NORTHROP

MULTIDISCIPLINE REPORT

Chevalier College Stage 1 Hospitality Precinct

11 Charlotte Street Burradoo NSW 2576

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PREPARED FOR
Maddison Property Pty Ltd
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Multidiscipline Report

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1. INTRODUCTION

1.1 General

This Multi-discipline Services Return Brief has been prepared by Northrop Consulting Engineers Pty Ltd (Northrop), the electrical, hydraulics, fire and mechanical engineering consultants for the design and documentation of the works to be completed for Chevalier College Hospitality Precinct development, located at 11 Charlotte St, Burradoo, NSW 2576.

This Return Brief is intended to provide the client a brief for the services that have been proposed for the facility with emphasis on the systems that will be provided throughout the facility. It is recommended that this document is read carefully so that there is a clear understanding of the scope of works.

This Return Brief is a working document. Northrop welcomes comments and/or queries regarding the content of this document from all project stakeholders so that all specific project requirements are captured. Please note that some information is subject to change following the issue of a Building Certifier's Report, Arborist's Report, Geotechnical Report, Fire Engineering Report and the like.

With respect to the current National Construction Code (NCC 2022), we understand the building is classified as a Type 9b building. The building's effective height is less than 25 m.

This Return Brief has been prepared with reference to the following documentation:

- Northrop Services Consultants Site Inspection, dated 15.11.2024
- Issue for information Chevalier College LEAF Architecture Plans, dated 11.03.2025

2. MECHANICAL

2.1 Methodology

Our methodology is to contribute to the concept design of the building to ensure the building achieves a high performance, over the full life cycle, in the following areas:

- Minimal consumption of resources.
- Minimal atmospheric emissions having negative environmental impacts.
- Minimal discharge of harmful liquid effluents.
- Minimal site impacts on the site ecosystem.
- Maximum quality of indoor environment, including indoor air quality, thermal comfort, illumination

2.2 Standards

All mechanical services shall be in accordance to the following standards:

• Building Code of Australia	NCC 2022
• AS1668.2:2012	The Use of Ventilation and Air conditioning in Buildings - Ventilation Design for Indoor Air-Contaminant Control.
• AS 1324.1-2001	Air Filters for Use in General Ventilation and Air-conditioning – Application, performance & Construction
• AS 4254.1-2021	Ductwork for air-handling systems in buildings – flexible ductwork
• AS 4254.2-2012	Ductwork for air-handling systems in buildings – rigid duct

2.3 Extent Of Work

The extent of mechanical services to be provided are summarised as follows:

2.3.1 Air Conditioning & Ventilation

Air conditioning systems to serve the following areas:

- Entry Foyer
- Hospitality room
- Food technology

2.3.2 Mechanical ventilation

Mechanical ventilation systems to serve the following areas:

- Amenities
- Laundry/store
- Change rooms
- Food technology
- Hospitality Kitchen
- Dry store
- Preparation room
- Scullery
- Furniture store

Note: Where achievable we propose areas to be naturally ventilated by building openings.

2.4 Design Criteria

The systems shall be designed to meet the following criteria:

2.4.1 External Ambient Conditions

The external design conditions shall be based on weather data, as follows:

	External
Summer	31.9˚C / 21.7˚C (DB/WB)
Winter	4.1˚C 80% RH

2.4.2 Internal Room Conditions

The design room conditions nominated below are based on the conditions recommended by the Australian Institute of Refrigeration and Heating (AIRAH). The design room conditions shall be as follows:

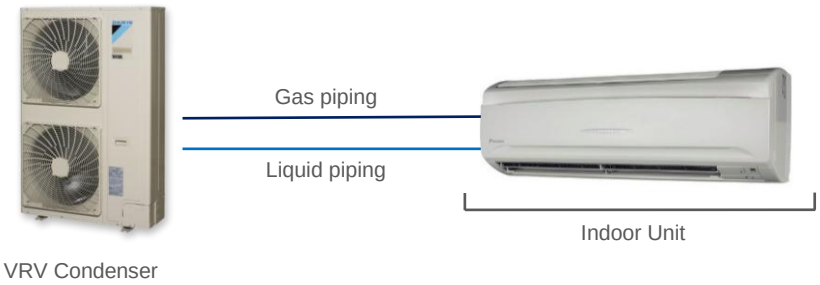
Zone / Room	Summer	Winter
All conditioned spaces	24°C DB	21°C

2.5 Air Conditioning Systems

2.5.1 Wall mounted VRF System

The indoor fan coil units shall be served by externally located air cooled condensers for heat rejection.

The individual rooms shall be air conditioned via high wall mounted fan coil units.



VRV System

The fan coil units shall have the following features:

- The units shall be high wall mounted and visible.
- Refrigerant pipes shall partly run within the room and are either run within the wall cavity, or are concealed in the ceiling space.
- Condensate shall be drained by gravity only. Condensate pumps are only considered in special cases as agreed by the client, and shall be located in the wall cavity.

Size of the VRV system shall be limited to maintain safe refrigerant charge in accordance with AS1677.

VRV side discharge condensing unit

Wall Mounted FCU:

High Wall Mounted Fan Coil Unit

2.6 Mechanical Ventilation Systems

2.6.1 Hospitality kitchen ventilation

A ducted mechanical exhaust system is required to serve the kitchen exhaust hoods specified by the food and beverage consultants. Based on the existing kitchen on the premises, it is assumed that seven hoods will be used in the new layout. The final number of exhaust fans and flow rates will be confirmed once the new layout and equipment are finalised. Each commercial kitchen exhaust hood is assumed to require an exhaust system with a capacity of 1,500 L/s, resulting in a combined flow rate of 10,500 L/s for the space.

A ducted makeup air system shall supply 90% of the exhausted air via a façade louvre.

Area	Air Flow Rate
Commercial Kitchen hood	1,500 L/s

2.6.2 Food technology room ventilation

A ducted mechanical exhaust system is required to serve the range hoods specified by the food and beverage consultants. Each range hood in the food technology room is assumed to exhaust 200 L/s, with a combined flow rate of 1,400 L/s for the space.

A ducted makeup air system shall supply 90% of the exhausted air in the food technology area via a façade louvre.

Area	Air Flow Rate
General Kitchen hood	200 L/s

2.6.3 Amenities ventilation

A ducted mechanical exhaust system shall serve the amenities and discharge via the façade. Flow rates will comply with AS 1668.2-2012.

Area	Air Flow Rate
Amenities	The greater of 10 L/s.m^2 or 25 L/s per fixture

2.6.4 Dry store and furniture store ventilation

A ducted mechanical exhaust system shall serve both storage areas and discharge via the façade. Flow rates will comply with AS 1668.2-2012.

Area	Air Flow Rate
Dry store & Furniture store	5 L/s.m^2

2.6.5 Preparation room, Scullery and Circulation ventilation

A ducted mechanical outside air system shall serve the Preparation room and Scullery from a façade louvre. Flow rates shall be in accordance with AS1668.2-2012.

Area	Air Flow Rate
Preparation room & Scullery	3.5 m²/per person at 10L/s
Circulation	1L/s.m²

2.6.6 Change rooms & Laundry ventilation

A ducted mechanical exhaust system shall serve the change rooms and laundry, discharging via the façade. Flow rates will comply with AS 1668.2-2012.

Area	Air Flow Rate
Laundry	15 L/s/m²
Change rooms	5 L/s/m²

All penetrations through facade or roof to have BAL-19 bushfire mesh.

2.7 Automatic Control Requirements

Electronic controls are provided with the following functions and shall be in accordance with Part J of the BCA.

2.7.1 Air Conditioning

2.7.1.1 Fixed Wall Mounted Controller

Air conditioning units serving the Entry Foyer, Hospitality and Food technology shall operate under their own local temperature control. A fixed wall mounted controller is provided in each space served with the following functions as a minimum:

- On/off switch
- Fan speed adjustment
- Temperature set point adjustment
- In-built thermostat

Users have the ability to control the above directly.

Wall Mounted Individual Controller

2.7.2 Mechanical ventilation systems

2.7.2.1 Hospitality kitchen

An isolator switch is proposed adjacent to each commercial hood on the wall, interlocked with the respective roof-mounted fan and makeup air system.

2.7.2.2 Food technology room

An isolator switch is proposed next to the demonstration desk. This switch shall control all the food technology range hoods and be interlocked with the makeup air system.

