RETURN BRIEF

ST PATRICKS COLLEGE - STRATHFIELD NEW SCIENCE & LEARNING CENTRE

MECHANICAL SERVICES

JHA

CONSULTING ENGINEERS

DOCUMENT CONTROL SHEET

Title	Return Brief
Project	St Patrick's College, Strathfield – New Science & Learning Centre
Description	Return Brief for Mechanical Services
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Prepared By

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EXECUTIVE SUMMARY

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

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

The brief is designed to achieve a summarized, succinct and coherent written description of the scope of the services to be designed. The document is not intended as a Specification or Bill of Materials. Nor is it intended to provide detail of the equipment selection in the main. The document provides for a description of the end outcome of services to be provided within the building.

It is the intent of this document to represent a sign-off of the projects Mechanical Services to be provided for the client by JHA Consulting Engineers.

1 MECHANICAL SERVICES

1.1 GENERAL

The proposed mechanical systems will include, but not limited to;

- Air Conditioning System
- Outside Air System
- Toilet Exhaust System
- Miscellaneous Ventilation System
- Fume Cupboard Exhaust System
- Kitchen Exhaust System
- Car Park Exhaust System
- Controls

In preparing of the mechanical service design we shall remain cognizant of the following general design factors:

- The design life of the services elements (excluding consumables) will be a minimum of 10 years where possible and practical;
- All equipment and components selected are to be reliable, sourced from a reputable manufacturer or supplier who has a proven history for ongoing service is Australia.
- The design solution will endeavour to be:
    - Sustainably responsible and use low energy systems and equipment (while being cognizant of life cycle costings and capital cost implications);
    - Flexible and easily adaptable to accommodate changes in use
    - Aesthetic appeal that is consistent with the architect's vision for development;
    - Consider constructability in terms of ease, practicality, cost effectiveness, ease of commissioning
    - Provide safe easy access to plant for servicing and maintenance.
    - Minimise operational costs
    - Have user interfaces that are easily operable by staff.
- Coordination of service space, and ceiling void spaces with the architectural, structural and other service disciplines.
- Consider acoustic implications of mechanical plant selections and locations, and adherence to relevant standards, development applications and the project acoustic report.

1.2 STANDARDS AND REGULATIONS

Australian Standards	The Use of Ventilation and Air Conditioning in Buildings – Ventilation Design for indoor air contaminant control.	AS 1668.2:2012
	The Use of Ventilation and Air Conditioning in Buildings – Fire and smoke control in multi compartment buildings.	AS 1668.4:2015
	Air-handling and water systems of Buildings.	AS 3666.1.2011
	Refrigerating systems and heat pumps – safety and environmental requirement – design, construction, testing, marking and documentation	AS/NZS 5149.2.2016
	Ductwork for air handling system in buildings	AS 4254.2012

	Other relevant and referenced Australian Standards	
Authorities	National Construction Code (NCC)	*2019*
	Concept Fire Engineering Strategy (MCD Engineering)	*p*
	SEARs Report	

1.3 DESIGN CRITERIA

1.3.1 EXTERNAL DESIGN CONDITIONS

The cooling and heating load designs conditions for the development will be as follows (as appropriate for North Parramatta NSW – AIRAH DA9):

	Summer	Winter
Outside Ambient	35.6°C DB / 23.9°C WB Full Solar Load	5.8°C DB & 80% RH No Solar Load

1.3.2 INTERNAL DESIGN CONDITIONS

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

Room	Occupancy (m^2 /person)	Room Temp Summer (°C) **	Room Temp Winter (°C) **	Relative Humidity (%)*	Outside Air (l/s/person)	Exhaust Air (l/s)	Lighting Load (W/m^2)***	Equipment Power (W)
	Basement							
Comms Room	n/a	24.0 + 1.0	21.0 + 1.0	n/c	n/a	n/a	To suit proposed equipment. Provisionally 1500W per rack.	
Wellness Room	As per Furniture Layouts	24.0 + 1.0	21.0 + 1.0	n/c	10 or natural ventilation	n/a	15	10 W/m^2
Storage Room	n/a	n/c	n/c	n/c	n/c	5 $l/s.m^2$	n/a	n/a
WC's	n/a	n/c	n/c	n/c	n/a	10 $l/s.m^2$	n/a	n/a
	Ground Level							

