DEPARTMENT OF EDUCATION (NSW)

SYDNEY OLYMPIC PARK NEW HIGH SCHOOL

BUILDING SERVICES RETURN BRIEF

2021 / 08

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Sydney Olympic Park new high school
Building Services Return Brief

Department of Education (NSW)

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TABLE OF CONTENTS

1 REPORT PURPOSE

WSP has been engaged by the Department of Education NSW to provide the following services for the main works of the 'Sydney Olympic Park new high school' project.

This report aims to provide an overview of the electrical and mechanical concept services design proposed for the site and outline the required design parameters.

This report refers to discusses the following services:

- Mechanical;
- Electrical;

2 INTRODUCTION AND BACKGROUND

2.1 Proposal

The proposed development is for the construction of a school whereby the project is known as Sydney Olympic Park new high school. The school is to be developed in two stages. The SSD application will seek consent for both Stage One and Stage Two. While Stage Two is submitted as part of this proposal, construction is subject to approval of additional funding.

Stage One will provide for a Stream 5 high school, catering for up to 850 students. Stage Two will bring the school up to a stream 9 school capability catering up to 1,530 students.

The design features a six storey building. To the north of the site, a hall building (for sports and performance) is proposed.

The play space required to meet the need of students for Stage One can be generally accommodated onsite, within the 9,511sqm available. Additional play space may be required to accommodate the increased student numbers anticipated during Stage 2. The proposed adjoining play space comprises an area of around 8,800sqm, and will be subject to a Joint Use Arrangement with the City of Parramatta (intended future landowner) and available for public use outside school hours. The future Wentworth Point Peninsula Park will result in an open space area of approximately 4 ha.

The remainder of the peninsula (TfNSW land) is under review and will be subject to a separate approval process. Redevelopment of this land will include the new access road proposed off Burroway Road along the eastern boundary of the subject site and is proposed to include car parking, drop-off zones and delivery zones.

2.2 Site Description

The proposed development is located within the peninsula of Wentworth Point at 7-11 Burroway Road, Wentworth Park across parts of three lots; Lot 202 DP1216628, Lot 203 DP1216628 and Lot 204 DP1216628. The site forms part of the Wentworth Point Planned Precinct, which was rezoned in 2014 for the purposes of high density residential, public recreation, school and business purposes.

The site is approximately 9,511sqm in area, with a frontage of approximately 91m to Burroway Road. It currently contains vacant land, which is cleared of all past development, and almost entirely cleared of native vegetation.

The surrounding area is generally characterised by high rise residential and mixed-use developments. The site is directly adjacent to the Wentworth Point Peninsula Park and immediately east of Wentworth Point Public School.

Figure 2 Site Aerial Map

2.3 Report Aim

This return brief aims to describe the extent of the mechanical and electrical services for the 'Sydney Olympic Park new high school' project.

2.4 Definitions

Unless the context otherwise requires, the following definitions apply:

- AS – Australian Standard
- BCA – Building Code of Australia
- DA – Development Approval
- D&C – Design and Construct
- ESD – Ecologically Sustainable Development
- NCC – National Construction Code
- EFSG – Educational Facilities Standards and Guidance's
- FCU – Fan Coil Units
- ERV- Energy Recovery Ventilator

2.5 Basis of Report

This report is based upon the following sources of information:

- Proposed Group GSA concept architectural layouts issued 27/01/2021.
- Email correspondence with Essence PM & Group GSA
- Fire Engineering Design note from Stantec 23/11/2020
- ESD Green Start Pathway from Stantec 08/02/2021

2.6 Limitations

The design approach for the services is based upon preliminary planning solutions and layouts, and as such should be treated as concept only and should not be used for the basis of pricing or tender. Once the project has developed from the concept phase, this document and its associated sketch layouts will be developed into a detailed design package. We note that value management is yet to be undertaken.

2.7 Clarifications Required

- A meeting with school's ICT and Security stakeholder will be required during the early design stages to gain an understanding of their requirements and system.
- A survey of the existing underground services will be required
- All required audio-visual services (including hearing aid loops) are to be designed and documented by others.
- All dry fire services are to be designed and documented by others.
- Stage / specialist lighting is to be designed and documented by others.
- Requirements for a MATV / PAYTV system are to be confirmed with DoE.

- All wireless access points are to be supplied by DoE and installed by the electrical contractor
- All voice over IP phones are to be supplied by DoE and installed by the electrical contractor
- All active communications equipment installed within the equipment racks by DoE
- Issues and review of the BCA report
- Issue and Review of the Fire Engineering report
- Final Green Star Target agreements
- SINSW to confirm school operation hours
- Canteen cooking provision (current allowance for no commercial kitchen)
- Confirmation of spaces to be conditioned. E.g. no conditioning system for staff admin areas
- SINSW to confirm Material Workshop requirement. E.g. hot works exhaust allowed for these spaces

3 GENERAL REQUIREMENTS

3.1 Standards and Guidelines

The following standards and guidelines will be applicable throughout the project:

3.1.1 General

- NCC BCA 2019
- Local government and municipal council regulations
- Occupation / workplace health and safety legislation
- EFSG Guidelines
- DEG-55 Report
- SG951
- DOE structured cabling systems specification

3.1.2 Mechanical Services

- AS/NZS 1668.1 Fire and smoke control in multi-compartment buildings
- AS/NZS 1668.2 Mechanical ventilation in buildings
- AS/NZS 1668.4 Natural ventilation in buildings
- AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)
- AS/NZS 3666.1 Air-handling and water systems of buildings

3.1.3 Electrical Services

- Service Rules and Regulations of the local Supply Authority
- AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)
- AS/NZS 3008.1 Electrical Installations - Selection of cables.ac
- AS/NZS 1680 Interior Lighting
- AS/NZS 2293 Emergency Evacuation Lighting
- AS/NZS 3439 Low-voltage switchgear and control gear assemblies
- AS 4674 Design, Construction and Fit-out of food premises
- The requirements of the Australian Telecommunications Authority

4 DESIGN CRITERIA

This section summarises the design criteria which will form the basis of our scope of works:

4.1 Mechanical Services

4.1.1 External Environmental Conditions

CONDITION	DRY BULB TEMPERATURE (˚C)	WET BULB TEMPERATURE (˚C)
Winter	4.1	-
Summer	33.9	23.2

North Parramatta deemed to be the most relevant location to the respective geographic location for this project.

