.9 Fire Fan Control Panel

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A Fire Fan Control Panel (FFCP) will be located in the Fire Control Room.

The FFCP will be connected to FACP and control the automatic activation and shut down of smoke control equipment.

The FFCP will have manual controls available for fire fighter use. The panel fascia will have indicator lamps showing the status of the system.

#### 5.10 Portable Fire Extinguishers

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Portable fire extinguishers will be provided to satisfy clause E 1.6 of the Building Code of Australia, and local government requirements.

Generally fire extinguishers will be distributed throughout the building in areas of specific hazard.

Fire extinguishers in public areas will be located in clear cover security cabinets to minimise the potential risk of vandalism

#### 5.11 Distribution Piping and Wiring Systems

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The fire services and life safety distribution piping and wiring systems will be coordinated with the architectural design and all other services to follow set services routes throughout the complex to conceal services wherever possible and simplify access for maintenance and servicing.

## 6 Vertical Transportation Services

### 6.1 Residential Tower

#### 6.1.1 Introduction

While the performance of elevator systems within commercial properties is largely defined by the Property Council of Australia there are no such advising body providing performance criteria for residential apartment properties. For the purpose of our analysis of we will reference the performance criteria for “Luxury Apartments” as prescribed within the Chartered Institute of Building Services Engineer’s – Transportation Systems in Buildings (CIBSE) Guide D. CIBSE Guide D is an internationally recognised document for defining the parameters of elevator equipment and performance outcomes when designing vertical transportation systems.

#### 6.1.2 Lift Strategy

The vertical transportation design will be developed to incorporate sufficient vertical transportation elements for a “Luxury Apartments” as defined by CIBSI Guide D and surmised below.

The quantum, speed and size of lifts are to be confirmed by traffic calculation and simulation.

<b>Strata Residential Apartments (Block 2)</b>	
Performance Level	Premium Grade
2 Way Handling Capacity	8% of total building population in any 5 minute period (4% up / 4% down)
Target Interval	45 – 50 seconds
Car Loading	≤ 60%
Occupancy:	1 Bedroom & Studio Apartments – 2 persons 2 & 3 Bedroom Apartments – 1.5 persons / bedroom
Lift Car Size	Passenger Lifts – 17 pass (1275kg) Passenger / Goods – 21 Passengers (1600kg)
Entrance Dimensions	Passenger Lifts – 1100mm x 2400mm Shared Passenger / Goods – 1300mm x 2400mm

#### 6.1.3 Lift Type

In considering the likely lift speed required to provide appropriate average waiting intervals for both traditional gearless design with a machine room located above and machine-roomless lifts will be used. Lift cars will have LCD monitors for displays and floors will have interfaces to display current lift position. Hall lantern indicators will be provided to show direction of travel and lift position.

#### 6.1.4 Sustainability

The lift installation will be designed to deliver a premium grade level of service with a minimal environmental impact. Ideally all lifts will include Variable Voltage Variable Frequency (VVVF) motor drives with power regenerative features.

#### 6.1.5 Building Management System Interface

All lifts will be linked to a central control room with selected functions monitored by the BMS system, nominally:

- Lift out of service
- Lift alarm pressed
- Lift in fire service operation
- Lift in generator operation

#### 6.1.6 Lift Security

All lifts will be fully integrated with the building access security control system and include the following provisions where applicable:

- Have an electronic data key or proximity card reader which allows for individual floors to be secured or released. The speed of reading will be such that users can quickly register on entering the lift.
- Have allowance for CCTV cabling within the lift car trailing cables

#### 6.1.7 Maintenance Requirements

All equipment will be of latest technology with a proven reliability and serviceability under the anticipated traffic loads and environment.

Particular attention will be afforded to the design and layout of equipment to make provisions for suitable maintenance access in line with safe working practices.

