

Report

Building Services Concept Report

LEARNING HUB - DETAILED DEVELOPMENT APPLICATION

Loreto School, Kirribilli

Report

CONFIDENTIAL

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1 EXECUTIVE SUMMARY

1.1 Purpose

The purpose of this report is to provide a high level concept for the building services for the proposed new Learning Hub building at Loreto School in Kirribilli, Sydney. It is proposed that this report is developed during the conceptual stage leading up to the Detailed Development Application for the building.

1.2 Authority

Authority to undertake this report was provided by Cian Fitzgerald of Artazan Property Group based on our fee proposal dated 4th July 2016.

1.3 Key Issues

On the basis of our review of the architectural concept documentation and the existing building infrastructure via available as-built documentation and site inspections, the following items have been identified as key issues that will need to be addressed as part of the proposed development:

Electrical Services

- Due to the inaccuracy and lack of as-built services documentation, a detailed survey of the proposed development area is required to locate any existing inground services. Existing services may be required to be rerouted to retain connections to other buildings on site and for future accessibility.

Hydraulics Services

- Further survey works of the domestic cold water, sanitary and stormwater infrastructure are required to confirm the details and capacities of the systems.

Fire Protection Services

- The requirements of the fire protection systems will be determined by the finalised BCA report. The fire protection services will also be subject to fire engineering requirements.



2 BACKGROUND

2.1 Information Sources

- Services master plan report undertaken by NDY.
- As built documentation supplied by Loreto Kirribilli.
- Architectural conceptual documentation received to date.

2.2 Revision History

Revision Number	Date Issued	Comment
P01	15 November 2016	Preliminary draft for discussion
P02	15 December 2016	Updated preliminary draft for discussion
P03	27 March 2017	Draft
P04	11 July 2017	Draft
P05	21 July 2017	For SSD Submission

3 MECHANICAL SERVICES

The following outlines the mechanical services for the proposed new Learning Hub at Loreto School in Kirribilli, Sydney.

Mechanical services covered in this report are listed below:

- Ventilation;
- Air conditioning;
- General exhaust; and
- Kitchen exhaust.

3.1 Concept Summary

Based on the architectural plans received to date, the following mechanical services are to be provided to serve the new Learning Hub:

- Outside air system;
- Return air system;
- Variable Refrigerant Flow (VRF) air conditioning system;
- Commercial kitchen exhaust;
- Make-up air to the kitchen;
- Spot-cooling and heating within the kitchen (if required); and
- A building management controls system (BMCS).

It is noted that the air conditioning and ventilation concepts are provided on the basis that motorised outside air intake louvers (documented by the Architect) are provided as part of the mixed-mode natural ventilation strategy in certain areas of the school.

3.2 Description of Concept

The air conditioning and ventilation concept consists of a mixed-mode air conditioning and ventilation system. In summary, during periods of favourable outside air temperatures the mechanical air conditioning and outside air systems will shut off to the perimeter rooms and motorised louvers on the facade of the building will open to allow outside air to enter the perimeter rooms (forced via the exhaust system) providing ventilation to the space. During adverse outside air temperatures the louvers will remain shut and the mechanical systems will be utilised to provide air conditioning, outside air and exhaust to the various spaces within the building. Details of each of the systems to be provided are described below.

3.2.1 Air Handling Systems

A mechanical outside air system will be provided that will comprise of an outside air louvre (proposed to be located on the facade of the top level of the Learning Hub), a heat exchange air handling unit (in the mechanical plantroom) and a duct riser reticulating from the outside air louvre to all levels of the Learning Hub. Ducts will reticulate outside air to each VRF fan coil unit from takeoffs from the outside air riser on each level.



3.2.2 Natural Ventilation Elements

Motorised outside air louvers (documented by the Architect) will be provided to suitable rooms on the perimeter of the Learning Hub. These louvers will interlock with the mechanical ventilation and air conditioning systems so that these rooms can utilise natural ventilation when outside air conditions allow as a means of saving energy and reducing running costs.