PARAMETER	DESIGN CRITERIA
Ventilation	Outside Air: AS 1668.2 (Mechanical) or AS 1668.4 (Natural)
Exhaust Air	General Requirements: AS 1668.2
Hours of Operation	8.00am to 6.00pm Monday – Friday (Pending SINSW approval)
Supply Air	Air Diffusion Performance Index (A.D.P.I.) of no less than 0.80 at full or part load operation unless superseded by Green Star Air Change Effectiveness requirements.

4.1.2 Internal Environmental Conditions

AREA	WINTER		SUMMER	
	DRY BULB TEMPERATURE (°c)	RELATIVE HUMIDTY, RH (%)	DRY BULB TEMPERATURE (°C)	% RH
Internal Conditions (for air conditioning plant full load performance)	21 +/- 1	-	24 +/- 1	-
Lift Shafts	The greater ambient +5°C db or 40°C db			

Relative humidity will be controlled by virtue of dry bulb temperature only.

4.1.3 Internal Heat Gains

PARAMETER		DESIGN CRITERIA
Occupancy		As per architectural layouts / AS 1668.2 8.00am to 6.00pm
Infiltration	Perimeter Façade:	0.25 air changes per hour
	Main Entry Lobby:	1.0 air change per hour
People		70 Watts / person sensible 60 Watts / person latent
Lighting		NCC Section J
Equipment		10 Watts / m^2 NLA

No diversity shall be applied to the internal heat gains.

4.1.4 Building Parameters

PARAMETER	DESIGN CRITERIA
Roof	Refer to Architectural Documentation
Walls	Refer to Architectural Documentation
Glazing	Refer to Architectural Documentation
Partition Loads	Adjacent non-air conditioned spaces included

4.2 Electrical Services

ITEM	DESIGN CRITERIA
Electricity Supply	→ To local network service provider standards → 400/230 V → 50 Hz
Electrical maximum demand	

Room category selection	Mech	Power and lighting
Office	40. Va/m2	50. Va/m2
Canteen	35. Va/m2	120. Va/m2
Hall	35. Va/m2	15. Va/m2
General learning	35. Va/m2	30. Va/m2
Outdoor learning	0. Va/m2	20. Va/m2
Common general area	35. Va/m2	20. Va/m2
Store	0. Va/m2	5. Va/m2

	Plant	5. Va/m2	10. Va/m2	
	Car park	0. Va/m2	15. Va/m2	
	Sports centre	35. Va/m2	30. Va/m2	
	Spare	15%	15%	
Consumer mains	→ As per Code → 2 hour fire rated or as required by utility, Radox FR, Firestop. → Max. Demand or capacity of substation if sole user.			
Main Switchboard	→ One main switchboard → Ventilated internal switch room (2hr fire rated, two exits) → Main busbar and switch to substation rating → Other busbars rated for 20% load growth → Connection provisions for known future building loads → Minimum of 25% spare circuit breaker space or 6 3PH spare circuit breaker spaces (whichever is greater). In instances where the required spare circuit breakers exceed 160A 3PH, provision for connection of future switchboard modules may be provided. → Air circuit breakers 1600 A and above → Moulded case breakers less than 1600 A → Fault level to match incoming supply and to local network providers requirements. → Top / Bottom entry → Top / Bottom exit → Free-standing → Front access only → Form 3B			
Power factor correction	→ Minimum power factor of 0.9 lagging			
Supply authority metering	→ To Ausgrid requirements			
Electrical energy metering	→ As per NCC Section J8.3 requirements → Separate meter for canteen distribution board and major services loads → Central monitoring system			
Distribution boards	→ Moulded case breakers > 100 A → Miniature circuit breakers < 100 A → Final sub circuit Protection Circuit breakers - Min 10kA fault level → Individual RCD protected circuits, RCBO to code requirements → Digital multifunction meter for lighting and power circuits as required by code → Connection provisions for known future building loads → Minimum of 25% spare circuit breaker space or 6 1PH spare circuit breaker spaces (whichever is greater).			

