Electrical & Mechanical Services

Schematic Design Report

UPGRADES TO KINGSWOOD PUBLIC SCHOOL

KIPS-NDY-XX-XX-RP-N-0001

Revision 6 – 12/03/2025

CONTENTS

INTRODUCTION

Introduction

This Electrical and Mechanical Services technical report has been prepared to accompany a Review of Environmental Factors (REF) for the Department of Education (DoE) for upgrades to Kingswood Public School (the activity) under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) and State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP TI).

This document has been prepared in accordance with the Guidelines for Division 5.1 assessments (the Guidelines) by the Department of Planning, Housing and Infrastructure.

This report examines and takes into account the relevant environmental factors in the Guidelines and Environmental Planning and Assessment Regulations 2021 under Section 170, Section 171 and Section 171A of the EP&A Regulation.

Proposed Activity Description

The proposed activity for upgrades to Kingswood Public School includes:

- One (1) new single storey classroom building comprising eight (8) general learning spaces (GLS), two (2) learning commons areas, two (2) multi-purpose spaces and a verandah along the eastern side of the building;
- The construction of a covered walkway that will provide a connection between the proposed classroom building and an existing covered outdoor learning area (COLA) to the north east of the proposed building; and
- Removal of existing portable classroom buildings containing ten (10) classrooms.

Activity Site

The project site is located at 46-54 Second Avenue, Kingswood and is legally described as Lot 172 in Deposited Plan (DP) 839785. Kingswood Public School is located on the southern side of Second Avenue.

The image below is an aerial photograph of the site.

MITIGATION MEASURES

Mitigation Measures			
Mitigation Number/ Name	**When is Mitigation Measure to be complied with**	**Mitigation Measure**	**Reason for Mitigation Measure**
Noise	During Works During normal operations	Refer to NDY Noise and Vibration Impact Assessment	Minimise noise impacts to nearby sensitive receivers.
Heritage Considerations	During Works	Trenching to be located clear of Building B	To avoid affecting Building B (Heritage Listed).

Evaluation of Environmental Impacts

We note that the Noise impact can be adequately mitigated though the proposed measures and will not have a significant affect on the environment.

We note that the Heritage impact can be adequately mitigated though the proposed measures and will not have a significant affect on the environment.

SCOPE

This report has been provided by Norman Disney & Young (NDY) to provide recommended actions and observations in relation to the Electrical, AV, Communications, Security and Mechanical systems to accommodate the upgrades to Kingswood Public School.

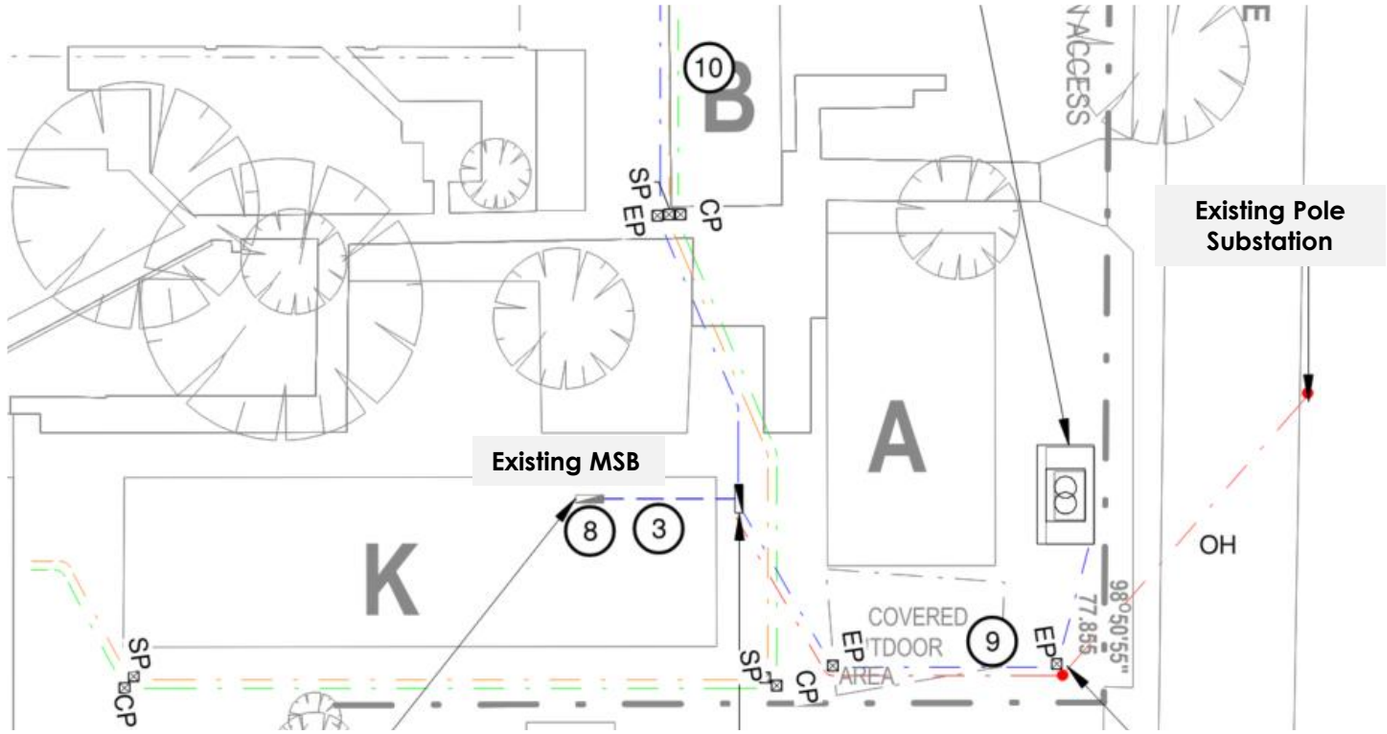
Recommendations and observations in relation to the Electrical, AV, Communications, Security and Mechanical services are provided herein. This schematic design has been developed in line with the DoE Standard Hub Layout and the Pattern Book.

NDY
A TETRA TECH COMPANY

ELECTRICAL SERVICES

Electrical Services

EXISTING ELECTRICAL SUPPLY



Kingswood Public School (KIPS) is currently supplied by a single low voltage connection at pole-mounted substation 8150 on Second Avenue. This substation has a 315kVA transformer and two (2x) LV feeders, each with 250A limits. The eastern LV feeder that the school is connected to serves 15 customers in total.

The School contains one (1x) main switchboard located in Block K, which supplies all sub-distribution boards throughout the site via a network of pits and conduits. The board has the following characteristics:

- Built to AS3439.1 – manufactured in 2007
- Form 2 Segregation
- 30kA fault rating
- 250A Service protection device

Maximum demand for the site is 192A (A-phase) based on the logged data of the MSB's power meter.

There is a 59kW solar array located on the roof of Block L (a.k.a Hall), with inverters connected to a PV distribution board in the Block L switch room.

Electrical Services

ELECTRICAL LOAD ANALYSIS

Applicable Standards & Guidelines
The services concepts have been developed on the basis of the following:

- NCC 2022
- EFSG v1 & 2
- AS3000
- AS/NZS 1680
- AS/NZS 2293.1
- AS/NZS 1158
- NSW Department of Education Pattern Book

Demand Component	Load (A)
Existing School Maximum Demand	192A
Removal of Demountable Spaces	-32A
New Works (Block M, A/C upgrades etc.)	95A
Spare Capacity per EFSG	38A
Estimated New Maximum Demand with Spare Capacity	**293A**

Capacity/Demand	Load (A)
Substation Connection Limit	250A
Existing Maximum Demand	192A
Substation Spare Capacity Before Works	**58A**
Estimated New Maximum Demand with Spare Capacity	293A
Substation Spare Capacity After Works*	**-43A**

Based on the latest maximum demand calculation for the school, following the proposed works, the school will need an increase in supply capacity from Endeavour Energy.