#### 6.1.8 Standards & Design

The lift installation will be developed in accordance with the following standards;

- AS1735 Lifts, Escalators and Moving Walks
- AS1735.12 Facilities for Persons with disabilities
- AS 1428.2: Design for Access and Mobility; Part Two: Enhanced and Additional Requirements – Buildings and Facilities
- AS 4431 Guidelines for Safe Working on New Lift Installations in New Constructions;
- Building Code of Australia
- Other relevant Codes and Standards
- AS/NZ 3000: Electrical Installations (known as the Australian/New Zealand Wiring Rules). Wiring requirements for lift installations;
- AS/NZ 3008: Electrical Installations – Selection of Cables;
- Cable sizes for lift installations.

#### 6.1.9 Compliance with the BCA

The capacity of lifts proposed will be larger than those prescribed by the BCA under “deemed-to-satisfy” compliance, to accommodate DDA considerations.

## 6.2 Retail Podium

### 6.2.1 Introduction

Throughout the Retail Areas the majority of passengers will be transported by escalators which will provide service between levels B1, G, 1 & 2.

Lifts will also be provided between levels B4, B3, B2, B1, G, 1 & 2 for retail car park access and for the provision of vertical transportations services for persons with disabilities.

### 6.2.2 Lift Strategy

The quantum, speed and size of lifts are to be confirmed by traffic calculation and simulation.

Retail Lifts (Block 2)	
2 Way Handling Capacity	10% of total building population in any 5 minute period (5% up / 5% down)
Target Interval	45 – 50 seconds
Car Loading	≤ 60%
Lift Car Size	21 pass (1600 kg) – 26 pass (2000kg) in order to accommodate trolley, pram and wheelchair access.
Entrance Dimensions	1200mm X 2400mm

Retail Escalators (Block 2)	
Handling Capacity	4500 pax / unit / hour
Max Incline	30 degrees
Tread Width	1000 mm
Balustrade Type	Glass
Transition	2 flat steps, 3 for rises above 6m
Speed	0.5 mps
Balustrade Height	1000 mm

### 6.2.3 Sustainability

The lift installation will be designed to deliver a premium grade level of service with a minimal environmental impact. All lifts will include Variable Voltage Variable Frequency (VVVF) motor drives with power regenerative features.

Traditional non-regenerative drives use a series of resistors as the lift decelerates to a stop. This creates a number of inefficiencies a) energy is dissipated as heat b) additional electrical loads required to cool the LMR.

Regenerative Drives feed this energy back into the building internal electrical utility where it can be used by other loads connected to that network. Electrical power is generated when the elevator travel up with light loads, down with heavy loads or during the deceleration process. Energy savings are subject to load, speed, length of runs & traffic patterns with savings being up to 60% of energy used by non-regenerative drives.

Escalators will incorporate variable frequency drives to reduce power consumption whereby running speeds are reduced by 50% or stopped completely during periods of light traffic.

#### 6.2.4 Building Management System Interface

All lifts will be linked to a central control room with selected functions monitored by the BMS system, nominally:

- Lift out of service
- Lift alarm pressed
- Lift in fire service operation
- Lift in generator operation

#### 6.2.5 Lift Security

All lifts will be fully integrated with the building access security control system and include the following provisions where applicable:

- Have allowance for CCTV cabling within the lift car trailing cables

#### 6.2.6 Maintenance Requirements

All equipment will be of latest technology with a proven reliability and serviceability under the anticipated traffic loads and environment.

Particular attention will be afforded to the design and layout of equipment to make provisions for suitable maintenance access in line with safe working practices.

#### 6.2.7 Standards & Design

The lift installation will be developed in accordance with the following standards;

- AS1735 Lifts, Escalators and Moving Walks
- AS1735.12 Facilities for Persons with disabilities
- AS 1428.2: Design for Access and Mobility; Part Two: Enhanced and Additional Requirements – Buildings and Facilities
- AS 4431 Guidelines for Safe Working on New Lift Installations in New Constructions;
- Building Code of Australia
- Other relevant Codes and Standards
- AS/NZ 3000: Electrical Installations (known as the Australian/New Zealand Wiring Rules). Wiring requirements for lift installations;
- AS/NZ 3008: Electrical Installations – Selection of Cables;
- Cable sizes for lift installations.