Food Tech Classrooms	As per Furniture Layouts	26.0 + 1.0	19.0 + 1.0	n/c	Based upon makeup air for kitchen hoods	Exhaust rates will be as per kitchen hood specification.	15	25 W/m^2
Canteen	As per Furniture Layouts	26.0 + 1.0	19.0 + 1.0	n/c	Based upon makeup air for kitchen hoods	Exhaust rates will be as per kitchen hood specification.	15	25 W/m^2
Gathering / Foyer / Indoor Dining	As per Furniture Layouts	24.0 + 1.0	21.0 + 1.0	n/c	N.V	n/c	15	10 W/m^2
WC's	n/a	n/c	n/c	n/c	n/c	10 l/s.m^2	n/a	n/a
Canteen Storage	n/a	n/c	n/c	n/c	n/c	5 l/s.m^2	n/a	n/a
	Level 1							
Science Laboratories	As per Furniture Layouts	24.0 + 1.0	21.0 + 1.0	n/c	Naturally ventilated makeup air to fume cupboard	Exhaust to suit fume cupboard requirements	15	20 W/m^2
Write – Up & Community Learning	As per Furniture Layouts	24.0 + 1.0	21.0 + 1.0	n/c	N.V	n/c	15	10 W/m^2
Meeting Rooms	As per Furniture Layouts	24.0 + 1.0	21.0 + 1.0	n/c	10	n/c	15	20 W/m^2
Science Prep	As per Furniture Layouts	24.0 + 1.0	21.0 + 1.0	n/c	10	Exhaust to suit fume cupboard requirements	15	20 W/m^2
	Level 2							
Science Laboratories	As per Furniture Layouts	24.0 + 1.0	21.0 + 1.0	n/c	Naturally ventilated makeup air to fume cupboard	Exhaust to suit fume cupboard requirements	15	20 W/m^2
Write – Up & Flexible Learning Spaces	As per Furniture Layouts	24.0 + 1.0	21.0 + 1.0	n/c	N.V.	n/c	15	10 W/m^2
Meeting Rooms	As per Furniture Layouts	24.0 + 1.0	21.0 + 1.0	n/c	10	n/c	15	20 W/m^2

Preparation Room	As per Furniture Layouts	24.0 + 1.0	21.0 + 1.0	n/c	10L/s.person or to suit make-up air to fume cupboards	Exhaust to suit fume cupboard requirements	15	20 W/m²
Chemical Store	As per Furniture Layouts	n/c	n/c	n/c	n/c	15 l/s.m²	n/a	n/a

n/c = Not Controlled, n/a = Not Applicable, N.V. = Naturally Ventilated

Notes:

* No humidity control is proposed. The relative humidity range is generally achieved as a result of mechanical cooling.

** Temperature control range relates to temperature at the point of control.

** Air conditioning sizing is based on the upper limit of the range i.e. 24 ± 1.0 = 25 degrees. On design days the internal temperature is expected to be up to 25 degrees.

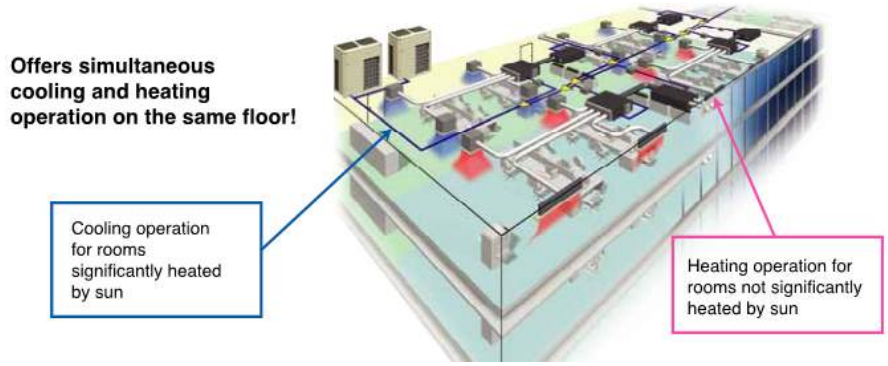
*** Lighting allowances are only applicable to the mechanical system capacity and are not reflective of actual lighting design.

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

2 SYSTEM DESCRIPTIONS

2.1 AIR CONDITIONING SYSTEM

The air conditioning system to the occupied spaces within the new building will be VRV/VRF (variable refrigerant flow/volume) Heat Recovery System, which can provide simultaneous operation of cooling and heating to each individual space. Each system will comprise of indoor ceiling mounted cassettes, ducted fan coil units and outdoor condensers located externally in a dedicated plant on the roof top. The indoor units serving each space will be either ceiling mounted ducted fan coil units or ceiling cassettes to suit architectural layouts.



Typical VRF Heat Recovery System Schematic Diagram

Ceiling Cassette Unit

Ducted Fan Coil Unit

Each indoor unit will be equipped with a wired remote control panel for individual control. The control panel will provide control for on/off switch, temperature display, temperature reset, mode selector, fan speed selector, time clock as minimum.

The VRV/VRF system will have an intelligent touch screen central controller to allow the facility manager and maintenance staff to easily control and monitor the VRV/VRF system. Local controllers can be pre-programmed to provide limited user interface as required (e.g. time scheduling, temperature band control etc.).