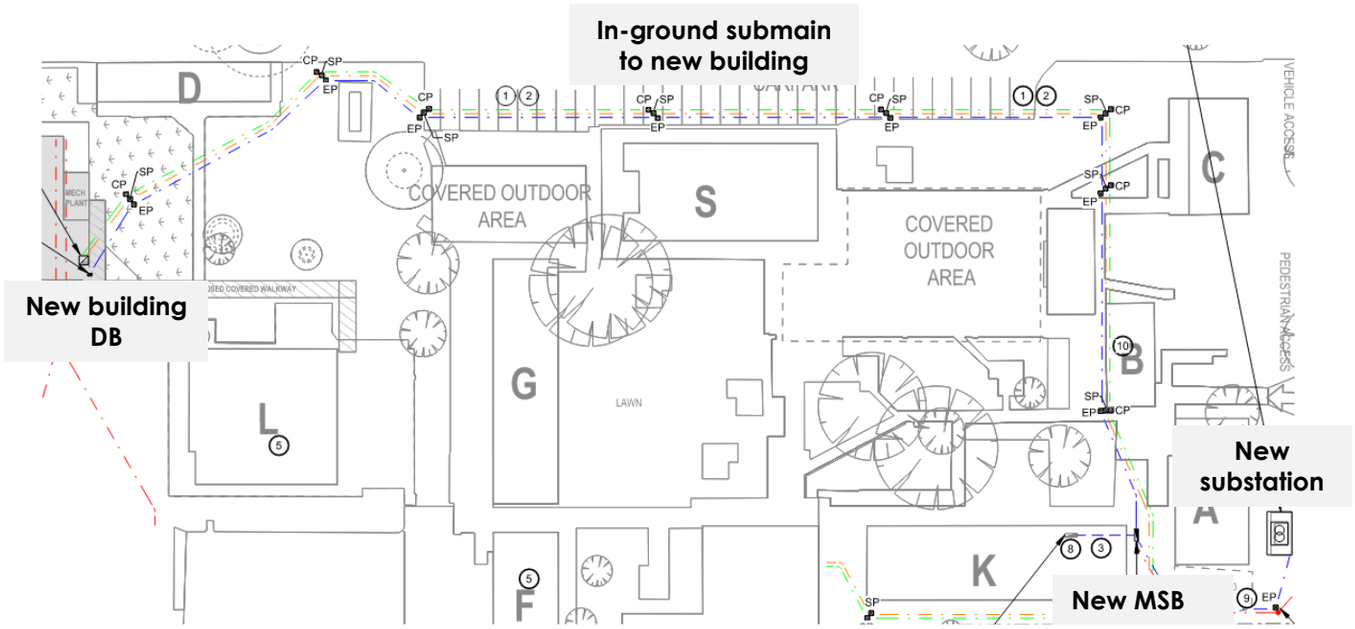
Furthermore, the existing MSB is not adequate for re-use due to:

- Built to older AS3439.1 standard
- Rated to 250A three phase (insufficient for maximum demand)

Hence a new MSB is to be provided for the school. This new MSB is required to be installed prior to the new larger supply connection being established.

Electrical Services

PROPOSED ELECTRICAL SUPPLY



A formal load application was lodged with Endeavour Energy on 15/11/2024 for a new total school load of 293A. A standard connection offer was provided by Endeavour Energy on 20/11/2024, indicating that the existing pole substation connection on Second Avenue can be replaced by a new kiosk substation to cater for the additional load. This new substation shall feed a new main switchboard (MSB) fitted with an adjustable circuit breaker set at no greater than 294A per phase. This connection offer is valid for a period of 12 months from the date it was received.

The new substation is proposed to be established on the Second Avenue boundary to supply the School *(see image right)*. The existing connection to the pole-mounted substation, consumer mains and the private power pole on the School premises are to be disconnected and removed.

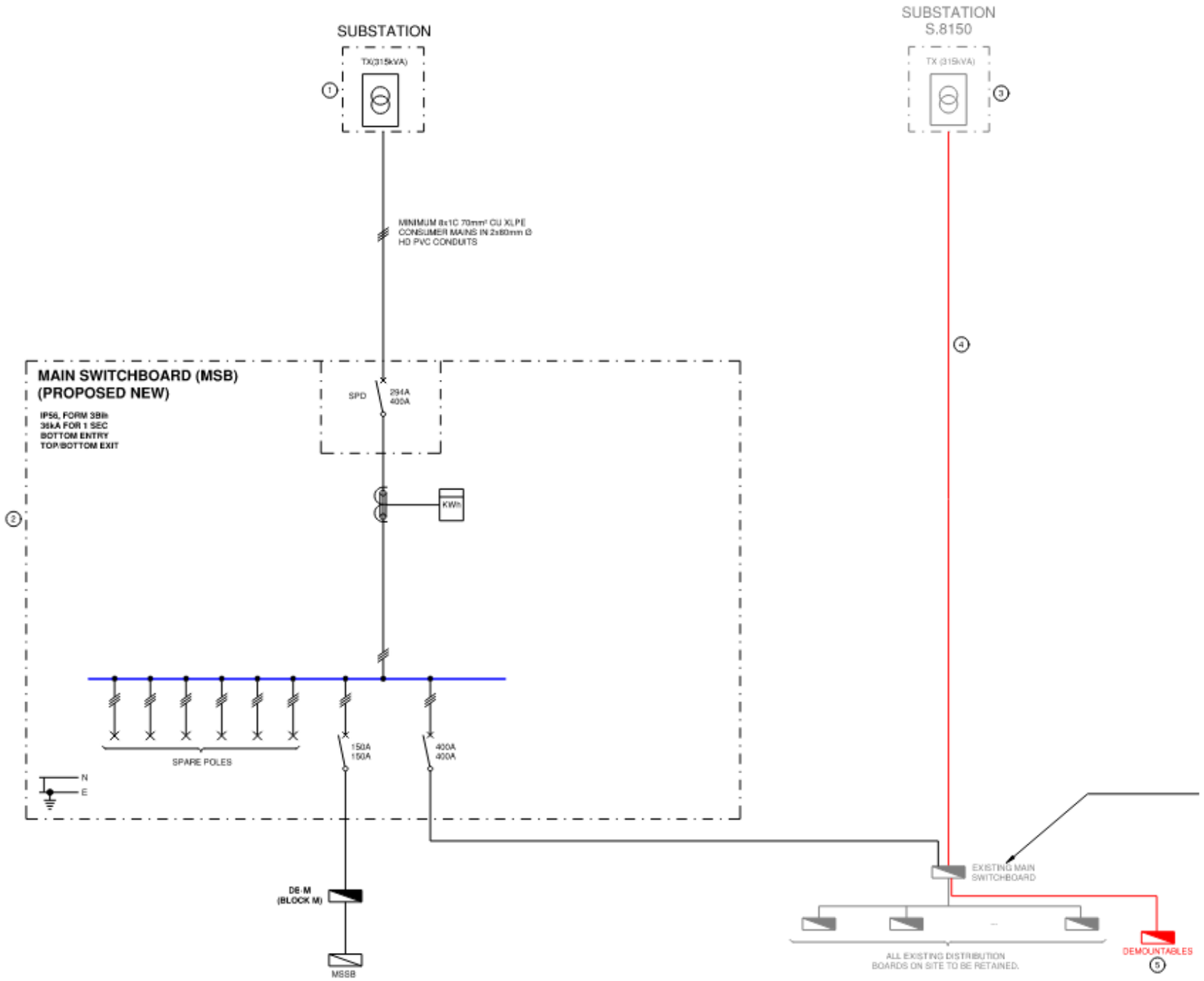
New consumer mains cabling is to be reticulated between the new substation and a new external MSB located outside Block K. The new MSB is proposed to have the following characteristics:

- Rated to 400A three-phase
- Form 3Bih
- IP56
- 36kA fault rating for 1 sec (TBC)
- Designed to AS61439

The old MSB will be retained and used as a main distribution board (MDB). The new MSB will back-feed the old MSB (relabeled as MDB) using the existing consumer mains cabling repurposed as a new submain.

The substation works will be completed under a separate REF application.