	→ Minimum one distribution board on every level of each individual building (except mezzanines and stores). Buildings joined only by roofs or at corners will be considered separate buildings, buildings joined by common slabs will be considered a single building. → Each board serves equipment within a 25m radius, refer to distribution board section of this return brief for exceptions.
Submains	→ Capacity Max. Demand + 20% → Mechanical FLC of connected equipment → XLPE / PVC copper type generally → Life safety services Radox FR, Firestop. → 4 core less than 125 A. → Cable tray support for all submains reticulation
Final sub circuits	→ 20A minimum rating → Power 2.5mm^2 V75 min. → Lighting 2.5mm^2 V75 min → External 4mm^2 V75 min. → Max 80% utilisation of AS/NZS 3000
Voltage drop	→ Consumer mains < 1% volt drop → Submains approx. 2.5% volt drop → Final sub-circuits, 3.5% volt drop
Cable containment systems	→ Conduits, cable trays, cable ladders and catenary → All underground power conduit pathways will be provided with the following spare conduits (minimum): 2 x 32 mm uPVC, 1 conduit of sufficient size (minimum 32 mm dia.) to enable an extra parallel leg of the designated submain to be installed → Underground conduits will be provided to serve all known future site buildings / loads → Communication pathways will have a minimum of 50% spare capacity.
General power outlets and power to other services	→ Outlets provided to suit nominated equipment and for general cleaning purposes → Outlets will be documented based on the EFSG requirements, user group workshop meetings and architectural drawings / data sheets. → Dedicated circuits will be provided for all critical and 3PH equipment. → A maximum of 6 power outlets will be connected to a single circuit in high power consumption areas, 12 outlets in all other areas. Double socket outlets will be considered two outlets.
Uninterruptable power supply	→ One UPS per communications room → 3Kva, 30 minutes battery autonomy

Fans	→ provided based on the EFSG requirements and user group workshop meetings and architectural data sheets. → Where required, one 1420mm diameter fan (or similar) will be provided every 25m^2. Oscillating wall fan provided where ceiling fan is not practical. → Refer to Fan section of this return brief for further information
Electric heating	→ Provided in each accessible bathroom → Typically in the form of an electric heat lamp → Timer control as per the EFSG requirements
Lighting	→ provided to internal and external building areas as required by the EFSG → Energy efficient LED lights → To AS1680, the EFSG and SG951 requirements
Lighting control	→ DALI lighting control system → Include timer control, motion detector control, daylight harvesting, dimmer control, manual control etc → As per functionality outlined in the EFSG and SG951 for each room type.
Emergency Lighting & Exit Signs	→ As per code → LED type exit fittings → LED spitfire type emergency fittings plaster ceiling areas → LED batten type emergency fittings in back of house areas. → Computer monitored system
Lead-in communication cabling pathways	→ Two (2) 100mm dia PVC lead in conduits reticulated from the boundary pit to the main communications room
Fibre To The Premises	→ NBN connection infrastructure
Structured communications cabling system	→ Communication racks including power distribution units, patch panels, cable management etc. → Patch / fly leads → Fibre backbone cabling (OS2 9/125 single mode) → Copper horizontal cabling (Cat 6A low smoke zero halogen) → Cable containment systems → Data outlets (RJ45) → As per EFSG requirements
Wireless access point cabling	→ Provided as per DoE ICT stakeholder requirements
MATV / PAYTV	→ Requirements for a MATV / PAYTV system are to be confirmed with DoE.

Electronic access control	→ As per Department of Education School Security Unit briefing document (site specific)
Intruder detection	→ As per Department of Education School Security Unit briefing document (site specific)
Video intercom	→ As per Department of Education School Security Unit briefing document (site specific)
CCTV System	→ As per Department of Education School Security Unit briefing document (site specific)
Assistance required call system	→ Provided within each accessible bathroom → Local external buzzer and pilot light outside each accessible bathroom → Master control station located at the reception desk
Period bell and public announcement speaker system	→ Provided throughout the school → Central control system located at the reception desk → Programmable for the automatic scheduling of the period alarm
Photo voltaic system	→ Electrical contractor to engage a specialist designer / installer. → Sized in accordance with the EFSG requirements
Earthing and bonding	→ As per code
Lightning and surge protection	→ Requirement to be confirmed during detailed design → Surge diversion for incoming main switchboard supply, individual circuits serving critical equipment (such as communication racks) and for any copper communications cables entering building using surge diverter modules.

5 MECHANICAL SERVICES

This section of the return brief aims to provide a description of the proposed mechanical services for the 'Sydney Olympic park new high school' project.

5.1 Services Design Scope

The scope of works for mechanical services will include the following:

- Space cooling where required in line with the EFSG & DG-55 report
- Space heating where required in line with the EFSG & DG-55 report
- Reverse cycle air-cooled chiller system and axillary equipment
- Air-cooled chillier system and axillary equipment
- Ceiling concealed fan coil units (FCU)
- Energy recovery ventilators (ERV)
- Wall mounted gas fired radiators
- Split DX systems
- Natural ventilation
- General air supply systems
- Outside air supply systems
- General exhaust air system
- Toilet & changing room exhaust air systems
- Kiln exhaust air systems
- Hot metal exhaust air system
- Fire sprinkler pump room exhaust and flue
- Commercial kitchen exhaust air systems
- Fume cupboard exhaust
- Chemical store exhaust

5.2 Chilled Water System

The building shall be served via a central air-cooled chilled water system using water as a working medium to transfer energy (heat) from the conditioned space for rejection to the atmosphere. The system shall consist of large outdoor air-cooled chiller units located roof level, the system shall supply to multiple indoor units via a water pipe network that distributes flow to each unit.

5.3 Heating Hot Water System

The building shall be served via a central reverse-cycle air-cooled chiller system providing heating hot water as a working medium to transfer energy (heat) from the conditioned space for rejection to the atmosphere. The system shall

consist of outdoor reverse-cycle air-cooled chiller units located at roof level, the system shall supply to multiple indoor units via a water pipe network that distributes flow to each unit.

5.4 Space Cooling

The internal spaces shall be cooled via a combination of ceiling concealed chilled water Fan Coil Units (FCU's) and Energy Recovery Ventilators (ERV's) within each space requiring conditioning in accordance with the DG-55 report and the EFSG's.