Typical Indoor Unit Wired Remote Controller

Typical Touch Screen Central Controller

2.2 MIXED MODE VENTILATION / TRAFFIC LIGHT INDICATION PANEL

The building will incorporate a mixed mode ventilation strategy to allow the college to minimise the use of air conditioning systems when ambient conditions are suitable. It is proposed to utilise a traffic light system within each learning space, to visually notify teaching staff when it is suitable to utilise natural ventilation (operable windows/louvres) or when it is appropriate to use the air conditioning.

Additionally, the central atrium/communal spaces will utilise automated louvres to allow for natural ventilation and night purge, aiding in reduction of air conditioning energy usage. Descriptions of which are further detailed below;

2.2.1.1 Learning Space Traffic Light Indication

Each learning space (with the exception of Food Tech spaces) is to be provided with a dedicated control system and will include the following:

- Room temperature sensor;
- Control panel / traffic light indication system (as detailed below);
- Manual push button to activate the A/C for an adjustable period of time (2-hours) and
- Interlocking of the operation of the A/C to the lighting motion detectors.

An external proprietary system (weather station) comprising of wind speed monitoring, temperature and humidity sensors will link to a traffic light indication system to serve each learning space. The indication panel within each Learning space will indicate the following:

- Green Light - Outdoor conditions are suitable to utilise natural ventilation. Turn off A/C;
- Amber or Blue Light – User discretion to use A/C and
- Red Light – Outdoor conditions are not suitable for natural ventilation, A/C can be used.

The traffic light system shall operate under the following conditions;

- The GREEN light shall be illuminated whenever the outdoor temperature and humidity is within an adjustable range e.g. 18-24°C and 70% R.H.
- When the outdoor conditions are with +/-2°C of the temperature set points, the amber/blue light shall illuminate, indicating user preference on use of the A/C;
- When the outdoor conditions are outside the set temperature range for a pre-programmed period of time (approximately 10 minutes) or high wind speeds,
    - The GREEN light shall switch off & RED light switches on;
    - The red light indicates the user should close all windows/louvers/doors & switch on the A/C.

Figure 1 – Red, Amber & Green Traffic Light Example

Figure 2 – Green, Blue & Amber Traffic Light Example

2.2.1.2 Night Purge

Automated louvres within the main Foyers / Common core area will be utilised to provide some pre-cooling of the building at night time when external conditions are suitable (night purge) whilst also providing an option to naturally ventilate the space during the day via manual control. A dedicated control system will be provided to control the operation of the automated louvres and connect to the external weather station. The following details a summary of the proposed operation of the night purge system;

- When outside air temperature and humidity is lower than the indoor temperature and humidity, and the indoor temperature is 2°C more than the set point, night purge will be utilised to pre-cool the building to a pre-set level outside normal operating hours (i.e. late evening / early morning);
- High level automated louvres to open and
- All A/C and ventilation systems to automatically shut down (with the exception of Comms / Server Room A/C).

2.3 OUTSIDE AIR SYSTEMS

Ducted outside air will be provided to enclosed spaces from the façade at each level to provide make-up air and/or outside air to individual spaces.

Ducted fan coil units and ceiling mounted cassettes will generally be provided with individual outside air connections. Where supplementary outside air is required, oversized ceiling mounted diffusers / grilles will be provided in close proximity to air conditioning units providing air at low velocity to limit hot or cold draughts.

Where ducted outside air cannot be provided, a natural ventilation strategy will be implemented via the use of operable windows/louvres and doors with opening area not less than 5% of floor area in accordance with NCC Clause F4.5. Mechanically ventilated system will be in compliance with AS 1668.2 where natural ventilation is not feasible.

2.4 EXHAUST AIR SYSTEMS

Ducted exhaust air will be provided to enclosed spaces (e.g. store rooms) to the façade at each level.

The car park area will be provided with a dedicated exhaust system; associated plant and equipment will be located at roof level. Make-up air will be via openings within the car park perimeter.

All food tech areas and canteen will be provided with dedicated kitchen exhaust systems, associated plant and equipment will be located at roof level. Make-up air will be provided via ducted outside air from the façade connected into each individual hood.

Dedicated fume cupboard exhaust systems will also be provided, associated plant will be located at roof level.

3 PROPOSED MECHANICAL SYSTEMS

3.1 CAR PARK

It is proposed that the basement car park is to be served via a mechanical exhaust system that will discharge at roof level. The exhaust ductwork shall consist of a full height plenum around the perimeter of the southern portion of the car park. The exhaust plenum shall extend beneath the car park slab to a dedicated fire separated exhaust riser to roof level. Exhaust grilles shall be installed within the perimeter plenum to provide ventilation coverage of the car park. System will discharge via a fan & attenuators (for acoustic purposes) located at roof level. The car park exhaust discharge point is to be located at a distance greater than 6m from any outside air intakes, building and natural ventilation openings.

Make-up air shall be via openings located beneath the tiered seating on the opposite side of the car park and a perforated roller shutter door to the entry.

