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ATC ROYAL RANDWICK HOTEL

Engineering Services Concept Design Report

17/05/2012

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ATC ROYAL RANDWICK HOTEL

Engineering Services Concept Design Report

17/05/2012

Australian Turf Club (ATC)

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1 Executive Summary

The following report is intended to provide a summary of the design status at the initial planning stage of the Australian Turf Club (ATC) Royal Randwick Hotel development. WSP have been appointed to provide consultancy services for the Mechanical, Electrical, Hydraulics and Fire Protection Services.

This document describes the various design processes employed by the relevant disciplines during the initial project stage. Diagrams are provided throughout to show indicative plant spatial requirements and riser locations required to service the building.

The Proposal

The Royal Randwick Racecourse Hotel will be provided with new incoming electrical, gas and water supplies including electrical switchboard within the basement back of house area with vertical reticulation through the building. A sprinkler valve room accessed off the basement car park entrance ramp serving the basement car park sprinkler system. The drainage from the building will not all be via gravity and a sump pump will be located within the basement. All kitchen waste will be via a grease arrestor.

The building will be provided with either chilled water of a refrigerant based VRV system to provide cooling. High occupancy areas such as conference rooms will be provided with air handling plant within the ceiling void to provide local control of internal environment.

The main mechanical plant will be located at the roof level including extract fans from the commercial grade kitchen extract system which shall exhaust at roof level.

1.1 Further Actions

Key options have been raised within this report require sign off or approval to enable progression into schematic design. These issues are as follows;

- Choice of mechanical systems.
  - VRV
  - Chilled Water with air cooled chiller on roof
  - Precinct Chilled Water with water cooled chiller in grandstand plantroom
- Augmentation of incoming electrical supply to be resolved
- Confirmation for Tenancy split for electrical submetering

1.2 Further Design Development

The following summarises some key areas that require further design development with the entire design team to resolve throughout the schematic design phase of the project;

- Apartment hydraulic and toilet extract riser location – position within apartment to be as per figure 26 with final coordination with architect to be carried out
- Development and integration of Architectural lighting design concepts

Director General's Environmental Assessment Requirements (DGR's)

This report responds to the following DGR's to be incorporated within the Environmental Impact Statement (EIS)

- DGR 3: Built Form and Urban Design – Design quality including mechanical plant
- DGR 6: Environmental and Residential Amenity – Servicing requirements including mechanical plant etc.

Approvals

- City Plan Services - Demonstrating compliance with all relevant Australian Standards listed under clause 2.4 of this report and Section J, the BCA and the Fire Engineering Report.

Impacts and Mitigation Measures

Refer to the infrastructure report for details of impacts upon local utilities & infrastructure and proposed mitigation measures.

2 Introduction

2.1 Project Description

The Australian Turf Club (ATC) Royal Randwick Hotel project, sited in the northern section of the Royal Randwick Racecourse adjacent to the officials grandstand precinct, will comprise of an 8-story trackside development.

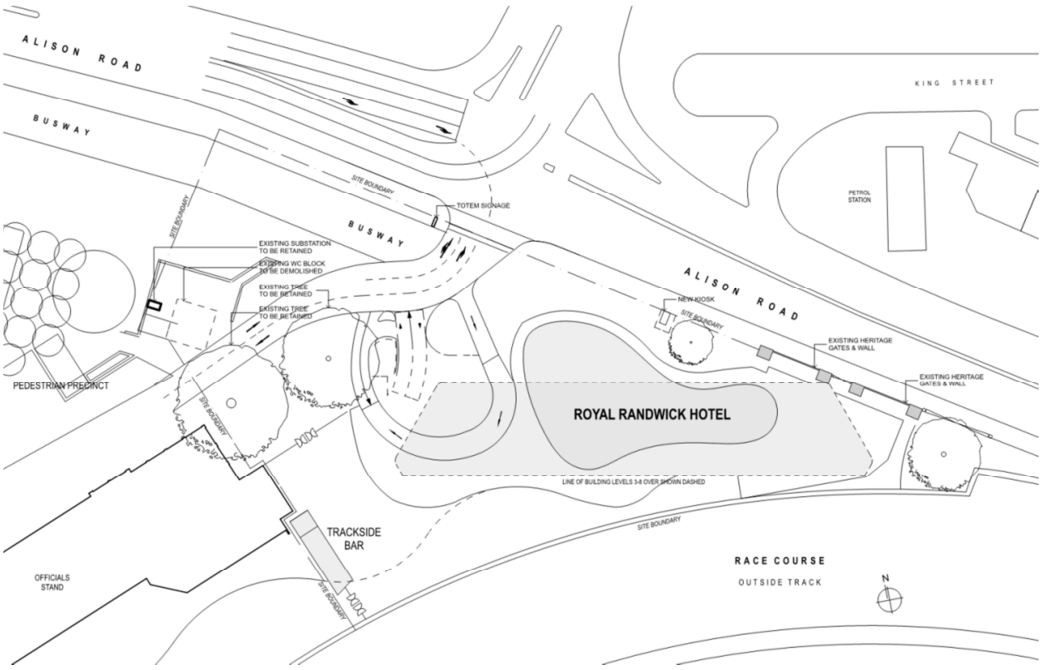


Figure 1: Royal Randwick Hotel Site Plan (Curtsey of TZG, 2012)

Located approximately 6km from the Sydney CBD, in the suburb of Randwick, the race course is well known for its racing calendar and entertainment events. Located near University of New South Wales, and Prince of Wales Hospital, the venue has exposure to public transport including routes to CBD areas, and Sydney Kingsford-Smith Airport through Alison Road, and Anzac Parade.

Figure 2: Site Plan

The proposed development comprising a basement area which will contain back of house areas/stores, and car park with 50 dedicated secure spaces; The ground level foyer and reception with lift lobby area which will provide direct access to trackside café/restaurant/bar area, including a commercial grade kitchen area; First floor will be dedicated to conference and meeting facilities; Second floor will contain a recreation, pool deck and terrace area; and the remaining upper five floors will consist of 170 key serviced apartments, consisting of hospitality suites, 1 and 2 bedroom apartments.

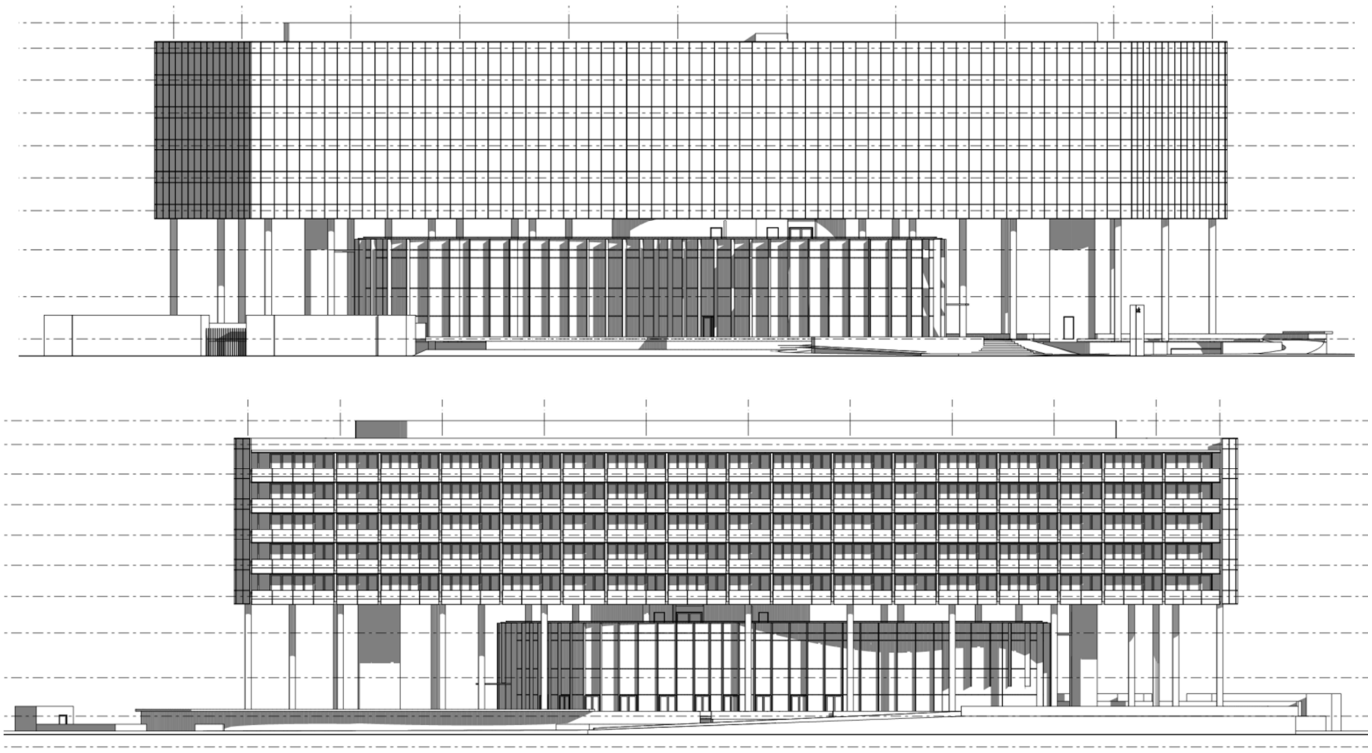


Figure 3: North and South Elevation Drawings (Curtsey of TZG, 2012)

Figure 4: Royal Randwick Hotel (Curtsey of ATC, 2012)

2.2 Objective

The objective of this report is to provide a return brief containing design principles and parameters to be agreed and adopted for the design of the following building services:

- Mechanical Services (Heating, Ventilation and Air Conditioning);
- Electrical Services (Utility infrastructure, lighting and power);
- Hydraulic Services (Gas infrastructure, sanitary plumbing, domestic hot and cold water); and
- Fire Protection Services (Sprinklers, hydrants, hose reels, smoke detection, EWIS).

The following services do not form part of the scope of this document:

- Fire Engineering;
- Telecommunications, data, and audio visual equipment;
- Specialist refrigeration including cold rooms and beverages;
- Kitchen equipment;
- Swimming pool equipment;
- Vertical transportation;
- ESD advice, including Greenstar and NABERS; and
- Acoustics.

2.3 Applicable Documents

The following documents have been used to assist in compiling this report and should be read in conjunction to this document.

- Australian Turf Club (ATC) Design Manual, ATC Areas 2012;
- Adina Royal Randwick Racecourse Design Manual 21st November 2011; and
- Tonkin Zulaikha Greer Architects (TZG) Preliminary Drawings for DA 24/04/2012 Set.

2.4 Legislation, Regulations, Codes and Standards

The following standards are applicable throughout the project:

- Building Code of Australia;
- NSW Statutory Regulations;
- Relevant Australian Standards including but not limited to AS 1668.1, AS 1668.2, AS 3666, AS 4254, AS 1432, AS 3000 AS1677.1.;
- The requirements of the NSW Work Cover Authority.

2.5 Definitions

The following definitions are used within this report:

AS	–	Australian Standard.
BCA	–	Building Council of Australia.
BGA	–	Glass Alarms.
BMS	–	Building Management System.
CCTV	–	Closed Circuit Television.
DA	–	Development Approval.
DDC	–	Direct digital controls.
DIN	–	Deutsches Institut für Normung (German Institute for Standardization).
ESD	–	Ecologically Sustainable Development.
EWIS	–	Emergency Warning and Intercommunications System.
FFCP	–	Fire Fan Control Panel.
FtA	–	Free to Air.
GPO	–	General Purpose Outlet.
HVAC	–	Heating, Ventilation and Air Conditioning.
IPTV	–	Internet Protocol television.
LED	–	Light Emitting Diode.
NCC	–	National Construction Code of Australia.
NLA	–	Net lettable Area.
ONT	–	Optical Network Terminal.
PVC	–	Polyvinyl Chloride.
RCD	–	Residual Current Device.
RWTP	–	Recycled Water Treatment Plant.
TPS	–	Thermo Plastic Sheathed.
UPS	–	Uninterruptable Power System.
XLPE	–	Cross-linked polyethylene
FCU	–	Fan Coil Unit
AHU	–	Air Handling Unit

2.6 Design Criteria

The following section of the report will proceed to provide an overview of the preliminary design criteria which is being adopted for each of the disciplinary services.

2.6.1 Mechanical Services

Table 2 below states the average internal summer and winter design conditions for the Royal Randwick Hotel spaces.

The internal temperature during the mid-season will vary between the two temperature limits.

The relative humidity with the space is uncontrolled and will typically vary between 40 - 60%RH depending on the actual room temperature, and the ambient temperature relative to the humidity at the time of measurement.

The internal comfort conditions are as per Table 2 below:

Area/space	**Winter**		**Summer**	
	° C	% RH	° C	% RH
Internal Comfort Conditions	21.5 +/- 1.5K	N/A	22.5 +/- 1.5K	N/A

Table 1: Internal Comfort Conditions

The external conditions for Sydney, Australia are as per Table 2:

Summer	
Dry Bulb	32.8°C
Wet Bulb	22.6°C
Winter	
Dry Bulb	7°C

Table 2: External Conditions

The preliminary casual gains associated with the conditioned spaces are as per Table 3 below:

Hotel Floor Apartment	Gain (W/ m²)		Density
	Sensible	*Latent*	
Lighting	15		
Small power	150		Per Apartment
Occupancy	70	60	2 People per bedroom
Hotel Floor Corridor/Lobby	Gain (W/ m²)		Density
	Sensible	*Latent*	
Lighting	15		
Small power	25		
Occupancy	N/A	N/A	
Offices	Gain (W/ m²)		Density
	Sensible	*Latent*	
Lighting	10		
Small power	20		
Occupancy	70	60	10m²/person
Meeting Room	Gain (W/ m²)		Density
	Sensible	*Latent*	
Lighting	15		
Small power	25		
Occupancy	70	60	As per seating on plans
Conference Room	Gain (W/ m²)		Density
	Sensible	*Latent*	
Lighting	15		
Small power	25		
Occupancy	70	60	As per seating on plans
Main Kitchen	Gain (W/ m²)		Density
	Sensible	*Latent*	
Lighting	15		
Corridor/Lift Lobby	Gain (W/ m²)		Density
	Sensible	*Latent*	
Lighting	15		
Occupancy	N/A	N/A	

Gym	Gain (W/ m²)		Density
	Sensible	*Latent*	
Lighting	20		
Small power	TBC		
Occupancy	210	315	3.5m^2/person
Foyer	Gain (W/ m²)		Density
	Sensible	*Latent*	
Lighting	15		
Small power	5		
Occupancy	70	60	3.5m²/person
Restaurant & Bar	Gain (W/ m²)		Density
	Sensible	*Latent*	
Lighting	15		
Small power	5		
Occupancy	80	80	1m²/person

Table 3: Typical Gains Table

The preliminary ventilation rates are as per Table 4 below:

Location	Supply Quantity	Exhaust Quantity
Basement		
Car park	75% to 90% of exhaust rate	10,000 L/s
Loading dock		3,000 L/s
Toilets (Basement)	8ACH and make up via corridor	10ACH
Garbage rooms		5 L/s.m²
Toilets (Public - Car park)	Air make up via door grille	10ACH
Offices	10 L/s.person	Balanced with supply
General Stores	Nat ventilation through door grille	
Laundry	15 L/s.m²	15 L/s.m²
MSB room	4 L/s.m²	4 L/s.m²
Comms	10 L/s	10 L/s
Gas meter room	Nat ventilation through door grille	
Fire sprinkler and pump room	Nat ventilation through door grille	
Corridor/Lobby	To provide make-up to surrounding stores	1L/s.m²
Ground Floor		
Toilets	8ACH and make up via corridor	10ACH
Kitchen	20ACH*	20ACH*
Stores	Nat ventilation through door grille	
Comms	10 L/s	10 L/s
Restaurant and Bar	7.5L/s.person	7.5L/s.person
Offices	10 L/s.person	Balanced with supply
First aid room	24 L/s	24 L/s
First Floor		
Plating kitchen	10ACH	10ACH
Store	Nat ventilation through door grille	
Toilets	8ACH and make up via corridor	10ACH
Second Floor		
Gym		
Toilets	8ACH and make up via corridor	10ACH
Reheat kitchen	10ACH	10ACH
Upper Floors (Lv3 to 7)		
Toilets	Via apartment	35 L/s.bathroom
TOGA maids room	Nat ventilation through door grille	
ATC operator room	10 L/s.person	10 L/s.person

*Preliminary ventilation rate, allowance has been made for additional volume when kitchen equipment layout is completed

Table 4: Typical Ventilation Table

All the above ventilation rates will be as a minimum in accordance with AS 1668.2 or as sated above where greater to improve indoor air quality.

2.6.2 Electrical Services

The following standards shall be applicable throughout the project:

- Building Code of Australia.
- Relevant Occupation/Workplace Health and Safety legislation.
- Supply Authority Regulations (AusGrid).
- City of Sydney Regulations.
- Australian Standards AS3000.

The electrical supply for the development has been made based on the following load assumptions:

- Electrical equipment power densities as detailed within the mechanical load schedules.
- Electrical cooking to hotel rooms.

Mechanical system loads are based on most onerous load case.

2.6.3 Hydraulic Services

Hydraulic Services shall be in accordance with:

- Building Code of Australia
- NSW Building code
- AS3500
- AS5601/AG601
- AS2419
- AS2441
- AS1221
- Local Authority requirements
- All other relevant codes

2.6.4 Fire Protection Services

The Design Criteria forming the basis of the Fire Protection Services design will comprise:

Fire Services System	BCA requirement	Australian Standard
Smoke Detection and Alarm System	NCC Spec E2.2a Clause 3	AS1670.1-2004
	NCC Spec E2.2a Clause 4	AS1670.1-2004
Building Occupant Warning System	NCC Spec E2.2a Clause 6	AS1670.1-2004
Fire Sprinkler System	NCC Spec E1.5	AS2118.1-1999
Fire Hydrants	NCC Spec E1.3	AS2419.1-2005
Fire Hose Reels	NCC Spec E1.4	AS2441-2005
Portable Fire Extinguishers	NCC E1.6	AS2444-2001

Table 5: Fire Protection Design Criteria

3 Mechanical Services

3.1 General

The mechanical services scope of works is described within this section of the report. The two subsections described will outline the proposed mechanical services options, including advantages and disadvantages of each system – Section 3.2 Mechanical Services Options – and the current mechanical system design which are under consideration – Section 3.3 Ventilation.

3.2 Mechanical Services Options

The current options being proposed for the air-conditioning system for Royal Randwick Hotel include the following:

- Chilled Water System;
  - Precinct Chilled Water – Plant located within the grandstand plant room.
  - Centralised Roof Mounted Plant – Located on the roof of the hotel.
- Variable Refrigerant Flow (VRF) System;

Depending on the air conditioning system installed, the general procedure can be divided into three main sub-systems:

- **Air Side (Blue):** The conditioned space, where heat and moisture must be removed to maintain comfort conditions. This includes the conditioned space, a distribution system (ducts, plenums and air diffusers) and air handling systems (fan coil units incl. fans, coils and filters);
- **Working Medium (Green):** The working medium is dependent on the characteristics of the system installed. The working medium acts as the medium that transfers energy (heat) from the conditioned space for rejection to the atmosphere. The work medium is commonly distinguished in two main categories: water based or refrigerant based; and
- **Heat Rejection (Red):** Through this final loop, heat transferred from the conditioned space via the working medium is rejected to atmosphere.