ELECTRICAL DISTRIBUTION – SITE LEVEL



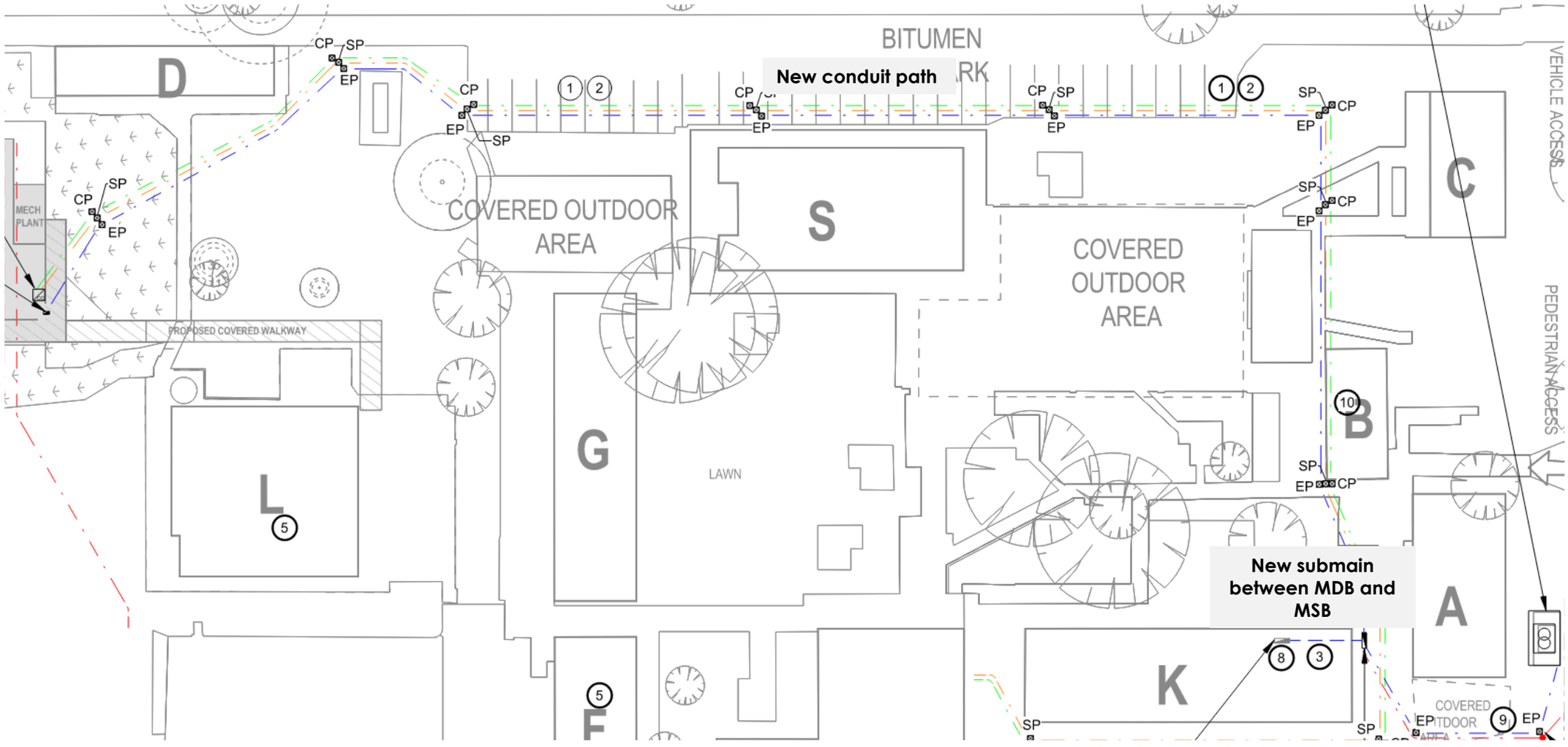
Kingswood Public School - Single Line Diagram

Electrical Services

ELECTRICAL DISTRIBUTION

The existing pit and conduit network will need to be extended to provide a new cable pathway to the new building. This pathway will require new in-ground conduits to be installed with cable pits at 30m intervals and at changes in direction. All new in-ground conduits will include spare capacity as required by the EFSG to facilitate future upgrade works.

The new MSB will back-feed the old MSB (to be relabeled as MDB) using the existing cable containment systems within Block K along the route currently used for the existing consumer mains.



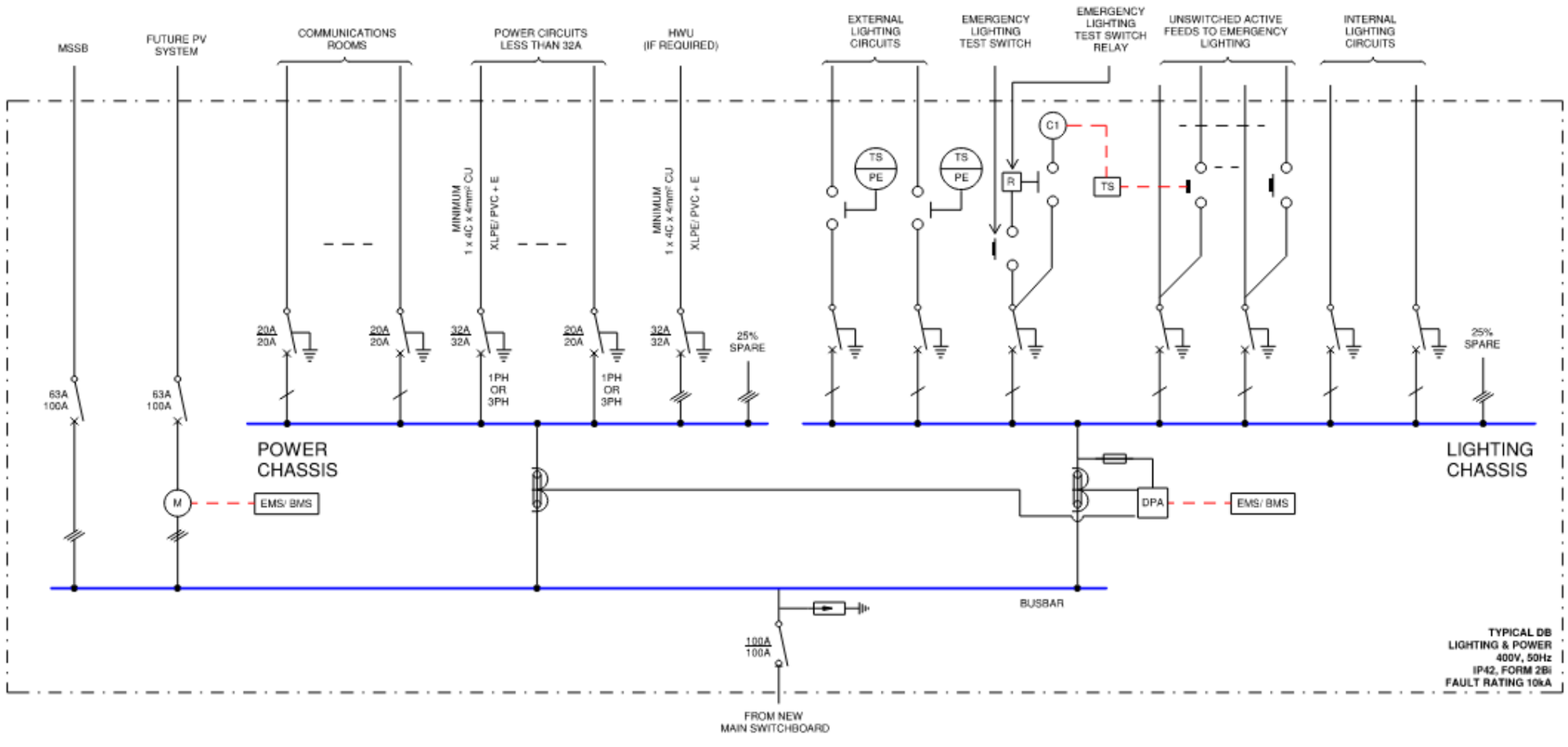
ELECTRICAL DISTRIBUTION PROPOSED NEW BUILDING – BLOCK M

The proposed new building, Block M, will be supplied by a new electrical distribution board (EDB) contained in a purpose-built cupboard located within the building's core. This cupboard will be 60-minute fire-rated, and smoke-sealed.

The electrical cupboard will be ventilated via intumescent door grilles to manage heat and moisture.

Spatial provisions have been allowed for within the EBD cupboard to facilitate future installations of PV inverters if required.

The EDB will include separate sections for power and lighting as well as surge protection. This EDB will supply spaces in the proposed new building, including the MSSB located in the plant area.