3.2 AMENITIES

A centralised toilet exhaust system shall be provided to serve the Amenities/WC's within the building and discharge through a common riser to roof level via a duct mounted fan and attenuators as necessary. The exhaust fan shall operate on a pre-programmed time clock, time scheduling to match the requirements of the college. Make-up air to each WC will be provided through the use of internally insulated transfer ducts and grilles.

Toilet facility adjacent to wellness room is to be provided with a dedicated exhaust system and discharge to the façade. Exhaust fan shall be interlocked to the operation of the light and be complete with an adjustable overrun timer.

3.3 WELLNESS ROOM

Wellness room is to be naturally ventilated through the use of operable windows. The room is to air conditioned through the use of a ducted fan coil unit. The associated outdoor condenser will be located within the mechanical plant at roof level. Refrigerant pipework will reticulate from roof level through a dedicated riser to serve the FCU.

3.4 STORAGE

Basement storage room to be provided with a local exhaust system comprising of an inline fan ducted to the façade located under the seating area. Fan shall operate continuously or be provided with a time schedule.

3.5 PUMP ROOM

Ventilation to the pump room is to be finalised based upon the proposed usage of the space. For the purpose of this brief, the pump room shall be provided with a dedicated exhaust system which will discharge at roof level. Makeup air to the space will be through the use of a dedicated outside air system from the louvered openings located under the seating area. Fan shall operate continuously.

3.6 COMMS ROOM

Comms room will be provide with a wall mounted split system air conditioner. The corresponding outdoor unit will be located within the car park at high level.

3.7 CANTEEN AND FOOD TECH

The Canteen, Food Tech and Food Tech Prep spaces are to be provided with commercial type kitchen exhaust systems and will discharge above roof level through inline fans and attenuators. Exhaust ductwork will connect directly into kitchen hoods, ductwork shall reticulate to roof level in dedicated fire rated risers.

Access panels will be provided in the kitchen ductwork at 3m intervals and at every change in direction for cleaning purposes. Flow rates to each hood shall be based on the confirmed hood selections from the kitchen consultant. Kitchen exhaust discharge shall be at roof level, discharge in a vertical direction and be located a distance of greater than 6m from any outside air intakes, building and natural ventilation openings. Operation of the kitchen exhaust system shall be via a switch (complete low/medium/high switching) located at the teacher's desk / workstation.

Makeup air to the kitchen hoods will be provided from the façade and ducted directly to each kitchen hood. In celling mounted fans shall be provided to serve each teaching space / area and be complete with acoustic treatment to comply with the advice of the acoustic consultant. Outside air fan shall be interlocked to the operation of the exhaust air fans.

Provision for air conditioning to each food tech space and canteen will be provided through the use of ceiling mounted cassettes to provide a 'tempered' solution (i.e. not fully air conditioned – refer to Section 1.3 Design Criteria). Each classroom will be provided with a combined wall mounted temperature sensor and controller at the teacher's desk. Associated outdoor units will be located at roof level in a dedicate plant enclosure.

3.8 FOOD TECH STORE AND CANTEEN STORAGE

Food tech store and canteen storage rooms will be provided with a dedicated local exhaust system comprising of an inline fan ducted directly to the façade. Fans will either run continuously or be provided with a time schedule.

3.9 DINING, GATHERING FOYER, COMMUNITY/FLEXIBLE LEARNING AND WRITE UP

Open spaces are to be naturally ventilated through the use of operable windows/ louvers and doors. Minimum openings are to be greater than or equal to 5% of the total floor area. Provisions for Automated louvers within the main Foyers / Common core area can be utilised to provide some pre-cooling of the building at night time when external conditions are suitable.

Provision for air conditioning to the dining space & gathering / foyer will be provided through the use of ceiling mounted cassettes. Associated outdoor units will be located at roof level in a dedicate plant enclosure.

3.10 SCIENCE PREP

Science prep space will be provided with a dedicated mechanical ducted outside air system from the façade directly into air conditioning units and / or grilles. A dedicated mechanical exhaust system will also be provided discharging at roof level through and inline fan via a fire rated riser.
Air conditioning will be provided to the Science prep through the use of ceiling mounted cassettes. Associated outdoor units will be located at roof level in a dedicated plant enclosure.

3.11 MEETING ROOMS

Air conditioning to Meeting Rooms will be provided through the use of ducted fan coil units (FCU). Outside air will be ducted from the façade and connected directly into the FCU. Relief air will be provided through the use of internally lined ductwork and grilles.

3.12 SCIENCE LABS

Science labs are to be provided with dedicated fume cupboard exhaust systems. Fume cupboard exhaust ductwork is to reticulate in dedicated fire rated risers and discharge individually above roof level through the use of roof mounted centrifugal fans; discharge point is to be 3m above roof level. Make-up air to fume cupboards will be via internally insulated ductwork and grilles from adjacent spaces.

Air conditioning to Science Labs will be provided through the use of ceiling mounted cassettes. Associated outdoor units will be located at roof level in a dedicated plant enclosure.