It is proposed at this stage that the following rooms may be able to incorporate natural ventilation, pending design development, final architectural design and acoustic advice:

Level	Room
Lower Ground 1	PDHPE Learning Area
Lower Ground 2	-
Lower Ground 3	Studio Food Technology Food Technology Kitchen
Lower Ground 4	Studio Jewelry Studio Woodwork Woodwork workshop
Ground Level	Studio Design Robotics Presentation Circulation / Open Collaboration
Level 1	Studio Design / Art Studio Textiles Workshop Design Circulation / Open Collaboration
	Plantroom Circulation / Open Collaboration

3.2.3 Studio Food Technology and Food Technology Kitchen

Two (2) kitchen learning areas, the Studio Food Technology / Design and Food Technology Kitchen, are proposed for the Learning Hub. The conceptual spatial advice provided has been based on the Food Technology Kitchen needing to meet the requirements of a commercial kitchen; pending the final layout and usage of this space the services requirements of this room may be able to be reduced in the design stage.

In the Food Technology Kitchen it is proposed that kitchen exhaust hoods will be provided above each cooking surface and these are proposed to be ducted to a kitchen exhaust air riser that will reticulate from the kitchen through the building vertically to exhaust at roof level.



Make-up air to the Food Technology Kitchen is proposed to be provided in the form of outside air via high-level louvers on the facade of the Learning Hub.

✎ Spot cooling and heating could be provided to work areas within the kitchen to improve the comfort within the space.

3.2.4 Building Management and Control System (BMCS)

A building management and control system (BMCS) will be provided to the Learning Hub to monitor and control all of the mechanical systems installed. The detailed requirements of the BMCS will need to consider the master plan for the site with regards to having one (1) central system capable of monitoring all buildings on the site from one central location.

Given that the Learning Hub will form the first stage of the proposed site-wide development, it is proposed that the BMCS solution incorporate a web-interface such that the facilities manager can access the BMCS from the facilities management office or other laptop or computer with an internet connection. The options and preferred method are to be defined in the design stage.

3.2.5 Toilet Exhaust System

A toilet exhaust air riser will be provided to exhaust air from amenities areas within the building in accordance with the required codes and standards.

3.2.6 Woodwork / Metalwork System

A dust extract system is proposed to be installed to serve the new woodwork and metalwork rooms on Lower Ground 4 of the Learning Hub.

An Image of a potentially suitable product from Micronair Dust Control (the Vibraclean VC4) is shown overleaf in Image 3.1. It is noted that the suitability of the proposed product will be subject to detailed design and the final requirements of the woodwork and metalwork rooms.



Image 3.1 – Example image of the Micronair Dust Control Vibraclean VC4 model.



3.2.7 Design Standards

The mechanical systems are proposed to be designed in accordance with the following standards. Confirmation of all design standards and revisions will be required from the BCA consultant prior to design commencing.

- National Construction Code (NCC) section J; and
- AS/NZS 1668.

The relevant revisions of the design standards and NCC will need to be advised by the BCA consultant.

3.3 Spatial Requirements

The following spatial requirements will need to be allowed for by the Architect and provided for the above services:

Mechanical Services	Location	Approximate Spatial Requirement
Heat exchange Air Handling Unit (AHU)	Plantroom – top floor	3m wide x 2m deep x 2m high
Outside air riser	Reticulated vertically from AHU to lowest floor	800mm x 800mm
Return air riser	Reticulated vertically from AHU to lowest floor	800mm x 800mm
VRF condenser units	Plantroom (louvred) or outside – top floor	10m x 5m* footprint, minimum height 2.75m
Kitchen exhaust riser	Continuous vertical riser from kitchen to roof of building	1,500mm x 1,500mm
Kitchen make up air louvres	Façade of semi-commercial kitchen at high level	Approximately 5m ² of total louvre area
Ceiling space allowance for ductwork, fan coil units, refrigerant pipework, return air path etc.	Each floor	900mm ceiling void height
Toilet exhaust air riser	Reticulated vertically from lowest level amenities to roof	Pending BCA report and number of amenities
Woodwork / metalwork exhaust system	Located outside on the ground level of the Learning Hub (exterior to the woodwork room)	950mm x 950mm x 4,000mm

*It is noted that multiple orientations of units are possible that can modify the length and width dimensions of the required plant area. Should the units be located outside instead of in a louvred plantroom, the required footprint may be able to be reduced.



It is noted that all of the above spatial requirements are conceptual only, final space requirements will be determined in the design phase.

3.4 Further Information Required to Develop Concept

The following information is required to be provided in order for the mechanical services concept to be further developed:

- Finalised BCA report;
- Confirmation of location and number of amenities;
- Dust extract requirements of the proposed woodwork and metalwork appliances;
- Details of the proposed commercial kitchen; and
- Further details on the proposed architectural drawings including general arrangement plans.