Special areas such as computer rooms, comms rooms, audio-visual rooms requiring air conditioning shall be provided via standalone split refrigerant DX air-conditioning systems comprising but not limited to internal A/C unit (either wall mounted, or Ceiling concealed), external wall hung or roof mounted condenser and all associated pipework, where applicable in line with WSP specific design requirements.

They system shall be separated from the central chilled water system due to their 24/7 operation.

Where air-conditioning is required, the external condensers and chillers are to be installed as per the requirements of the EFSG and DG-55 report.

It is our interoperation from the DG-55 report that air conditioning is to be provided to learning spaces only and therefore the staff administration spaces do not receive air-conditioning.

They system shall be separated from the central chilled water system due to their 24/7 operation.

5.5 Space Heating

The internal spaces shall be cooled via a combination of ceiling concealed heating hot water Fan Coil Units (FCU's) and Energy Recovery Ventilators (ERV's) within each space requiring conditioning in accordance with the DG-55 report and the EFSG's.

Where air-conditioning is required, the external reverse cycle chillers are to be installed as per the requirements of the EFSG and DG-55 report.

It is our interoperation from the DG-55 report that air-conditioning is to be provided to learning spaces only and therefore the staff administration spaces do not receive air-conditioning, however will receive heating via wall mounted gas fired heater in accordance with the EFSG's.

5.6 Ventilation

5.6.1 Learning Spaces

It is proposed that each of the learning spaces shall have the following ventilation strategies employed:

→ When the space air conditioning system is enabled, the space shall be mechanically ventilated in accordance with the NCC 2019 and 1668.2. Mechanical ventilation shall be via a dedicated Energy Recovery ventilators (ERV) ducted to the in-ceiling fan coil units for each space. Where wall mounted units are utilised in lieu of ducted fan coil units, outside air is to be supplied to the space via ductwork and a supply air diffuser.

- → ERV units are required to preconditioning the outside air supply to FCU's. The ERV units are incorporated with supply and exhaust fans which shall be interlocked to run in unison and at the same speeds.
- → When the space air-conditioning system is disabled, these spaces shall be naturally ventilated from the façade via operable windows and doors in accordance with the NCC 2019 and AS 1668.2. Where a space does not have two external façades or has a room depth of greater than 7 meters the ERV units extract fan shall operate to assist with cross ventilation ensure fresh air passes through the space.

5.6.2 Sports and Performance Hall

The main hall shall be naturally ventilated via a combination of fixed open louvres, operable windows and doors on the perimeter facade in accordance with the requirements of the EFSG's.

5.6.3 Internal Office Spaces

Spaces which do not have access to an external facade shall be provided with mechanical extract via inline axial fans within the ceiling void. Makeup air to these spaces shall be via a combination of door under cuts and door grilles dependent on-air volume.

5.6.4 Storerooms

Storerooms are to be naturally-ventilated. Ideally, this is via cross-ventilation, but if this not possible single-sided natural ventilation is to be provided.

5.6.5 Toilets / Changing Rooms

Staff and student toilet facilities shall be naturally ventilated via fixed open louvres at high level in accordance with the requirements of the EFSG's.

Staff and student changing facilities shall be naturally ventilated via fixed open louvres at high level in accordance with the requirements of the EFSG's.

Accessible toilets shall be mechanically exhausted to roof level or façade where applicable, with the discharges located away from any air intakes or natural ventilation device or openings. Makeup air to the accessible toilets shall be via either door undercuts or door grilles as per EFSG's

5.6.6 Laundry

Laundry spaces shall be mechanically exhausted either to roof level or façade where applicable, complete with exhaust fan, grilles, power and required ductwork.

The discharge shall be located away from any air intakes or natural ventilation device or openings

Makeup air to the space shall be via either door undercuts or door grilles as per EFSG's & AS.1668.

5.6.7 Clerical / Printing Room

The clerical/printing room shall be mechanical extract above the printers with exhaust reticulation to either the façade or roof level, complete with exhaust fan, grilles, power and required ductwork.

Makeup air shall be provided via the outside air provision to the space, as per EFSG.

5.6.8 Ceramic Kiln Room

Each kiln within the kiln room will be provided with a dedicated exhaust which will discharge at roof level to atmosphere within a dedicated fire rated riser complete with exhaust fan, grilles, power and required ductwork.

The discharge shall maintain 6m separation from all outside air intakes and openings and 10m separation from main central plant to prevent corrosion of items.

Makeup air shall be via fixed open wall mounted louvres to the adjacent naturally ventilated outdoor workshop.

5.6.9 Canteen

Due to SINSW's move towards 'Healthy Eating Policy' which requires food preparation on site and more commercial cooking equipment, the Space shall be provided with a single dedicated kitchen exhaust which will reticulate to roof level within a fire isolated riser complete with bifurcated roof mounted fan.

A provisional allowance of 3,500L/s exhaust rate.

The canteen exhaust discharge shall maintain 6m separation from all outside air intakes and openings as well as main central plant.

Makeup air shall be ducted from a façade louvre complete with outside air fan, grilles, power and required ductwork.

Kitchen hoods shall be provided by the kitchen consultant

5.6.10 Pump room

The fire pump room shall be natural ventilated via the facade with mechanical flue and exhaust for the diesel sprinkler pumps. The risers shall reticulate to roof level via a fire rated enclosure complete with exhaust fan, grilles, power and required ductwork.

The pump room extract requirements are to be confirmed with the fire protection engineer upon specification of the sprinkler pumps.

5.6.11 Main Switch room

The main switch room shall be naturally ventilated via fixed open louvres on the perimeter facade in accordance with the requirements of the AS.1668.