2.7.2.3 Amenities

The exhaust fan serving the amenities shall be activated by a motion sensor. The fan shall be equipped with a run-on timer to allow operation for 30 minutes (adjustable) after the toilet lights have timed out.

2.7.2.4 Dry store and furniture store

The dry store and furniture store extraction systems shall operate 24/7 to ensure continuous ventilation.

2.7.2.5 Preparation room, Scullery and Circulation

The preparation store, circulation, and scullery exhaust fan shall be interlocked with the light switch.

The general kitchen hood exhausting the preparation store shall also be interlocked with a light switch.

2.7.2.6 Change rooms and Laundry

The exhaust fan shall be interlocked with the light switches in each change room, and connected to a relay sensor linked to the dryer. The fan shall have a run-on timer for 30 minutes (adjustable) after the change room lights are switched off and the dryer has finished operating.

3. ELECTRICAL

3.1 General

3.1.1 Applicable Standards

Electrical systems and services will be generally designed and developed in accordance with the following standards:

Reference	Edition	Title
AS 1670	2018	Automatic fire detection and alarm systems.
AS 2293	2018	Emergency evacuation lighting in buildings.
AS/CA S008	2020	Requirements for customer cabling products.
AS/CA S009	2020	Installation requirements for customer cabling (Wiring Rules).
AS/NZS 1680	2009	Interior and workplace lighting.
AS/NZS 3000	2018	Electrical installations – Wiring rules
AS/NZS 3008.1.1	2017	Electrical installations - Selection of cables - Cables for alternating voltages up to and including 0.6/1 kV - Typical Australian installation conditions
AS/NZS 11801	2019	Information technology - Generic cabling for customer premises
AS/NZS 60598 series	2013	Luminaires – General requirements Luminaires – Particular requirements (for all relevant usages)
AS/NZS 61347.1	2016	Lamp controlgear - General and safety requirements
AS/NZS 61386.1	2015	Conduit systems for cable management - General requirements
AS/NZS 61439 series	2015	Low-voltage switchgear and controlgear
NSW SIR	2018	NSW Service and Installation Rules

3.2 Existing Services

Northrop has performed non-invasive investigations in regards to the existing site conditions, considering the context of the proposed Chevalier College Stage 1 Hospitality Precinct development.

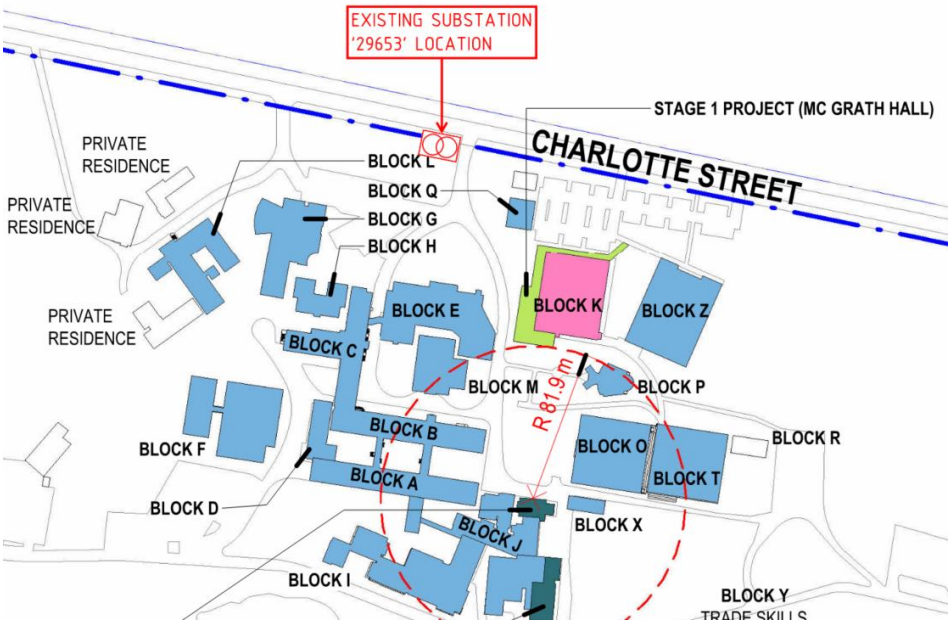
Our assessment has been based on the site inspection conducted on 15/11/2024, information provided by the relevant electrical and telecommunications utility authorities, and information provided by the project representatives including but not limited to:

- As-Built Drawings
- Fire/Evacuation Diagrams

3.2.1 Electrical Utility Infrastructure

The existing site is supplied by electrical utility infrastructure from Endeavour Energy, as per the following:

Asset Number	29653

Type of Asset	Pad-mount Kiosk Substation/Transformer
HV Operating Voltage	11 kV
Location on Site	
Name & Distributor No.	Endeavour Energy
Incoming Consumer Mains	8 x 1c x 240mm^2 Cu XLPE/PVC
Capacity	An enquiry to Utility Authority will need to be lodged to determine the capacity of the asset, and the capacity available on the asset that may be allocated to the new development works.

Image	

Supply Authority metering for the existing site is located on external main switchboard, with NMI number NEEE0029495.

3.2.2 Power Quality and Demand Assessment

The maximum demand was not able to be determined from the site visit and assessment. Lodging a technical enquiry to Endeavor Energy will be required to provide estimate peak demand drawn from the college, in addition to understanding spare capacity of street network.

The most accurate solution is to complete a **load profiling** exercise performed on the MSB by a specialist electrical contractor, to determine spikes in usage and to indicate where phase unbalance may be prevalent.

The most accurate results shall be observed if the load profiling equipment is monitoring the site for a period of at least one week. **Maximum** electricity demand will typically be observed during the extremities of summer or winter, where the air conditioning/heating is expected to be operating at maximum current draw.

The load profiling exercise undertaken should, at minimum, outline the following additional information:

- RMS voltage stability
- True power factor – low power factor (less than 0.9 lagging) is against the current Service and Installation Rules and will contribute to higher electricity bills. Power Factor Correction equipment is required if power factor is less than 0.9.
    - Displacement power factor

3.2.3 Main Switchboard (MSB)

The Building's Main Switchboard (MSB) is located externally of 'Block C'.

- The MSB is a commercial grade Form 3bih construction, IP56 switchboard, manufactured by Blacktown City Switchboards .
- Switchgear is of single manufacture and age, most switchgear is original and of Schneider manufacture.
- The MSB is in good/ condition for a board of its age.

3.2.4 Distribution Boards (DB)

The existing site contains a number of distribution boards (DB). DB-M (McGarth Hall) is the primary DB for stage 1 works. A brief condition report on the observed DB is as follows:

Distribution Board	Image	Observations
DB-M		• Manufactured circa Nov 2023. • 250A Main Switch • Good condition, observed to be constructed to standard. • Few spare spaces. • Typed circuit schedule sighed. • RCD protection sighted on general power or lighting circuits. • Emergency lighting circuits not marked with the symbol. • Emergency Lighting Test Switch sighted

3.2.5 Lighting

3.2.5.1 General Lighting

A combination of LED and Fluorescent luminaires was observed to be installed throughout the existing McGarth building, internally and externally. The condition of light fixtures appears to be mixed, with some in good condition with clean diffusers, while others appear to be missing diffusers, not operable or unclean.

3.2.5.2 Emergency and Exit Lighting

Existing emergency and exit lighting were sighted throughout the existing site.

- The emergency and exit lighting system appears to be standalone.
- Emergency lighting fittings are of the self-contained “Spitfire” type with LED lamps.
- Sub-circuits with emergency lighting fittings are not clearly denoted with a symbol on the relevant distribution boards.

3.2.6 Communications Systems

3.2.6.1 Fixed Communications

The hall is serviced by fixed communications systems, including a structured cabling system. The following observations are made:

- The hall is served by a secondary “building distributor” wall mounted rack located within cupboard western side of entry foyer.
- Existing horizontal cabling is observed to be Panduit Cat 6 U/UTP.

3.2.7 Security and Access Control

The hall is observed to be protected throughout with a Salto security and access control system.

- Selected doors in the site are protected with swipe card access – multi-level access is incorporated to limit access to sensitive areas by unauthorised personnel. Swipe-card protected doors are alarmed and will sound when open for an excessive period.
- Selected room areas are protected with infra-red intruder detection.
- CCTV cameras were sighted in certain areas within the back of house area. The location of video recording equipment was not observed.
- Security and access control panels was not observed in the hall during the site visit – assumed to be installed nearby in close proximity.