3.13 PREPARATION ROOM

Preparation room is to be provided with a dedicated fume cupboard exhaust system. Fume cupboard exhaust ductwork is to reticulate in dedicated fire rated risers and discharge above roof level through the use of roof mounted centrifugal fans; discharge point is to be 3m above roof level. Make-up air to fume cupboards will be via internally insulated ductwork and grilles from the adjacent spaces and/or ducted outside air from the façade.

Air conditioning to the Prep Room will be provided through the use of ceiling mounted cassettes. Associated outdoor units will be located at roof level in a dedicated plant enclosure.

3.14 CHEMICAL STORE

Confirmation on the type of chemicals to be stored will determine whether high level supply air & low level exhaust is to be provided. Chemical store is to be provided with a dedicated mechanical exhaust system, discharging at roof level through and inline fan. Make-up air will be provided from a dedicated outside air system ducted from the façade.

3.15 ELECTRICAL

A new mechanical service switchboard will be installed at roof level to serve all new mechanical services. Mechanical board shall be suitable for external installation

3.16 ACOUSTIC

The Mechanical design and documentation will include for recommendations provided by the project Acoustic Consultant; as a minimum the following will be provided;

- Acoustic rated plant enclosure at roof level where required
- Vibration isolation mounts on all plant
- Attenuators
- Internally insulated ductwork where required and
- Appropriately sized ductwork and grilles

3.17 SMOKE/FIRE CONTROL

System shutdown will be provided to all mechanical systems via a fire trip signal from the main site Fire Indicator Panel (FIP). The car park exhaust system shall continue to operate in fire mode, ramping up to full speed. Kitchen exhaust and Comms Room air conditioning shall also continue to operate. Automatic reset is to be provide to all systems that trip in fire mode.

3.18 CONTROL SYSTEMS

A centralised controller shall be provided to monitor and control all of the air conditioning and ventilation systems. The central controller shall be located in a location agreed by the college to allow only authorised personnel access. The

central controller will allow users to monitor, program and control the operation of the units, alter temperature set points, time scheduling, alarms etc. It is proposed to connect the central controller to the internet to allow remote interfacing. Connection to the night purge system shall also be provided to automatically turn off the air conditioning systems in night purge mode or natural ventilation mode.

3.18.1 LEARNING SPACE AND FOOD TECH

As noted in Section 2.2 a mixed mode strategy is proposed to Learning Spaces. It is proposed that when external conditions are not suitable, the air conditioning can be activated by the local wall mounted controller (adjacent to the Teacher's desk) for a period of two hours before automatically turning off. The operation of the air conditioning will also be interlocked to the lighting PIR system; should no movement be detected within individual Learning Spaces after a set period of time (typically 10-15 mins) the air conditioning units will automatically turn off.

3.18.2 COMMUNITY LEARNING SPACE

Air conditioning systems to open Learning Spaces will be via localised controllers in staff areas and operated via a time schedule. Staff shall have the ability to turn off air conditioning units to allow for natural ventilation to the open spaces. Units will automatically turn off outside scheduled hours.

3.18.3 MEETING ROOMS

Air conditioning to Meeting Rooms shall be activated via the local wall mounted controllers. Unit shall operate for a period of two hours prior to automatically turning off.

3.18.4 STAFF ROOMS

Air conditioning systems to staff areas will be activated via local wall mounted controllers; units shall be able to be turned on or off during scheduled hours and shall automatically turn off outside of scheduled hours. After-hours usage will allow the air conditioning units to operate for a period of two hours before automatically turning off.

3.18.5 OUTSIDE AIR SYSTEMS

Outside air systems will be interlocked to the operation of the air conditioning system served.

3.18.6 FOOD TECH AND CANTEEN EXHAUST

Local controllers will be provided to each Food Tech area and Canteen to control the kitchen hood exhaust fans. Low/medium/high settings will enable the Teacher to control the exhaust fan. Associated outside air fans shall be interlocked to the operation and speed of the exhaust fan.

3.18.7 CAR PARK EXHAUST

The car park exhaust system shall be controlled via a carbon monoxide monitoring system. The associated fan will be provided with a variable speed drive (VSD) for balancing and energy conservation purposes.