5.6.12 Comms Room

The comms room shall be mechanically ventilated in accordance with AS.1668 to maintain positive pressure and prevent the ingress of dust and contaminates. The mechanical supply to the comms room shall be filter backed with relief air via either door undercuts or door grilles.

5.6.13 Welding Room

The welding room will be provided with a dedicated hot works exhaust which will discharge at roof level to atmosphere within a dedicated fire rated riser complete with exhaust fan, grilles, power and required ductwork.

The discharge shall maintain 6m separation from all outside air intakes and openings.

Makeup air shall be via fixed open façade louvres.

5.6.14 Kitchens learning spaces

Kitchen learning Spaces shall be each be provided with a single dedicated kitchen exhaust which will reticulate to roof level within a fire isolated riser complete with bifurcated roof mounted fan.

A provisional allowance of 3,500L/s exhaust rate.

The kitchen exhaust discharge shall maintain 6m separation from all outside air intakes and openings as well as main central plant.

Makeup air shall be ducted from a façade louvre complete with outside air fan, grilles, power and required ductwork.

Kitchen hoods shall be provided by the kitchen consultant.

5.6.15 Science Lab / Chemical Store

A single fume cupboard has been provided for each science lab with a PVC Fume cupboard exhaust to reticulate to roof level within a fire isolated riser, complete with exhaust fan, power and required ductwork, complete with roof mounted corrosion resistant fan, power and required ductwork.

The chemical store exhaust shall reticulate to roof level within a fire isolated riser, complete with roof mounted corrosion resistant fan, power and required ductwork.

The discharge shall maintain 6m separation from all outside air intakes and openings and 10m separation from main central plant to prevent corrosion of items.

Makeup air shall be ducted from a façade louvre complete with outside air fan, grilles, power and required ductwork.

5.6.16 Materials Workshop

The materials workshop shall be provided with a hot works extract system until the official room designation is confirmed.

This provisional extract system will reticulate and discharge at roof level with makeup air via façade louvres.

5.6.17 Circulation stairwells

All stairwells have been assumed to be naturally ventilation in accordance with the Fire Engineers advices.

5.6.18 Circulation Corridors

All stair wells have been assumed to be naturally ventilation in accordance with the Fire Engineers advices.

5.6.19 Lift Shaft

The lift shaft is to be naturally ventilated via high and low-level louvres, with sufficient to satisfy the NCC BCA maximum temperature conditions.

5.7 Ceiling Fans

Note that the ceiling fans nominated in EFSG's are to be documented and provided as part of the electrical package of works.

5.8 Controls

The base building management system (BMS) will be provided to control the central plant items and air distribution equipment. The system will be based on a number of intelligent stand-alone controllers associated with each major plant item. These will be interconnected via a communications bus and administered by an operator workstation. It is proposed for the system to be an open protocol network.

The mechanical control system will include an optimising temperature control strategy. The cooling/heating systems will start prior to scheduled occupancy, based on the time necessary for the zones to reach their occupied set points. The start time will automatically adjust based on changes in outside air temperature and zone temperatures.

BMS will also incorporate alarms and monitoring points associated with major plant items across all disciplines.

The system controls shall be in accordance with the requirements of the EFSG's and DG-55 report.

Full system control shall be provided as the design develops

6 ELECTRICAL SERVICES

6.1 Electrical Scope of Work

The electrical services design will be developed in accordance with the requirements of EFSG guidelines and will include the below major items:

- Kiosk substation (by ASP Level 3)
- Consumer main cabling
- Main switchboard
- Power factor correction (if required)
- Supply authority metering
- Electrical energy metering
- Distribution boards
- Submain cabling
- Final sub-circuit cabling
- Cable containment systems
- General power outlets and power to other services
- Uninterruptable power supplies (rack mounted)
- Fans
- Lighting (internal and external)
- Lighting control system (DALI)
- Emergency lighting and exit signs
- Lead in-communication cabling pathways
- Fibre to the Premises (FTTP) Infrastructure (NBN)
- Structured communications cabling system (including backbone cabling)
- Voice over IP (VoIP) cabling
- Wireless Access Point (WAP) cabling
- MATV / PAYTV system
- Electronic Access Control System (ECAS)
- Intruder Detection System (IDS)
- Video intercom dystem
- CCTV system
- Assistance required call system
- Period bell and public announcement speaker system
- Photo voltaic system
- Earthing and bonding system
- Lightning (if required) and surge protection system

6.2 Kiosk Substation / Electrical Maximum Demand

The preliminary maximum demand calculation completed for the school indicates the site load will be around 1,300A 3PH. This is inclusive of air conditioning power requirements and the 15% spare required by the EFSG. A new Ausgrid kiosk substation will be required on site to meet these power requirements. All works associated with the substation will be completed by the appointed ASP Level 3 designer. There is a preference for the substation to be located along the site boundary to the road (away from the school playgrounds) and in close proximity to the main switch room (within 50m).

The site maximum demand will need to be reviewed and confirmed during detailed design and development.

6.3 Consumer Mains

Consumer mains cabling will connect the site Main Switchboard to the Ausgrid kiosk substation. Consumer mains cabling will be fire rated for two (2) hours and will generally be reticulated underground using a system of conduits and pits.

6.4 Main Switchboard

A new main switchboard will be installed in a dedicated main switch room on ground level (final location to be confirmed) to distribute power throughout the site. The main switch room will be 2 hour fire rated and will meet the minimum spatial requirements outlined in the EFSG. There is a preference for the room to be provided with external building access, two exit pathways will be provided as required by AS3000.