3.3 Electrical Services

3.3.1 Incoming Supply

The existing underground incoming supply to the college is proposed to be retained, supported from substation 29653 within the site boundary to the external main switchboard. Correspondence will need to be initiated with the local energy authority, Endeavour Energy to determine spare capacity to support the redevelopment of the McGarth Hall.

3.3.2 Load Assessment Calculations

A preliminary assessment of the load requirements for the proposed development has been undertaken, according to AS/NZS 3000:2018 Table C3.

Assumptions used in the calculation are as follows:

- Kitchen loads are assumed to be utilizing fully or majority electric to capture the highest case scenario for load assessment.
- As gas is available to the site, there is the possibility that gas cooking appliances can be utilised if there is insufficient capacity to supply the required demand. This has the effect of halving the expected load for cooking appliances, compared to if electric element or induction cooktops are installed.
- We have assumed **25** VA/m^2 of air conditioning as per AS/NZS 3000:2018 Table C3 – this is based on either a local VRV system or a Central Chilled Water system. If a variable air volume system is instead selected, this figure may reduce.
- We have assumed a 10% spare capacity figure.

NON-DOMESTIC

Group	Sub Location	Description	Area	VA/m2	Load (kVA)	Load (A / Phase)
Block K	Entry Foyer	Reception/Waiting Area	87	50	4.35	6.28
Block K	COLA	Outdoor Learning Space	268.6	25	6.72	9.69
Block K	SLA: Hospitality	Commercial Kitchen	161.2	400	64.48	93.07
Block K	Prep Room	Pantry	14.7	35	0.51	0.74
Block K	Dry Store	Store Room	13.3	10	0.13	0.19
Block K	Circulation - Total	Circulation	63	30	1.89	2.73
Block K	SLA: Food Tech	Commercial Kitchen	106.8	400	42.72	61.66
Block K	Coolroom	Refrigerated Storage	6.4	300	1.92	2.77
Block K	Laundry	Laundry	12.8	150	1.92	2.77
Block K	Acc. WC	Toilets	6.5	30	0.20	0.28
Block K	WC- M	Toilets	24.1	30	0.72	1.04
Block K	WC- F	Toilets	25.3	30	0.76	1.10
Block K	Change 1 & 2	Shower/Change Room	18.1	30	0.54	0.78
Block K	Stage	Stage	39.5	250	9.88	14.25
Block K	Furniture Store	Store Room	83.8	10	0.84	1.21
Block K	Main Hall	Hall	769.4	65	50.01	72.18
Block K	Plant	Plant Space	7.6	15	0.11	0.16

Specific Loads	Description	Quantity	Load (A)	Load (A / Phase)

Spare Capacity	10.00%
Total AS3000 Maximum Demand (Non Domestic)	205.63 kVA
	298.01 Amps/Phase

Based on these calculations, a load in the order of 298.01 Amps per phase (205.63 kVA) would be anticipated for the upgrade of the hall.

3.3.3 On-Site Electricity Generation – Generator (Bushfire Compliance)

On-site electricity generation, in the form of back-up diesel generator is proposed for the Chevalier College Stage 1 Hospitality Precinct development in order to comply with BCA Specification 43 Bushfire protection subclause S43C12 Emergency power supply.

The generator will be sized and specified to operate 4 hours before the fire front during a bushfire event, and 2 hours after the passing of the fire front per code requirements. A manual transfer switch (MTS) shall be installed in the new main distribution board to allow for the connection of a diesel back-up generator. The distribution board will be split to allow for 'shedding' of non-essential circuits and backup of essential circuits during bushfire / emergency event. Equipment required to be backed up will be essential mechanical equipment, fire pumps, emergency lighting & exit signs, and any additional equipment required to maintain tenability during bushfire / emergency event.

Refer to concept sketch drawings for preliminary spatial allowance for the physical generator, room dimensions and requirements.

3.3.4 On-Site Electricity Generation – PV System

On-site electricity generation, in the form of photovoltaic panels, is proposed for the Chevalier College Stage 1 Hospitality Precinct development.

The direction of the on-site electricity generation will be further clarified following response from the Client. Northrop can allow for the following options:

- **Option 1:** Documentation of grid connected PV system on the roof in accordance with respective input from the Structural Engineer. Full documentation will include all electrical works required to ensure the correct installation of PV system (such as in distribution boards, main switchboard, and the like).
- **Option 2:** Documentation of provisions only for PV system for future installation.

The electrical infrastructure for the PV system (whether current or future) will be located in the distribution board closest to the PV Panels. The PV system is proposed to be grid-connected, backfeeding excess produced energy into the energy authority's infrastructure to offset the development's electricity bills.

Battery storage of solar produced energy is an optional consideration and may be considered following further discussion with the Client.

3.3.5 Electricity Metering

In accordance with NCC Section J9D3, separate energy meters will be provided in each Distribution Board to monitor lighting, power, mechanical and other plant deemed to constitute a substantial electrical demand. Energy meters are to be IP networkable in order to report energy monitoring statistics to an energy management system for future provision.

3.3.6 Electricity Distribution

The existing distribution board as noted in Section 2.4, does not have insufficient capacity to accommodate the new maximum demand for the hall. Additional upgrades including circuit breaker at MSB, submain cabling and new distribution board is required to serve the development.

As outlined in Section 3.1.1, the calculated maximum demand assumes that the kitchen appliances will be primarily or entirely electric. However, if gas-powered appliances are considered, there may be an opportunity to avoid further upgrades to the electrical infrastructure, including utilising the existing distribution board 'DB-M'.

3.4 Power

3.4.1 Electrical Accessories

A summary of styles of electrical accessories that are proposed to be used is shown below.

Item	Description/Usage	Indicative Image
General Purpose Outlet	10A switched Clipsal Iconic Pro 3000 series general power outlet in Vivid White Finish. Clipsal Iconic Pro 3000 series outlets have non-removable faceplates making them suitable for installation in a school environment.	
General Purpose Outlet with USB Charging	10A switched Clipsal Iconic Pro 3000 series general power outlet in Vivid White Finish, with built-in USB charging facility (1 x USB-A and 1 x USB-C) for smartphones, tablets and other portable computing devices. Allowance may be made in lobbies, waiting areas and corridors, to allow occupants to charge their mobile devices.	

Item	Description/Usage	Indicative Image
General Power Outlet (Dark)	10A switched Clipsal Iconic 3000 series general power outlet in Anthracite Finish. Following architectural direction, allowance shall be made in areas painted with a dark wall or ceiling cover.	
Floor Boxes	Floor boxes are a common solution to providing power in rooms such as meeting rooms, where running cables across the floor may result in safety hazards.	

3.4.2 Power Allowance in Spaces

3.4.2.1 Common Areas

Throughout the development, preliminary general purpose outlet (GPO) locations shall be provided for review with the initial documentation issue. These will continue to be developed with input from the Client and Architect as required. Power supplies will be allowed for mechanical systems (including air-conditioning), hydraulic pumps, oil separators, grease arrestor, exhaust and supply fans etc, where necessary.

3.4.3 Main Hall & Stage

The auditorium is to be provided with general power throughout the seating area for general purposes, including cleaning, personal user devices, and ad-hoc audio-visual equipment. The control room shall be provided with separately earthed, surge protected and dedicated power circuits as required for audio-visual and performance equipment.

3.4.3.1 Corridors

Corridors throughout shall be provided with cleaners' general purpose outlets. Cleaners' outlets shall be combined on a dedicated circuit, with a maximum of fourteen (14) cleaners' outlets on a single circuit.

Cleaners' outlets will be provided with a beige coloured flush plate marked 'CLEANERS' USE ONLY'.

3.4.4 Kitchens

Coordination will be undertaken with the Chevalier College Stage 1 Hospitality Precinct development's designated kitchen design consultant. Power services including general power outlets, captive outlets, permanent connections and the like, will be provided in accordance with the kitchen design consultant's documentation.

3.5 Lighting

3.5.1 Strategy & Concept

The proposed strategy towards lighting design is to adhere to the following tenets:

- Long term cost savings through energy efficiency.