4 ELECTRICAL SERVICES

The following outlines the electrical services for the proposed new Learning Hub at Loreto Kirribilli, Sydney.

Electrical services covered in this report are listed below:

- Low voltage power distribution; and
- Lighting.

4.1 Concept Summary

Based on the architectural plans received to date, the following electrical services are to be provided to serve the new Learning Hub:

- Supply from Main Switchboard to the new Learning Hub;
- Distribution boards for the new building;
- Metering;
- Low voltage cabling;
- General and dedicated equipment power installation;
- Energy efficient lighting installation and emergency lighting; and
- Lighting control system.

4.2 Description of Concept

Main Switchboard

The existing main switchboard (MSB) was upgraded in 2013 and has service protection device installed. Based on preliminary estimated maximum demand calculations, the existing main switchboard capacity is adequate for the proposed works and no upgrade works to the MSB is anticipated.

The existing main switchboard (MSB) will be utilised to service the new Learning Hub. New circuit breaker will be installed to service the new building.

Main Distribution Board

A new main distribution board (MDB) will be provided for the Learning Hub located on the Ground Floor of the building. The final switchboard location is subject to the submain cable reticulation into the building and will be determined as part of the subsequent design development.

The MDB will serve local distribution boards throughout the new Learning Hub building and safety services via dedicated “Safety Services” bus section.

Power supplies to relevant fire and lift services will comply with the requirements related to these services in AS/NZS 3000 and AS 1670, and where required will be provided with appropriate battery back-up.

Distribution Boards

Distribution boards (DB's) will be provided throughout the Learning Hub on each floor level for the efficient management of power distribution throughout the facility.

Distribution boards will comply with the requirements of AS/NZS 3000 and be provided with split power and lighting chassis.



RCD protection will be provided to outgoing power and lighting final subcircuits to AS/NZS 3000 requirements.

Metering

Energy monitoring will be provided consistent with Section J (Part J8) requirements of the National Construction Code (NCC).

Digital power analyser (DPA) will be utilised to separately monitor specific loads/load groups including:

- Separate metering of general power and lighting.
- Mechanical services switchboard.
- Lift
- Safety services.

Low Voltage Cabling

New low voltage cabling including submains and final distribution subcircuit cabling will be provided from the designated point of supply (main switchboard or distribution board) to the respective building facilities.

All submains will be XLPE/PVC except where safety services may require fire rated cabling. Submains cabling will be sized for the calculated maximum demand and selected to meet the requirements of AS/NZS 3008.1.1.

Cable selections will be determined as part of subsequent design development and associated final equipment selections, load requirements and circuit routing (and hence voltage drop).

Cabling will be reticulated via cable trays or ladders in electrical risers and via catenary reticulation throughout the building.

Power Outlets

General purpose power and outlets (GPO's) will be provided throughout to suit briefed and user requirements and otherwise consistent with industry standards.

Special purpose power outlets will be provided as required to suit specific equipment installation and layout requirements.

All mechanical services plant and equipment, hydraulic services equipment and fire detection services systems will be provided with dedicated submains and subcircuit wiring as appropriate.

General Interior Lighting

General interior lighting will be provided throughout the building compliant with AS/NZS 1680 requirements and the requirements of the National Construction Code (NCC), and in particular Section J, Part J6 requirements.

Local light switches will be provided for operation of lighting with motion detectors where practical.

Energy efficient fluorescent or LED lighting will be utilised to minimise energy consumption. Luminaires will be provided with high frequency low loss electronic ballasts.

Perimeter security lighting will be time clock and photoelectric (PE) cell controlled.



Emergency Evacuation Lighting

A system of emergency lighting and emergency exit signage will be provided throughout for emergency evacuation purposes and compliant with National Construction Code (NCC) and AS/NZS 2293 requirements.

Emergency evacuation lighting will be of the single point type with integral battery charger/battery packs employed to provide a minimum of 2 hours battery back-up power.

Manual test switch facility will be provided at local distribution boards.

Existing Gymnasium Extension

The existing under stair store housing Gymnasium switchboard will be demolished and a new switchboard cupboard is proposed to house a new switchboard.