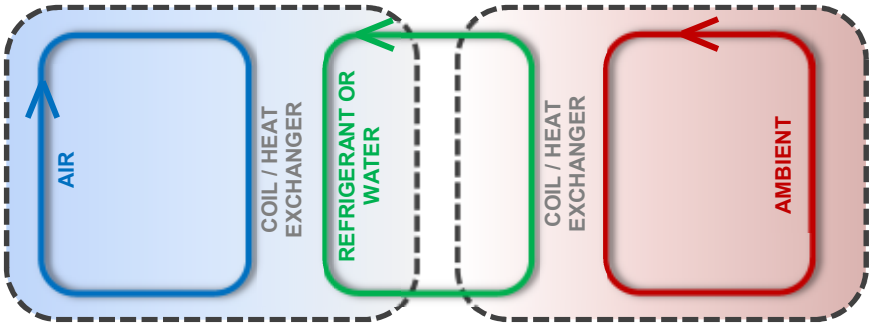


Figure 5: Air-Conditioning System

3.2.1 Chilled Water System

Through a cooling coil, heat is transferred from air to chilled water. The cooling/heating is performed by ceiling concealed fan coil unit(s) (FCU), whilst chilled, heating water pipe work, and minimum outside air per occupants is supplied through main risers from roof plant.

The system can be described as per following;

- Central chiller (With heat rejection to atmosphere);
- Primary and secondary pumps;
- Pressurisation and water treatment;
- Pipework reticulation;
- Room terminal unit (Fan coil and/or air handling units); and
- Controls.

Advantages

- ✓ Energy efficiency opportunities (subject to plant design and selection);
- ✓ Flexibility in plant location – water can be pumped long distances;
- ✓ Smaller footprint plant (design dependent);
- ✓ Concealment of plant (aesthetic & acoustic benefits);
- ✓ Simultaneous heating and cooling (via associated heating water plant);
- ✓ Long plant life (20 to 25 years);
- ✓ Control of coil and supply air temperatures (improved comfort control); and

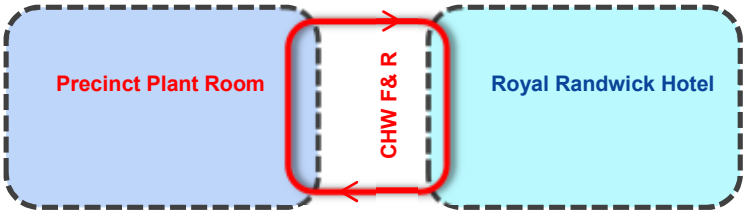
Disadvantages

- ✘ Capital costs;
- ✘ Maintenance costs;
- ✘ External plant noise;
- ✘ Water treatment; and
- ✘ Division of energy costs requires costly metering systems.

Due to the site location, the chilled water can be sourced from existing race grounds precinct, and/or an individual centralised roof mounted plant.

I. Precinct Chilled Water System

With the redevelopment of the existing racecourse grounds facilities, opportunity has been presented to utilise the chilled water system from precinct plant room and establish a connection with the Royal Randwick Hotel.



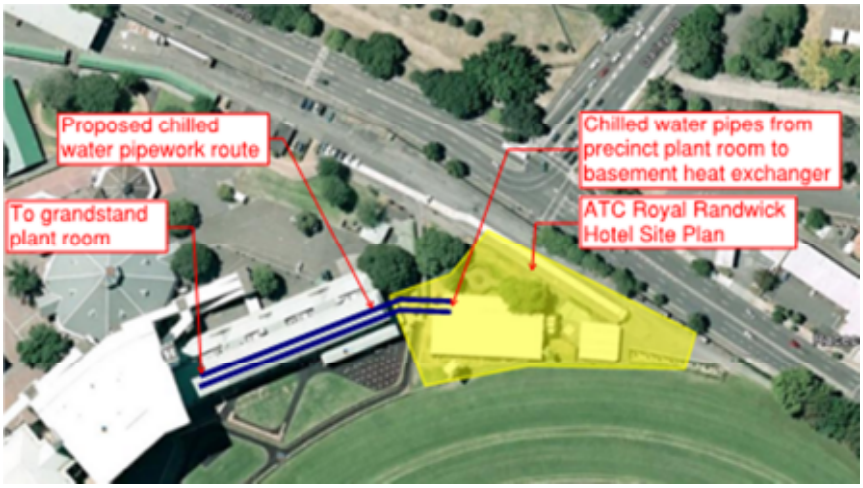


Figure 6: Precinct Chilled Water

The precinct plant room will contain the equipment required to serve the Royal Randwick Hotel, including but not limited to the following:

- Water cooled chillers;
- Cooling towers;
- Primary circuit pump set;
- Control panel; and
- Associated ancillary equipment.

The chilled water flow and return reticulation pipework will distribute water to the Royal Randwick Hotel basement plate heat exchanger. Basement plant will contain the secondary loop where the chilled water pipe work will be distributed throughout the building, serving the required ceiling fan-coil units (FCU), air-handling units (AHU), and roof mounted air-handling units. The heating system will be provided by gas fired or equivalent boilers located in the roof plant room.

II. Centralised Roof Mounted Plant

The centralised plant should operate as per the Precinct Chilled Water System method, with exception that the equipment would be located in a roof mounted plant room.

Roof equipment would include but not limited to the following:

- Air-cooled chillers;
- Primary and secondary loop pump sets;
- Gas fired or equivalent boilers;
- Control Board; and
- Other, any additional equipment required.

System can be represented as per Figure 8 below.

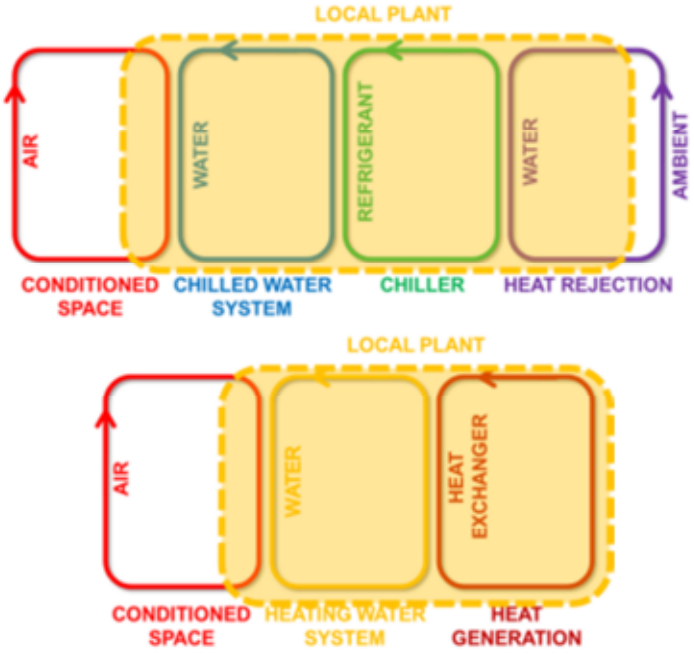


Figure 7: Cooling and Heating Circuit

The cooling/heating is performed by ceiling concealed fan coil units (FCU), whilst chilled and heating water pipe work, and minimum outside air per occupants is supplied through main risers from roof plant.

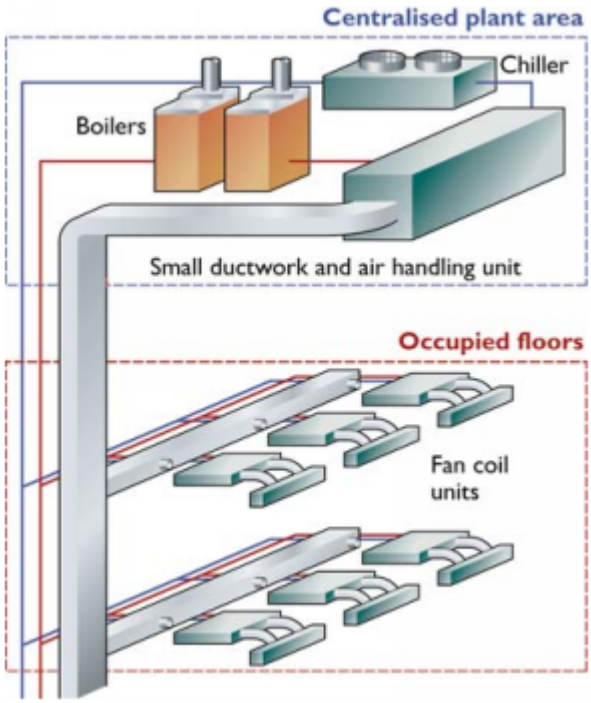


Figure 8: Centralised Plant Equipment

III. Precinct Chilled Water System vs Centralised Roof Mounted Plant System

Implementation of the **Precinct Chilled Water System** will provide with the following;

- ✓ Smaller overall plant area;
- ✓ Centralised acoustic containment;
- ✓ Reduces potential additional plant associated with providing decentralised thermal plant (i.e. redundancy satisfied with less equipment);
- ✓ Provides the benefits of an improved operational efficiencies associated with larger, more diversified plant;
- ✓ Supports the opportunity to optimise plant on a larger scale to operate at the most efficient loading band (modularity);
- ✓ Facilitates flexibility and future proofing of the site through the provision of site reticulation that accommodates future expansion;
- ✓ Presents an opportunity to incorporate thermal storage for peak load lopping, reducing the peak installed plant requirements;
- ✓ Builds on financial economies of scale to couple larger plant as opposed to smaller, decentralised plant;
- ✓ Reduces the plant spatial requirements in each building; leads to an increase in usable floor space;
- ✓ Reduces the maintenance costs and centralises the Facilities Management operation;
- ✓ Reduces the gas and electricity reticulation (dematerialisation) to individual buildings;
- ✓ Allows for the increased opportunity to incorporate non-traditional plant methodologies, including: Combined Heat and Power (CHP) – co-generation; and Combined Cooling, Heat and Power (CCHP) systems – tri-generation; and
- ✓ Opportunity to build the plant in modular stages, tracking the capacity requirements of the site as it is developed.

Implementation of the **Centralised Roof Mounted Plant System** will provide with the following;

The advantages and disadvantages of the system are as per aforementioned in Precinct Chilled Water System, with exception to the following:

- ✓ Shorter pipework reticulation;
- ✓ Eliminates the basement plate heat exchanger plant room;
- ✓ Reduced primary circuit pump energy; and
- ✓ Use of air cooled chiller reduces overall plant area.

3.2.2 Variable Refrigerant Flow (VRF) System

Refrigerant based systems use a refrigerant (typically R410a) to transport thermal energy around a building to required plant, and floor equipment. External units can carry out a reverse cycle operation to provide both heating and cooling. VRF systems can simultaneously provide heating and cooling in separate areas serviced by the same air conditioning system by incorporating heat recovery technology between internal units and the external heat pump or condenser units.

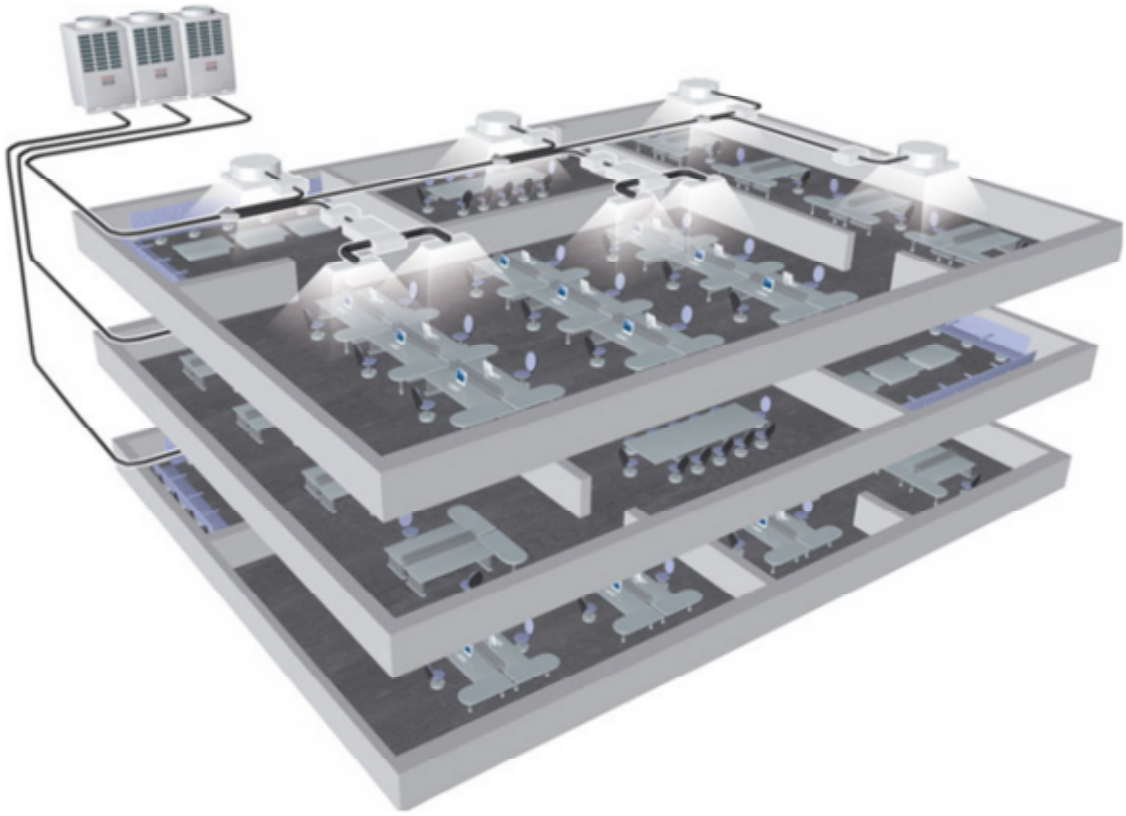


Figure 9: VRF System

The possible implementation of VRF system in the Royal Randwick Hotel development would result in the following but not limited equipment list:

- Ceiling concealed package units located in bulkheads above entry door for apartments, and in meeting, conference, kitchen, and circulation area; and
- Roof mounted condenser/heat pump reverse cycle units, depending on the refrigerant charge and floor plan split layout. Located in an open, roof located plant, external condensing units require good ventilation to eliminate risk of short circuiting (drawing in warm discharge air through cooler) and ensure maximum performance and efficiencies.
- Associated ancillary equipment (e.g. pipework reticulation, controls etc.)

Implementation of the following system will provide with the following:

Advantages

- ✓ Capital cost (offset by copper reticulation);
- ✓ Simplicity of control systems (proprietary); and
- ✓ Proprietary control systems enable analysis of energy usage between apartments/suites.

Disadvantages

- ✘ Limitations in plant position – maximum pipe lengths will influence design;
- ✘ Space required for external plant;
- ✘ Reduced plant life (10 to 15 years);
- ✘ Extensive refrigerant pipework reticulation zones;
- ✘ Replacement strategy significant in plant and riser arrangement/access;
- ✘ Limited control over operating temperatures (comfort/air dumping); and
- ✘ Refrigerant volume – design constraints.

3.2.3 Quantitative Comparison

An indicative quantitative summary of the two available systems below illustrates the monetary variances between the two systems. It should be notes that information below is only an opinion of cost, and the QS should review the information and remains responsible for the cost plan including the relevant costs associated with implementation, operation, and maintenance.

The below table is a comparison of mechanical air conditioning plant alternatives only and excludes ventilation plant which is constant for the three options proposed.

Cost	VRV/VRF	Chilled Water (Centralised Roof Plant)	Chilled Water (Precinct Chilled Water)
Capital Cost (per m²)	$350	$450	$450
Additional capital cost for Precinct ChW infrastructure ($ total)	N/A	N/A	$165,000 (total)
Total Capital cost	$3,150,000	$4,050,000	$4,215,000
Cost of Electricity (at 15c/kWh)	$247,799	$227,355	$214,532
Cost of Gas (at 7.5c/kWh)	$8,079	$30,864	$30,864
Total Annual Operation Expenditure ($/year)	$255,878	$258,219	$245,396
Maintenance Cost ($/year)	$84,000	$86,000	$86,000
Economical Life	15 Years	20-25 Years	20-25 years
Simple 15 Year Cost	$5,098,170	$5,163,285	$4,970,940
Simple 20 Year cost*	$9,947,560	$6,884,380	$6,627,920

Table 6: Preliminary Quantitative Comparison

*Assumes full replacement of VRV system

General Assumptions:

Conditioned Space: 9,000 m²
Average annual COP for VRV System: 2.0
Average annual COP for Chilled Water System: 2.5
Energy Cost: 15c/kWh
Gas Cost: 7.5c/kWh
Diversity: 60% average annual operation
Maintenance: $100/hr
Energy costs: Electricity at 15 c/kWh, Gas at 7.5 c/kWh

VRV:

- FCU - 1 hour, 4 times per year each (200 off)
- CU - 2 hours, 1 per year each (20 off)

Chilled Water:

- FCU: 1 hour, 4 times per year each (200 off)
- Chiller Plant: 16 hours, 4 times per year

Preliminary quantitative expenditure table above (Table 6) contains information outlined in the WSP Built Ecology Preliminary NABERS Result report (Rev 01, 8th May 2012).

3.3 Ventilation

The quantity of outside air delivered to the Royal Randwick Hotel will be calculated using the building predicted occupancy. This total expected occupancy will be multiplied by the appropriate outdoor air ventilation rate defined by the gazetted Australian Ventilation Standard, AS1668.2-1991 to establish to total building outdoor supply volume.

The total outdoor ventilation volume will be diversified through building to ensure the appropriate level of ventilation is delivered to the various occupied spaces at any given time.

Where possible, implementation of an air handling unit (AHU) located in ceiling space above service corridor on ground level, and conference room package units, a heat recovery unit will be applied.

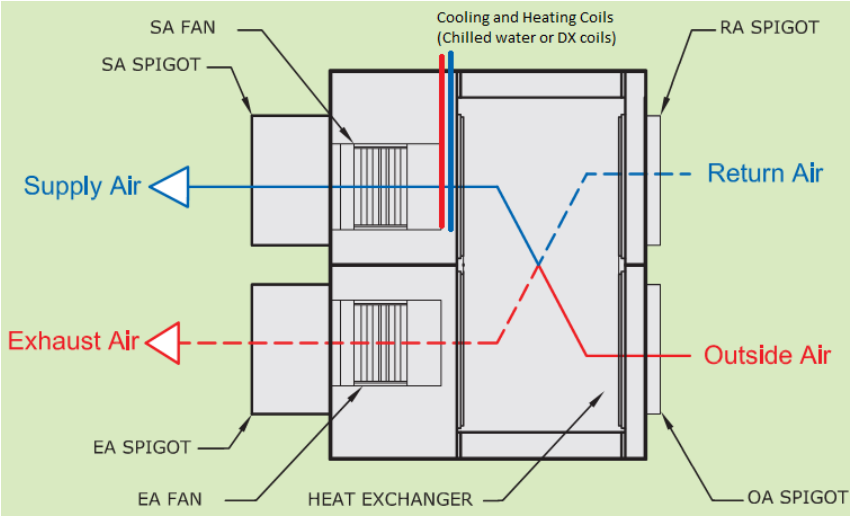


Figure 10: Heat Recovery (Curtsey of Air Change, 2012)

By using the temperature and humidity of the relief air from the area and passing it through a plate to plate style heat exchanger adjacent to the incoming outdoor air, the humidity and temperature of the incoming outdoor air will be lowered. This system represents a passive approach that will reduce the overall mechanical energy intensity.

Furthermore the outside air, which has been pre-conditioned by roof air handling units, lowers the overall local unit capacity requirement. Cooling and heating coils provide the necessary cooling and heating load.

Below sections of the mechanical services section of the report will illustrate the preliminary design treatment options for each level.

3.3.1 Basement

The basement level area of Royal Randwick hotel contains back of house areas/stores, and car park with 50 dedicated secure spaces. Figure 11 below outlines the various mechanical passive and active systems used to adequately ventilate the basement area.

Figure 11: Basement Level

1. **Loading Dock** – The single loading dock space is ventilated by a ≈ 3000L/s exhaust fan system and ductwork located at high level. Make-up outside air is drawn through the basement ramp which is open to atmosphere. Sensors (CO and NO_2) will be connected to the fan to control the volume flow and operation intensity.

   The loading dock will possibly also contain a space provision for air cooled condenser, which is used to serve the basement cold rooms. If required the condensers will be placed on the roof, depending on the refrigeration equipment design.