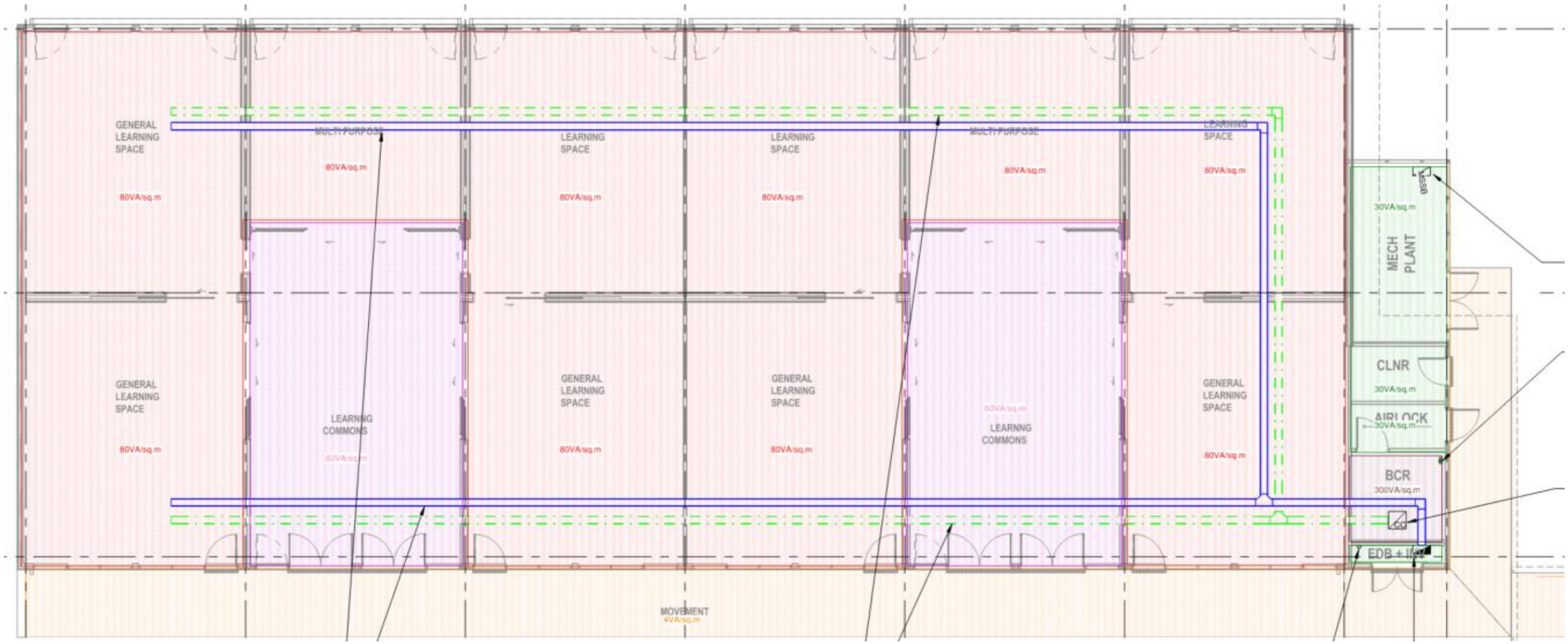
Kingswood Public School – EDB Schematic

Electrical Services

POWER ARRANGEMENT – BLOCK M

Cable trays within the ceiling void for the reticulation of cabling from the EDB to spaces within the new building are to be provided. Final reticulation to individual outlets shall be achieved using a catenary wire system.

Cable trays are also to be provided for the mechanical services switchboard (MSSB) submain. Cable trays shall be sized based on the final number of circuits required by the DoE Pattern Book and shall include spare capacity for future expansion as per the EFSG.



Electrical Services

POWER & COMMUNICATIONS OUTLETS

INDICATIVE POWER AND TELECOMMUNICATIONS OUTLETS QUANTITIES BY LOCATION

ROOM TYPE	ROOM QUANTITY	GPO	DGPO	DTO	CAPTIVE OUTLETS	STO
CLEANER ROOMS	1	-	1 (WP)	-	-	-
AIR LOCK	1	1	-	-	-	-
DB + INVERTER CUPBOARDS	1	-	2	2	-	-
BCR	1	-	4	2	2	-
LEARNING COMMONS	2	1	4	4	-	2
MULTIPURPOSE SPACE	2	1	3	3	-	-
GENERAL LEARNING SPACE	8	3	4	3	-	2
PLANT	1	1 (WP)	-	-	-	-

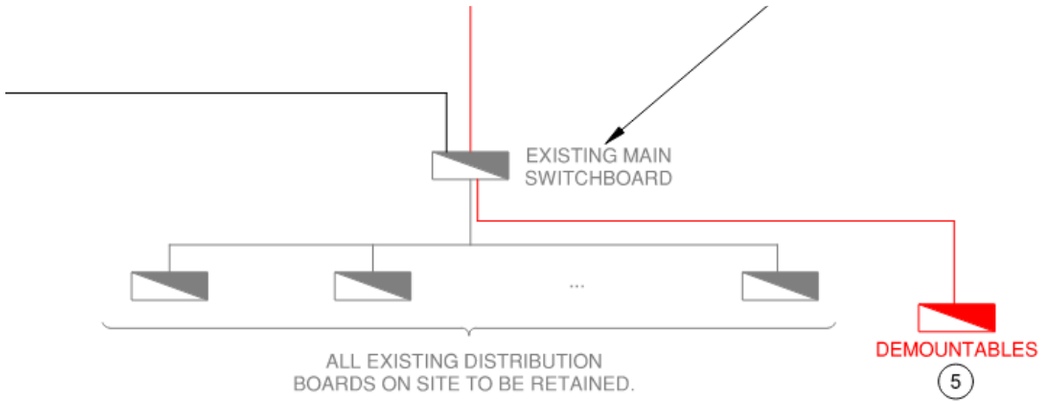
The proposed electrical design includes power outlets, telecommunications outlets and ceiling fans. Indicative quantities have been provided for each area of the proposed new building to align with requirements of each space as documented in the latest EFSG documents. These quantities are to assist with tendering and for indicative pricing. Final quantities and locations are to be based on the provisions documented in the DoE Pattern Book.

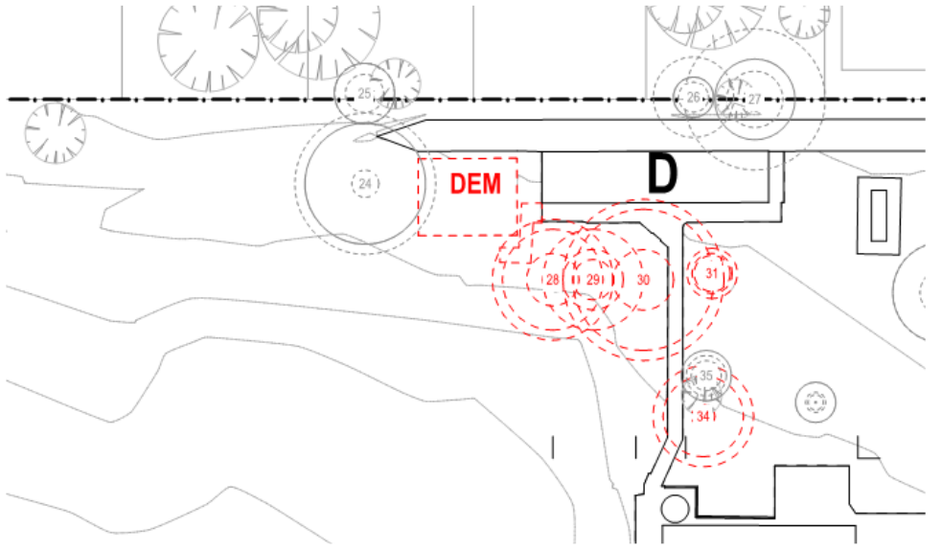
Electrical Services

ELECTRICAL STAGING WORKS

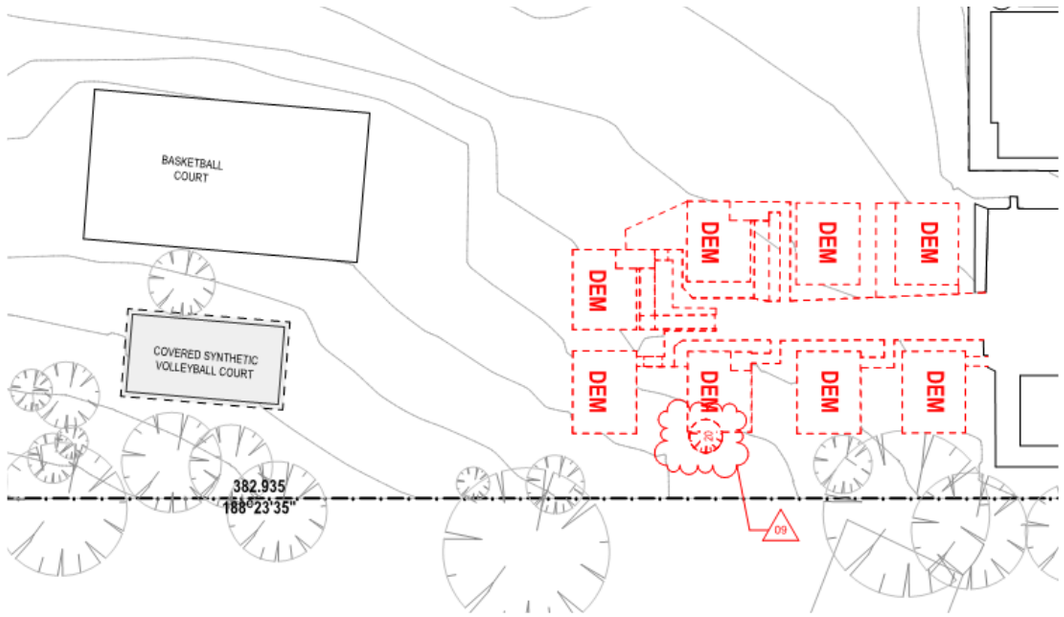
To mitigate impacts of the upgrade works on the operation of the school, staging will be required. This will involve the installation of key backbone infrastructure early in the construction stage to serve the final development, so that it does not clash or coincide with the existing demountable buildings and does not need to be modified after initial installation. An overview of the staging intent is as per the below:

- **Stage 1:** Disconnection and removal of existing submains and communications cabling to demountable D12848. Conduits to be abandoned in-ground. Supplies to all other existing demountables are to be temporarily retained.
- **Stage 2:** Construction of new building including installation of new submain, communications fibre and security cabling.
- **Stage 3:** School transitions to new building. Existing submains and communications cabling to remaining demountables are to be disconnected and removed. Conduits to be abandoned in-ground.