- Selection of good value light fittings to rationalise construction cost.
- Limitation of the number of different types of fittings, to encourage savings in wholesale procurement.
- Design will be carried out in accordance with the recommendations of AS/NZS 1680 for internal lighting, and AS/NZS 1158 for external lighting.
- Lighting will be entirely LED and be finalised, agreed and developed with directions from the architect where appropriate.
- All LED luminaires will utilise high colour rendering index (colour corrected) light sources to ensure that all physical objects in the spaces are correctly illuminated.
- Visual comfort is to be a primary focus; no fittings shall be specified that exhibit excessive glare characteristics, flicker, or do not conform to a constant light output characteristic (minimum L70/50,000 hour life).
- Existing luminaires shall be audited and assessed by nominated contractor and determined if suitable for reuse. It is recommended that all fluorescent luminaires shall removed and not reused due energy saving, flicker free and long term cost saving advantages of LED luminaires over fluorescent.

The lighting concept, in general, is to enhance the prestige of the fittings and finishes proposed by the architect, and minimise intrusive penetrations in the ceiling. The layout, where possible, will be optimised to increase spacing and use the optic qualities of the luminaire to provide maximum illumination.

It is noted that the architect has not commenced producing reflected ceiling plans at this early stage, and the concepts shown are for idea-gathering only. Upon the initial release of draft reflected ceiling plans, Northrop will update the lighting concepts to suit. The design concepts for spaces that we propose, pending RCPs, are as follows:

Space	Design Intent
Circulation Spaces	Continuous recessed linear lights, LED battens or recessed downlights harmoniously matching the feature ceiling, offering a direct beam. 
Hospitability Area	Depending on the ceiling chosen, recessed LED troffer or surface mounted battens over the work area improve the visibility and functionality of the area, specifically aiding the occupants in performing tasks such as cooking, prepping, and other activities within the hospitality zone.

Space	Design Intent
	
Work Areas	Continuous suspended linear lights offering a direct/indirect beam. The addition of an indirect light beam allows the entire room to feel illuminated. The result is a higher perception of a positive working area and happier, healthier staff. 
Features	Where appropriate (e.g. meal preparation areas), the main room lighting shall be supplemented by LED strip lighting integrated into the joinery. Alternatively, suspended feature lights may be appropriate, however do not allow for flexibility in furniture positioning. 
Performance Spaces	The auditorium / hall requires a flexible and precise level of lighting control. The light fixture itself should be unassuming yet powerful. Combined with a control system, the stage operator can create unique or atmospheric effects for the audience, to supplement the on-stage effects. The LED modules must have smooth dimming, down to 0.1%, with zero flicker. Nominated LED modules will also be free of “invisible flicker”, which can negatively affect video recording.

Space	Design Intent
	
Landscape & Hardscape	Lighting will enhance the natural environment crafted by the landscape architect, and bring the area to life from dusk hours, or on duller days. The natural environment is designed to be inspiring – the lighting must not be disruptive. Fixtures that integrate within the hardscape and the trees create a pleasing illusion:   Uplighting trees planted in between the hardscape will also provide an illuminating effect: 

3.5.2 Controls

Lighting controls will be designed with energy efficiency in mind, with reference to NCC Section J where applicable. Timers and sensors will be used to minimise the effects of energy wastage.

Individual light switches will generally match the style of general power points and other adjacent wall plates.

An addressable lighting control system will be incorporated in at least 90% of the Chevalier College Stage 1 Hospitality Precinct development. This is to maintain the targeted Ecologically Sustainable Development (ESD) credits. Additionally, this will ensure that prestige and flexibility are maintained throughout the building. There are several manufacturers of addressable lighting control systems for consideration to install in the building, including Clipsal C-Bus, Philips Dynalite, Gerard Lighting RAPIX, and Tridonic connectDIM. Motion occupancy sensors will be specified in areas of work to reduce overall energy consumption and greenhouse gas emissions. Microwave sensors are selected over infrared sensors as these detect presence with body heat rather than movement, reducing false non-detection of presence.

The addressable lighting control shall be integrated with the proposed AV system offer control of lighting functionality, scene and dimming for the stage and main hall areas.

3.5.3 Lighting Allowance in Spaces

3.5.3.1 Learning Areas

Learning areas will be provided with high quality LED downlights, or high quality LED linear luminaires with glare-free diffusers. Luminaires will be equipped with electronic dimming drivers and high output reflectors consistent with ESD principles. The lux level shall be typically 320 lux with the exception of spaces such as design & technology classrooms, or laboratories, where 400 lux is desired for higher precision work. Control will be provided by motion occupancy sensors and timed individual switches locally.

Space	Lux Level	Control Type	Comments
Learning Areas	320 lx	Motion Sensor / Local Override Switch	60 minutes (or one period) time switch
Laboratories	400 lx	Motion Sensor / Local Override Switch	60 minutes (or one period) time switch
Open Learning Area	240 lx	Motion Sensor / Local Override Switch	Master push-button light switch panel
Covered Outdoor Learning Area	160 lx	Light Switch Panel	Master push-button light switch panel

3.5.3.2 Auditorium

The auditorium's lighting will be designed in coordination with the nominated specialist theatre consultant. The specialist theatre consultant will design technical lighting and/or special effects directed at the stage. Northrop will design general lighting throughout the auditorium. It is proposed to install ceiling mounted or suspended twin-fixture LED luminaires which can be interfaced with stage lighting to provide dimming effects.

3.5.3.3 Corridors / Circulation

Corridors will be provided with LED downlights, LED linear lights, or a mixture, depending on the architectural ceiling design. Lighting control will be by motion sensors running on a time switch, intermixed with 24 hour lights at circulation areas such as near lifts. All lights can be overridden by manual controls to be installed at a centralised location.

Space	Lux Level	Control Type	Comments
Internal Corridors / Circulation	200 lx	Motion Sensor / Time Switch / Light Switch Panel	Master push-button light switch panel

3.5.3.4 *Commercial Kitchens, Serveries & Laundries*

The lighting layout will be designed to achieve a maintained illuminance level of 240 lux. The lighting will consist of recessed cleanroom LED linear luminaires with a minimum IP rating of 44.

Space	Lux Level	Control Type	Comments
Commercial Kitchen	500 lx	Local Switching	-

3.5.3.5 *Other Internal Areas*

The allowance for lighting levels and lighting control throughout the building's common areas can be summarised in the following table, as per AS 1680.1:2006.

Space	Lux Level	Control Type	Comments
Amenities (e.g. Change Rooms)	80 lx	Motion Sensor	30 minutes time switch.
Toilets	80 lx	Motion Sensor	10 minutes time switch.
Live Storage (commonly accessed)	80 lx	Motion Sensor	30 minutes time switch.
Dead Storage (not commonly accessed)	40 lx		
Plant Rooms (excluding Electrical Switchrooms)	80 lx	Motion Sensor	30 minutes time switch.
Communications Rooms	400 lx	Motion Sensor	30 minutes time switch.
Fire Stairs	80 lx	Motion Sensor	30 minutes time switch.

3.5.3.6 *Landscape*

External/landscape lighting will be designed in coordination with the Landscape Architect,

All exterior areas will be designed to comply with varying classifications of AS/NZS 1158.3.1 (Pedestrian Area (Category P) Lighting) and AS 4282 (Control of the obtrusive effects of outdoor lighting).

The main entrance will be illuminated to AS/NZS 1158.3.1 Category PA2. This provides a brightly lit, welcoming environment to create a feeling of safety and accessibility, whilst enhancing the prestige of the building.

All interconnecting elements such as walkways and stairways will be lit to Category PE2 as a requirement of AS/NZS 1158.3.1.

All other perimeter lighting will be provided to achieve the minimum safety levels of lighting.

All exterior luminaires will be selected to achieve IP65 external grade classification or higher.

External lighting will be specified to use LED type luminaires, controlled via daylight sensors and time switches with a manual override control if necessary. Light fittings are to be provided with a powder coated finish to the architect's colour scheme requirements. External light fittings will have 3000K colour temperature (warm white).

Space	Lux Level	Control Type	Comments
Building façade, access to building & landscaping	< 50 lx	PE Cell/Time-of-day Switches	Recessed steplights, inground lights, etc. – coordinate with landscape architect.

3.6 Communications

3.6.1 Communications Rack – Building Distributor

The existing communications rack located in the Block K will be disconnected and removed. A new rack will be established within a spare storage space or dedicated communications room if possible. The room will contain communications racks/cabinets for the structured cabling system, security and access control head-end equipment, and television distribution equipment.