2. **Car Park Outside Air Make-Up** – The outside air make up for the car park exhaust is drawn through two locations. The 4m² chevron type or equivalent weatherproof louvre to outside, located adjacent to the fire hydrant and sprinkler pump room, with minimum 50% free area.
3. **Entry/Exit Roller Door** – Used to provide make up outside air to the car park, the 5m² louvred door at minimum 40% free area is required.
4. **Public Male and Female Toilets** – Individual exhaust system provides extract for the bathrooms, with make-up supply drawn through door/wall grilles to outside. For female bathroom, 0.6m² to outside grille area required, and 0.5m² for male bathroom. Exhaust duct work is reticulated across car park, to the exhaust riser adjacent to the gas meter room.
5. **Outside Air Louvre** – The 5m² required weatherproof louvre is used provide minimum O/A to basement AHU, located in one of the basement back of house stores. The AHU, coupled with a heat recovery system will provide pre-condition air to the circulation zone, and required basement stores. By positively pressurising the circulation space, it will reduce the transfer of odours from the stores (such as garbage room, chemical storage etc.) entering the basement lobby and

adjacent areas.

In additional to providing direct pre-conditioned outside air to basement spaces, the AHU will be serving minimum O/A to ceiling concealed FCU's in the TOGA house-keeping office.

Communications room will be served by the main basement AHU, providing direct pre-conditioned outside air into the space based on occupancy rates. A separate FCU located if possible in adjacent room ceiling, to mitigate risk of cooling media reticulating over server rack's, or room located critical computer room air-conditioning unit (CRAC) will be used to provide cooling to the communications room.

6. **Car Park Exhaust System** – The floor to ceiling exhaust plenum, connected to a fan room, is used to extract approximately 10,000 L/s of car park exhaust air through grilles located within the full height plenum. The 3.9m² required area of the exhaust riser will be reticulated below ground floor decking, and exhausted through a 8m² weatherproof chevron type or equivalent louvre into the landscaping area on ground floor.

7. **Basement Exhaust Riser** – Adjacent to the gas meter room, the 8m² basement exhaust shaft riser to ground level will contain the following systems:

   - Loading dock exhaust system;
   - Basement general exhaust;
   - Garbage exhaust system – Extracting the basement garbage room areas;
   - Cleaner room exhaust system – Extracting the basement cleaner room;
   - Basement male and female amenities exhaust system – Exhaust for basement located male and female amenities;
   - Chemical exhaust system – Extracting the basement chemical room area;
   - Dirty linen and laundry exhaust system – Extracting the basement dirty linen stores and laundry room. Additional dryer exhaust can be exhausted through the riser if required; and
   - Basement public toilets exhaust system – Extracting male and female car park toilet exhaust by across floor high level duct reticulation.

   Reduced height clearance above the adjacent car space will be required in order to adequately manage all ductwork in riser reticulation. Exhaust riser will be extracting minimum of 3m above ground floor level, and not less than 6m away from any outside air entry louvres.

3.3.2 Ground Floor

Royal Randwick Hotel ground level contains the foyer and reception with lift lobby area which provides direct access to trackside café/restaurant/bar area, including a commercial grade kitchen area. Figure 12 below outlines the various mechanical passive and active systems used to adequately ventilate the ground floor area.

Figure 12: Ground Floor

1. **Basement Exhaust Riser –** Basement exhaust riser from below, discharging minimum 3m above ground floor level, through a chevron type or equivalent weatherproof louvre, with approximate area of 5m² at minimum 50% free area. Discharging into the landscaping area above basement ramp and not less than 6m away from any outside air entry louvres.
2. **Car Park Exhaust –** Car park exhaust riser reticulating below ground floor decking, and discharging into landscaped area, through a weatherproof chevron type or equivalent louvre, with approximate area of 8m² at minimum 50% free area.
3. **Male, Female, and WC Amenities –** All floor amenities located on ground floor are being discharged through a riser located adjacent to the kitchen exhaust riser. Preliminary riser layout as per Figure 13 below.

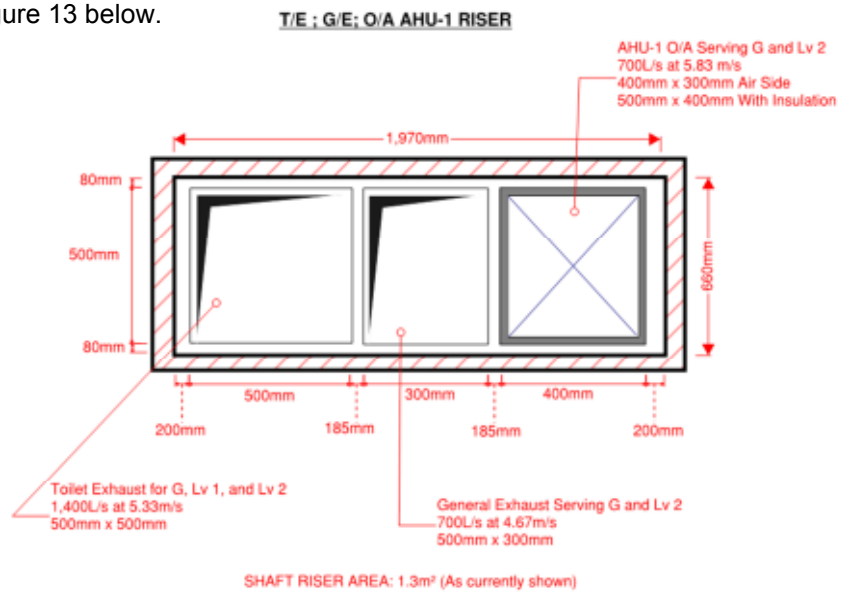


Figure 13: Outside Air, Toilet and General Exhaust Riser

4. **Main Ground Level Kitchen –** The kitchen exhaust riser in a fire isolated riser shaft to roof plant area. Access panels required on each floor for internal cleaning and minimum 1.5m spacing's throughout horizontal transfer sections. Make-up outside air is served by a ceiling concealed pre-conditioning unit, which draws air from an outside air louvre on façade as per Figure 14 below.

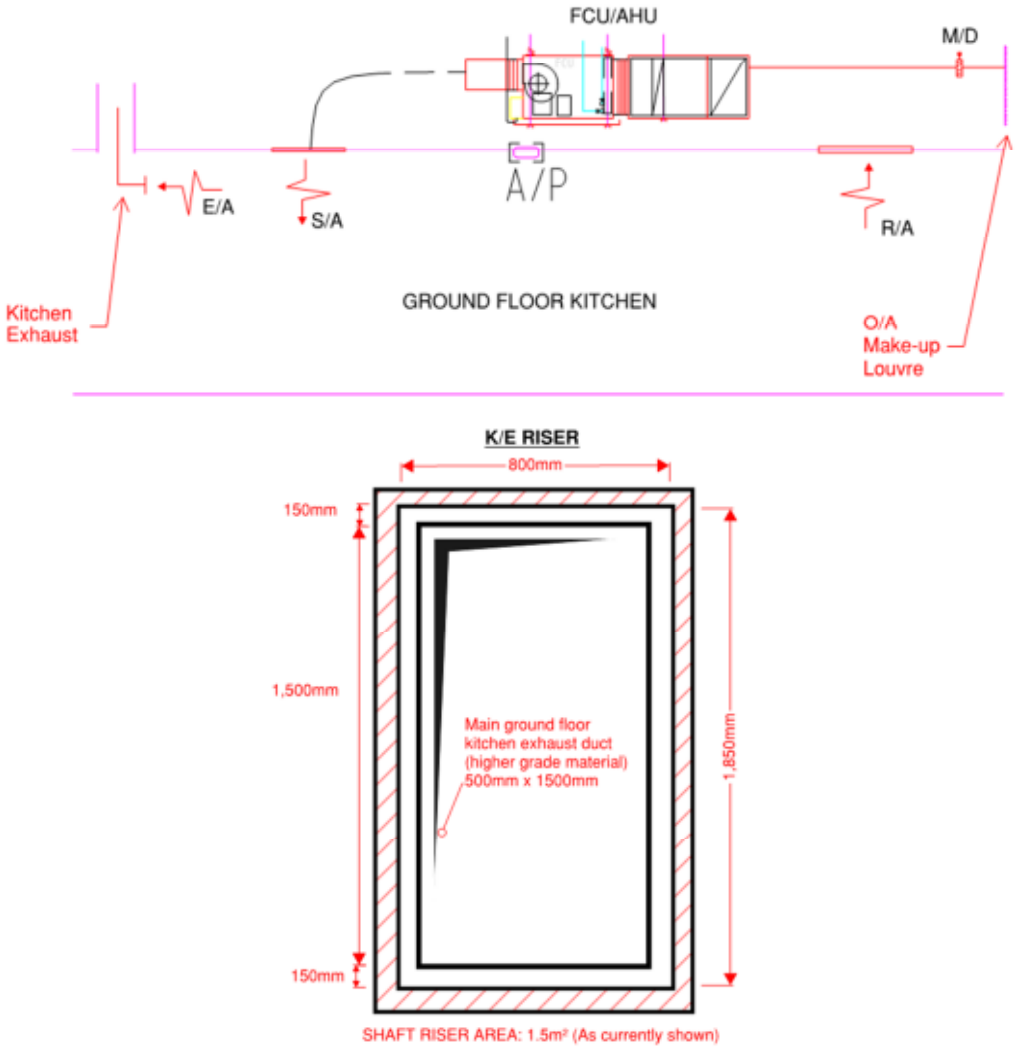


Figure 14: Kitchen Exhaust and Supply

Provisional allowance has been made in the riser size volume flow rate, until the final kitchen equipment layout and requirements are selected.

5. **Restaurant/Bar –** Supply to the restaurant/bar area provided by an above corridor ceiling concealed AHU with heat recovery unit. Minimum outside air is served by a riser in the corridor, which is supplied from the level 2 intake plenum fan room. Supply ductwork is branched throughout the restaurant/bar ceiling space, which serves pre-conditioned outside air to the ceiling fan coil units (FCU's). Access panels required below the corridor AHU and restaurant/bar FCU's, for maintenance. Return air is extracted via a grille within the vertical face of the bulkhead to the corridor AHU heat recovery unit, and exhausted though ductwork to the ground floor exhausts fan room. FCU's to be located away from the furniture layout in order to facilitate future maintenance from below.

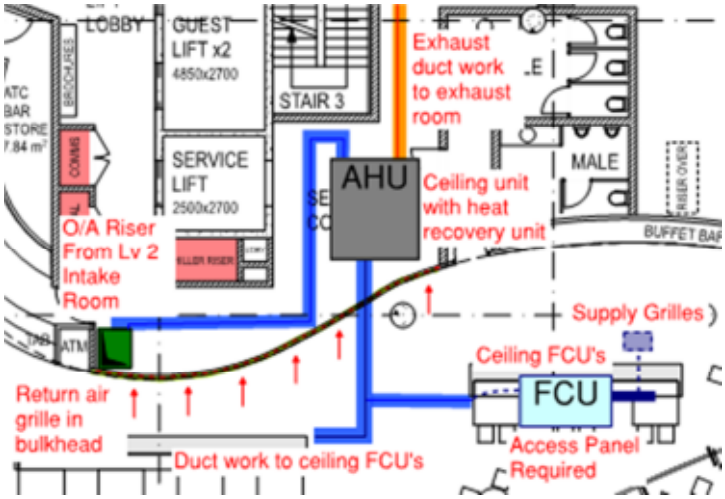


Figure 15: Restaurant/Bar Supply and Exhaust

6. **Foyer –** The foyer area on ground floor is conditioned via a bulkhead supply grille or jet diffuser located at first floor high level. Supply air is delivered from the first floor corridor ceiling concealed AHU, which draws outside air from the level 2 outside air intake plenum fan room riser.

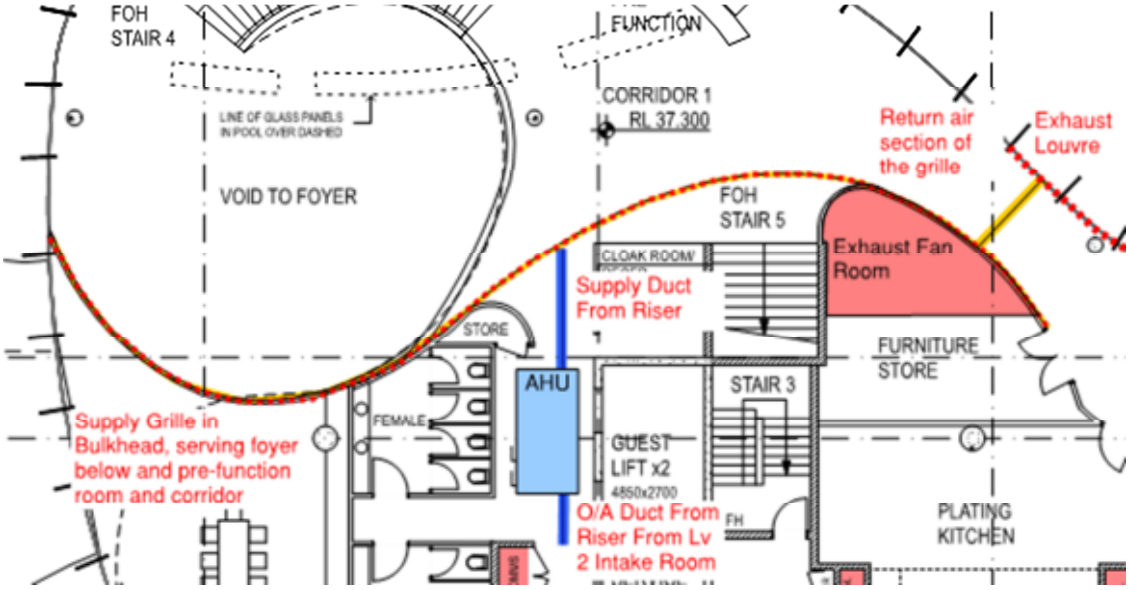


Figure 16: Foyer Supply

7. **Offices –** Supply for the managers and administration office is provided by the ceiling FCU's, which are supplied with minimum pre-conditioned outside air from the riser adjacent to the kitchen exhaust riser (Fig 13), whilst the pre-conditioning AHU is located at roof level.
8. **Exhaust Fan Room –** Ground floor exhaust fan room discharges air through a weatherproof chevron type or equivalent louvre to outside. The extract areas which are exhausted by the exhaust fan room include the following:
    - Restaurant/Bar exhaust air from the above corridor ceiling concealed AHU with heat recovery unit;
9. **Circulation Zone –** Ground floor circulation zone is served by the minimum pre-conditioned outside air from the riser adjacent to the kitchen exhaust riser (Fig 13), whilst the pre-conditioning AHU is located at roof level.

    The exhaust is extracted via a general exhaust system, located in the riser adjacent to the kitchen exhaust riser (Fig 13).
10. **Stores –** Ground floor stores (First aid room, Luggage store, and TOGA Comms Room) are supplied with minimum pre-conditioned outside air from the riser adjacent to the kitchen exhaust riser (Fig 13), whilst the pre-conditioning AHU unit is located at roof level.

    The exhaust is extracted via a general exhaust system, located in the riser adjacent to the kitchen exhaust riser (Fig 13).

3.3.3 First Floor

First floor will be dedicated to conference and meeting facilities. Figure 17 below outlines the various mechanical passive and active systems used to adequately ventilate the first floor area.

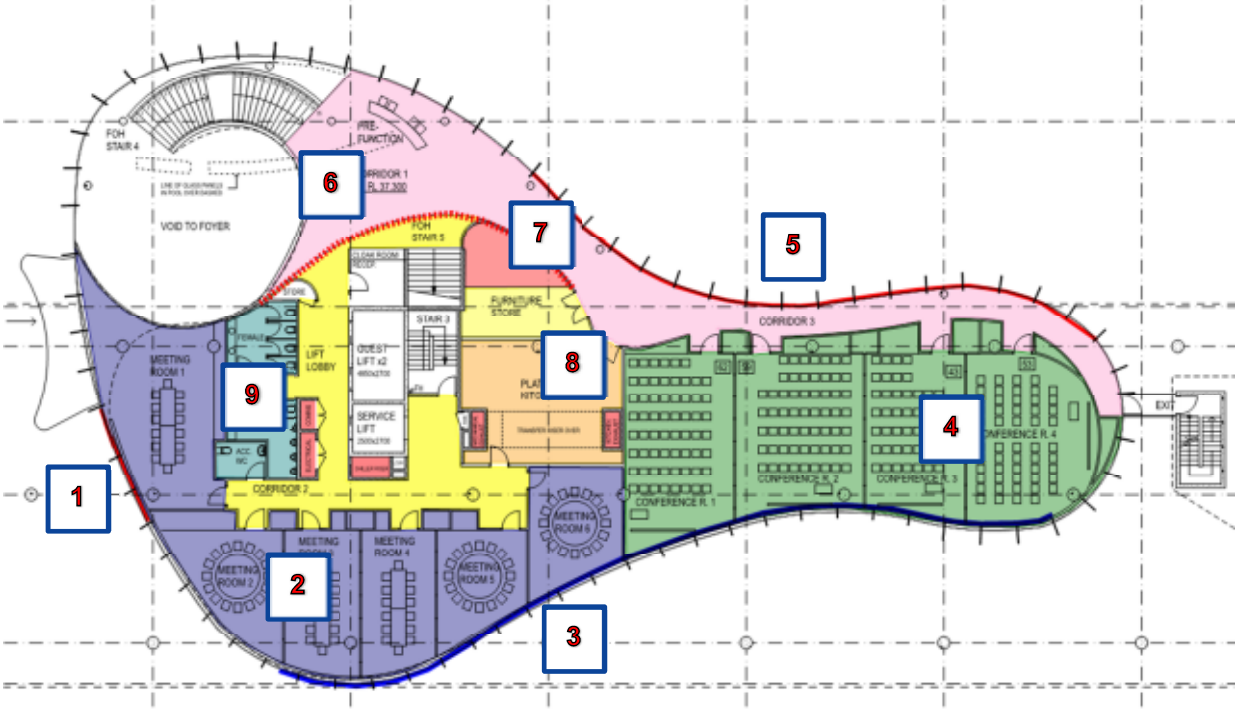


Figure 17: First Floor

1. **Exhaust Louvre –** A façade weatherproof louvre with approximate required area of 1.1m² used to exhaust portion of the meeting rooms. Final location to be not less than 6m away from any outside air entry louvres.
2. **Meeting Rooms –** Meeting rooms are served by the individual ceiling concealed AHU, which is supplied with outside air from the façade weatherproof louvre with approximate required area of 10.5m². Louvre is sized for economy mode capacity i.e. 100% fresh air volume for periods of free cooling or full recirculation to reduce energy consumption. Access panels will be required below the units for maintenance and access purposes.
3. **Outside Air Louvre –** The approximate 10.5m² outside air weatherproof intake louvre will provide outside air to the meeting room AHU's and conference room AHU's, sized to economy mode capacity. Intake louvre should be of not less than 6m away from the exhaust louvre.
4. **Conference Rooms –** Served by ceiling AHU's with heat recovery unit.