4.3 Spatial Requirements

The following spatial requirements will need to be allowed for by the Architect and provided for the above services:

Electrical Services	Location	Approximate Spatial Requirement
Main Distribution Board	Dedicated cupboard on the Ground Level. The final switchboard location is subject to the submain cable reticulation into the building and will be determined as part of the subsequent design development.	1600Wx500D switchboard. 1400 clearance to the front. 200 clearances to each side.
Floor Distribution Boards	Dedicated riser cupboard on each floor (Levels C-F).	1600Wx300D switchboard. 1400 clearance to the front. 200 clearances to each side.
Floor Distribution Boards	Dedicated riser cupboard on each floor (other levels).	800Wx300D switchboard. 1400 clearance to the front. 200 clearances to each side.
Gymnasium Distribution Board	Dedicated cupboard under stair in Gymnasium.	800Wx300D switchboard. 1400 clearance to the front. 200 clearances to each side.

4.4 Further Information Required to Develop Concept

The following information is required to be provided in order for the electrical services concept to be further developed:

- Survey of existing underground service reticulation in the proposed development area;



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- Building Surveyors report; and
 - ESD options to be implemented.



5 HYDRAULIC SERVICES

The following outlines the hydraulic services for the proposed new Learning Hub at Loreto School in Kirribilli, Sydney.

Hydraulic services covered in this report are listed below:

- Domestic hot and cold water;
- Sanitary drainage;
- Tradewaste drainage; and
- Roofwater.

5.1 Concept Summary

Based on the architectural concepts received to date, the following hydraulic services are to be provided to serve the new Learning Hub:

- A connection to new / existing site Water infrastructure to serve the proposed development;
- A connection to new / existing site Sewer infrastructure to serve the proposed development (including tradewaste); and
- A connection to new / existing site Stormwater infrastructure to serve the proposed development.

5.2 Description of Concept

5.2.1 Domestic Hot and Cold Water

A water connection will be extended from new / existing site infrastructure to serve the amenity areas, cleaners sinks and commercial kitchen, within the proposed development.

As outlined in the previously issued masterplan report, further survey works are required on the existing infrastructure to confirm the details and capacity of the system. The outcome of this survey will confirm if the existing infrastructure will have sufficient capacity to serve the proposed building. Notwithstanding this, it is likely the existing infrastructure will have sufficient capacity to serve the proposed building.

Centralise electric hot water plant will be provided to serve the amenity areas, cleaners sinks and commercial kitchens.

It is noted that during this conceptual stage of the project preliminary pressure and flow enquiries were submitted to the local authority (Sydney Water) to understand the capacity of the towns mains infrastructure serving the school. The pressure and flow enquiries for each of the two (2) towns mains on either site of the Loreto Kirribilli School site had the following main pressure results:

Street Name	Minimum Permissible Pressure (metres head)	Maximum Permissible Pressure (metres head)
Elamang Avenue	58	117
Carabella Street	36	95



5.2.2 Sanitary drainage

A sanitary drainage connection extended from new / existing site infrastructure will serve the amenity areas, cleaners sinks and commercial kitchen within the proposed building.

As outlined in the previously issued masterplan report, further survey works are required on the existing infrastructure to confirm the details and capacity of the system. The outcome of this survey will confirm if the existing infrastructure will have sufficient capacity to serve the proposed building. Notwithstanding this, it is likely the existing infrastructure will have sufficient capacity to serve the proposed building.

The location of the existing Sydney Water sewer infrastructure needs to be reviewed against the location of the proposed building to confirm no negative impact to the Sydney Water sewer.

A Sydney Water Co-ordinator (SWC) should be engaged to advise the extent of works required / limitations on the site as a result of the authority mains running through the property.

A new external in-ground Grease Arrestor to be provided to treat the waste from the commercial kitchen.

5.2.3 Roofwater

Roofwater drainage connections will be extended from new / existing site infrastructure to drain the proposed building.

The civil engineer to confirm the location of the roofwater connection points, into the infrastructure.

5.3 Spatial Requirements

The following spatial requirements will need to be allowed for by the Architect and provided for the above services:

Hydraulic Services	Location	Approximate Spatial Requirement
Hot water plant	Local to amenity core, on upper or lower levels.	10m ²
Domestic cold water Booster pump	Ground level, Local to amenity core.	10m ²
Grease Arrestor	Ground level, external, In-ground	10m ²

5.4 Further Information Required to Develop Concept

The following information is required to be provided in order for the hydraulic services concept to be further developed:

- Confirmation on the existing Water and Sewer infrastructure;
- Details of the proposed commercial kitchen; and
- Further details on the proposed architectural drawings.



6 FIRE PROTECTION SERVICES

The following outlines the fire protection services for the proposed new Learning Hub at Loreto School in Kirribilli, Sydney.