The room shall operate at a maintained temperature of no more than 25 degrees Celsius. An independent air-conditioning system shall be designed and installed in the **communications / storage room**. The air-conditioning system shall be continuously run to maintain the prescribed ambient temperature.

The room can be electronically locked and secured with key-card/key-fob access as part of the access control system. A reed switch shall be installed on the door to record and signal an alarm (where required) if unauthorised access has been gained to the main communications room.

3.6.2 Structured Cabling System

The Chevalier College Stage 1 Hospitality Precinct development is to be provided with a complete Structured Cabling System to support the Client's current and future ICT requirements. The design will be and be able to support at minimum the following applications:

- IEEE 802.3 (Ethernet over twisted pair) data networks (10/100/1000/10G Base-T);
- Wireless networks up to IEEE 802.11ax (Wi-Fi 6);
- Digital (VoIP) voice services;
- Audio Visual services, including IPTV, AV control systems, AV over IP, and video-conferencing;
- TCP/IP-based building service systems, such as BMCS, energy monitoring, security and access control;

It is the Client's responsibility to provide active ICT equipment to the project, the enclosed scope covers only passive components to the structured cabling system. Active ICT equipment includes, but is not limited to routers, switches, wireless access points, telephony systems, servers, computers, and the like.

All cabling products utilised in the structured cabling system, including but not limited to; cables, panels, racks, connectors, adapters, outlets, accessories and the like, shall be a complete single-vendor solution. The nominated approved vendor for the structured cabling system shall be R&M or Panduit.

The structured cabling system shall comprise a star topology, consisting of:

- Campus Distributor
- Building Distributor
- Horizontal cabling from relevant distributors to field outlets, at work areas or IP components (cameras, telephones, building service endpoints and the like). Floor distributors are to be located in strategic positions throughout the building, to ensure that field cabling does not extend over 90 metres in length.
- Horizontal cabling from relevant distributors to wireless access point (WAP) field outlets. WAPs, specified by the Client, are to support Power over Ethernet. Northrop's scope of works does not include wireless heat-mapping, all WAP locations will be based off best practices, and finalised by the WAP vendor during the construction phase.

The structure shall not deviate from the star topology; sub-communications rooms should not be supplied by other sub-communications rooms. Cabling types for structured cabling system to support the new building distributor in McGarth Hall Block K shall be as follows:

Intra-building backbone cabling shall be a minimum of 12-core multi-mode (OM4) and 12-core single-mode (OS2) fibre optic cable.

Horizontal cabling and connectivity for general applications shall conform to a compliant Class E_A channel. Twisted-pair cabling shall be a minimum of Category 6_A unshielded, foil-twisted pair (U/FTP) cable. Twisted-pair cabling for high-priority applications, such as machinery or audio-visual, shall utilise a minimum of Category 6_A shielded, foil-twisted pair (S/FTP) cable with shielded jacks.

3.6.3 Uninterruptible Power System (UPS)

An Uninterruptible Power System (UPS) at this stage we understand is not required, however can be provided as requested. Typically, an UPS will be sized with 20 minutes continuously running capacity during black outs, and be sized according to the final electrical load of critical communications services. Critical communications services include:

- Communications racks;
- Servers and active equipment;
- Security and access control system.

The battery size shall be determined following the finalisation of active equipment electrical loads.

3.6.4 Television System

Television system we understand is not explored and required at this stage, however can be provide as requested. The following outlines details if a television system is implemented.

A single roof mounted antenna shall be installed at the highest point of the development. Amplifiers and splitters will be installed in the communications cupboards on each floor.

Television system connectors will be distributed throughout the building in areas nominated by the Architect and Client to house a television.

All television points will be supplemented with an additional data point forming part of the structured cabling system to facilitate connections to online video streaming services.

Pay Television is tentatively available in the local area by way of roof-mounted satellite dish. The Client is to nominate which of the following approaches shall take place for Pay Television (Foxtel) services:

- No allowance for Pay Television.
- Allowance for future Pay Television services.
- Full Pay Television installation, which requires liaison with a Foxtel contractor to complete the satellite dish installation.

3.6.5 Period Bell & Public Address System

Existing Period Bell / PA system shall be expanded to cater for new hall upgrade. We envisage that the existing system is capable of supporting multiple programmable days for period bells, background music as well as multiple remote paging stations and multiple audio zone output selection.

A new PA amplifier will be installed in comms cabinet and connected to the existing headend equipment via Cat 6 LAN cables.

3.7 Electronic Security

Existing Chevalier College Stage 1 Hospitality Precinct development is observed to be protected by a Salto electronic security system.

It is proposed that the existing system shall be expanded to accommodate for additional access control and security requirements for McGarth Hall upgrade. Installation and supply by an experienced and licenced specialist security contractor.

3.7.1 Intruder Alarm System

The intruder alarm system is proposed to consist of the following components:

3.7.1.1 Perimeter Alarm

A perimeter alarm system utilising reed switches on nominated internal and external doors, and nominated openable windows will be provided.

All ground level external doors, and all other doors directly exposed to the public will be armed with reed switches, which upon unauthorised interruption will trigger an alarm. Selected fire exit doors facing the public are alarmed and allow for egress only.

Reed switches are temporarily disarmed when a door is opened by an authorised means, i.e. by card reader or request-to-exit push button.

3.7.1.2 Infra-Red Detectors

Infra-Red intruder detectors are to be installed to protect nominated interiors from unauthorised access.

The protection offered by Infra-Red intruder detectors is configurable, and can be adjusted on a time or timer basis, activate and de-activate by way of card reader/keypad controls, or be programmable from a computer.

3.7.2 Building Access Control

The access control system will be designed to protect nominated doors, lifts and other entrances from unauthorised access. The system will be designed to be capable of operating on a timer - designated operating hours shall be set by the Client.

Egress from the building is unrestricted as per NCC fire safety requirements. Exit doors will be provided with a ‘request for exit’ push button adjacent to the door.

- At entrances to the building accessible from the street.

- Areas to be restricted to staff entry only.

The access control system is proposed to consist of the following components.

3.7.2.1 Proximity Card System

The security contractor is required to supply additional proximity smart cards on an as-needed or required basis (replacing lost cards or client requesting additional cards).

Drawing Symbol (Left) and Examples of Card Readers (Centre, Right)

3.7.3 Closed-Circuit Television System

The existing Closed Circuit Television System (CCTV) system installed shall be modified and expanded to accommodate for the McGarth Hall upgrade. Existing CCTV cameras and recording devices shall be retained, relocated and reused if suitable. New cameras shall match the existing make, model and type. At this stage, it is proposed that all public-facing areas and secure areas are covered by CCTV.

3.8 Safety Services

3.8.1 Emergency and Exit Lighting

An emergency and exit lighting system in accordance with the NCC and AS/NZS 2293 shall be documented for all internal areas. The system shall be complete with emergency light test switches in local switchboards.

Emergency lighting shall be ceiling recessed or surface-mounted LED point type where practicable. Otherwise, emergency lighting shall be incorporated within general lighting (e.g. integrated in LED battens and/or circular wall lights etc.).

Typical point-type emergency luminaire

Illuminated exit signage shall be slimline LED pictorial type, illuminated with ceiling recessed control gear where practicable. The layout of the exit escape signage will be guided by the Fire Engineering Report and/or Building Compliance Report once made available.

Northrop will work with the Architect to determine the most appropriate style of exit sign to be used for each area. For example, dark rooms are best suited with dark edge-lit exit signs, large open spaces are better suited with large format exit signs.

Typical exit signs.

3.8.2 Fire Detection System

The full extent of the fire detection equipment is subject to the production and issue of a Fire Engineering Report (FER) by a suitably qualified fire engineer.

Automatic fire detection system will be required if a mechanical ducted system is proposed in accordance with the NCC. To avoid the need for installing a fire detection system, we recommend considering alternatives to the ducted mechanical system, if feasible.

If required, the fire detection system will consist of smoke detectors, thermal detectors, distributed throughout the new development will be documented per requirements of AS/NZS 1670 and the NCC. Concealed smoke detectors will also be incorporated within all the roof spaces with a height greater than 800mm as required by AS/NZS 1670.