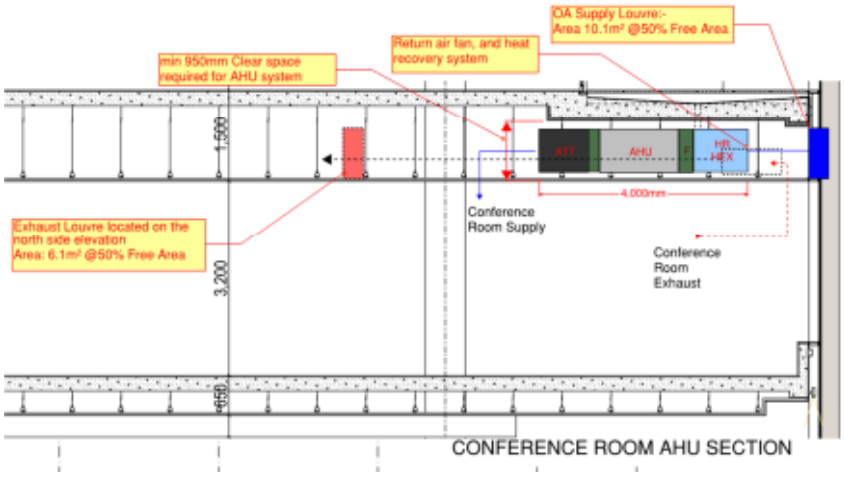


Figure 18: Conference Room Supply and Exhaust

5. **Exhaust Louvre –** A façade weatherproof louvre with approximate required area of 7.1m² used to exhaust economy mode air volume from conference room AHU's and exhaust fan room.
6. **Pre-Function Room and Circulation Space –** Supply air is delivered from the first floor corridor ceiling concealed AHU, which draws outside air from the level 2 outside air intake plenum fan room. Supplied by bulkhead supply grille used to serve the foyer area (Fig 16) and corridor supply grilles.
7. **Exhaust Fan Room –** Used to exhaust first floor store, plating kitchen, and ground floor foyer and pre function room area through chevron type or equivalent weatherproof louvre to outside.
8. **Plating Kitchen –** Minimum outside air is served by a riser in the corridor, which is supplied from the level 2 intake plenum fan room. General exhaust is extracted from the exhaust fan room. Plating kitchen will contain a kitchen exhaust duct transfer bulkhead. Access panels will be required to service and clean the ductwork internally from grease build-up with minimum 1.5m spacing's throughout horizontal transfer section.
9. **Male, Female, and WC Amenities –** All floor amenities located on first floor are being discharged through a riser located adjacent to the kitchen exhaust riser. Preliminary riser layout as per aforementioned Figure 13.

3.3.4 Second Floor

Second floor recreation, pool deck and terrace area. Figure 19 below outlines the various mechanical passive and active systems used to adequately ventilate the second floor area.

Figure 19: Second Floor

1. Smokers section of the terrace to be located away from the main lobby entry, and outside air intake plenum area.
2. **Gymnasium –** Supply to the gym is provided by the adjacent mini-plant containing a vertical AHU. Access required to the plant for service and maintenance. Outside air to the AHU supplied by the façade 0.9m² weatherproof intake louvre, whilst the 0.6m² weatherproof exhaust louvre is not less than 6m away from the intake louvre.
3. **Male, Female, and WC Amenities –** All floor amenities located on second floor are being discharged through a riser located adjacent to the kitchen exhaust riser. Preliminary riser layout as per aforementioned Figure 13.
4. **Outside Air Intake Fan Room –** Minimum 2m wide fan room to be used to supply dedicated ground and first floor areas. The fan room to incorporate a full face façade intake louvre door with attenuator to increase acoustic properties and minimise sound reverberation through the ductwork. The inline fan assists in air distribution throughout the riser. Access to the room is required through the louvred access door.
5. **Serving Kitchen –** Supplied with minimum pre-conditioned outside air from the riser adjacent to the kitchen exhaust riser (Fig 13), whilst the pre-conditioning AHU is located at roof level.

3.3.5 Upper Floors (Level 3 to 7)

The upper five floors of the Royal Randwick Hotel will consist of 170 key serviced apartments, consisting of hospitality suites, 1 and 2 bedroom apartments. Figure 20 below outlines the various mechanical passive and active systems used to adequately ventilate the hotel floor area.

Figure 20: Upper Floors (Level 3 to 7)

1. **West Supply Zone –** Hotel floor has been split into three pre-conditioned outside air supply zones. West supply riser required with clear internal area of 1.46m² and typical aspect ratio of 3:1, provides pre-conditioned outside air to apartment FCU's and also supplies portion of the pre-conditioned outside air to the lobby corridor. The lobby corridor is positively pressurised to eliminate any odour transfer between apartments, and also to provide make-up supply to the apartments via door under-cut.
2. **Centre Supply Zone –** Centre supply riser with clear area of 1.12m² provides pre-conditioned outside air to apartment FCU's and also supplies portion of the pre-conditioned outside air to the lobby corridor, and to the ATC operator room.
3. **East Supply Zone –** East supply riser with clear area of 1.46m² provides pre-conditioned outside air to apartment FCU's and also supplies portion of the pre-conditioned outside air to the lobby corridor.
4. **Lobby and Corridor –** Lobby and corridor are supplied with pre-conditioned outside air.

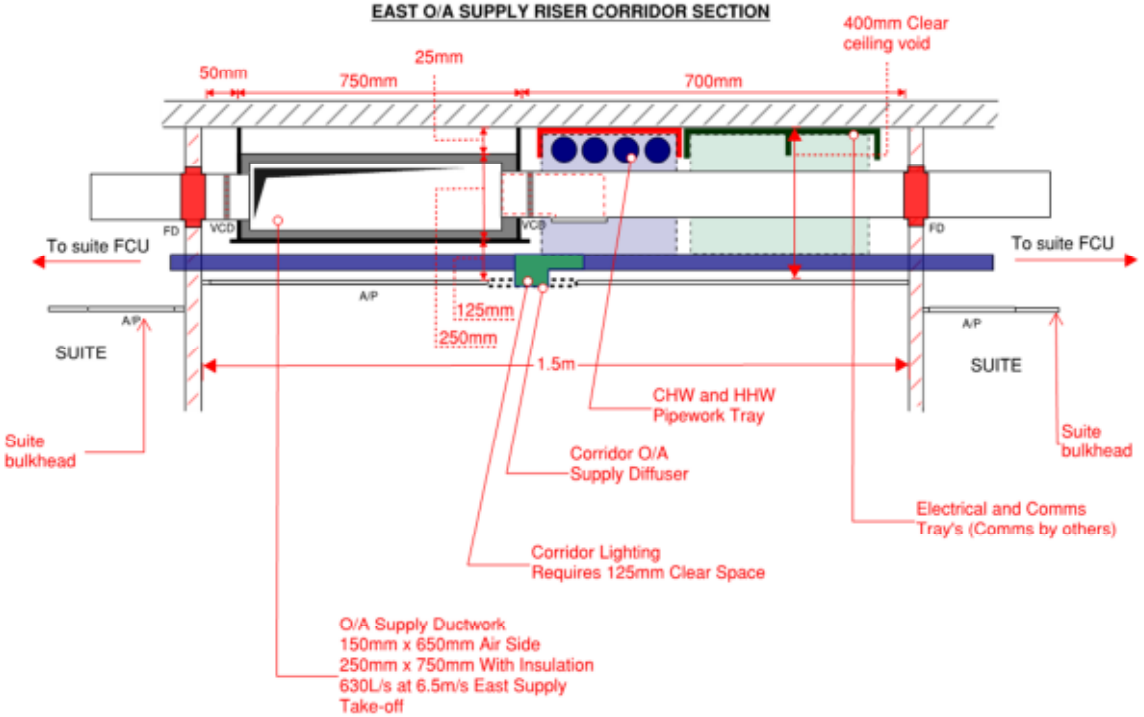


Figure 21: Typical Corridor Section

5. **Typical Apartment –** Typical hotel floor apartment is supplied with pre-conditioned outside air based on occupancy outlined in the Adina Royal Randwick Racecourse Design Manual, 2 people per bedroom at minimum 10 L/s.person through a branch from the corridor supply duct. The supply duct will penetrate the apartment suite above the entry door; a fire damper will be installed.

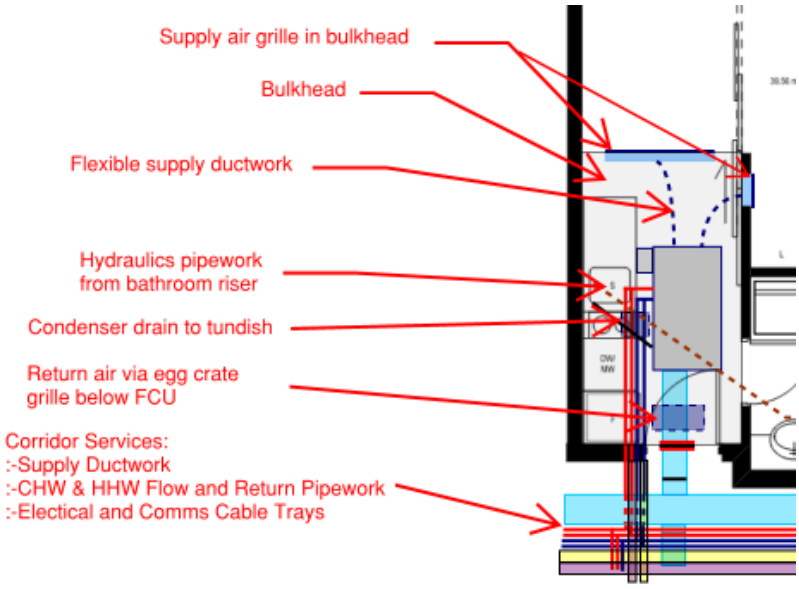


Figure 22: Typical Hotel Apartment Services

Supply duct will provide the minimum pre-conditioned air to the back of the FCU, located in the bulkhead above the apartment entry corridor. A return air egg crate style grille will be located in the underside of the bulkhead, which will draw return air from the apartment by the bulkhead FCU, where minimum pre-conditioned air and return air will mix in the FCU. Supply air to the apartment will be provided by a supply slot grille in the bulkhead side, for the main living area, and also a supply slot grille in the bedroom area.

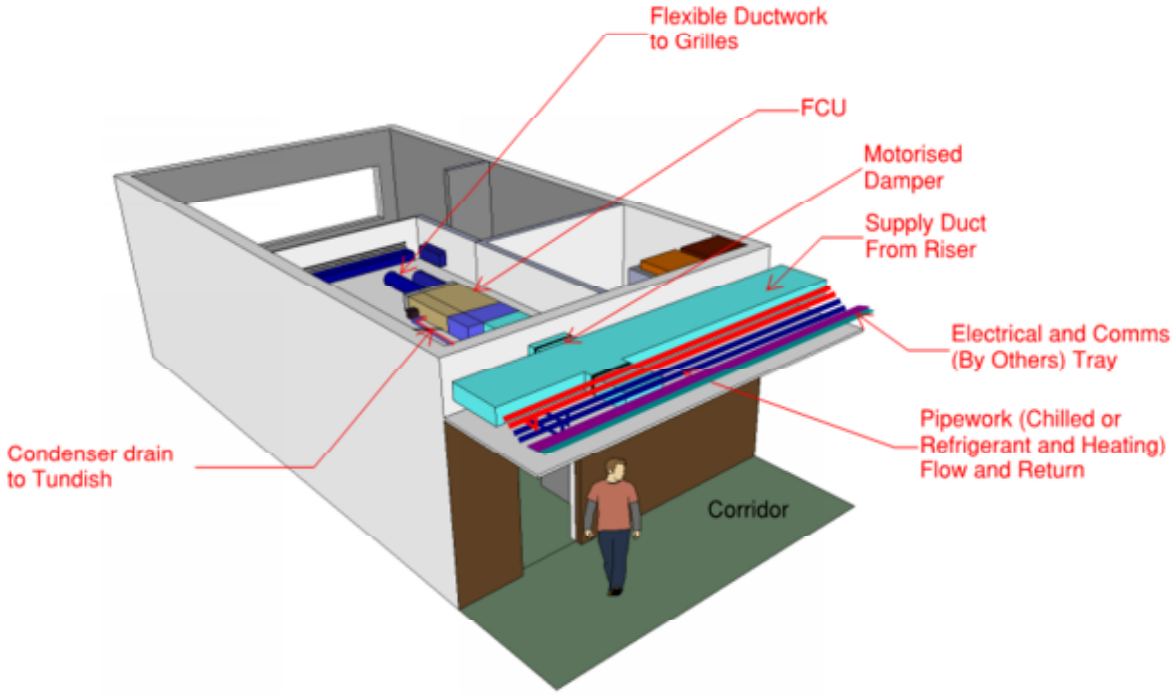


Figure 23: Typical Hotel Apartment Detail 1

Flow and return pipework (chilled water or refrigerant) will be supplied to the apartment FCU through an adjacent slot above the apartment door. The main central pipework riser will take-off on each hotel floor, and corridor pipework will branch out to the apartments. Condenser drain from the FCU will be directed into a tundish.

An access panel will be required in the underside of the bulkhead to provide access to FCU controls, filters, and for maintenance purposes

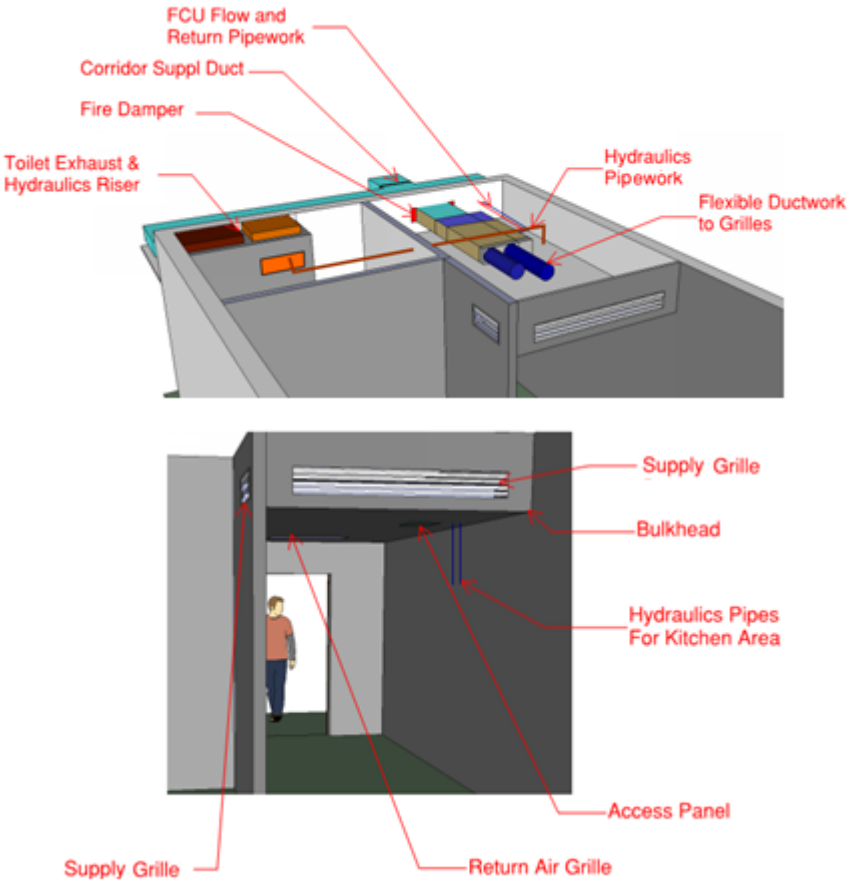


Figure 24: Typical Hotel Apartment Detail 2

Toilet exhaust will be via a sub-duct arrangement, through a riser located in the bathroom at an extract volume of 35L/s per bathroom. The sub duct arrangement is used to eliminate the need for fire dampers, whilst maintaining to the system operation during fire mode. Sub-duct design and implementation will be as per the BCA gazetted AS1668.1 1998.

Each toilet exhaust riser will be serving two adjacent room bathrooms (where possible), as outlined in figures below.

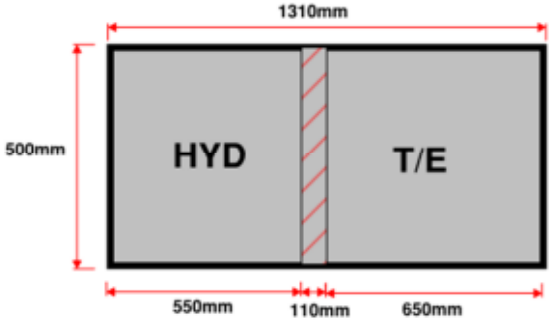


Figure 25: Preliminary T/E and Hydraulics Riser

Riser shaft will be divided into a toilet exhaust and hydraulics riser by a fire isolated separation wall.

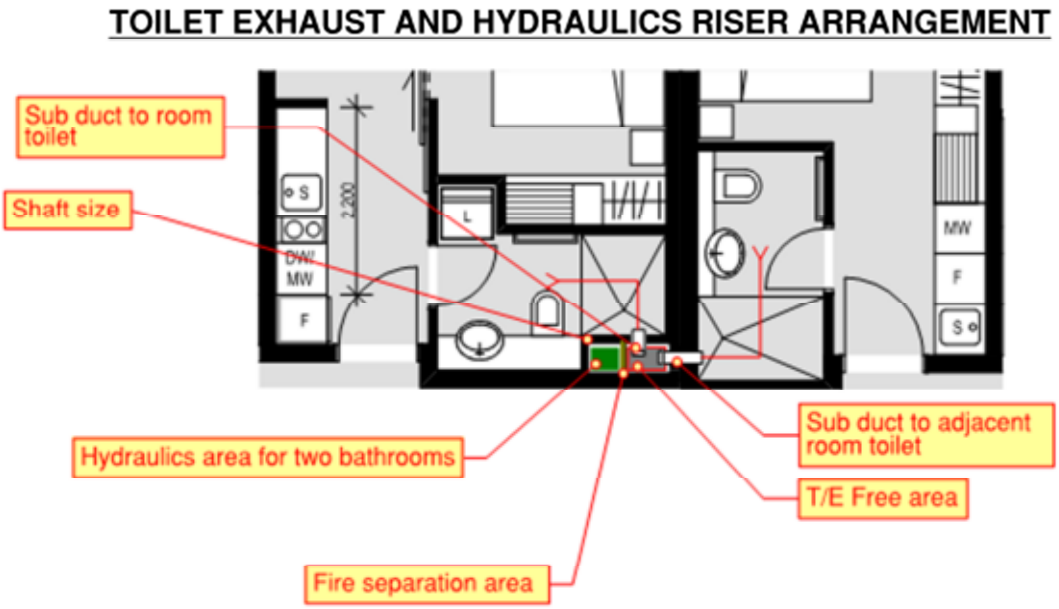


Figure 26: Apartment Toilet Exhaust

3.3.6 Roof Top Level

The roof level of the Royal Randwick Hotel will contain the plant area, equipment layout and footprint space will be dependent on the mechanical system selected. Plant area will also contain mechanical control panel board, and any required hydraulics, fire, and electrical services equipment. Certain disciplinary elements may require enclosure against the elements, with size, and location to be confirmed in latter stages of the design process. Furthermore, the plant area will contain an access/egress to allow regular inspection, maintenance and possible future plant space.

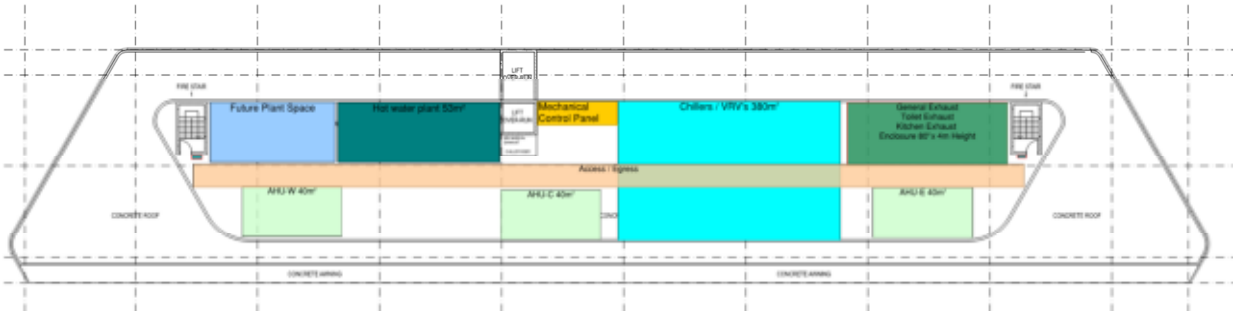


Figure 27: Roof Level

3.4 Building Management System (BMS)

The Royal Randwick Hotel will be provided with an open protocol BMS comprising of a head end with a graphical interface of all mechanical plant and equipment.

All sub metering and energy monitoring will be logged on the BMS and accessed via the head end PC.

The BMS will be provided with internet access in order to allow remote access for maintenance staff as well as facility to provide critical alarm alert to relevant personnel.

The following list of services are not currently proposed to be included as part of the BMS as they are generally standalone systems. Whilst the integration of these on to a single system is possible, generally it is not the most practical or cost effective solution.