The main switchboard will be divided into separate sections for life safety services (if required) and house services. The incoming supply will be fitted with a service protection device in accordance with Ausgrid requirements and surge protection. The Main Switchboard will be floor mounted, Top/bottom connected including a cable pit, Form 3b modular construction, IP42 rated enclosure.

The main busbar will be rated to meet the incoming substation supply with the other busbars rated for 20% load current growth as per the EFSG requirements. The main switchboard will include connection provisions for known future building loads as well as a minimum of 25% spare circuit breaker space or 6 3PH spare circuit breaker spaces (whichever is greater). In instances where the required spare circuit breakers exceed 160A 3PH, provision for connection of future switchboard modules may be provided.

The Main Switchboard will supply power to all equipment installed on the site including but not limited to:

- → Life safety systems (if required)
- → Lighting and power
- → Mechanical services air conditioning plant
- → Hydraulic services plant and equipment
- → Fire services plant and equipment
- → Communication services plant and equipment
- → Security services plant and equipment
- → Lift Services

6.5 Power Factor Correction

Power Factor Correction will be provided if required to achieve a minimum power factor of 0.9 lagging in accordance with the Service and Installation Rules of New South Wales. Power factor units will standalone (separate to the main switchboard), have a 10 year design life and will be located within the main switch room.

6.6 Supply Authority Metering

A single supply authority (Ausgrid) meter will be installed within the main switch room to meter the incoming supply to the main switchboard. The meter will be accessible by Ausgrid personnel and located in accordance with Ausgrid standards. The architect will be required to specify door locking hardware keyed to Ausgrid standard keying arrangements.

6.7 Electrical Energy Metering

Energy meters will be installed for different load groups as required by the NCC Section J8.3 as well as for equipment where energy consumption information will benefit the ongoing maintenance of the building. All energy meters will be connected to a central monitoring system.

The system will monitor the energy consumption of the following:

- Mechanical services
- Lighting
- Power
- Central hot water supply
- Lifts
- Canteen distribution board
- Major services loads

The energy metering system will display and record information relating to:

- Instantaneous voltage, power, current and energy consumption
- Maximum and minimum recorded voltage, power current, and energy consumption
- Historical voltage, power, current and energy consumption
- Trend analysis

6.8 Distribution Boards

Distribution boards will be installed throughout the school for general power and lighting circuits. Dedicated distribution boards will be provided for the school canteen and mechanical services equipment. Mechanical distribution boards will typically form part of the mechanical services scope of works (including all sub-circuits) with all submains cabling installed by the electrical contractor.

Electrical services distribution boards will typically be surface mounted, front connected, DIN circuit breaker type and IP42 rated. All distribution boards will be of sheet metal construction, enclosed and complete with hinged, lockable doors. Circuit breakers will have a minimum rating of 10 kA with integral 30mA RCD protection (RCBO) for all individual lighting and general power sub-circuits.

The distribution boards will have separate chassis for lighting and power sub-circuits where required. Each chassis will be fitted with an energy meter as required by the NCC. Distribution boards will include connection provisions for known future building loads as well as a minimum of 25% spare circuit breaker space or 6 1PH spare circuit breaker spaces (whichever is greater).

Electrical distribution boards will typically be installed in dedicated lockable electrical cupboards accessible from general circulation areas. The electrical cupboards will be sized in accordance with the EFSG and Australian Standard requirements. Cupboards will be fire rated and fitted with smoke seals where required by the Australian Standards and NCC. Distribution boards will also be installed in plant rooms where required and the school canteen.

A minimum of one distribution board will be provided on every level of each individual building (except mezzanines and stores). Buildings joined only by roofs or at corners will be considered separate buildings, buildings joined by common slabs will be considered a single building. Distribution boards will generally be spaced such that each board serves equipment within a 25m radius. In areas where the distribution board circuits have a low electrical load, the area served by the distribution board may exceed the 25m radius. In heavy electrical load areas, the 25m radius may be reduced.

External switchboards will be avoided where possible. Any external switchboards installed will be IP56 rated (minimum) and be fitted with anti-condensation heaters.

6.9 Submain Cabling

All submains cabling will originate from the Main Switchboards and utilise copper conductors. Non-essential services submains cabling will be XLPE/PVC type cabling. Essential services will be cabled in polymeric insulated fire rated copper cabling and be provided with additional mechanical protection as required by the NCC and AS/NZS. Submains cabling will be designed to allow for an additional 20% capacity over the calculated maximum demand capacity or 25A/PH (whichever is greater).

6.10 Final Sub-Circuit Cabling

All final sub-circuit cabling will utilise stranded copper conductors with PVC type insulation. Final sub-circuits will have a minimum rating of 20A and generally use 2.5mm^2 cable (minimum).

6.11 Cable Containment Systems

Submains cabling will generally be reticulated from the main switchboard to each distribution board using a network of underground conduits and in-building cable trays / ladders / conduits. Vertical submains cabling installed between building floors will generally be installed within dedicated electrical riser cupboards. Riser cupboards will be constructed of non-combustible material and will be smoke-sealed. Riser cupboards will be suitably sized so to be shared with rising vertical cabling and electrical distribution boards. Refer to the Distribution Board section of this return brief for further information.

Cable draw-in pits will be provided at each change in underground conduit direction and along straight runs to facilitate initial and future cable installation. A cable pit will be provided in the main switch room to facilitate connection of incoming and outgoing cabling at the main switchboard. Cable pits will be connected to the storm water system for drainage as part of the hydraulic services scope of works (by others). Separate pits will be provided for communication and security services.