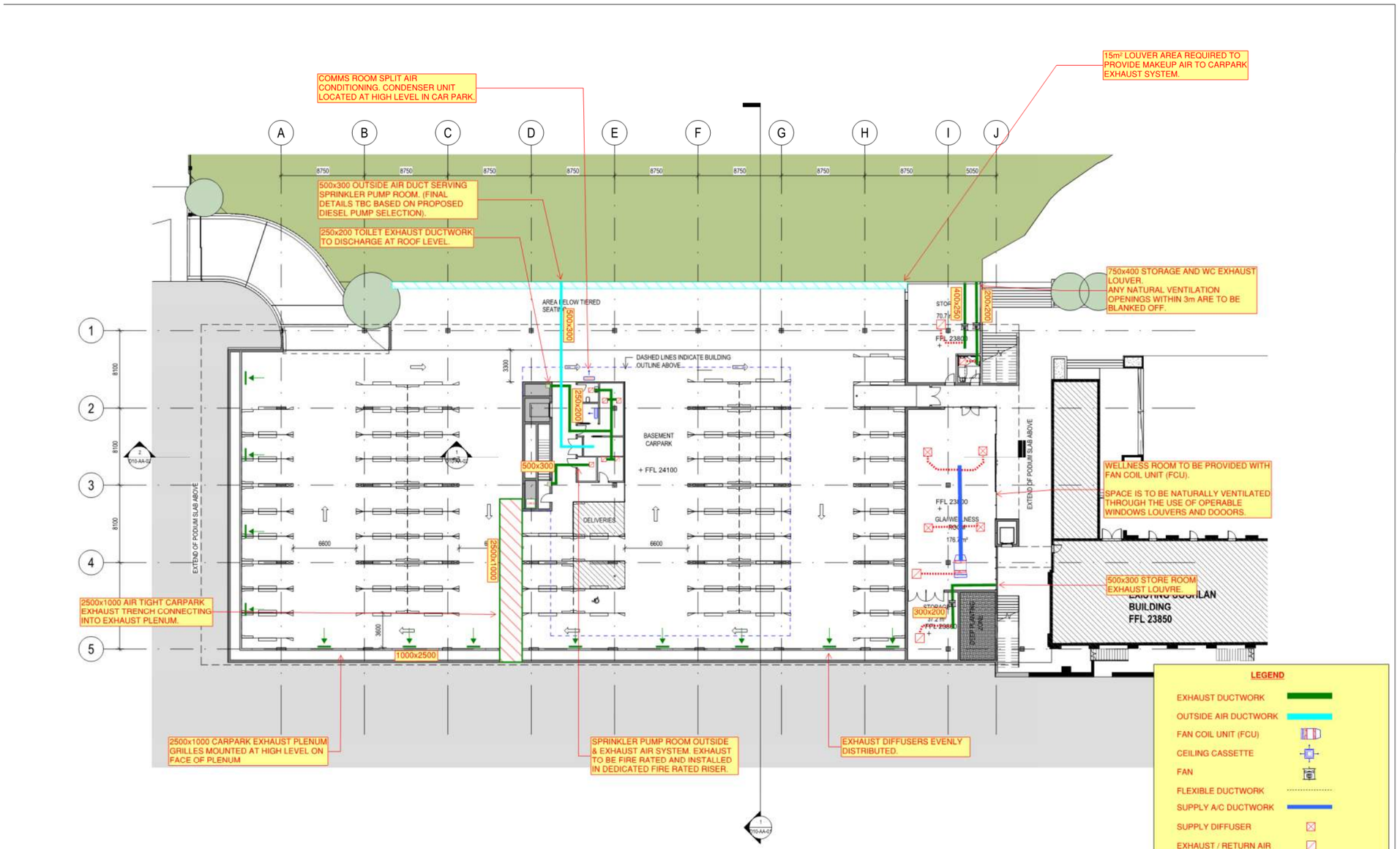
3.18.8 EXHAUST SYSTEMS

All exhaust fans will be provided with a programmable time clock to suit the hours of operation. Local WC exhausts will be interlocked to the lighting PIR occupancy sensor and be complete with an adjustable run on timer.

3.18.9 FUME CUPBOARD EXHAUST

Local on/off switch will be provided adjacent to the fume cupboard. An emergency stop button will also be provided in close proximity to the hood.