Exclusions from BMS:

- Lighting control;
- Billing software (sub-tenancies);
- Security and CCTV;
- Access control; and
- VRF system control/metering (where applicable).

4 Electrical Services

4.1 Scope of Services

The electrical services scope of works shall include for:

- Coordination of supply to the building, sub-stations, underground cables and metering arrangements;
- General light and power;
- Electrical sub-mains to mechanical, fire, lifts and hydraulic switchboards;
- General electrical distribution system throughout, including distribution boards;
- Emergency / exit lights;
- External Lighting including external cable reticulation and controls.
- Lightning protection;
- Uninterruptible power supplies; and
- Electrical power supplies and containment for IT, Audio Visual, security, access control, intruder detection and Intercom systems.

4.2 Electrical Supply

The Royal Randwick Hotel site currently contains existing electrical infrastructure owned by Ausgrid (formerly Energy Australia).

The location of the existing incoming high voltage mains from Alison Road will impact the Hotel site, where the future driveway is to be located. These cables will need to be redirected to a more favourable position to enable the excavation of the Royal Randwick Hotel driveway to the basement car park.

A new 2 metre wide cable easement will need to be established in Ausgrid's favour over the redirected sections of HV cable.

The remaining existing infrastructure around the site is not expected to provide any significant impact to the proposed development.

A new Kiosk Substation will supply the Hotel from the incoming HV feeders, pending confirmation of availability of supply from the Ausgrid HV Planning section.

The new pad mounted kiosk substation will be located on the site boundary to the north, off Alison Road.

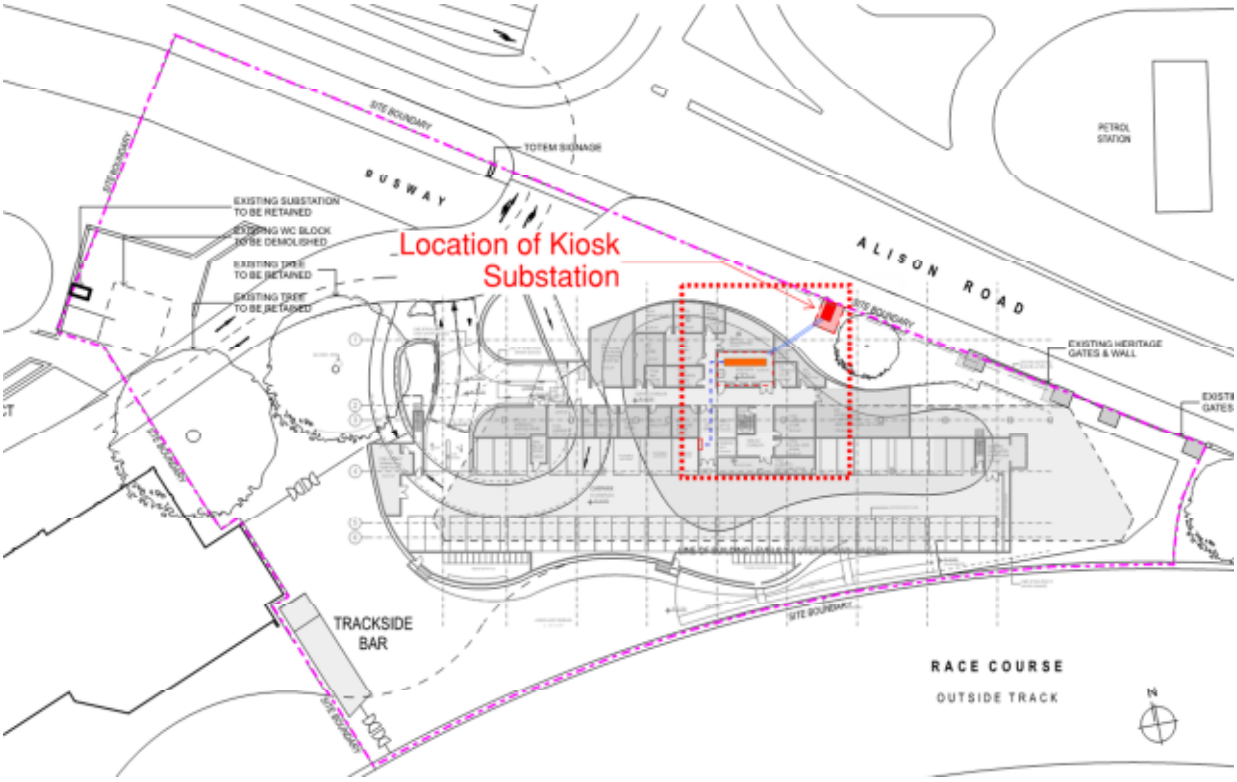


Figure 28: Location of Proposed Kiosk Substation

The electrical supply for the development has been based on the load assumptions listed within the design criteria sections. On this basis, the maximum demand of the development is in the order of 700 kVA.

The client is required to initiate and enter into a connection and supply contract with Ausgrid for the service. This contract is required to be entered into prior to any connection of electricity or commencement of substation development works.

The use of the existing HV distribution feeder network to serve the Hotel is still under discussion with Ausgrid.

4.3 Substation and Consumer Mains

The substation shall be an Ausgrid pad mount kiosk substation. The substation shall be designed to Ausgrid standards and requirements inclusive of details of the substations design, easements, and access requirements. Electricity supply to the hotel shall be derived from the LV switchboard of the kiosk substation.

The detailed design of the substation installation shall be carried out by an Ausgrid accredited, Level 3 designer. The client will be required to engage a Level 1 accredited installer for the construction of the substation.

4.4 Main Switchboards

A main switchboard shall be provided to serve the development. The main switchboard shall be located in the main switch room located in a basement of the building.

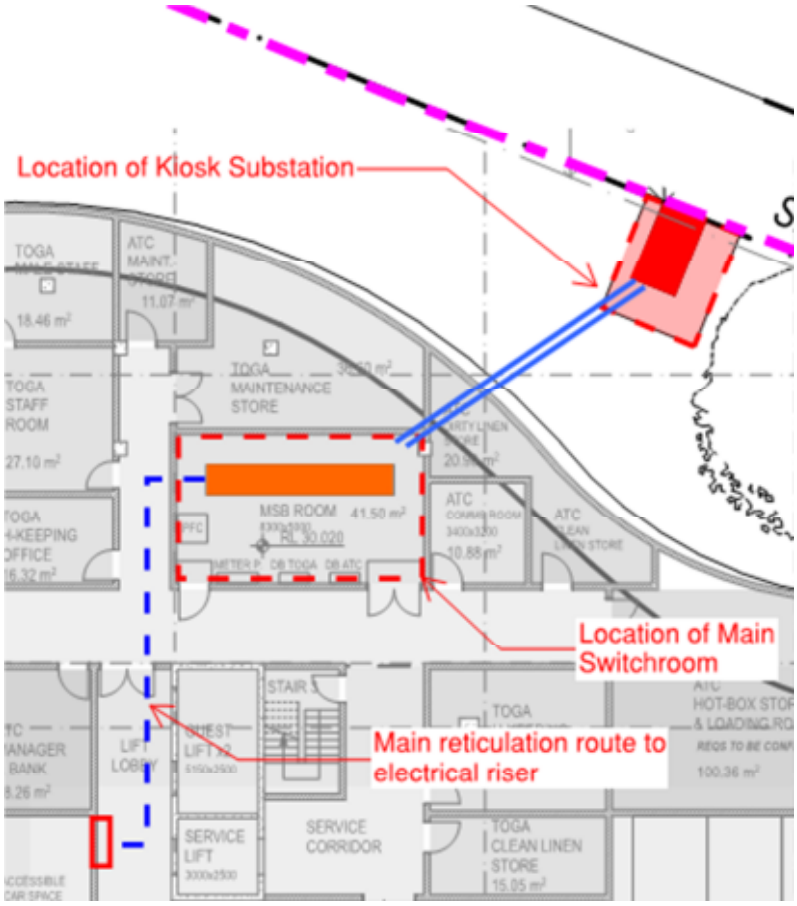


Figure 29: Location of Main Switch Board

The main switchboard(s) shall be divided into separate sections for essential services, house services (ATC), hotel services and an unmetered section for retail use. The main switchboard(s) shall also provide power to mechanical, hydraulic and fire services for both house and hotel areas. Each section of the switchboard shall be provided with multi-function meters to display and record load information.

The main switchboards shall be of the floor mounted top entry/exit, front connected cubicle type and of form 3B separation. The main switchboards shall be designed to provide an additional 20% spare capacity.

4.5 Supply Authority, Tariff & Energy Metering Arrangement

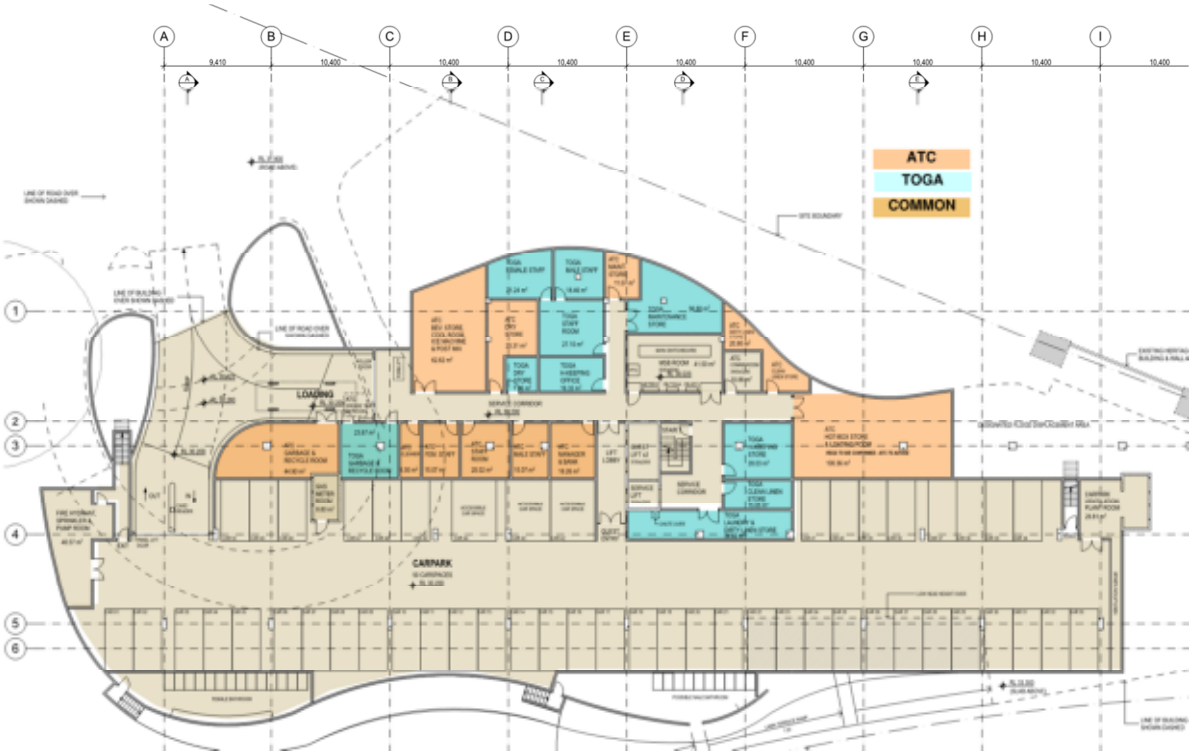
Authority meters shall be of the Ausgrid type, as issued by them, accessible from common areas for access by Ausgrid personnel, and located in accordance Supply with Ausgrid standards. Meters are tto be provided for the House (ATC) and Hotel services.

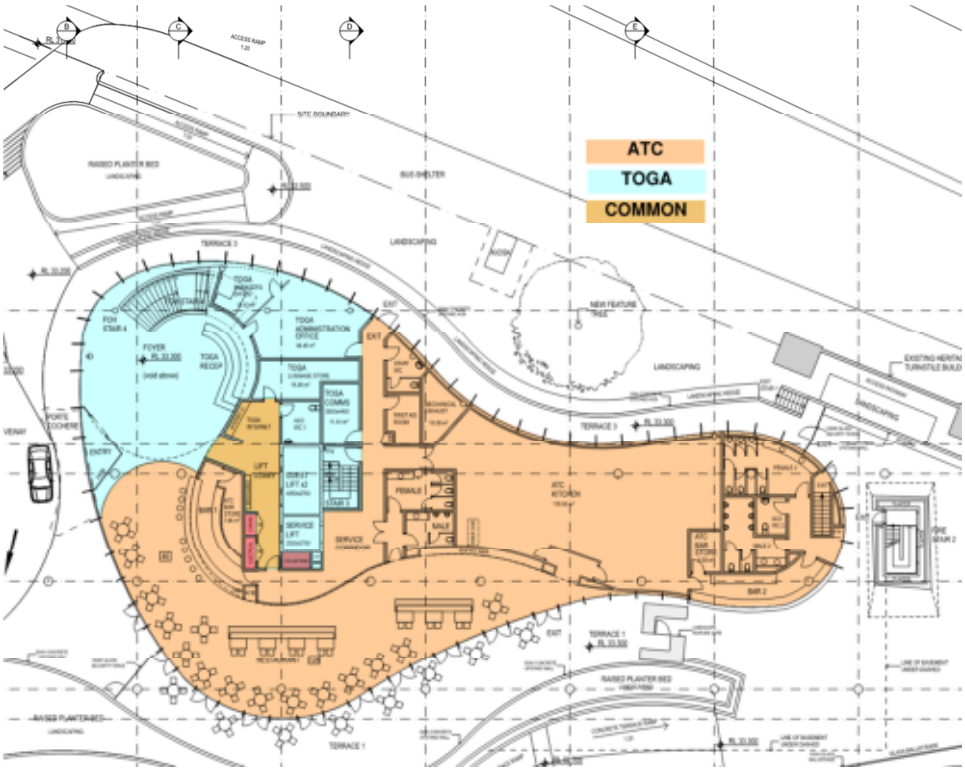
Where required, the architect shall be required to specify door locking hardware keyed to Ausgrid standard keying arrangements.

Generally supply authority metering arrangements shall be to the approval of Ausgrid. However, it is proposed that the electrical distribution system shall be arranged such that nominated areas could have separate revenue meters to potential sub-tenancies. These have been identified as:

- All internal and external bars and restaurants including the kitchen facilities and terraces located on the ground floor;
- All conference and meeting facilities located on level 1;
- The pool and terrace areas located on level 2; and
- Hospitality suites.

Each potential tenancy shall be provided with individual single or three phase direct connected metering.

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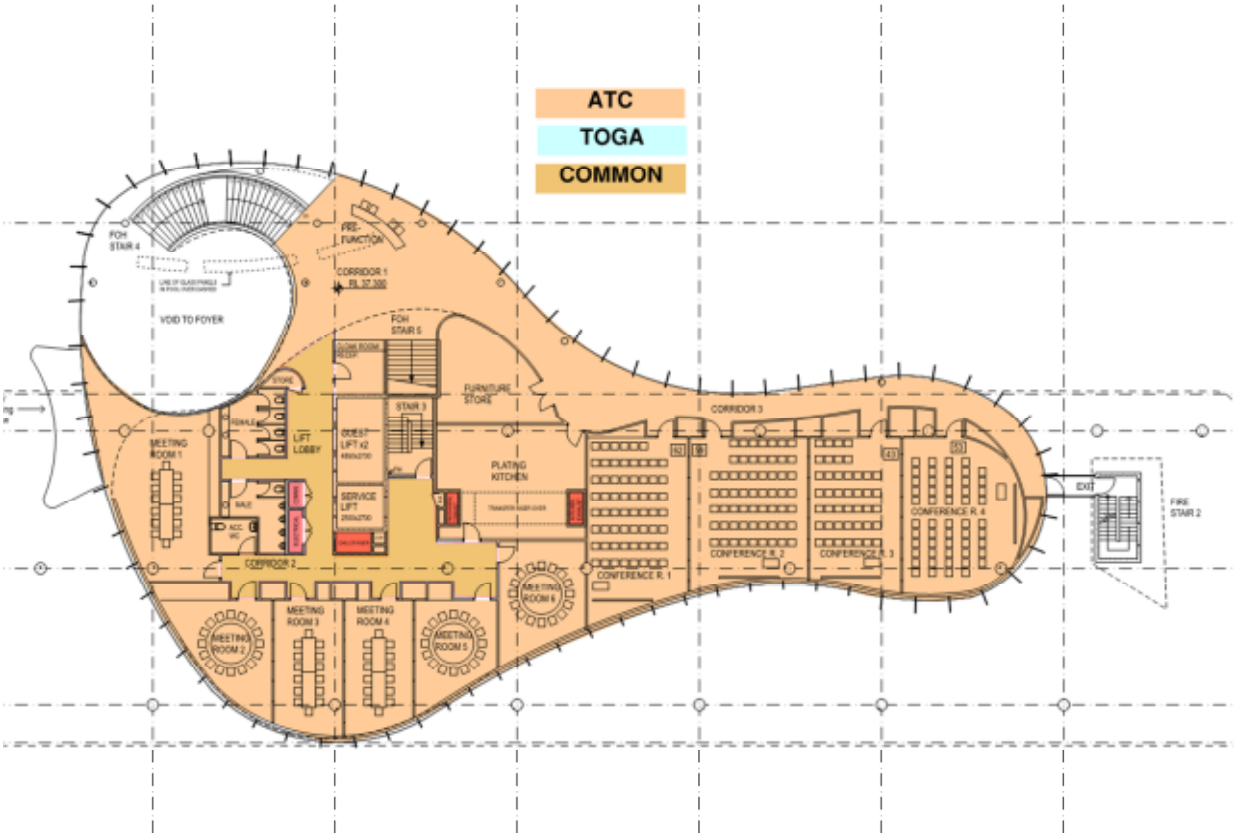
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FOH STAIR 5
FURNITURE STORE
CORRIDOR 3
MEETING ROOM 1
LIFT LOBBY
PLATING KITCHEN
CONFERENCE R. 4
CONFERENCE R. 2
CONFERENCE R. 3
CONFERENCE R. 1
CORRIDOR 2
MEETING ROOM 3
MEETING ROOM 4
MEETING ROOM 5
MEETING ROOM 6
EXIT
FIRE STAIR 2

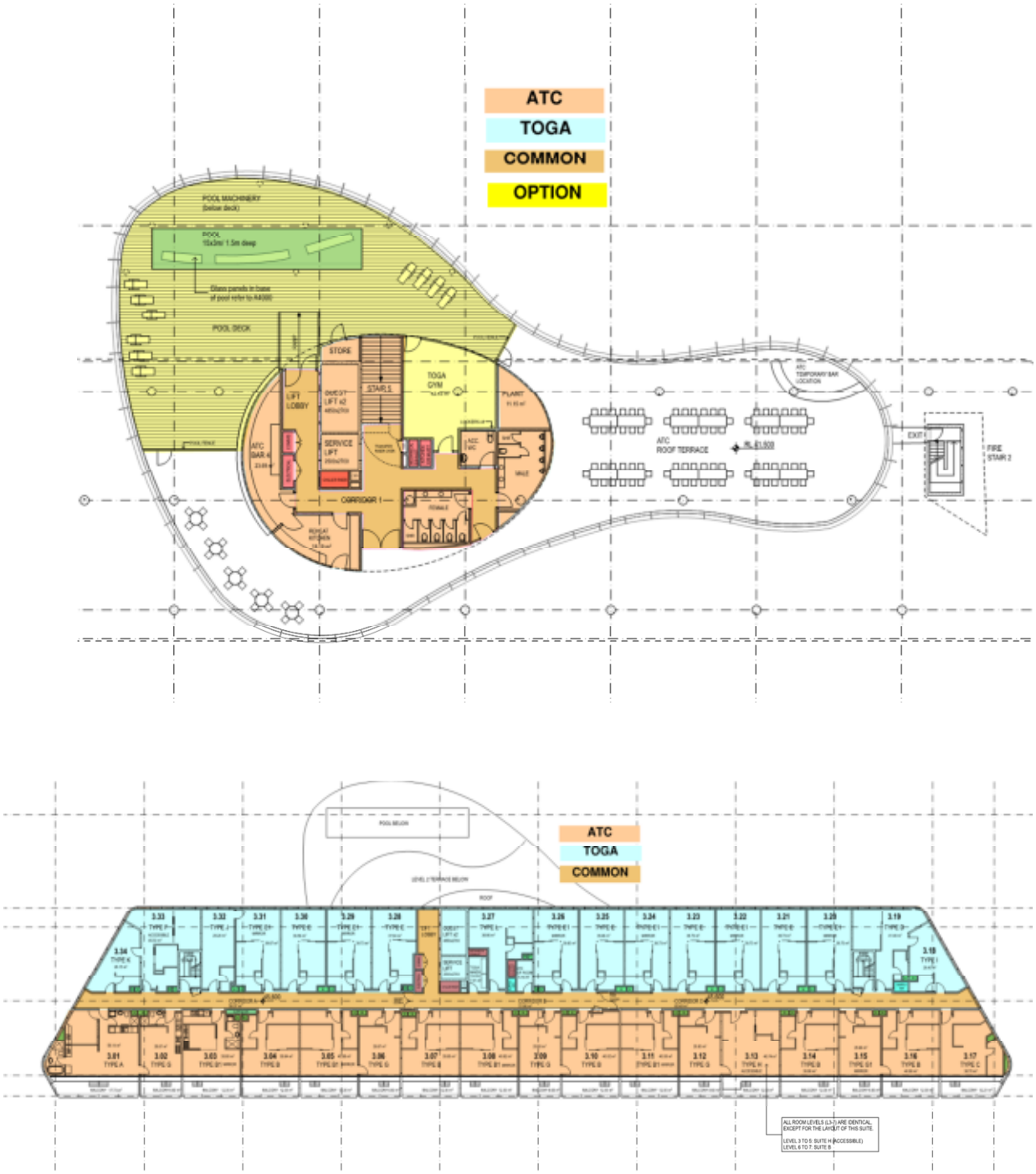


Figure 30: Royal Randwick Hotel Floor Potential Tenancy Splits

Energy Metering

There are a number of elements that shall be considered when determining the electrical energy metering strategy, including BCA, NABERS and operator requirements. To enable suitable metering and monitoring of these elements, an energy metering system (EMS) shall be installed. The EMS shall be configured in such a way that it is suitable to monitor and record all the components without the need for multiple levels of metering and monitoring of the same elements.