Separate cable containment systems will be installed for power and communications cabling. Where practical power and communication containment will be installed adjacent to each other / in the same trench. Services will be separated

from each other in line with the Australian Standards. Horizontal cable trays will be installed in general circulation areas where possible.

Underground conduits will be sized in accordance with the Australian Standards. All underground power conduit pathways will be provided with the following spare conduits (minimum):

- 2 x 32 mm uPVC
- 1 conduit of sufficient size (minimum 32 mm dia.) to enable an extra parallel leg of the designated submain to be installed

Underground conduits will be provided to serve all known future site buildings / loads including:

- Conduits appropriately sized for the anticipated future building electrical load.
- 4 x 50 and 4 x 32mm conduits for future site equipment with an unknown electrical load.

All communication pathways will have a minimum of 50% spare capacity. All wiring will be concealed where possible.

6.12 General Power Outlets and Power to Other Services

Power outlets will be provided to suit nominated equipment and for general cleaning purposes. Outlets will be documented based on the EFSG requirements, user group workshop meetings and architectural drawings / data sheets. Socket outlets will be positioned to suit the application, intended use and architectural joinery. General use wall mounted outlets will typically be mounted at 300mm AFFL with 20% (minimum 1 per classroom) mounted in accordance with AS1428 for disabled person access.

Dedicated circuits will be provided for all critical and 3PH equipment. A maximum of 6 power outlets will be connected to a single circuit in high power consumption areas, 12 outlets in all other areas. Double socket outlets will be considered two outlets. Outlets will be appropriately IP rated for wet areas in accordance with AS3000 and will require the use of a tool to gain access to the wiring (face plates will be removable by hand, to be confirmed by DoE).

Any stove isolating switches required will be installed in a visible location and fitted with a neon light indicating when the isolator is turned on. Master on/off switches will be provided in special rooms nominated by the DoE and in the EFSG (e.g. computer learning spaces). Similarly, emergency power off switches will be provided in rooms nominated by the DoE and in the EFSG (e.g. laboratories).

All outlets will be fitted with traffolyte labels (or approved equal) indicating the supplying distribution board and circuit number.

6.13 Uninterruptable Power Supplies (Rack Mounted)

Each communication room will be provided with a rack mounted UPS system. The UPS will provide battery backed power to all essential rack mounted equipment. Each UPS will have a capacity of 3kVA and will be provided with 30 minutes battery autonomy (10 year design life), to be confirmed by School ICT stakeholder.

6.14 Fans

Ceiling fans will be provided based on the EFSG requirements and user group workshop meetings and architectural data sheets. Where required, one 1420mm diameter fan (or similar) will be provided every 25m^2. Fans / groups of fans (4 maximum) will be provided with speed / timer controllers as per the EFSG requirements.

Ceiling fans will **not** be provided in the following areas:

- Rooms less than 12 sq.m. (provide oscillating wall fan in lieu of the ceiling fan)
- Food service units

- → Small rooms where lighting flicker effect from the blades may occur
- → Where dust nuisance could be exacerbated
- → Over bandsaws or disc sanders in Materials (Wood) Technology
- → Close to fume cupboards in science laboratories and science preparation rooms
- → Ceiling spaces subject to ball damage
- → Spaces with ceiling heights of less than 2700 mm (provide oscillating wall fan in lieu of the ceiling fan)
- → Where only one luminaire can be installed (provide oscillating wall fan in lieu of the ceiling fan)

Fans will be evenly distributed within the required rooms and positioned to avoid light flicker.

6.15 Electric Heating

Electric heating will be provided in each accessible bathroom. This will typically be in the form of an electric heat lamp / light. All electric heaters will be provided with timer control as per the EFSG requirements.

6.16 Lighting (Internal and External)

Lighting will be provided to internal and external building areas as required by the EFSG. Energy efficient LED lights will be used wherever possible to ensure general efficiency and low maintenance of the lighting installation. Detailed liaison will be required with the Architect to ensure that the light fitting selection meets the architectural design intent and aesthetic requirements for each space. Any required feature lighting is to be specified / designed by the architect for incorporation into the electrical drawings.

The luminaires and lighting design will achieve the requirements of AS1680, the EFSG and SG951.

6.17 Lighting Control System (DALI)

An intelligent fully addressable, programable DALI lighting control system will be provided throughout the school. The lighting control system will include timer control, motion detector control, daylight harvesting, dimmer control, manual control etc. The lighting control system will operate independently of the period bell alarm.

The lighting control system will achieve the functionality outlined in the EFSG and SG951 for each room type.

6.18 Emergency Lighting and Exit Signs

A computer monitored / maintained emergency lighting and exit sign system will be provided. The system will allow for automated testing of all installed fixtures and will produce test reports identifying any fixtures that have failed the required tests. The system will be designed to meet the requirements of the National Construction Code (NCC) and AS 2293.

Emergency lights within plant rooms, fire stairs, back of house areas etc. will typically be integrated into the general use luminaire (LED emergency batten). Separate emergency luminaires will be used where the general use luminaire is not available as an emergency fitting. Exit signs will be surface mounted type.

Emergency lights in front of house areas will typically be recessed ‘spitfire’ type luminaires and ‘edge lit’ type exit luminaires.

Exit luminaries will use the “running man style” green/white pictorial. All fixtures will be self-contained type with integral battery packs.

6.19 Lead-in communication cabling pathways

The lead in communications network services will include provision of two (2) 100mm dia PVC lead in conduits reticulated from the boundary pit to the main communications room.

Final selection of lead-in services to be confirmed during detailed design.