The fire detection system will be an addressable site-wide network, with a Fire Indicator Panel (FDCIE) located in the entrance to the building in accordance with Fire Brigade requirements. Sub-fire indicator panels will be provided at the entrances of satellite buildings and where required by AS/NZS 1670 and/or the Fire Engineering Report.

4. HYDRAULICS

4.1 General

4.1.1 Applicable Standards

Hydraulic systems and services will be generally designed and developed in accordance with (but are not limited to) the following standards:

Reference	Edition	Title
NCC	2022	National Construction Code of Australia
AS 2419.1	2005	Fire Hydrant Installations
AS 2441	2005	Installation of Fire Hose Reels
AS 2444	2001	Portable Fire Extinguishers and Fire Blankets
AS 2865	2009	Confined Spaces
AS 2941	2013	Fixed Fire Protection Installations - Pumpset Systems
AS/NZS 3500.1	2021	Plumbing and Drainage - Water Services
AS/NZS 3500.2	2021	Plumbing and Drainage - Sanitary Plumbing and Drainage
AS/NZS 3500.3	2021	Plumbing and Drainage - Stormwater Drainage
AS/NZS 3500.4	2021	Plumbing and Drainage - Heated Water Services
HB 230	2008	Rainwater Tank Design and Installation Handbook
HB 233	2008	Fire Protection Systems Testing - Water Conservation Handbook
HB 263	2004	Heated Water Systems

4.2 Methodology

Our methodology is to contribute to the concept design of the building to ensure the building achieves a high performance, over the full life cycle, in the following areas:

- Minimal consumption of resources.
- Minimal atmospheric emissions having negative environmental impacts.
- Minimal discharge of harmful liquid effluents.
- Minimal site impacts on the site ecosystem.

4.3 Scope of Works

The extent of the hydraulics work covered in this return brief consists of the following systems and services;

- Sanitary Plumbing and Drainage;
- Trade waste Plumbing and Drainage (Grease waste);
- Stormwater Drainage;
- Cold Water Service;
- Natural Gas Service;
- Hot Water Service;
- Rainwater Re-use Water Service;
- Fire Hydrant Service;
- Fire Hose Reel Service.

4.4 Existing Services

Northrop has performed non-invasive investigations in regard to the existing site conditions. No additional loading from the proposed building onto the existing site infrastructure needed as development does not relate to an increase in population.

At the time of this report, services locating is being carried out to determine the extent of existing concealed services, size and location to assist in the capacity and accessibility of existing systems.

4.5 Sewer Infrastructure

As the development already has access to an on-site sewer main network, a letter will need to be provided to Wingecarribee Shire Council stating that the development works do not relate to an increase in population allowing the development to retain the current site connection.

4.6 Potable Water Infrastructure

As the development already has access to an on-site water main network, a letter will need to be provided to Wingecarribee Shire Council stating that the development works do not relate to an increase in population allowing the development to retain the current site connection.

4.7 Natural Gas Infrastructure

As the development already has access to an natural gas main network, a letter will need to be provided to Jemena stating that the development works do not relate to an increase in population allowing the development to retain the current site connection.

4.8 Stormwater Drainage

4.8.1 Standards

Standard: NCC, Wingecarribee Shire Council and AS/NZS 3500.3 requirements.

4.8.2 System Description

The roof drainage system will comprise of eaves gutters with exposed downpipes and spreaders affixed to the external building façade in locations coordinated with the architect. These downpipes will make connection to the below ground stormwater system designed by the Civil Engineer.

Roof area catchments to be limited to 100m^2 for eaves gutters. Should larger catchments be required due to roof design, a performance solution will be required.

4.8.3 System Performance Requirements

- Eaves Gutter ARI - 1:20 year;
- Pipe Sizing Method: Colebrook White;
- Maximum Horizontal Pipe Velocity: 2.0 m/sec;
- Overflow Provision Capacity: 100% of system design flow.

The stormwater drainage service must be designed, constructed, and installed in such a manner as to:

- Convey stormwater to a point of connection;
- Avoid the likelihood of blockages;
- Provide adequate access for maintenance and clearing of blockages;
- Avoid the likelihood of loss to buildings or property;

4.9 Sanitary Plumbing and Drainage

4.9.1 Standards

General: The NCC, AS/NZS 3500.2, and Wingecarribee Shire Council requirements.

4.9.2 System Description

The sanitary drainage system for the proposed development shall be a combination of drainage and elevated drainage system principles with a main drainage vent extending above roof level.

This type of system is comprised of fixtures being connected by drainage principles and subsequently connecting to the main drain below ground. This style of plumbing system is acceptable for buildings with a rise of no more than four stories and is presented as a value engineered opportunity to minimise the overall venting requirements of the system.

4.9.3 Materials

Pipes and fittings will be specified as per the below materials schedule:

Item	Material Selection
Drainage	AS/NZS 1260 PVC-U Class SN6

4.10 Grease waste Plumbing and Drainage

4.10.1 Standards

General: The NCC, AS/NZS 3500.2, and Wingecarribee Shire Council requirements.

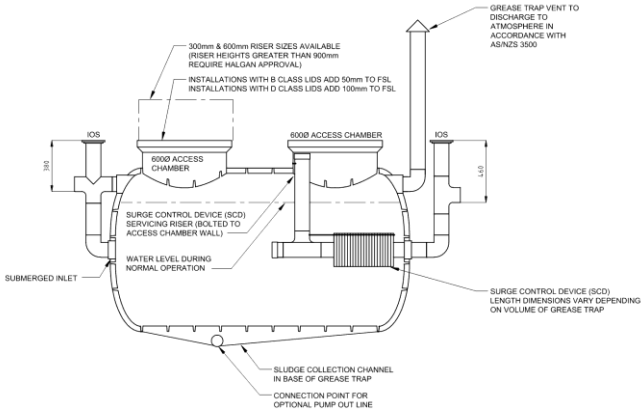
4.10.2 System Description

The grease waste drainage system for the proposed development shall be a combination of drainage and elevated drainage system principles with a main drainage vent extending above roof level. Grease waste from the hospitality kitchens will drain to the sanitary sewer system via a grease arrestor located adjacent the carpark to assist maintenance accessibility.

4.10.3 Materials

Pipes and fittings will be specified as per the below materials schedule:

Item	Material Selection
Grease waste	AS/NZS 5065 HDPE Class SN4



Halgan 1500L grease arrestor

4.11 Cold Water Service

4.11.1 Standards

General: The NCC, AS/NZS 3500.1, and Wingecarribee Shire Council requirements.

Water Supply: To AS/NZS 3500.1.

Backflow Prevention: To AS/NZS 2845.1 and AS 2845.2.

Copper Pipe: To AS 1432 and AS 4809.

Microbial Control: To AS/NZS 3666.1 and AS/NZS 3666.2 and the recommendations of SAA/SNZ HB 32.

4.11.2 System Description

The cold-water service will be designed in accordance with the NCC, AS3500.1, and Wingecarribee Shire Council requirements.

The cold-water service shall make connection to the existing site service network and reticulate to a sub-meter meter assembly located at the building boundary.

The water service shall reticulate through a backflow prevention device for containment protection and extend to the fixtures on the site.

4.11.3 System Performance Requirements

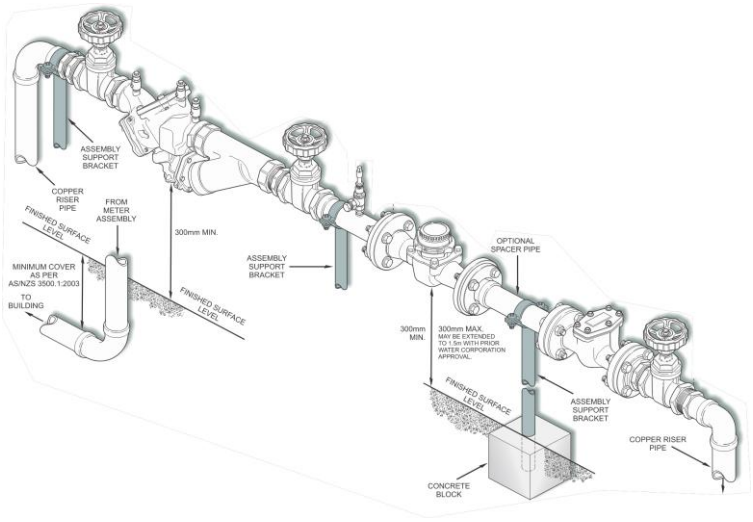
- Pipe Velocity Below ground: 1.6 m/sec;
- Pipe Velocity Above Ground: 1.6 m/sec;
- Maximum Pipe Velocity: 3 m/sec;
- Design Water Pressure at Fixtures or Outlets: 250 kPa;
- Minimum Water Pressure at Fixtures or Outlets: 50 kPa;
- Maximum Water Pressure at Fixtures or Outlets: 500 kPa.