To meet the requirements of the BCA, suitable energy metering shall be provided. This shall include the facility to record the consumption of:

- Artificial lighting;
- Air-conditioning plant;
- Appliance power;
- Lifts and escalators; and
- Ancillary plant.

To enable the hotel to achieve a NABERS rating, the EMS will monitor the following:

- Common area, guest room and back of house HVAC;
- Common area, guest room, exterior and back of house lighting;
- Vertical transportation servicing the hotel;
- Car park lighting and ventilation (where provided fort the exclusive use of the hotel guests and staff);
- On site hotel kitchens and restaurants servicing guests, including all on-site restaurants or cades with facility to charge-to-room for guests;
- Any on-site laundries;
- Any on-site heated indoor/outdoor pools for guest use;
- Lighting, power and HVAC services to any function or conference rooms on site;
- Gyms for guest use; and
- Day spas with guest charge-back facilitates, located within the hotel.

4.6 Power Factor Correction

Provisions for power factor correction shall be provided (within the main switch room) at the main switchboard to facilitate future installation of power factor correction equipment.

4.7 Stand-By Generator

Standby power generation facilities have not been proposed for electrical services for this building.

4.8 Uninterruptable Power Supply (UPS) units

UPS provisions are to be made to communications equipment, Property Management and Point Of Sale equipment for both ATC and Adina.

The capacity, autonomy and installation requirements are to be advised by the client / communications consultant.

4.9 Sub-Main Reticulation

All sub-mains cabling shall originate from the Main Switchboard(s) and utilise copper conductors. Non-essential services may be XLPE/PVC or PVC/PVC type cabling, essential services shall be cabled in polymeric insulated fire rated cabling and be provided with additional mechanical protection as required by the BCA and AS/NZ Standards.

Sub-mains cabling shall be designed to allow for an additional 20% capacity over the calculated maximum demand capacity.

Unmetered sub-mains shall be installed for retail and commercial spaces and utilise fused tee-off arrangements to supply individual tenancies.

Sub-mains cabling shall rise vertically through the building, installed into dedicated electrical riser cupboards located on every floor, maintaining verticality with the use of appropriate cable containment facilities, and accessed through common foyer spaces / corridors.

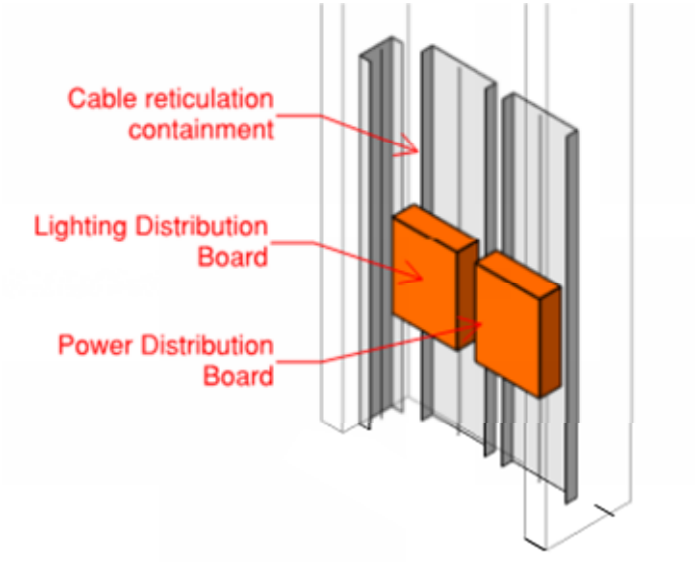


Figure 31: Typical Electrical Riser

Riser cupboards shall be constructed of non-combustible material and be smoke-sealed. Riser cupboards shall be sized suitably so to be shared with rising vertical cabling and electrical distribution boards.

Horizontal reticulation of sub-mains shall be by means of cable trays, cast-in conduits or catenaries' in ceiling spaces. Refer to Mechanical services section for typical corridor sections.

4.9.1 Distribution Boards

Distribution boards shall typically be of the surface mounted front connected, suitable for DIN type circuit breakers. All distribution boards shall be of sheet metal construction (with the exception of the hotel rooms where PVC shall be used), enclosed and complete with hinged, lockable doors.

General Distribution Boards shall be of the 3-phase, minimum 100Amp rated and 24-pole type, with separate chassis for lighting and power sub-circuits. Distribution boards shall be suitable to allow for independent energy metering of each chassis, and be complete with minimum 30% spare pole space for future requirements where in excess of 48-poles.

Accommodation floors shall utilise separate lighting and power distribution boards, shall be located within electrical riser cupboards on every level of the development. House distribution boards shall also be located in plant rooms and services area where required.

Each hotel room shall contain a dedicated distribution board located within a cupboard within the room. Distribution boards shall be of the single phase, surface mounted, insulated, load centre type of minimum 63 Amp rating and shall be split chassis to allow separate metering of the lighting and power loads.

Circuit breakers shall be of the DIN-rail type and of minimum 10 kA rating with integral RCD for all lighting and general power sub-circuits. All sub-circuits shall be required to contain individual integral residual current circuit breakers on every general lighting and power sub-circuit.

Additional distribution boards shall be provided where required to enable delineation between tenancies.

Mechanical, Hydraulics and other services distribution boards shall be provided by the respective services to their specification.

4.10 General Lighting and Power Sub-Circuit Cabling

All sub-circuit cabling shall be of minimum 2.5mm² V75 TPS type cabling. Power and lighting sub-circuits shall be designed with a maximum circuit utilisation of no more than 60%.

External sub-circuit cabling shall be of minimum 4mm2 V75 TPS cabling.

Horizontal reticulation of sub-circuits shall be by means of cable trays, cast-in conduits or catenaries' in ceiling spaces

Sub-circuits shall be run within ceiling voids and wall cavities where possible. All cabling shall be concealed from view in front of house areas. Where cabling is required to reticulate within solid walls, cables shall be chased and installed within conduits.

4.11 Lighting

Energy efficient fluorescent and LED down lights will be used wherever possible to ensure general efficiency and low maintenance of the lighting installation. Selection of the colour rendering characteristics of the lamps is important for the ambience of the space.

All lighting shall be designed to meet the lighting levels nominated in AS1680.

4.11.1 Front of House Area Lighting

Particular attention shall be taken to the lighting design of the front of house areas. The lighting scheme shall pay due attention to the form and function of the individual areas. The lighting will be coordinated and integrated in to the aesthetics of the architectural areas. These areas shall generally include:

- All public spaces;
- Building foyer;
- Bar and restaurant;
- Function areas;
- Open stairs;
- Lift lobbies;
- Conference and meeting rooms;
- Common areas and corridors; and
- Accommodation floor corridors.

Entrance lobbies, lift foyers and floor lobbies shall utilise either compact fluorescent downlights with low loss electronic control gear or LED downlights. Consideration to the architectural features of each area such as artwork, feature walls, display boxes, counters etc shall be given regarding luminaire selections. Dimming shall also be utilised to further highlight/accent these areas in the choice of lighting.

Function Areas shall be provided with either Compact Fluorescent or LED light sources. Dimmable controls shall be provided to cater for the varying requirements of functions whilst enhancing the visual appeal and comfort of the space.

Conference rooms shall utilise dimmable low energy, low loss compact fluorescent downlights. Separate switching for interior and perimeter zones as well as presentation control shall be installed. All fittings are to be dimmable.

Bar and restaurant areas shall utilise either Compact Fluorescent or LED luminaires. Luminaires shall utilise dimmable fittings to further enhance the ambience and visual appeal of the associated space.

Common area and corridors including accommodation floors shall utilise wall or ceiling mounted luminaires, with either compact fluorescent or LED light sources. Luminaires shall operate on a 24 hour basis where no natural lighting is available. Where natural lighting is available, photo electric sensors shall be utilised to turn off luminaires where light levels exceed 400 lux. Corridor lighting shall be provided with alternate switching operating on a timer controlled basis. Motion sensors shall be utilised as an override to switch on alternate fittings during ‘after hours’ times.

4.11.2 Amenities Lighting

Common amenities areas will be provided with a mix of recessed down lights using compact fluorescent lamps, and concealed linear fluorescent pelmet lighting to increase visual comfort and vertical performance.

Lighting control shall be through a combination of motion detectors and a level of 24-hour lighting.

4.11.3 Back of House Areas

These areas shall utilise surface mounted batten style linear T5 fluorescent luminaires complete with prismatic diffusers where applicable. Luminaires in plant areas shall be of the batten type complete with wire guards. Where plant rooms contain services required to be fixed to the ceiling slab, such as ductwork, pipes and cable trays, luminaires shall be of the chain suspended type. Where hydraulic and mechanical pipework reticulate above suspended luminaires, they shall be of the weather proof type.

All luminaires within fire stairs and escape passages shall operate in 24-hour operation.

All plant room lighting shall operate through standard light switching arrangements. Lighting in utility spaces such as store rooms and cleaners cupboards etc shall be controlled through a motion detector in each space/cupboard

4.11.4 Exterior Lighting

The exterior lighting will consist of purpose selected exterior luminaires to ensure long life and accurate illumination with a minimum of spill light. Light sources will be used for increased colour rendering and sense of safety. These will generally be limited to Metal Halide, LED or CFL lamp techonologies.

External Areas shall be designed to the requirements of AS1158. Typically the lighting subcategory hierarchy shall be as follows:

- Common Areas, Pathways and Footpaths – P2
- Steps, stairways and ramps – P9
- Uncovered Parking – P11a
- Disabled Parks – P12
- External Lighting – 40Eavg
- Road/Intersection Lighting – P2

The lighting will be arranged so that illumination is uniform and dark areas minimized. External lighting shall be placed on a daylight sensor and timer controls to meet DA conditions. All external designs shall be designed to comply with AS4282 to minimise adverse effects to the environment, including spill lighting, upward waste lighting and nuisance glare.

The locations of lights shall be such to minimise the number of poles unless where required for aesthetics, or security or other practical reasoning. Access to all luminaries and accessories will be suitable for outdoor use and will be vandal and weather resistant to suit the location.

Where required, Lighting Poles shall be selected to match surrounding installations for continuity, unless specifically intended for feature lighting or heritage purposes.

Provisions shall be provided to the Restaurant and Bar for electrical connections for bringing in and connecting Specialist Entertainment Lighting.

Generally, lighting to areas external to the site, shall be designed to the lighting requirements specified under the DA conditions, if required.

4.11.5 Emergency and Exit Lighting Systems

The emergency and EXIT lighting system shall generally include single point non-maintained mode luminaires. EXIT luminaires shall be maintained mode.

Emergency lighting testing functions shall be of the central computer monitored type utilising dedicated data signalling. The head end computer shall be located in the main communications room. The system shall be designed to the requirements of the Building Code of Australia (BCA) and AS2293.

Where applicable, the main entrance, lobbies and lift lobbies, corridors etc. will utilise recessed ‘spitfire’ type recessed luminaires and ‘edge lit’ type EXIT luminaires.

Plant rooms, fire stairs, back of house areas etc. will use integral emergency battery packs in fluorescent fittings to match the normal light fittings within the same area and surface mounted EXIT luminaires.

Each luminaires within fire stairs shall be of the integral emergency type. Exit luminaries will incorporate cold cathode type lamps or LED and use “running man style” green/white colour signage.

4.12 Amenities, Plant rooms & Lobbies Provisions

All common areas shall have their power and lighting services supplied from house services distribution boards. General power services shall be provided as required. Dedicated power services shall be provided to equipment as required.

Each lift lobby shall contain a minimum of one double GPO. GPO’s in lobbies and main entrances shall be of the recessed and white PVC flush plate type. In corridors, double GPO’s shall be provided at approximate 10 meter intervals.

GPO’s in plant rooms and basements shall be of the PVC flush plate, wall/surface mounted type and provided in locations as required.

General purpose power arrangements shall also be provided to common office spaces such as administration and reception desks, as required.

4.13 Typical Hotel Room Provisions

4.13.1 Supply

Each hotel room shall be supplied from the relevant floor distribution board. Individual distribution boards shall be provided to each room for local control / protection.

4.13.2 Lighting Provisions

Lighting in hotel rooms shall consist of recessed Compact Fluorescent or LED down lights in bathrooms, hallways, kitchenettes and bedrooms.

All other living areas shall be provided with either wall lights or recessed down lights utilising compact

fluorescent or LED lamp sources.

The option for integrated lighting within the vanity units within the bathrooms shall be investigated with the architect.

Lighting to splashbacks in kitchens shall be provided via the integrated lighting within the kitchen hoods.

Lighting controls shall be provided in the form of standard switching arrangements, with control from both the entrance and the bedhead, with room card override to ensure that lighting is off if the room is un-occupied.

Figure 32: Living, Bed, Corridor, and Bath Room Lighting

No provisions have been made for automatic blind controllers or other home automation devices.

4.13.3 Power Provisions

General purpose power shall be provided to hotel rooms as per the Adina brief. This shall include:

- Electric cook top;
- Microwave;
- Fridge/freezer;
- 2No. Double GPO's to study desk;
- Single GPO to the WC's;
- Power for Television;
- General power to the living areas;
- General power required for other services, such as ONT, A/C units etc;

Cover plates shall match finished colour of walls where general power outlets are installed;

Appliances shall not be provided as part of the electrical services installation

No provisions shall be made for electric heating to any areas.

4.14 Earthing and Surge Protection

Earthing systems shall be provided in accordance with Australian Standards and Supply Authority requirements throughout the building.

Earth bonding of structure shall be provided to the substation and building.

A separate communications earthing system will be provided, details to be confirmed with the communications consultant.

Surge diversion will be installed at the main switchboard on the incoming supply. Surge diversion will also be provided for copper communications cables entering building using surge diverter modules on the main comms rack.

4.15 Lightning Protection

An active isolated lighting protection shall be provided to the hotel in accordance with AS1768. This shall consist of a pole mounted air terminal, located on the roof, isolated down conductor and grounding system.

5 Hydraulic Services

5.1 Scope of Service

The scope of the hydraulic service is included under this section for the development shall include all hydraulic systems as listed below:

- Sub-soil drainage
- Rainwater drainage
- Sanitary plumbing and drainage
- Trade waste pre -treatment
- Cold water (potable) supply
- Domestic hot water supply
- Water metering
- Natural gas reticulation systems
- Fire hydrant system
- Fire hose reel system

5.2 System Description

5.2.1 Sub-Soil Drainage

Sub-soil drainage will be provided in the basement carpark. Basement sub-soil water will be collected into a pump out pit under the basement and transferred to the in-ground stormwater drainage system provided by the Civil engineer.

Duty and stand-by pumps will be provided in the pump out pit. The pit will be located away from car parking spaces for access and convenient maintenance.

Sub-soil drainage will also be provided to the bases of external retaining walls and behind kerbs at where the adjacent ground levels are higher.

5.2.2 Rainwater Drainage

Roof water drainage will be designed and installed in accordance with the requirements of Australian Standard AS3500.3, AS2180 and Randwick City Council. Open-ended overflows will be provided in the gutters and on the roofs for the relief of flooding that may occur due to blockages and/or rainfall intensity that might exceed the capacity of the system.

The system will be sized to collect roof water and drain external paved areas based on the following minimum criteria:

A. Box Gutters – 1 in 100 year 5 minute storm event

B. Eaves Gutters – 1 in 100 year 5 minute storm event

C. Podium Areas – 1 in 20 year 5 minute storm event

Pipes shall be acoustically lagged as required to meet the required noise levels.

Gutters shall be constructed from minimum 316-grade stainless steel, 1 mm minimum thick. All joints shall be welded and passivized. Installation of gutters shall ensure that future removal and replacement is facilitated.

Trench grates and grated pit outlets shall be adequately sized, slip proof and incorporate safety features for small wheels (bikes, prams, etc.) and pedestrians traversing over the grates.

Overflow pipes or duplicate downpipes of at least equal capacity to the downpipes shall be provided to all gutters, roof areas and balconies to prevent accidental building flooding.

The downpipes shall connect to the main trunk stormwater drainage system provided by the Civil Engineer. Connections are also to be made from planter boxes, podium areas and other areas.

5.2.3 Sanitary Plumbing and Drainage

The sanitary plumbing system will be of the fully vented modified design in accordance with Sydney Water's requirements and Australian Standard AS3500.2 – 1990 Part 2 Sanitary Plumbing and Sanitary Drainage and its Appendix.

Stack offsets will be minimised where possible.

The installations will be designed and installed such that it will be accessible for easy maintenance.

Horizontal pipe runs will be installed with sufficient gradients to achieve self-cleansing velocities to avoid potential problems with blockage.

All pipework installed within noise sensitive areas will be acoustically treated.

Plant rooms and equipment requiring provisions for drainage will be incorporated in the hydraulic services design.

A sewage pump out pit will be provided in the basement carpark of the building. Sanitary drainage that cannot be discharged to the external sewer main by gravity will be collected into this pit from where a pair of duty and stand-by pumps will lift the sewage to the gravity system for disposal off the building.

The pit will be located away from car parks for convenient maintenance.

Stack vents shall extend to roof and be terminated through roof venting to atmosphere.

5.2.4 Trade Waste Pre-Treatment

A grease arrestor will be provided, in accordance with Sydney Water's Trade Waste Policy in the basement loading bay to serve the kitchen / restaurant.

Pre-treated wastewater from the arrestor will be connected to the sanitary plumbing system for disposal to the sewer drainage system.

A fully vented modified grease waste drainage system will be provided for the club kitchen facility and commercial food preparation areas.

Grease stack vents will be terminated to atmosphere, through the highest roof level.

A grease waste pump-out line will be extended from grease arrestor and terminated in a truck accessible location.

Owing to the anticipated high temperature in the kitchen waste, HDPE pipework and fittings will be used in the system.