6.20 Fibre to the Premises (FTTP) Infrastructure (NBN)

A Fibre To The Premises (FTTP) system will be provided to enable the school to connect to the NBN (or a similar provider). The school will be required to initiate and enter into a contract between themselves and the telecommunications carrier before any lead-in cabling infrastructure will be installed or any telecommunications services be provided.

As a basis for infrastructure allowances and spatial allowances, communications services detailed will be based on regulations which stipulate NBN Co as the service provider. The final scheme will need to be reviewed and approved by the private provider selected by the client prior to installation.

6.21 Structured Communications Cabling System

The main communications room will be located on ground level (final location to be confirmed). A building / floor communications room will be provided on every floor of each individual building. Buildings joined only by roofs or at corners will be considered separate buildings, buildings joined by common slabs will be considered a single building. In some instances, individual floors may require the installation of additional communication rooms to ensure that the horizontal data cabling lengths do not exceed 90m.

The structure communications cabling system will be installed in a star topology, with each data outlet connected directly to the corresponding floor communications room (no consolidation points). The system will include the following typical components:

- Communication racks including power distribution units, patch panels, cable management etc.
- Patch / fly leads
- Fibre backbone cabling (OS2 9/125 single mode)
- Copper horizontal cabling (Cat 6A low smoke zero halogen)
- Cable containment systems
- Data outlets (RJ45)

The communication system will be designed in accordance with the EFSG and the DoE Structured Cabling System Specification Version 1.2 (June 2020). Data outlets will be provided to suit nominated equipment, the EFSG requirements, user group workshop meetings and architectural drawings / data sheets.

6.22 Voice Over IP (VoIP) System Cabling

Data outlets will be provided for VoIP phones in locations nominated by the DoE ICT stakeholders. Each VoIP location will be provided with a single data outlet. All VoIP phones are to be supplied by the DoE and installed by the electrical contractor. All rack mounted active VoIP equipment shall be supplied and installed by DoE.

6.23 Wireless Access Point (WAP) Cabling

Data outlets will be provided for power over ethernet wireless access points in locations nominated by the DoE ICT stakeholders. Each wireless access point will be provided with a double data outlet. All wireless access points are to be supplied by the DoE and installed by the electrical contractor.

6.24 MATV / PAYTV system

Requirements for a MATV / PAYTV system are to be confirmed with DoE.

6.25 Electronic Access Control System (ECAS)

Electronic access control will be provided at doors nominated in the Department of Education School Security Unit briefing document (site specific). The system will include the following typical components:

- Proximity card readers
- Electric door locks
- Door Release Buttons
- Break Glass Units
- Door Controller units

Door controllers will typically be installed within the communication rooms.

6.26 Intruder Detection System (IDS)

Intruder detection will be provided at doors and areas nominated in the Department of Education School Security Unit briefing document (site specific). The system will include the following typical components:

- Passive Infrared Detectors (both caged and non-caged)
- Door reed switches
- Screamers
- Arm/Disarm Keypads
- Controllers

Controllers will typically be installed within the communication rooms.

6.27 Video Intercom System

Video intercom panels will be provided at doors nominated in the Department of Education School Security Unit briefing document (site specific). The system will provide full duplex audio and one-way video communication between all call points and the master intercom panel located at the reception desk. The system will be interfaced with the Electronic Access Control System where required to allow remote door release functionality.

6.28 CCTV System

CCTV coverage will be provided in areas nominated in the Department of Education School Security Unit briefing document (site specific). The system will include the following major components:

- IP addressable CCTV cameras
- Power Over Ethernet Switches
- Network Video Recorder (NVR)
- Video Management System (VMS)
- Security monitors

Head end equipment will be located within the communication rooms.

6.29 Assistance Required Call System

An assistance required call system will be provided within each accessible bathroom. Upon activation of an assistance required call button, the system will notify a master control station located at the reception desk as well as activate the local external buzzer and pilot light. The master control station will be provided with a floor layout plan indicating the location of all call assist points and if any have been activated.

The accessible bathroom panels will be wall mounted in an easily accessible location near the toilet pan.

6.30 Period Bell and Public Announcement Speaker System

A period alarm bell and public announcement system will be provided throughout the school (internal and external areas). All speakers will be linked back to a central control system located at the reception desk. The system will be programmable and allow for the automatic scheduling of the period alarm. Public announcements will be made via a microphone located at the reception desk.

6.31 Photo Voltaic System

The electrical contractor will be required to engage a specialist designer / installer to complete the detailed design of a photo voltaic system for the site. The system will be designed and sized in accordance with the EFSG requirements. The system will be provided with a zero export device and shall be installed in accordance with Ausgrid requirements and AS4777.

6.32 Earthing and Bonding System

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

6.33 Lightning and Surge Protection

A risk assessment will be conducted based on the relevant standards to determine if a lightning protection system is recommended.

Should a lightning protection system be required, the system will be based on the Faraday cage principle complete with air terminations, down conductors and an earth electrode system. Steel columns where available will be used as down conductors whenever practical. Where a conventional steel reinforced concrete structure is used, steel reinforcing may be used as the down conductor provided proper bonding between steel rods is used. The steel reinforcement in basement floor slabs will be connected into the earthing system. Earthing electrodes will be used to supplement the above, or used

where connection to structure is not practical. Test points for checking the installation earth resistance will be incorporated in accessible locations.

Surge diversion will be installed at the main switchboard on the incoming supply. Surge diversion will also be provided on individual circuits serving critical equipment (such as communication racks) and for any copper communications cables entering building using surge diverter modules. Surge diverter modules will have LED status indicator lights and all outlets connected to surge protected circuits will be easily identifiable through labelling or colour coding.