Stage 1: Demolition of D12848



Stage 3: Demolition of D10575, D13009, D15527, D13910, D16097, D11489, D19674, and D10298

Electrical Services

SOLAR ARRANGEMENT

The existing solar arrangement for the school consists of a 59kWp array located on the roof of Block L (a.k.a Hall). The inverters for this array are connected to a PV distribution board in the Block L switch room.

EFSG requirements for a new PV system to offset the consumption of the proposed building have been departed from as part of the value engineering process. However, spatial provisions have been incorporated within the EDB cupboard of the new building to facilitate future PV installations.

Existing PV Array on Block L

Electrical Services

LIGHTING

General

All lighting will comply with all relevant Australian Standards, including AS1680 and AS1158 recommended illumination levels, the EFSG, Pattern Book and NCC 2022.

New LED luminaires will be provided for general lighting throughout the school. No specialist or feature lighting has been considered. Luminaires will be concealed and integrated within architectural details wherever possible to simplify the appearance of the ceiling and promote visual acuity. The lighting colour temperature to be used throughout the areas shall be 4000K unless noted otherwise.

Type of luminaires shall be coordinated with the Pattern Book and EFSG, indicatively:

- LED panels shall be used in general areas, such as general learning classrooms, admin and staff and enclosed corridors where possible.
- LED downlights are to be used in common areas, corridors, amenities and cleaners' rooms.
- LED battens shall be used in storerooms, electrical cupboard, communications and all plant rooms.
- Weatherproof, vandal resistant LED troffers shall be provided for all external areas including stairs and external corridors.

Emergency & Exit

Emergency luminaires and exit signs are to be provided in accordance with the NCC and AS/NZS 2293.1-2018. An emergency lighting test switch is to be provided at each EDB.

Control

As a part of value engineering initiatives, the digital programmable lighting control system (such as Dynalite DALI, KNX etc.) has been omitted from the scope. Instead, a simpler, 230V-based lighting control system is to be used. An EFSG departure has been lodged to note the deviation from the DoE design standards.

An indicative lighting control strategy is:

- Internal luminaires shall be controlled via motion sensors and switch plates with timer shutoff.
- External luminaires shall be controlled via motion sensors and photocells with timer shutoff.

Internal areas such as general learning spaces shall offer dimming where appropriate.

Electrical Services

LIGHTING

LIGHTING DESIGN LEGEND

80 LUX AVERAGE HORIZONTAL ILLUMINANCE AS PER EFSG AND AS/NZ AS1680.2.1-2008 TABLE D1
UGR AS PER EFSG AND AS/NZS AS1680.1-2006 TABLE 8.2
LIGHTING UNIFORMITY AS PER EFSGH AND AS/NZS AS1680.1-2006 TABLE 3.2

160 LUX AVERAGE HORIZONTAL ILLUMINANCE AS PER EFSG AND AS/NZ AS1680.2.1-2008 TABLE D1
UGR AS PER EFSG AND AS/NZS AS1680.1-2006 TABLE 8.2
LIGHTING UNIFORMITY AS PER EFSGH AND AS/NZS AS1680.1-2006 TABLE 3.2

240 LUX AVERAGE HORIZONTAL ILLUMINANCE AS PER EFSG AND AS/NZ AS1680.2.1-2008 TABLE D1
UGR AS PER EFSG AND AS/NZS AS1680.1-2006 TABLE 8.2
LIGHTING UNIFORMITY AS PER EFSGH AND AS/NZS AS1680.1-2006 TABLE 3.2

320 LUX AVERAGE HORIZONTAL ILLUMINANCE AS PER EFSG AND AS/NZ AS1680.2.1-2008 TABLE D1
UGR AS PER EFSG AND AS/NZS AS1680.1-2006 TABLE 8.2
LIGHTING UNIFORMITY AS PER EFSGH AND AS/NZS AS1680.1-2006 TABLE 3.2

400 LUX AVERAGE HORIZONTAL ILLUMINANCE AS PER EFSG AND AS/NZ AS1680.2.1-2008 TABLE D1
UGR AS PER EFSG AND AS/NZS AS1680.1-2006 TABLE 8.2
LIGHTING UNIFORMITY AS PER EFSGH AND AS/NZS AS1680.1-2006 TABLE 3.2

1


4


2


5


3


6


Electrical Services

COMMUNICATIONS NETWORK

Existing

The existing communications network at Kingswood Public School is serviced by Telstra and NBN lead-ins. The Network Termination Device (NTD) is located in the MCR within the library building (Block H). The existing MCR consists of a single communications cabinet. The existing communications cabinet does not appear to have capacity for an additional outgoing fibre connection to serve the new building M. However, there is capacity for a new FOBOT within this cabinet to serve the new BCR in Block M.

It is noted that the existing communications room does not strictly comply with the EFSG.

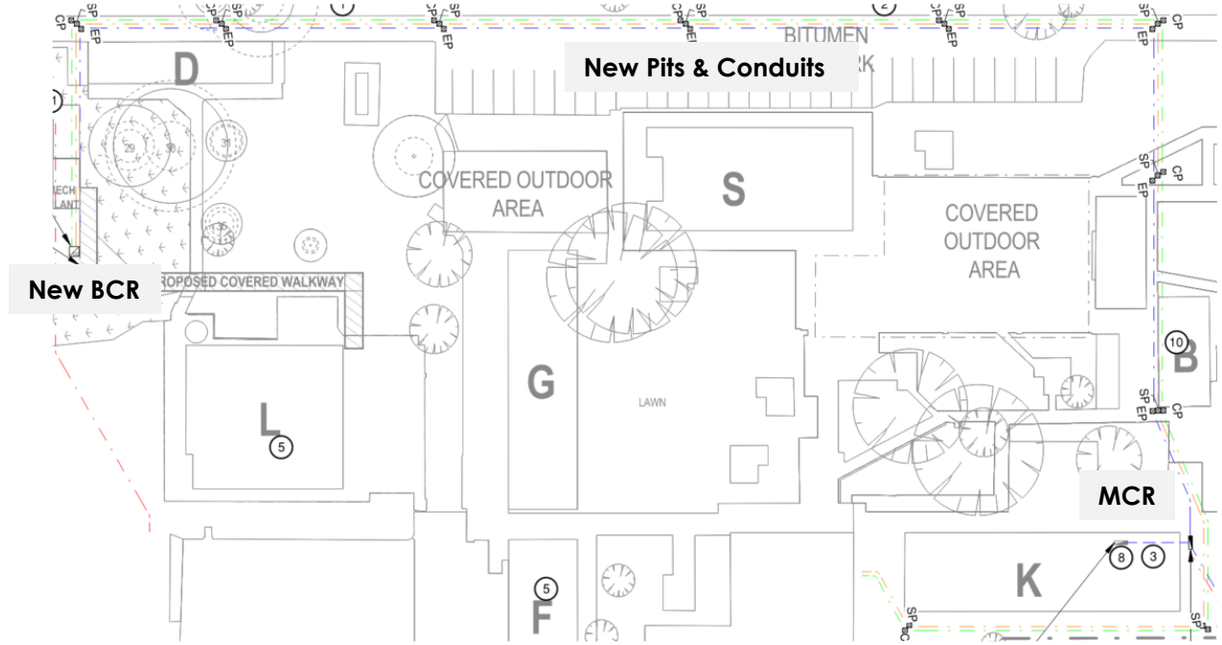
The School utilises fibre backbones between the MCR and other buildings. These are reticulated around the site using a network of pits and conduits.

Proposed

The existing MCR is to be retained in its current location for this scope of works. However, modifications are required, which will align with the recommended upgrades documented in the Kingswood ICT survey *(refer to Kingswood PS Appendix A – Existing School Survey Summary)*. New fibre is to be reticulated from a new FOBOT in the existing campus distributor to the new BCR in Block M.