4 MECHANICAL CONCEPT SKETCHES



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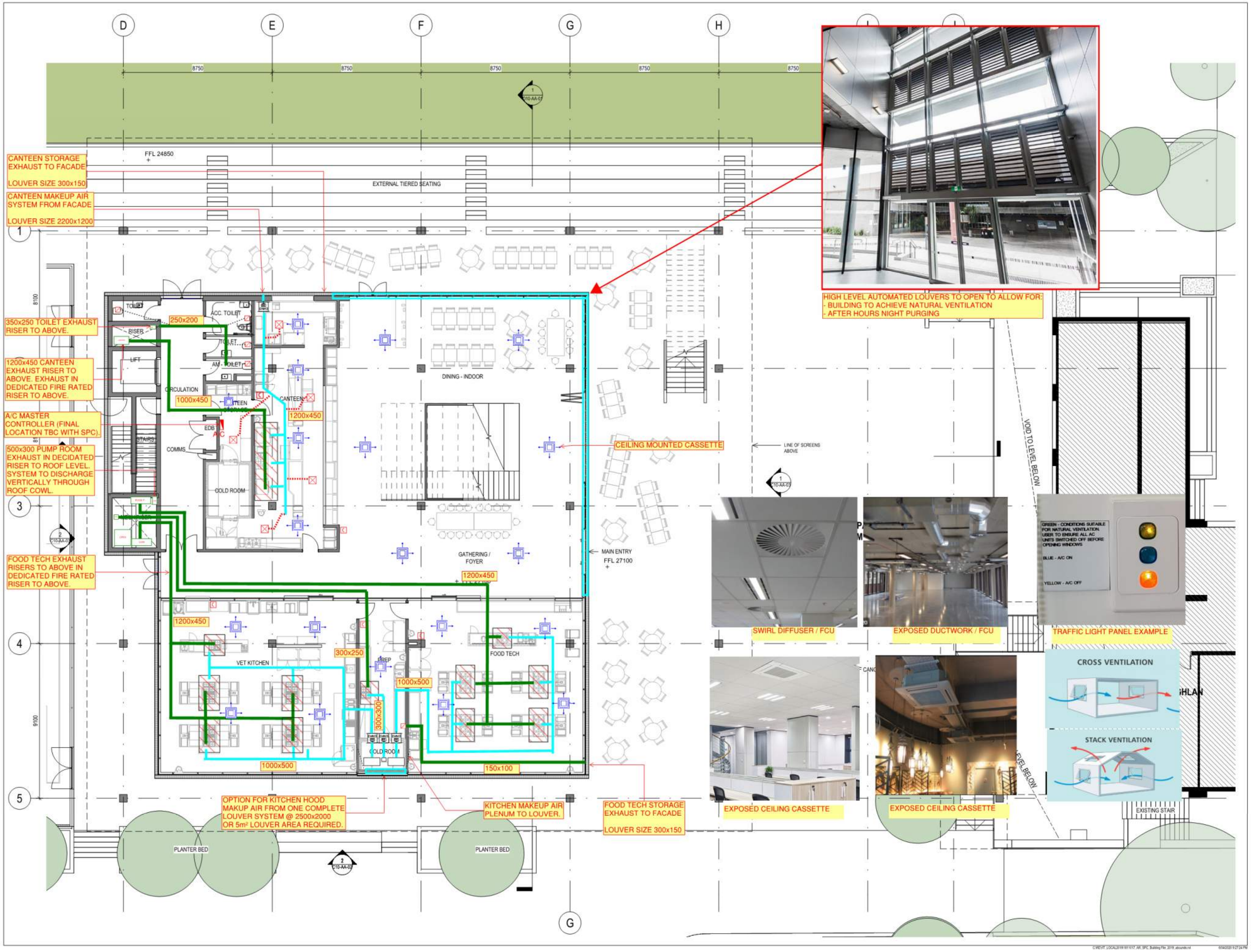

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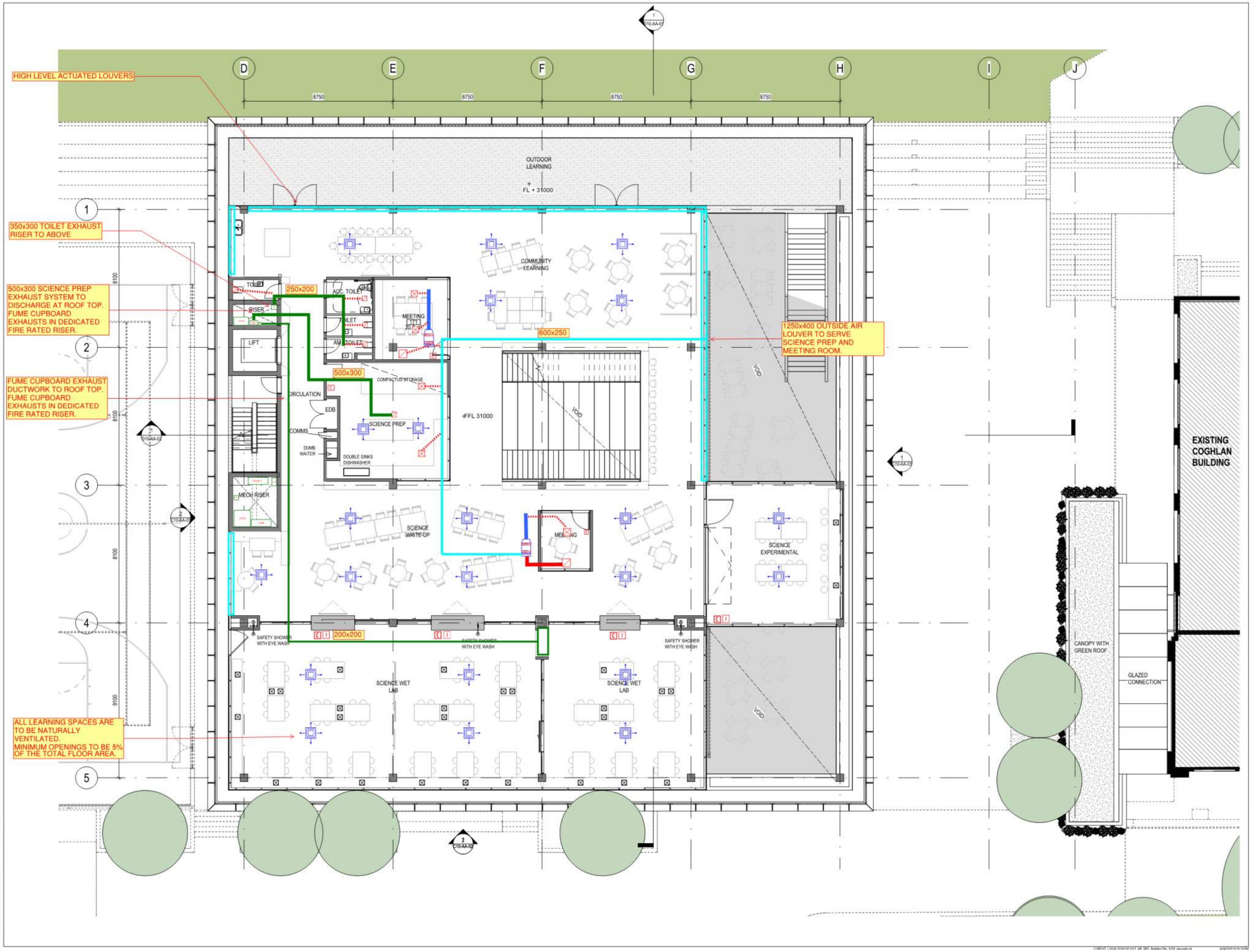