Fire protection services covered in this report are listed below (subject to BCA report):

- Fire Sprinkler System;
- Fire Hydrant System;
- Fire Hose Reel System;
- Sound System and Intercom System for Emergency Purposes;
- Fire Detection System; and
- Portable Fire Extinguishers.

6.1 Concept Summary

Based on the architectural concepts received to date, the following fire protection services are to be provided to serve the new Learning Hub:

- Fire Hydrant System in accordance with NCC 2016 Clause E1.3 and AS 2419.1 - 2005
- Fire Sprinkler System in accordance with NCC 2016 Clause E1.5 and AS 2118.1 – 1999 and AS 2118.2 - 2012
- Fire Hose Reel System in accordance with NCC 2016 Clause E1.4 and AS 2441 – 2001
- Portable Fire Extinguishers in accordance with NCC 2016 Clause E1.6 and AS 2444 – 2001
- Fire Detection System in accordance with NCC 2016 Spec. E2.2a and AS 1670.1 – 2015
- Sound System and Intercom System for Emergency Purposes in accordance with NCC 2016 Clause E4.9 and AS 1670.4 - 2015

6.2 Description of Concept

Fire Sprinkler System

The fire sprinkler system will be provided throughout the building in accordance with the BCA report by Steve Watson and Partners Rev 1.1 dated 1.12.16.

Fire Hydrant System

The fire hydrant system for the building will need to be located in the fire stairs and supplementary hydrants located throughout the building to achieve compliant fire hydrant coverage to the building. The hydrant system will need to be feed from the existing site ring main that is connected to the existing booster system.

Fire Hose Reel System

The fire hose reel system for the building will be fed from the fire hydrant system and be located throughout the building as required to achieve compliant coverage.

Portable Fire Extinguishers

Portable extinguishers are to be located in accordance with AS 2444 – 2001 throughout the building.



Fire Detection System

The fire detection system shall be located throughout the building in accordance with AS 1670.1 – 2015 spacing requirements. The detectors will all signal back to a fire indicator panel to be networked to the existing main campus fire indicator panel.

The fire detection system will be interfaced with the sound system to initiate the building warning system.

Sound System and Intercom System for Emergency Purposes

The sound system shall be located throughout the building in accordance with AS 1670.4 – 2015 and shall be initiated automatically by the fire system and also have the capability to be manually initiated at the panel.

6.3 Spatial Requirements

The following spatial requirements will need to be allowed for by the Architect and provided for the above services:

Fire Protection Services	Location	Approximate Spatial Requirement
Fire Hydrant Riser	Fire Stairs	150mm diameter
Fire Hose reel cupboard	Throughout the building	800w x 1200h x 400d
Fire Extinguisher cabinet	Throughout the building	300w x 600h x 250d
Fire Services Tank	Location TBA	124,000 liters (124m ³ , approximately 6.2m x 10m x 2m or equivalent)



7 VERTICAL TRANSPORTATION SERVICES

The following outlines the vertical transportation services for the proposed new Learning Hub at Loreto School in Kirribilli, Sydney.

Vertical Transportation services covered in this report are listed below (subject to BCA report):

- Learning Hub Passenger Lift No. 6
- Vertical Connection Passenger Lift No. 7

7.1 Concept Summary

Based on the architectural concepts received to date, the following vertical transportation services are to be provided to serve the new Learning Hub. Lift Services design in accordance with:

- NCC 2016 Clause E3.6
- NCC 2016 Specification E3.1
- AS 1735

7.2 Description of Concept Lifts

The following outlines the preliminary lift details and requirements:

Item	Requirement
Type	Machine-Roomless (MRL) Passenger Lift
Control	Conventional
Capacity	1,350kg (18 passenger)
Speed	1.0m/s
Levels served	7 levels
Car size	1400mm wide x 2000mm deep x 2300mm high
Entrance detail	1100mm wide x 2200mm high (two piece centre opening)
Lift features	Stretcher facility Security access control Accessible control features Onsite lift monitoring



7.3 Spatial Requirements

The following spatial requirements will need to be allowed for by the Architect and provided for the above services:

Item	Dimensions
Liftwell plan clear dimensions	2500mm wide x 2500mm deep
Overrun height	3800mm
Pit depth	1600mm

7.4 Further Information Required to Develop Concept

The following information is required to be provided in order for the vertical transportation services concept to be further developed:

- BCA Report from the certifier.
- Access consultant report.
- Architectural detail of vertical connection spaces.



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