The new BCR will be located in the core of Building M, with minimum plan area dimensions of 2.8m x 3.0m. This BCR will house a security field panel and communication rack(s) – the quantity of which will be determined in coordination with ITD at a later stage.

A new system of pits and conduits will be utilised to reticulate communications and security cabling to Block M.



PROPOSED COMMUNICATIONS, AV & SECURITY UPGRADES

Site Communications Upgrades

According to the Kingswood ICT Survey, the following upgrades are proposed for the existing communications system:

- New head end and edge switches are to be provided in the existing MCR as per the latest ICT survey.
- The existing BCR's in Blocks F and L are incompatible with the latest WAP PoE requirements and require switch replacement.

The existing Aruba 500 series WAPs on site are compliant with the latest ITD requirements and do not need replacement.

(refer to Kingswood PS Appendix A – Existing School Survey Summary).

Telephony

The existing NEC telephony system shall be expanded and upgraded (if required) to suit the proposed new building. Outlets for phone connections and handsets are to be provided.

PA

The existing PA system on site is to be expanded to suit the new building. New speakers, interconnecting cabling and amplifiers are to be provided.

AV

The final AV design shall be completed by the contractor is consultation with the EFSG and Pattern Book.

Indicatively, this will involve:

- Interactive Learning Displays
- Mounting Hardwar/ Mobile Trolleys
- Portable Hearing Augmentation

Security

A new Security Field Panel (SFP) is to be provided within the new BCR in Block M. New RS-485 LAN cabling is to be extended from the MCR to the new BCR in a star topology.

Indicatively, this will involve:

- PIR sensors throughout all new rooms.
- All perimeter doors leading will have reed switches to monitor door status.
- All electrical cupboards will be lockable with a master PWD "E" key.
- A sounder/screamer within each floor.

The final security design shall be based on the SSU brief.

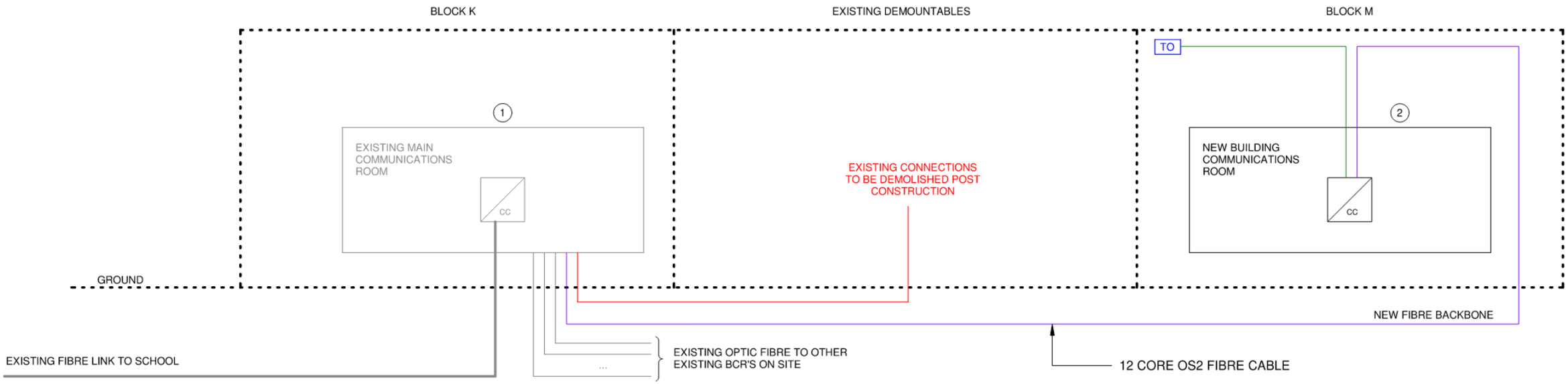
Video Security

A video security system shall be provided as per the SSU Brief. Indicatively this will involve:

- Minimum 6MP POE Camera
- NVR upgrades to enable recording for 42 days at 20 frames per second.
- Cat6A cabling.

(refer to Kingswood Public School SSU Draft Security Design).

COMMUNICATIONS NETWORK

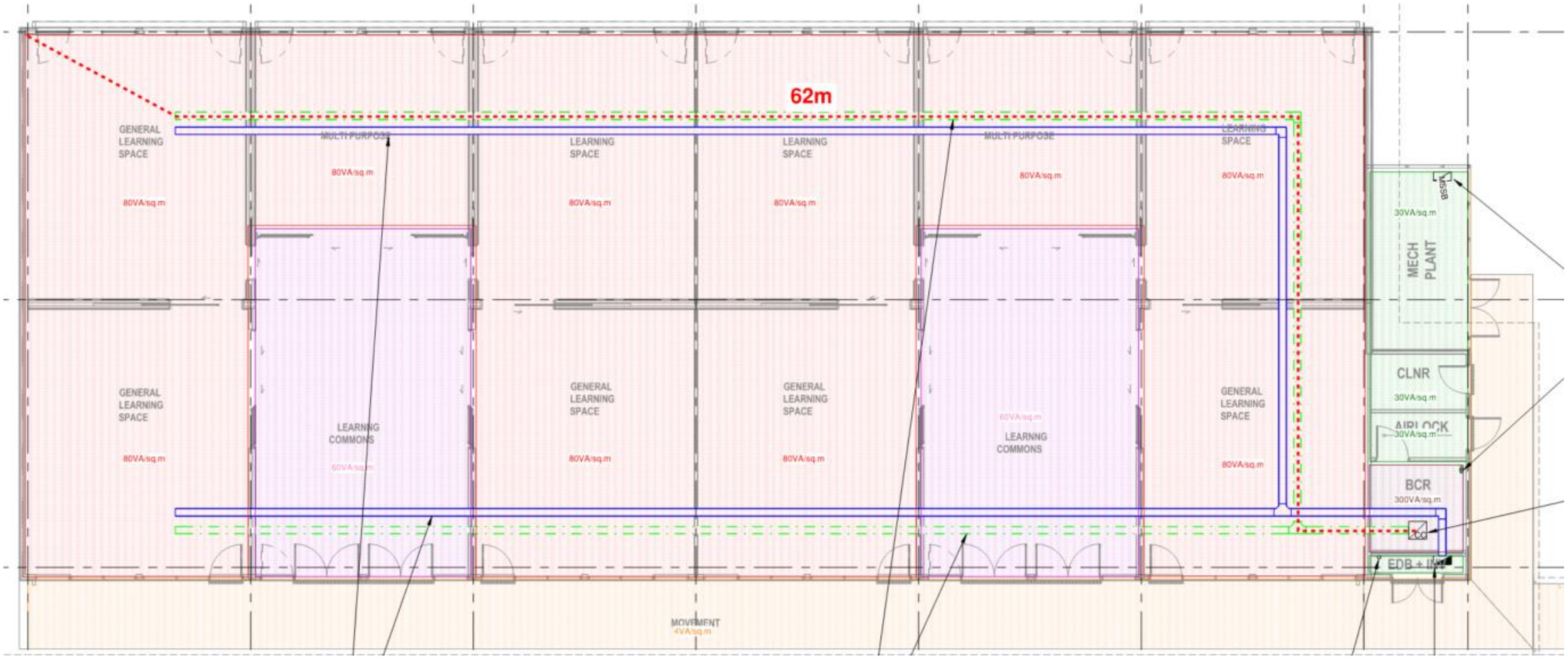


Kingswood Public School Communications Schematic

Electrical Services

COMMUNICATIONS NETWORK

The placement of the new BCR is such that the maximum length of horizontal structured cabling will be less than 75m as per the ESFG.



RISKS & OPPORTUNITIES

Pattern Book Development and Release

The DoE Pattern Book is currently being developed. The current designs are based on the available sections of the pattern book, with the existing EFSG utilised where the relevant sections of the pattern book have not yet been released. Subsequent issues of the pattern book may result in the current designs varying from requirements documented in the pattern book. This may result in a requirement for further design work if the plans are to be updated to align with the new pattern book.

Value Engineering – Lighting Control System

As a part of value engineering initiatives, the digital programmable lighting control system (such as Dynalite DALI, KNX etc.) has been omitted from the scope. Instead, a simpler, 230V-based lighting control system is to be used. An EFSG departure has been lodged to note the deviation from the DoE design standards.

Value Engineering – PV System

As a part of value engineering initiatives, the proposed PV system for Block M has been removed from scope. As a result, the proposed electrical cupboard EDB design is to remain the same to allow for a future PV system to be installed.

Trenching Works in Proximity to Block B

The current design proposes new trenching works for electrical, communications, and security conduits & pits that are to be routed adjacent to the heritage-listed Block B. The Heritage Consultant has been notified and is to advise on any potential archeological concerns these works may trigger.