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8	20/03/2020	FOR SSDA

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CLIENT

ST. PATRICKS COLLEGE
PROJECT

ST. PATRICKS COLLEGE
FRANCIS ST, STRATHFIELD NSW 2135
BVN PROJECT NUMBER

1811017.000
DRAWING KEY

TRUE NORTH PROJECT NORTH

GRAPHIC SCALE
0 2000 5000
SCALE

1 : 100@A1
STATUS

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DRAWING

GA PLAN - LEVEL 01

ISSUE
AR-B10-01-00 8

FUME CUPBOARD EXHAUST DUCTWORK TO ROOF TOP. FUME CUPBOARD EXHAUSTS IN DEDICATED FIRE RATED RISER.

SCIENCE EXPERIMENTAL ROOMS TO BE NATURALLY VENTILATED VIA THE USE OF OPERABLE WINDOWS AND LOUVERS.

1250x400 OUTSIDE AIR LOUVER TO PREPERATION ROOM, MEETING ROOM & CHEMICAL STORE.

EXISTING COGHLAN BUILDING

AFFL + FFL 34600

BVN

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GA PLAN - LEVEL 02
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ISSUE 8

JHA

FUME CUPBOARD EXHAUST INDIVIDUALLY DISCHARGE THROUGH CENTRIFUGAL FAN 3m ABOVE ROOF LEVEL.

SCIENCE PREP TO DISCHARGE 3m ABOVE ROOF LEVEL.

ATTENUATOR FOR ACOUSTIC PURPOSES

CANTEEN KITCHEN EXHAUST DUCTWORK

PUMP ROOM EXHAUST VERTICAL DISCHARGE

KITCHEN PREP EXHAUST VERTICAL DISCHARGE

OPTION TO DOUBLE STACK KITCHEN EXHAUST DUCTWORK. DISCHARGING VERTICALLY.

DOUBLE STACKED KITCHEN TECH EXHAUST SYSTEMS.

RISER

2000

9100

D E F G H I J

8750 8750 8750 8750 8750 5050

PERIMETER PLANTER BEDS

GRATED DRAIN

SERVICES/ PLANT AREA

LIFT

COVERED CIRCULATION

MEC

MULTI TENNIS COURTS

1:100 FALL

1:100 FALL

PROPOSED TENNIS COURT FENCE LINE

GRATED DRAIN

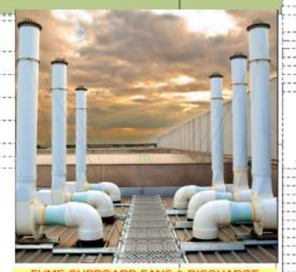
ROOF PLANT

1:100

COVERED AREA

PROPOSED FENCE LINE AND PLANTER BOX

LOCATION OF MECHANICAL OUTDOOR CONDENSERS. PLANT SIZE APPROX 13000x5000. ENCLOSED BY ACOUSTIC LOUVERS.



FUME CUPBOARD FANS & DISCHARGE TYPICAL

TOILET EXHAUST RISER DISCHARGING VERTICALLY THROUGH ROOF COWL

MECHANICAL SERVICES SWITCHBOARD

TYPICAL OUTDOOR CONDENSERS VRV/VRF HEAT RECOVERY

EXISTING COGHLAN BUILDING

BVN

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