A cooling pit complete with lint screens will be located within the basement loading area to serve the commercial laundry.

5.2.5 Cold Water (Potable) Supply

Domestic cold water service will be designed and installed in accordance with the requirements of Sydney Water and Australian Standard AS3500.1 – 1990 Water Supply.

It is intended for the potable water to be supplied via the authority street main in Alison Road and will require water billing meters located at the site boundary. (Subject to Sydney Water approval; refer "Existing Infrastructure Report")

Separate water meters complete with backflow prevention devices will be provided for the hotel and club areas.

A triplex variable speed pump assembly will be installed in the basement carpark level pump room to supplement mains pressures for the upper floor levels.

Cold water services shall reticulate to all of the required outlet points in the building room and supply domestic hot and cold water, mechanical cooling plant and the fire hose reel systems.

Fixtures, fittings and equipment will be provided with the maximum permissible 3 star WELS rating.

All internal domestic cold water pipework will have a maximum system velocity of 1.8 m / sec.

Supply pressures in the domestic water systems will be maintained between 300Kpa and 500Kpa. Pressure limiting/regulating devices will be installed on floor levels where the water pressures exceed the design limit.

Backflow prevention devices will be provided at the main water meter assembly and all supply points of high cross contamination risks such as required by the local authorities and codes.

Individual control valves will be provided to control each group of fixtures and wet areas including hotel bathrooms and kitchens, public amenities, commercial bars and kitchens, plant and equipment and the like.

All exposed control valves and exposed pipework in wet areas will be chromium plated.

5.2.6 Domestic Hot Water Supply

Hot water service will be designed and installed in accordance with the requirements of the local Authority having jurisdiction and Australian Standard AS3500.4 Part A Hot Water Supply Systems and its Appendix.

Gas-fire hot water heaters will be installed in the roof plantroom. Separate independent hot water systems will serve both the hotel and the club levels.

The hot water plant will be sized to cater for:

1. 2 hours peak demand
2. Probable simultaneous flow requirements
3. Special events

A complete flow and return systems incorporating circulating pumps will be provided to eliminate system dead legs and associated heated water delay times.

Heated water will be circulated at 65°C and returned to the heated water plant at 60°C.

All heated water flow and return pipe work to be insulated in accordance with the NCC Part J.

All internal domestic hot water pipework will have a maximum system velocity of 1.8 m / sec.

Hot water meters are to be provided to all hot water plant within the hotel rooms and club areas, as well as any common service that requires hot water.

All meters to be wired to “MDL” hub to remote reading.

Thermostatic mixing valves and tempering valves will be provided to deliver tempered water to all sanitary fixtures used primarily for personal hygiene purposes at required temperature.

Supply pressures in the domestic water systems will be maintained between 300Kpa and 500Kpa. Pressure limiting/regulating devices will be installed on floor levels where the water pressures exceed the design limit.

Backflow prevention devices will be provided at the main water meter assembly and all supply points of high cross contamination risks such as required by the local authorities and codes.

Individual control valves will be provided to control each group of fixtures and wet areas including hotel bathrooms and kitchens, public amenities, commercial bars and kitchens, plant and equipment and the like.

5.2.7 Water Metering

A system of water meters is proposed to be installed on site for all major and permanent occupant water uses allowing monitoring of water consumption for each of these major water uses through a Meter Data Loggers (MDL).

1. Hot water System (hotel & club areas)
2. Irrigation systems (if required).
3. Wash-down systems (if required).
4. Hotel / restaurant / bar/ club area.

5.2.8 Gas Supply

Low pressure natural gas will be brought into the building to supply the domestic hot water system commercial restaurant kitchen, cooking equipment and mechanical plant and equipment. The gas pressure regulator and meter assembly will be located in the gas regulator/meter room in the basement carpark of the building.

The gas riser will be located within the services duct within the building core.

Emergency gas shut off device will be installed in the gas service to isolate the supply during emergency and will be linked to the mechanical system.

Gas detectors will be provided to monitor gas leakage in plant rooms and where required.

5.2.9 Fire Hydrants

Fire hydrant service will be designed and installed in accordance with requirements of the Australian Standard AS2419, BCA, Fire Rescue New South Wales (FRNSW) and Randwick Council.

The fire hydrant system will comprise a fire brigade booster assembly located at or near the main entrance of the building. The system will be connected to the Sydney Water’s mains in Alison Street.

(Subject to Sydney Water and FRNSW approval; refer “Existing Infrastructure Report”).

A diesel engine driven hydrant pump will be installed in the hydrant pump room in the basement carpark to supply the hydrant landing valves throughout the building. The hydrant pump room will be directly accessible from outside of the buildings via fire stairs or isolated passages.

Hydrant risers and landing valves will be installed within all fire stairs and isolated passages as required by the Codes. Additional hydrants might be provided to supplement those in the fire stairs to provide the coverage, if necessary.

Fire Hydrant coverage will be achieved by ensuring all areas of the building can be adequately reached with a 30m hose length and 10m nozzle spray from a fire hydrant outlet.

Hydrant outlets will have a minimum of 10.0L/sec flow and 700kPa residual pressure at the two most disadvantaged hydrant outlets, as required for a system utilising on-site booster pumps.

The fire hydrant system will be constructed from medium grade galvanised steel tubes to Australian Standard AS2419.

Water used in regular testing of the hydrant system is to be collected for re-use.

5.2.10 Fire Hose Reels

Fire hose reels will be designed and installed in accordance with requirements of the Australian Standard AS2441, BCA, Fire and Rescue New South Wales (FRNSW) and Randwick Council.

Fire hose reels with thirty six (36) metres long hoses will be installed to provide coverage to all parts of the building and supplied from the domestic cold water service. The hose reels will be located within 4 meters from the required exits. Additional hose reels will be provided to supplement those at the exits to provide the coverage, if necessary.

Hose Reels will be provided to ensure all areas of the buildings are reached with a 36m hose and 4m of nozzle spray, and to ensure hoses are not required to extend between fire compartments.

The Hose Reel system will be supplied from the metered domestic water supply connection.

Fire Hose Reels will have a minimum of 0.33L/sec flow at the two most disadvantaged Hose Reels.

All pipework will be constructed from type B copper tube with silver soldered joints.

6 Fire Protection Services

6.1 Scope of Service

Fire services for this building will be provided in accordance with the National Construction Code, relevant Australian Standards, and any future fire safety engineered solution.

Services shall include:

- Fire Sprinkler System;
- Smoke Detection and Alarm System;
- Building Occupant Warning System;
- Portable Fire Extinguishers.

6.2 Systems Description

6.2.1 Fire Detection and Alarm System

The fire alarm systems will be designed in accordance with BCA, AS1670 and AS1668 and Fire and Fescue New South Wales (FRNSW) and Authority requirements

Fire detection will be provided throughout all building, with detectors selected to suit the specific hazard of each area to minimise the possibility of false alarms.

The fire detection and alarm system will be design as analogue addressable looped detection system, and will be connected to an approved monitoring company to notify fire brigade in the event of a fire alarm.

Addressable smoke detection will be provided to all common areas of the building and between living and sleeping areas within the residential units, with addressable thermal detectors provided in areas likely to cause false alarms.

An analogue addressable Fire Indicator Panel will be provided at the main designated building entry lobby to the building.

Interface will be provided with the following building services systems;

- Building occupant warning system for controlled evacuation of building occupants;
- Mechanical services system for system shut down upon fire alarm;
- Fire sprinkler system for monitoring of isolation valves, pump, and system activation;
- Fire hydrant system for monitoring of isolation valves, and pump;
- Security system for monitoring and release of locked doors in egress path; and
- Facility will be provided for isolation of incoming gas supply.

6.2.2 Building Occupant Warning System

A building occupant warning system will be provided throughout the building to allow controlled evacuation of the building during a fire condition.

Occupant warning speakers will emit a pre-recorded verbal evacuation message and will be located to ensure the required sound pressure level can be delivered to all occupied areas.

Emergency Control Panel facilities will be integrated into the main Fire Panel.

Visual Alarms (Strobes) will be provided in areas with high ambient noise level, and to any areas specified for use by hearing impaired occupants.

Break Glass Alarms (BGA) will be provided adjacent to required exits.

6.2.3 Fire Sprinkler System

The fire sprinkler system shall be designed in accordance with the BCA, AS2118 and Fire and Rescue New South Wales (FRNSW) Authority requirements.

Fire sprinkler protection will be provided throughout car park levels and podium level of the building, and will be designed to the following design criteria;

- Podium entertainment areas - ordinary hazard class 1 OH1
- Plant areas - ordinary hazard class 1 OH1
- Car park areas - ordinary hazard class 2 OH2

A grade 3 water supply will be provided comprising a dedicated connection to the Sydney Water main supply located in Alison Road. (Subject to Sydney Water and FRNSW approval; refer “Existing Infrastructure Report”).

An electric booster pump will be provided in a dedicated fire services pump room at basement level adjacent to the sprinkler control valves.

Sprinkler control valves will be provided within the fire services pump room at basement level, with direct access to road or open space.

Brigade booster enclosure will be provided within sight of the main building entry.

Due to the nature of the site, we would recommend a meeting with FRNSW be convened in conjunction with the “Fire Engineered Report” submission to seek “approval in principle” from the Brigades operations perspective.

6.2.4 Portable Fire Extinguishers

Portable fire extinguishers will be installed in accordance with BCA, AS2444 and Authority requirements.

Portable fire extinguishers to suit the relevant risk and associated signage will be provided throughout all areas of the building, lift motor rooms, plant rooms fire hose reel cupboards and kitchens.

Generally 4.5kg dry chemical extinguishers will be located within the fire hose reel cupboards throughout the building. 9.1 L AFFF fire extinguishers will be located throughout the car park levels. 5kg CO2 will be installed within electrical hazard areas.

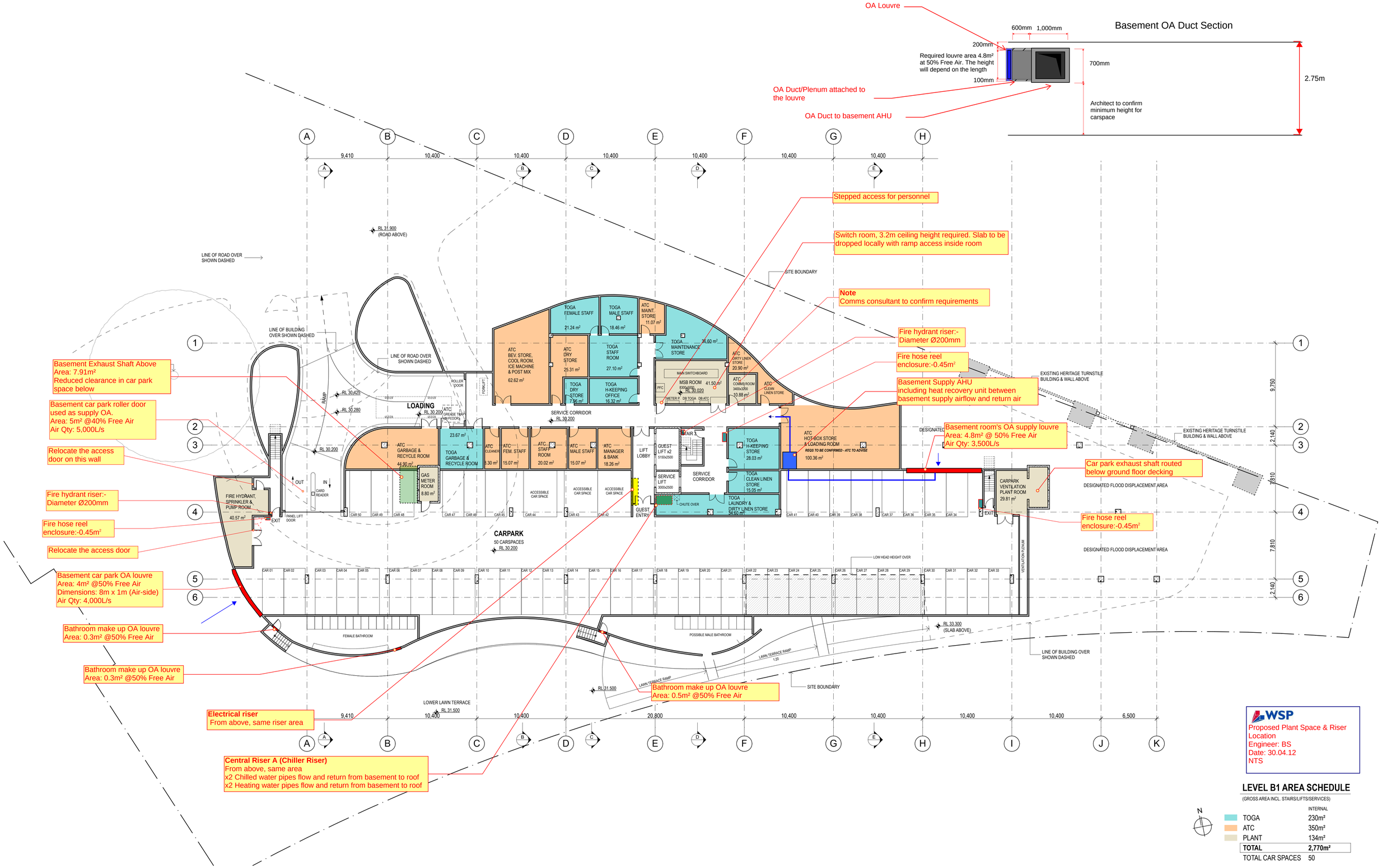
Fire blankets will be provided to all kitchen areas and similar risk areas.

7 Appendices

The attached documents in the appendix should be read in conjunction with the report.

Appendix Documents:

1. WSP Consolidated Services Mark-up 20/04/30



WSP
Proposed Plant Space & Riser Location
Engineer: BS
Date: 30.04.12
NTS

LEVEL B1 AREA SCHEDULE

(GROSS AREA INCL. STAIRS/LIFTS/SERVICES)

	INTERNAL
TOGA	230m²
ATC	350m²
PLANT	134m²
TOTAL	**2,770m²**
TOTAL CAR SPACES	50

PRELIMINARY - FOR COORDINATION 24/04/12

DATE	REV	NOTES :

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QUANTITY SURVEYOR SLATTERY AUSTRALIA PTY LTD T (02) 9423 8850	TRAFFIC ENGINEER PARKING CONSULTANTS INTERNATIONAL T (02) 9968 1844	FIRE ENGINEER RAW FIRE T (02) 9299 6605	TOWN PLANNER URBIS T (02) 8223 9900

CLIENT:
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PROJECT :
ROYAL RANDWICK HOTEL
PROJECT ADDRESS
Royal Randwick Racecourse
Alison Road
Randwick, NSW 2031
PROJECT NO : 10025

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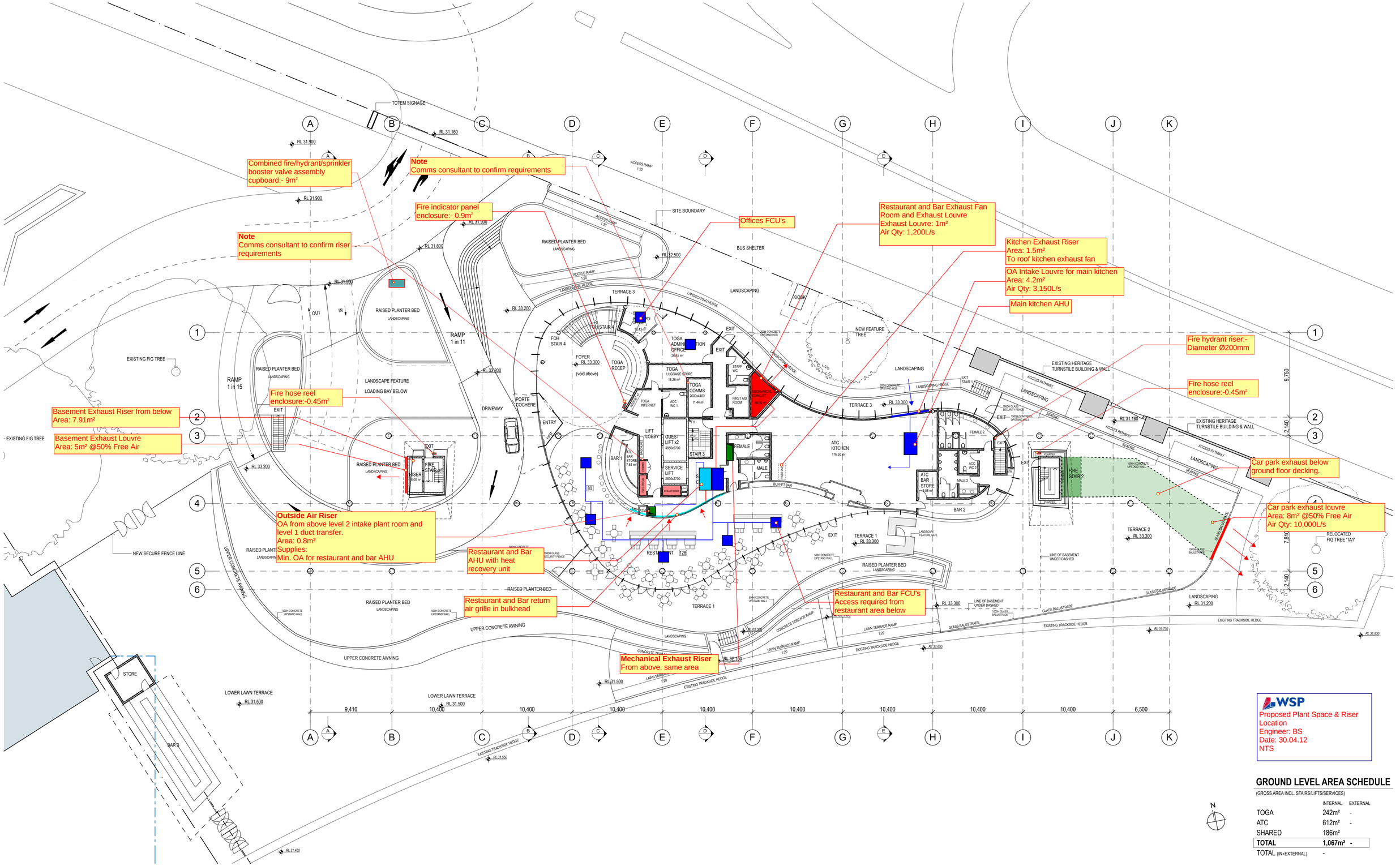
DRAWING TITLE
LEVEL B1 PLAN

DRAWN BY	JB
CHECKED	JC
SCALES	1:200/A1 1:400/A3
DATE	FEB 2012
PHASE	PRELIMINARY DA
DRAWING NO	A-1000
REVISION	-



WSP
Proposed Plant Space & Riser Location
Engineer: BS
Date: 30.04.12
NTS

GROUND LEVEL AREA SCHEDULE

(GROSS AREA INCL. STAIRS/LIFTS/SERVICES)