The cold water service will be designed in such a manner as to:

- Avoid the likelihood of contamination of drinking water within both the water service and the Wingecarribee Shire Council water supply;
- Provide water to fixtures and appliances at flow rates and pressures which are adequate for the correct functioning of those fixtures and appliances under normal conditions and in a manner that does not create undue noise;
- Avoid the likelihood of leakage or failure including uncontrolled discharges;
- Facilitate the efficient use of drinking water;
- Allow adequate access for maintenance of mechanical components and operational controls;
- Allow the system, appliances, and backflow prevention devices to be isolated for testing and maintenance, where required.

4.11.4 Water Meter Assembly

Water Meter Assembly



Length (mm)	Width (mm)	Height (mm)
1200	300	500

- To be located at building boundary;
- Meter to be located within vandal proof cage.

4.11.5 Materials

Pipes and fittings will be specified as per the below materials schedule:

Item	Material Selection
Below ground	PN16 polyethylene with electrofusion fittings
Above Ground	Type ‘B’ copper tube with silver brazed or press connection joints
Below Ground Below Buildings	Type ‘A’ copper tube with silver brazed or press connection joints
Above Ground Within Masonry Walls	Pre-lagged Type ‘B’ copper tube with silver brazed or press connection joints

Above Ground Within Non-Masonry Walls	Pre-lagged PN20 cross linked polyethylene with mechanical compression joints

4.12 Natural Gas Service

4.12.1 Standards

General: The NCC, AS/NZS 5601, Jemena Requirements.

Gas Supply: To AS/NZS 5601, Jemena Requirements.

Copper Pipe: To AS 1432 and AS 4809.

4.12.2 System Description

The natural gas service will be designed in accordance with the NCC, AS5601, and Jemena requirements.

The natural gas service shall make connections to the existing site service network and reticulate to a new regulator assembly located at the building boundary.

The gas service shall reticulate to hospitality teaching space cooking appliances via a safety shutoff valve located in an accessible position for use by teaching staff in case of an emergency.

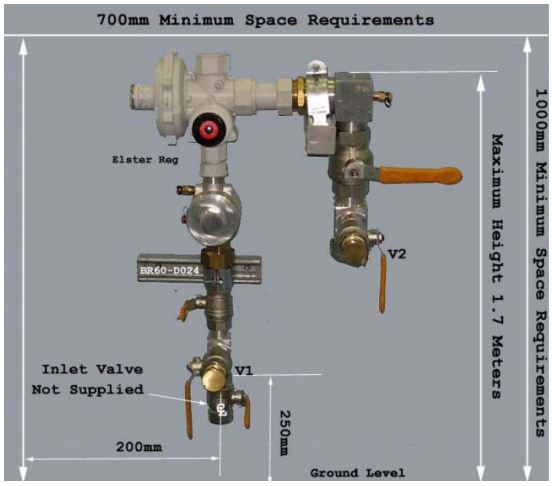
4.12.3 System Performance Requirements

- Design Gas Reticulation Pressure: 2.75 kPa;
- Maximum Pressure Drop: 1.5 kPa

The natural gas service will be designed in such a manner as to:

- Provide gas to fixtures and appliances at flow rates and pressures which are adequate for the correct functioning of those fixtures and appliances under normal conditions;
- Avoid the likelihood of leakage or failure including uncontrolled discharges;
- Facilitate the efficient use of natural gas;
- Allow adequate access for maintenance of mechanical components and operational controls;
- Allow the system, appliances to be isolated for testing and maintenance, where required.

Natural Gas Regulator Assembly



Length (mm)	Width (mm)	Height (mm)
700	500	1000

- To be located at building boundary;
- Regulator to be located within vandal proof cage.

4.12.4 Materials

Pipes and fittings will be specified as per the below materials schedule:

Item	Material Selection
Below ground	Type ‘B’ copper tube with silver brazed or press connection joints
Above Ground	Type ‘B’ copper tube with silver brazed or press connection joints
Below Ground Below Buildings	Type ‘A’ copper tube with silver brazed or press connection joints

4.13 Hot Water Service

4.13.1 Standards

General: The NCC, AS/NZS 3500.4

Water Supply: To AS/NZS 3500.1.

Heated Water Supply: To AS/NZS 3500.4.

Testing of Products for Use with Potable Water: To AS/NZS 4020.

Product Authorisation Requirements: To AS 3498.

Design for Access and Mobility: AS 1428.1 and AS 1428.2.

Backflow Prevention: To AS/NZS 2845.1 and AS 2845.2.

Copper Pipe: To AS 1432 and AS 4809.

Microbial Control: To AS/NZS 3666.1 and AS/NZS 3666.2 and the recommendations of SAA/SNZ HB 32.

4.13.2 System Description

The hot water service shall extend from the plant, circulating through the building ceiling space to each wet area via a circulating hot water system.

Temperature control valves shall be provided to reduce the draw off temperature to acceptable levels to all ablution fixtures.

Should excessively long ‘Dead Leg’ systems be unavoidable, the pipework will be heat traced to maintain temperatures on lengths of pipework as required.

4.13.3 Individual Water Heating Systems

The hot water heater shall be either a roof mounted heat pump with horizontally mounted storage tanks, Heat pump with vertically mounted storage tanks located on ground floor or within landscaping.

4.13.4 System Performance Requirements

- Maximum Pipe Velocity Copper Tube: 1.2 m/sec;
- Design Water Pressure at Fixtures or Outlets: 250 kPa;
- Minimum Water Pressure at Fixtures or Outlets: 50 kPa;
- Maximum Water Pressure at Fixtures or Outlets: 500 kPa;
- Minimum Hot Water Storage Temperature: 60°C;
- Maximum Temperature at Ablution Fixtures or Outlets: 50°C;
- Maximum Temperature at Ablution Fixtures or Outlets for the Aged, Sick, Children, or Disabled: 45°C.

The hot water service must be designed in such a manner as to:

- Avoid the likelihood of contamination of drinking water within both the on-site installation and the supply;
- Provide heated water to fixtures and appliances at flow rates and temperatures which are adequate for the correct functioning of those fixtures and appliances under normal conditions and in a manner that does not create undue noise;
- Avoid the likelihood of leakage or failure, including uncontrolled discharges;
- Allow adequate access for maintenance of mechanical components and operational controls;
- Allow the system, appliances, and backflow prevention devices to be isolated for testing and maintenance, where required.

4.13.5 Dead Leg Reduction

The hot water system pipework will be reticulated in a manner to reduce the amount of pipework required and to ensure the shortest distance possible between the water heater and the points of use. This reduces the 'dead leg' water wastage which is experienced as cold water is evacuated from the pipes until higher temperature water is delivered to the fixture.

Pipework branch sizes to individual fixtures will also be minimised to provide a balance between adequate flow and minimising the capacity of these branches and therefore the amount of water required to be discharged before hot water delivery.

4.13.6 Thermostatic Mixing Valve

Thermostatic Mixing Valve

Length	Width	Height
300	70	300

- Recessed in wall within lockable stainless steel box;
- Must be installed no lower than 300 mm from FFL and no higher than 1500 mm from FFL;
- To be accessible to allow for annual inspection and testing.

4.13.7 Materials

Pipes and fittings will be specified as per the below materials schedule:

Item	Material Selection
Above Ground	Type ‘B’ copper tube with press connection joints
Above Ground Within Masonry Walls	Pre-lagged Type ‘B’ copper tube with press connection joints
Above Ground Within Non-Masonry Walls	Pre-lagged PN20 cross linked polyethylene with mechanical compression joints

4.14 Rainwater Re-use Water Service

4.14.1 Standards

General: The NCC, AS/NZS 3500.1, Wingecarribee Shire Council.

Stormwater Drainage: To AS/NZS 3500.3.

Rainwater Supply: To AS/NZS 3500.1.