This is considered relatively low risk, as the trenching can be coordinated on site to accommodate applicable heritage constraints.

NDY
A TETRA TECH COMPANY

MECHANICAL SERVICES

Mechanical Services

CLIMATIC CONDITION & DESIGN CRITERIA

KINGSWOOD PUBLIC SCHOOL

Ambient condition:
- Summer: 36.6°C DB, 24.3°C WB
- Winter: 3.0°C

(temperatures based on Horsley Park Equestrian Centre weather station)

Internal design condition for <u>new</u> buildings per EFSG DG 55.02:
- Cooling: 24 ~25.5 °C
- Heating: 19.5 ~ 21°C

Occupancy density:
- 2 sqm/person in accordance with EFSG for GLS

Internal equipment gains: 30 W/person, which allows for 1 laptop/person

Lighting heat gains: 4.5 W/m2 in accordance with NCC 2022

Fresh air provision:
- 12 L/s/person in classrooms

Air-Conditioning Provision Requirement

The following is noted from the DoE Design Guidelines 55 on the provision of air conditioning:

Avg Mean Max Jan Temperature	New/Major Upgrade/Redevelopments Areas
≥33°C	**Provide to permanent learning spaces, staff, and administration areas.**
<33°C	**Provide to permanent learning spaces and libraries only.** Administration and staff areas to be conditioned ONLY when included in the project upgrade scope and inclusion is required to achieve compliance with the relevant standards. When not included, school can source their own fundings

Avg Mean Max Jan Temperature	Existing Areas
≥33°C	**Provide to permanent learning spaces and libraries only**. Admin and staff areas sourced by school own funding only.
≥30°C	**Provide to permanent learning spaces and libraries only.** No requirement for admin and staff areas
<30°C	**Schools may apply to DoE for A/C to be installed in permanent learning spaces and libraries**

As Kingswood Public School is 32.6 C, which is <33°C but more than 30° C isotherm, AC is required to be provided to the followings per the EFSG:

- **New Building: learning spaces, admin/staff offices, and communications rooms**
- **Existing Building: learning spaces and libraries only**

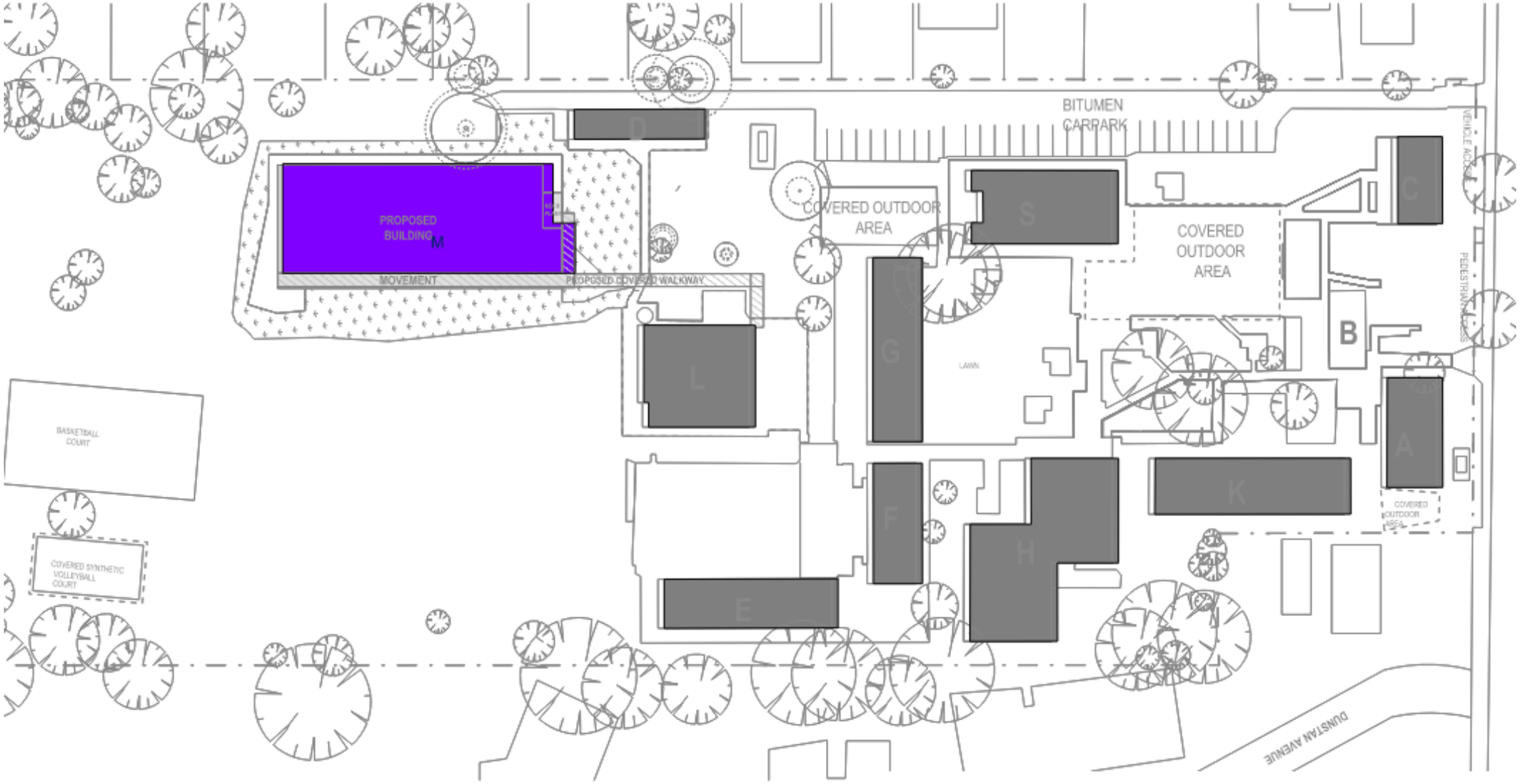
EFSG Cooler Classroom Program (CCP) Guideline defines the followings existing spaces as learning spaces:

Primary School	Secondary Schools
Home Base HB and associated Practical Activity Areas PAA (normally one space). Where separated by wall, PAA requires separate A/C	General Learning Spaces
Libraries and associated areas (reading, study, seminar rooms), provided the area is >17sqm. No A/C, fresh air, or controls for spaces <17sqm	
Withdrawal rooms (generally shared with Home Base and will share A/C and fresh air system with HB via vents/louvres or opening the door, unless separated and larger than 17sqm).	Practical rooms, including laboratories, kitchens & hospitality spaces, and performance and fitness workshops (but not gyms.)

Not Considered as Learning Spaces per CCP Guideline
• Preparation rooms (food & science) • Library workrooms and library offices • Storerooms • Any eligible rooms <15 sqm adjacent to air-conditioned space • Any room with open or meshed walls • Workshops • Hot metal area • Tin sheds • Craft room (if not learning space or PAA) • Seminar rooms (which are not part of library) • Study spaces • Darkrooms • Any spaces not used for learning by students

Kingswood Public School

Existing Site Plan and Existing A/C Provision



LEGEND

NO UPGRADES PROPOSED WITHIN THE BLOCK. BUILDING IS GENERALLY ALREADY PROVIDED WITH A/C OR A/C IS NOT REQUIRED FOR THE SPACES AS PER EFSG COOLER CLASSROOM PROGRAMS

NEW BLOCK TO BE PROVIDED WITH A/C AND VENTILATION AS REQUIRED. REFER TO ASSOCIATED DRAWINGS OF THE BLOCK FOR FURTHER DETAILS

Mechanical Services

TYPICAL COOLING & HEATING INFRASTRUCTURE SYSTEMS

From EFSG DG 55.02:

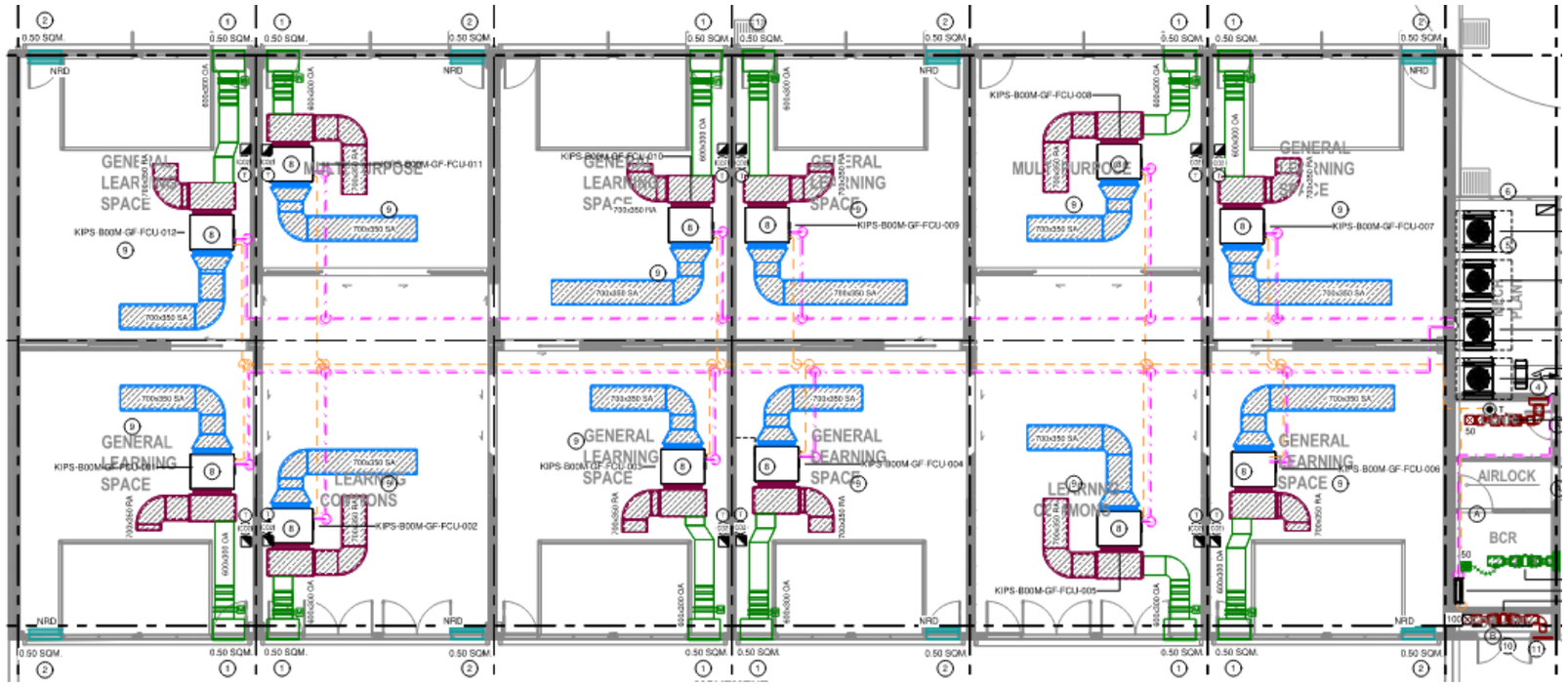
School Type	Air Conditioning System	Ventilation	Design Considerations
Cooling system capacity below 900 kW	Centralised ducted VRF	Ducted fresh air	• Refrigerant Charge • Energy Recovery Ventilator requirements due to specific conditions
Cooling system above 900 kW in a single building	Centralised ducted VRF Or Chilled/Heated Water System	Ducted fresh air	• Refrigerant Charge • Energy Recovery Ventilator requirements due to specific conditions • Centralised energy recovery ventilator to be considered • Chilled water system should be considered

For Kingswood Public School, it is expected that the cooling system capacity load will be <900 kW and thus a centralised ducted VRF system shall be applied

Mechanical Services

AIR CONDITIONING STRATEGY

NEW LEARNING BLOCK M



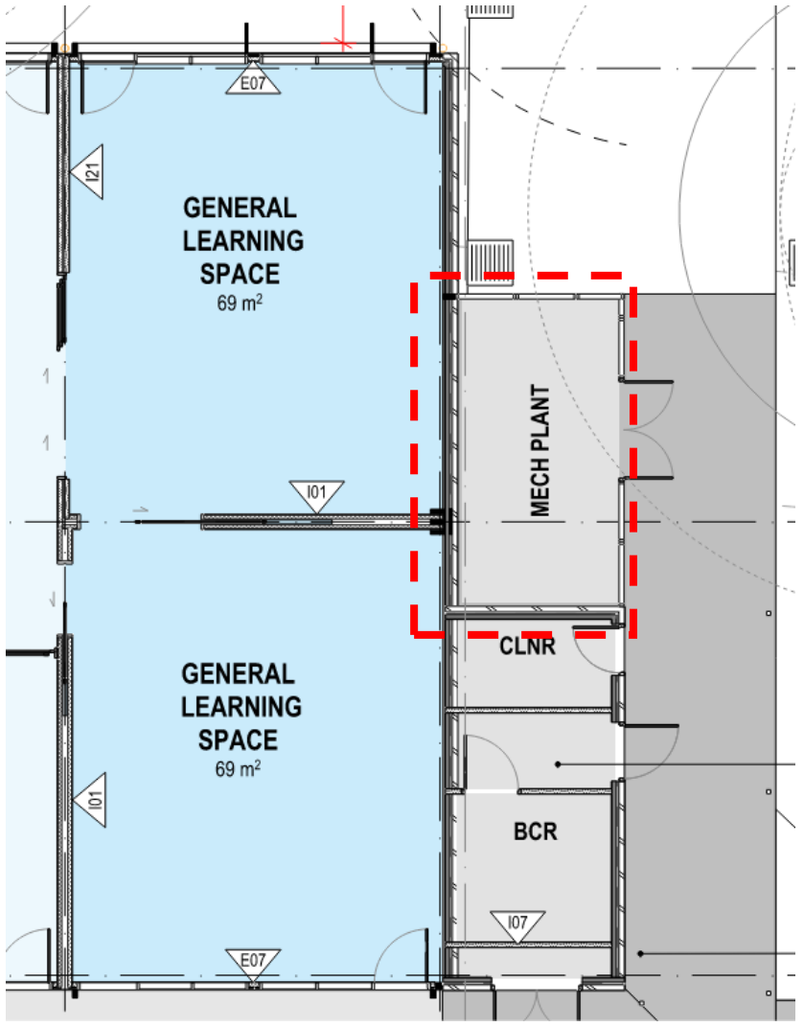
- GLS shall be air-conditioned in accordance with EFSG DG 55, i.e., in-ceiling ducted fan coil unit (FCU) with fresh air intake and relief air discharge louvres on façade. Condensers located on a dedicated external plant space.
- Amenities (cleaner space) to be mechanically ventilated, with discharge to external via louvre on the facade
- EDB cupboard will be mechanically ventilated as the cupboard houses more than 1 solar inverter
- BCR room shall be air-conditioned via wall-mounted A/C complete with fresh air provision

AIR CONDITIONING PLANT SPATIAL

OUTDOOR PLANT

New Learning Building

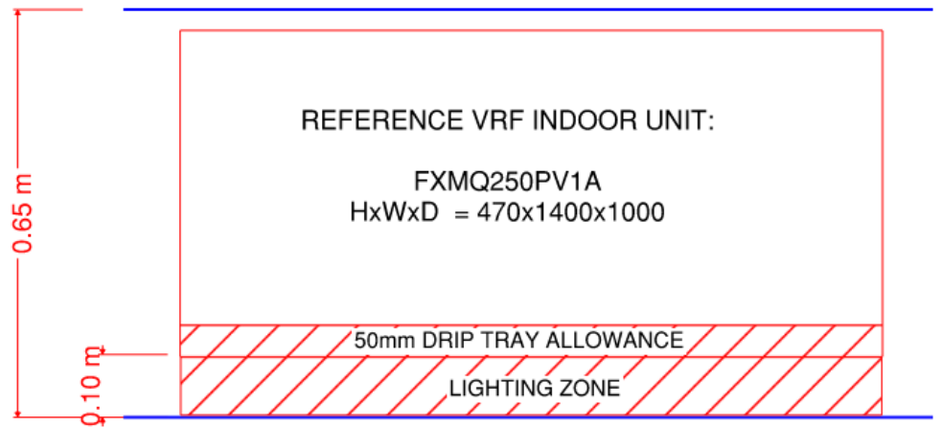
The A/C condensers for the new learning building will be located at Ground Level with the min size of 24 sqm. Space will be open to sky with louvred façade.



INDOOR CEILING SPACE

The indoor ceiling space required to accommodate the new ducted VRF unit in the new building space is estimated to be:

650 mm (clear) high minimum.



MECHANICAL CONTROL STRATEGY

Proprietary control is proposed for Kingswood Public School to serve the mechanical system.

NEW BUILDING

The proprietary control shall meet EFSG requirements, which include:

- Weather measurement will be used to determine favorable ambient conditions, to inform traffic light system of favorable outdoor conditions
- Dedicated space temperature sensor and CO2 sensor shall be provided to each general learning space
- User interface for operation of the systems via a Local Control Point incorporating pushbutton & Blue, Green and Yellow mode LED indication lights
- Controller to control the A/C in the new building

For Rooms with A/C, CO2 and Enthalpy Indication