	INTERNAL	EXTERNAL
TOGA	242m²	-
ATC	612m²	-
SHARED	186m²	
TOTAL	**1,067m²**	**-**
TOTAL (IN+EXTERNAL)	-	

N

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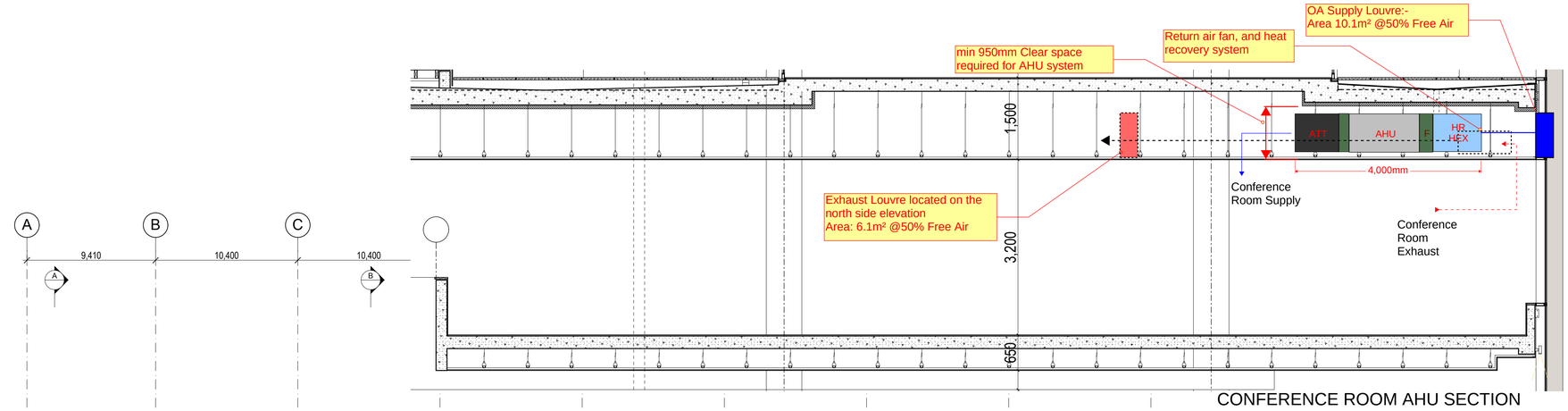
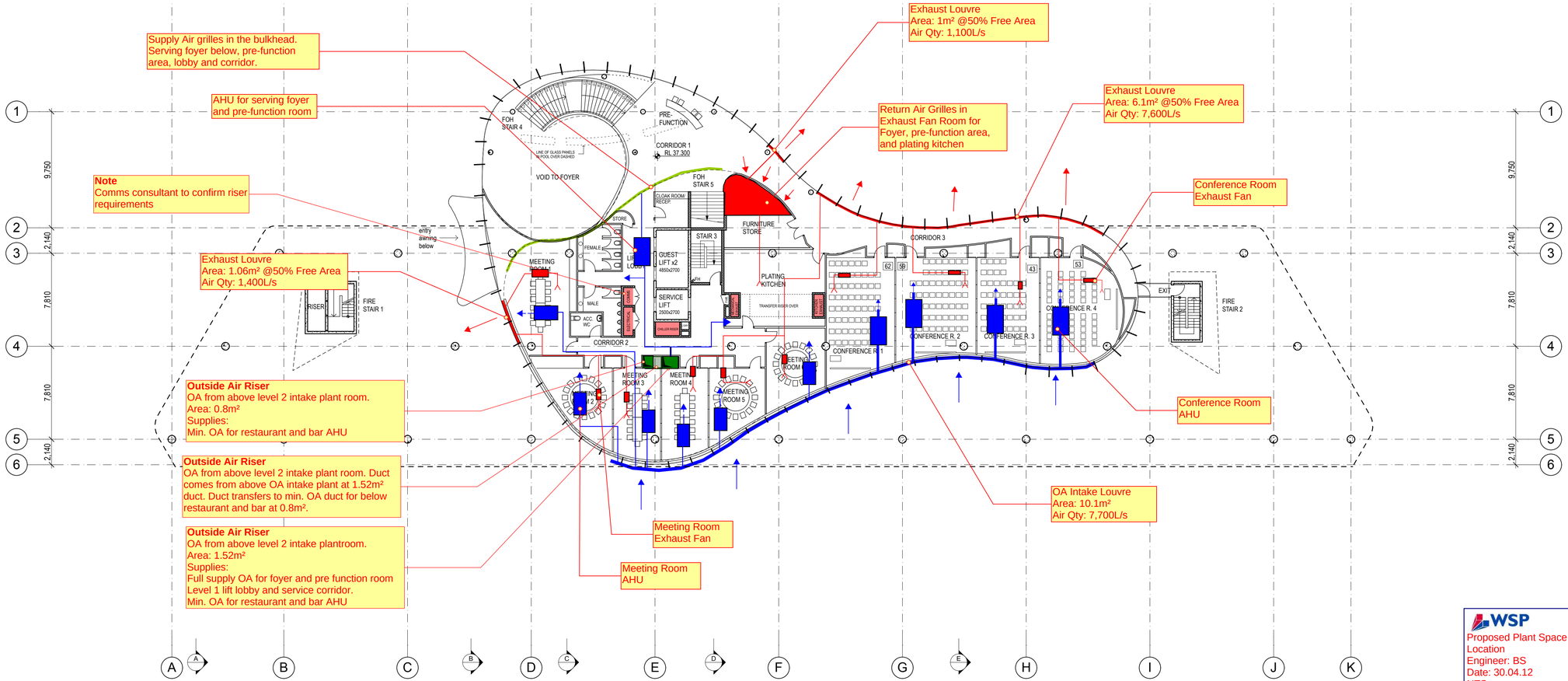
DRAWING TITLE
GROUND LEVEL PLAN

DRAWN BY	JB
CHECKED	JC
SCALES	1:200/A1 1:400/A3
DATE	FEB 2012
PHASE	PRELIMINARY DA
DRAWING NO	A-1001
REVISION	-



CONFERENCE ROOM AHU SECTION



WSP
Proposed Plant Space & Riser Location
Engineer: BS
Date: 30.04.12
NTS

LEVEL 1 AREA SCHEDULE

(GROSS AREA INCL. STAIRS/LIFTS/SERVICES)

TOGA	0m²
ATC	916m²
SHARED	0m²
TOTAL	**916m²**
VOID	150m²

N

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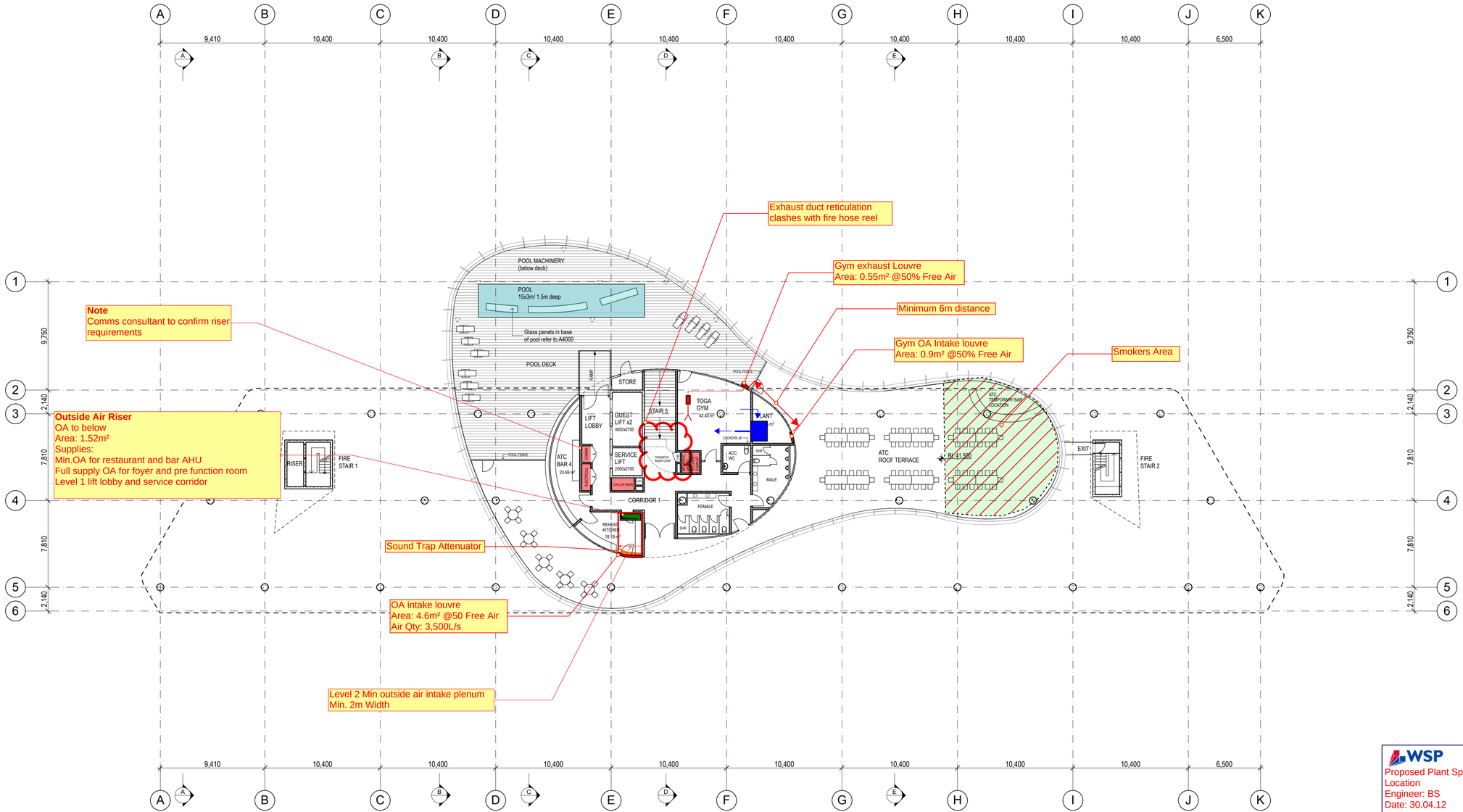
DRAWING TITLE
LEVEL 1 PLAN

DRAWN BY	JB
CHECKED	JC
SCALES	1:200/A1 1:400/A3
DATE	FEB 2012
PHASE	PRELIMINARY DA
DRAWING NO	A-1002
REVISION	-



WSP
Proposed Plant Space & Riser Location
Engineer: BS
Date: 30.04.12
NTS

LEVEL 2 AREA SCHEDULE

(GROSS AREA INCL. STAIRS/LIFTS/SERVICES)

	INTERNAL	EXTERNAL
TOGA	90m²	178m²
ATC	58m²	620m²
SHARED	94m²	
TOTAL	**292m²**	**776m²**
TOTAL (IN+EXTERNAL)	1,068m²	

N

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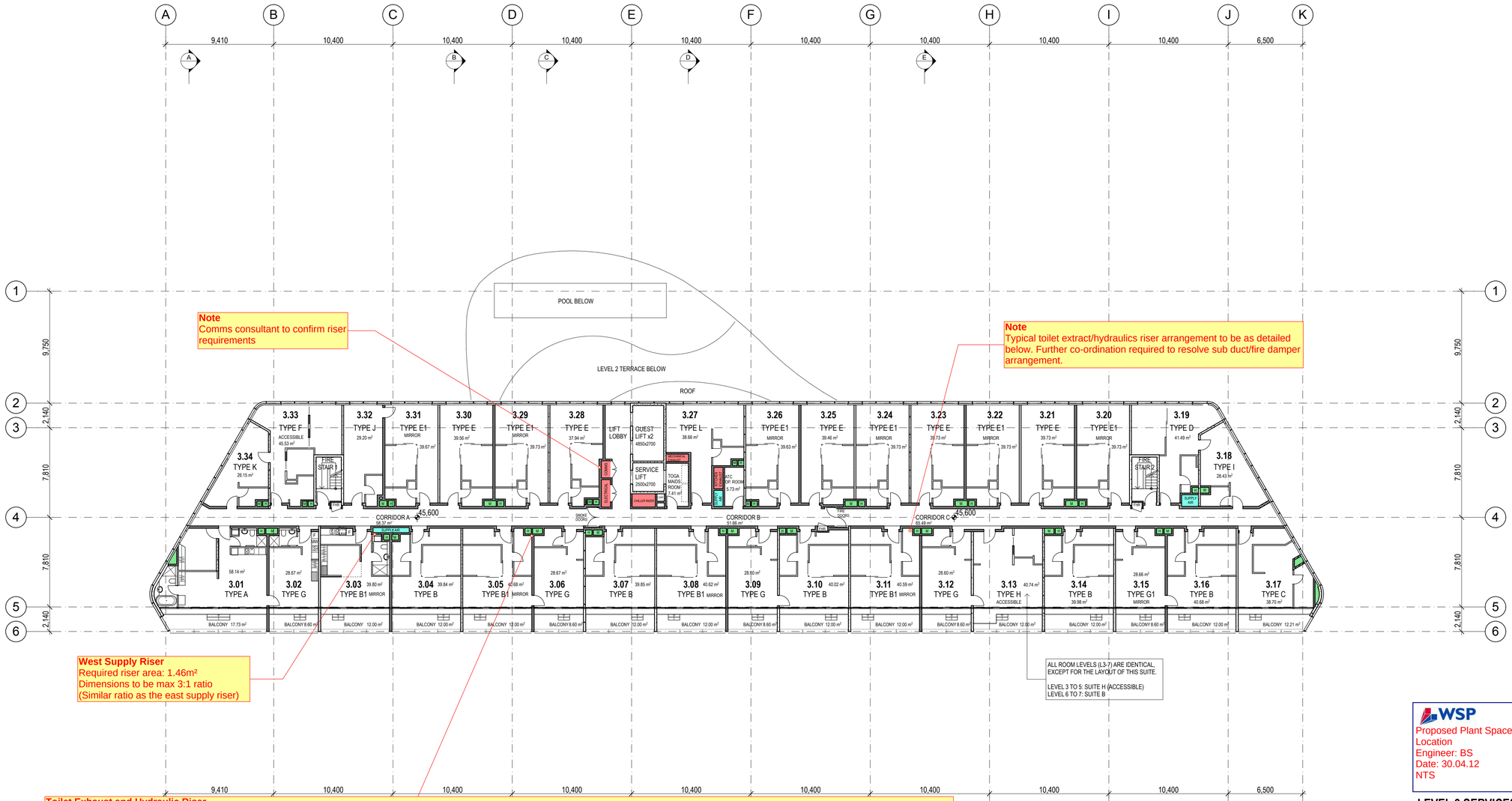
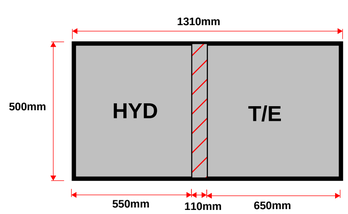
DRAWING TITLE
LEVEL 2 PLAN

DRAWN BY	JB
CHECKED	JC
SCALES	1:200/A1 1:400/A3
DATE	FEB 2012
PHASE	PRELIMINARY DA
DRAWING NO	A-1003
REVISION	-

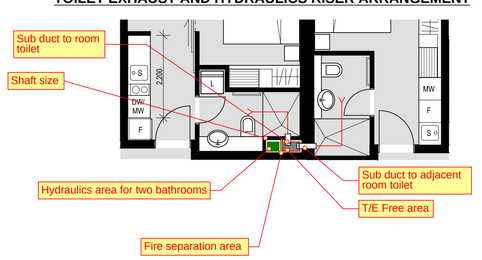


Toilet Exhaust and Hydraulic Riser

RISER TYPE
(1310mm x 500mm)



TOILET EXHAUST AND HYDRAULICS RISER ARRANGEMENT



WSP
Proposed Plant Space & Riser Location
Engineer: BS
Date: 30.04.12
NTS

LEVEL 3 SERVICES KEY

- SUITE HYDRAULIC & MECHANICAL
- CORRIDOR SUPPLY AIR
- HOTEL SERVICES RISER (FULL HEIGHT)

LEVEL 3 AREA SCHEDULE

(GROSS AREA INCL. STAIRS/LIFTS/SERVICES)

	INTERNAL	EXTERNAL
TOGA	1,665m²	200m²
ATC	8m²	
SHARED	-	
TOTAL	**1,673m²**	**200m²**
TOTAL (IN+EXTERNAL)	1,773m²	

N

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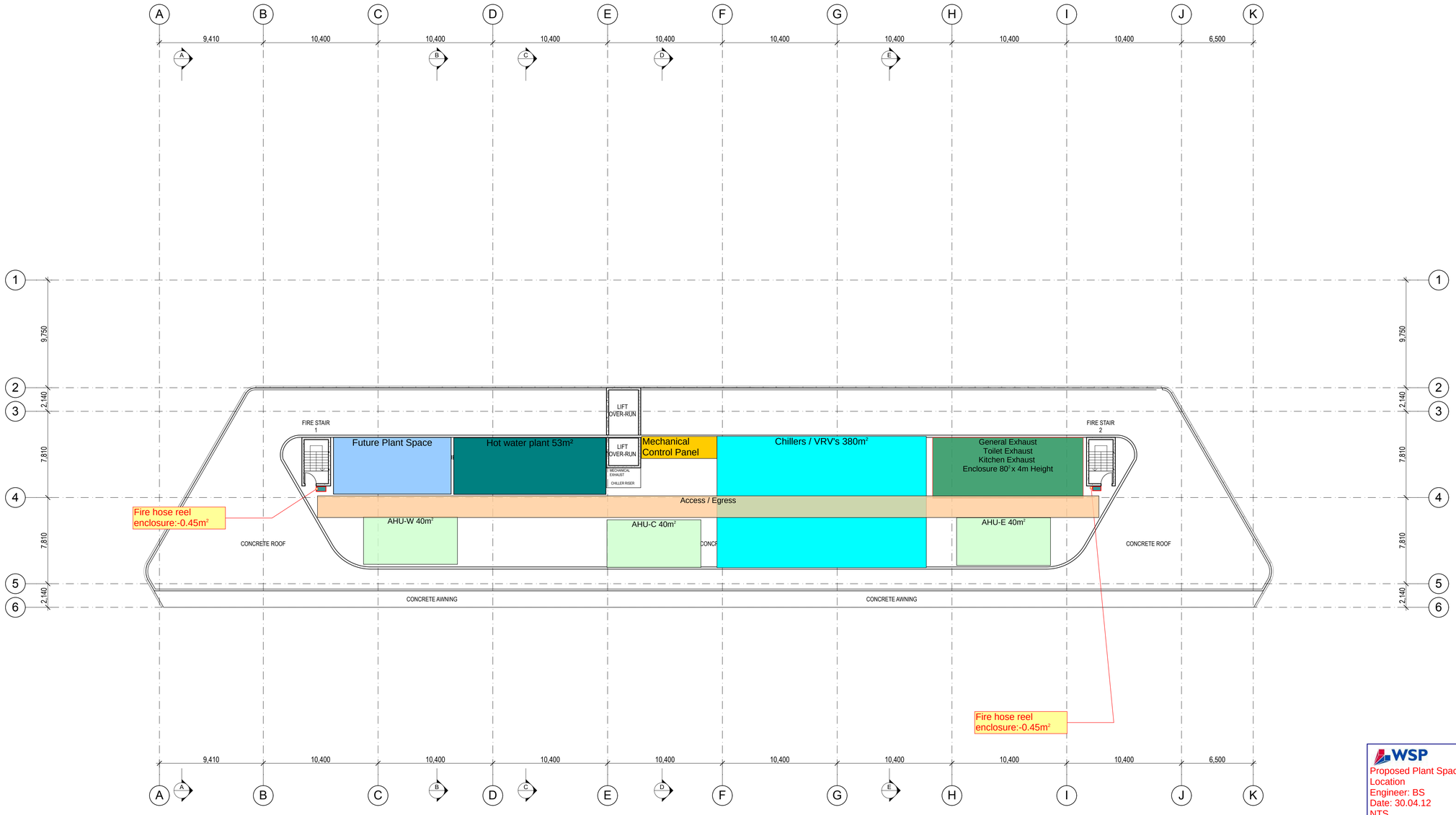
DRAWING TITLE
LEVEL 3 PLAN

DRAWN BY JB
CHECKED JC
SCALES 1:200/A1 1:400/A3
DATE FEB 2012
PHASE PRELIMINARY DA
DRAWING NO A-1004
REVISION -



WSP
Proposed Plant Space & Riser Location
Engineer: BS
Date: 30.04.12
NTS

LEVEL 8 AREA SCHEDULE

(GROSS AREA INCL. STAIRS/LIFTS/SERVICES)

TOGA	000m²	000m²
ATC	000m²	
SHARED	-	
TOTAL	**000m²**	**200m²**

N

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DRAWING TITLE
LEVEL 8 ROOF PLAN

DRAWN BY	JB
CHECKED	JC
SCALES	1:200/A1 1:400/A3
DATE	FEB 2012
PHASE	PRELIMINARY DA
DRAWING NO	A-1009
REVISION	-


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