Metal Tanks and Rainwater Goods: To AS/NZS 2179.1.

Design and Installation: To the recommendations of SAA HB 230.

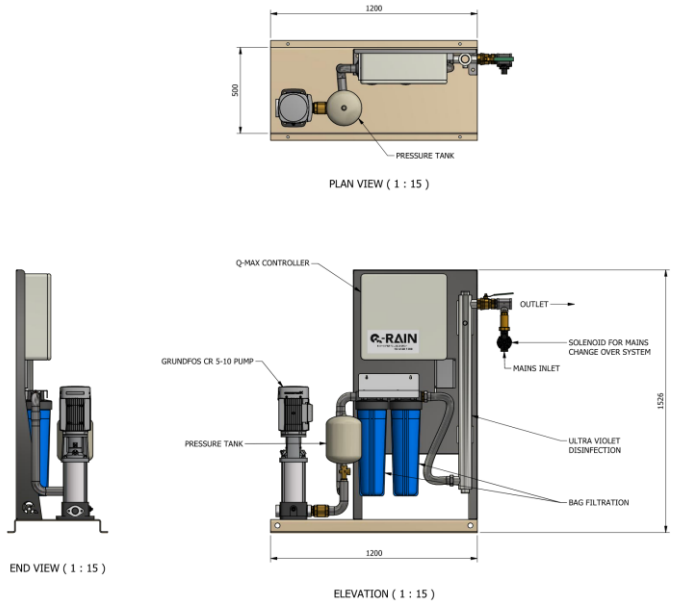
4.14.2 System Description

The rainwater re-use system shall be complete with prepackaged rainwater treatment plant consisting of UV lamps, filters, and associated valves and pipework in accordance with Volume 3 of the NCC - The Plumbing Code of Australia and AS/NZS 3500 requirements. The rainwater re-use water service shall be utilised for maintenance purposes (hose taps) and toilet flushing with the pumpset and associated equipment capable of delivering water supply to the proposed points of connection at the required pressures and on demand.

The rainwater harvesting system shall be provided with a potable cold water make-up supply complete with backflow prevention device to prevent the collected rainwater from entering the potable water system.

The filtration system shall comprise the following:

- 1 x automatic backwash filter;
- 2 x cartridge filters (1 x 20 micron and 1 x 5 micron)
- Ultraviolet lamps.



QMAX RAINWATER TREATMENT SYSTEM

4.14.3 System Performance Requirements

- Pipe Velocity Below ground: 2.4 m/sec
- Pipe Velocity Above Ground: 1.6 m/sec
- Maximum Pipe Velocity: 3 m/sec
- Design Water Pressure at Fixtures or Outlets: 250 kPa
- Minimum Water Pressure at Fixtures or Outlets: 50 kPa
- Maximum Water Pressure at Fixtures or Outlets: 500 kPa

The rainwater re-use water service must be designed in such a manner as to:

- Avoid the likelihood of contamination of drinking water;
- Provide non-drinking water to fixtures and appliances at flow rates and pressures which are adequate for the correct functioning of those fixtures and appliances under normal conditions and in a manner that does not create undue noise;
- Avoid the likelihood of leakage or failure including uncontrolled discharges;
- Allow adequate access for maintenance of mechanical components and operational controls;
- Allow the system, appliances, and backflow prevention devices to be isolated for testing and maintenance, where required.

4.14.4 Materials

Pipes and fittings will be specified as per the below materials schedule:

Item	Material Selection
Below ground	PN16 polyethylene with electrofusion fittings
Above Ground	Type ‘B’ copper tube with silver brazed or press connection joints
Below ground Below Buildings	Type ‘A’ copper tube with silver brazed or press connection joints
Above Ground Within Masonry Walls	Pre-lagged Type ‘B’ copper tube with silver brazed or press connection joints
Above Ground Within Non-Masonry Walls	Pre-lagged PN20 cross linked polyethylene with mechanical compression joints

4.15 Fire Hydrant Service

4.15.1 Standards

General: BCA E1D2, Fire and Rescue NSW, Wingecarribee Shire Council, and AS 2419.1 – 2005 requirements.

Design, Construction, and Performance: To AS 2419.1 - 2005

Installation: To AS 2419.1 - 2005

4.15.2 System Description

An existing on-site fire hydrant service is available installed and tested to AS2419.1 - 2005 providing coverage via externally located dual pillar fire hydrants. The system is comprised of a fire hydrant booster assembly, on-site fire hydrant storage tanks and on-site fire hydrant booster pumpsets.

An assessment of the development has been undertaken and deemed to be similar in conditions to the existing building.

A new dual pillar external attack hydrant will be required to extend from the existing fire hydrant service to supplament coverage from existing on-site fire hydrants.

4.15.3 System Performance Requirements

- Maximum Pipe Velocity: 4 m/sec
- Maximum System Pipe Friction Losses: 150 kPa
- Minimum Fire Hydrant Flow Rate: 10 L/sec
- Minimum Unassisted Feed Fire Hydrant Residual Pressure: 150 kPa
- Minimum Assisted Attack Fire Hydrant Residual Pressure: 700 kPa
- Maximum System Dynamic Pressure: 1200 kPa
- Maximum System Static Pressure: 1300 kPa

The fire hydrant service must be designed in such a manner as to:

- Avoid the likelihood of contamination of drinking water;
- Provide water to fire-fighting equipment at a flow rate and pressure that is adequate for the correct functioning of the equipment;
- Avoid the likelihood of leakage or failure including uncontrolled discharges;
- Allow adequate access for maintenance of mechanical components and operational controls;
- Allow the system and backflow prevention devices to be isolated for testing and maintenance.

4.15.4 Fire Hydrants

Fire Hydrant – External Dual Pillar

Length (mm)	Width (mm)	Height (mm)
750	450	750-1200

- If remote from the building, not less than 10 meters from the external wall of any building protected;
- If affixed to a building, the fire hydrant is to be separated by a fire rated wall with FRL 90/90/90 measuring 4.4 m wide x 3 m high;
- 1 meter clearance to be provided in front of hydrant to facilitate lay out of hose.

4.16 Fire Hose Reel Service

4.16.1 Standards

General: BCA E1D3, AS2441, and Wingecarribee Shire Council requirements.

Design, Construction, and Performance: To AS/NZS 1221.

Installation: To AS 2441.

4.16.2 System Description

The fire hose reel system shall make connection to the cold water service via a double check valve backflow prevention device.

All fire hose reels are to be located in a readily accessible position within 4 metres of a required exit, and along the normal paths of travel to an exit where additional coverage is required.

Coverage will be provided via a 36 metre hose issuing a 4 metre hose spray. The hose shall extend to 1 metre within the each room it is protecting.

4.16.3 System Performance Requirements

- Minimum Hose Reel Discharge Pressure: 220 kPa
- Minimum Hose Reel Flow Rate (19 mm Hose): 0.33 L/sec
- Minimum Hose Reel Flow Rate (25 mm Hose): 0.44 L/sec

The fire hose service must be designed in such a manner as to:

- Avoid the likelihood of contamination of drinking water;
- Provide water to fire-fighting equipment at a flow rate and pressure that is adequate for the correct functioning of the equipment;
- Avoid the likelihood of leakage or failure including uncontrolled discharges;
- Allow adequate access for maintenance of mechanical components and operational controls;
- Allows the system and backflow prevention devices to be isolated for testing and maintenance.

4.16.4 Fire Hose Reel

Fire Hose Reel

Length (mm)	Width (mm)	Height (mm)
900	500	2400

- Located within 4 meters of required exits;

- 1 meter clear space to be provided in front of cupboard to facilitate lay out of hose;
- Only fire services are permitted to be installed within cupboard;
- Not required for Building Classes 2, 3, 4, 8, or 9c.

4.16.5 Materials

Pipes and fittings will be specified as per the below materials schedule:

Item	Material Selection
Below Ground <DN25	AS 1432 Type B copper tube with press connection joints
Below Ground >DN25	AS 4130 PN20 polyethylene with electrofusion fittings
Above Ground	AS 1432 Type B copper tube with silver brazed or press connection joints
Above Ground Within Masonry Walls	AS 1432 Pre-lagged Type B copper tube with silver brazed or press connection joints
Above Ground Within Non-Masonry Walls	AS 1432 Pre-lagged Type ‘B’ copper tube with silver brazed or press connection joints

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