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SSDA REPORT
ALL SERVICES
NORTHSIDE PRIVATE HOSPITAL
GOSFORD

Job Number: 219004

Prepared by:

DSA Consulting
ABN: 82 613 850 598
Suite 10, 82-86 Pacific Highway
St Leonards NSW 2065
Ph: 02 9436 3500 Fax: 02 9437 0890
Email: dsaconsulting@dsaconsulting.com.au
Email: www.dsaconsulting.com.au

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Key Contact	Hoi Choy
Client	DCWC

Prepared by

Company	DSA Consulting
Address	Suite 10, 82-86 Pacific Highway, St Leonards NSW 2065
Phone	61-2-9436 3500
Fax	61-2-9437 0890
Email	david.shreeve@dsaconsulting.com.au
Website	www.dsaconsulting.com.au
Author	David Shreeve, Ian Murray, Leon Gower, Rob Post
Checked	DS
Authorised	DS

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Table of Contents

INTRODUCTION

This report outlines the services requirements for the Northside Private Hospital at Gosford. This report allows for a staged redevelopment of the site including:

- **Stage 1** – the demolition of the existing buildings and a built form development application for a part 11 storey, part 5 storey building with 2 basement levels and a lower ground floor level. Stage 1 will consist of in-patient units, general practitioner clinics, radiology rooms, pathology room, intensive care unit, operating theatres and ancillary retail. The basement levels will consist of parking, waste storage and loading dock.
- **Stage 2** – comprises a concept development application for a 4 storey building along Racecourse Road and is it is anticipated that it will be used for retail tenancy, ancillary tenancies and medical tenancies

Project Element	Development Particular
Site Area	10,180m²
Northside Private Hospital	23,783m²
Car Parking	389 car parking spaces
Inpatient Units	Total of 8 inpatient units comprising 224 beds
Building Height	49m
Floor Space Ratio	2.34:1
Primary Land Use	Health Services Facility ▪ medical suites; ▪ in-patient units; ▪ general practitioner clinics; ▪ radiology rooms; ▪ pathology room; ▪ intensive care unit; and, ▪ operating theatres.
Hours of Operation	▪ 24/7 operations ▪ Day surgery 7.00am to 7.00pm ▪ Retail Tenancy 8.00am to 6.00pm

MECHANICAL SERVICES

SYSTEM REQUIREMENTS

The air conditioning system is to be designed to conform with statutory guidelines and operational requirements. Providing a mechanical services system suitable for the internal fitout as a Class 9a Hospital Building.

STANDARDS AND REGULATIONS

The mechanical installation shall be subject to the following Standards and Regulations:-

- NSW Planning SSDA and CC conditions of Approval
- Building Code Of Australia (NCC 2016).
- AS 1668 Parts 2 (2015) and 2.(2012).
- AS 3666 Microbial Control.
- Local Supply Authority Requirements (Electrical) .
- AS 3000 Wiring Rules.
- AS 1055 Acoustics - Description and measurement of environment noise.
- AS 2107 Acoustics - Recommended design sound levels.
- AS 4254 (1995). (Ducting Standards).
- AS 4508 (Insulation Standards).
- AS 1851 Maintenance of Fire Protection Equipment.
- AS 1735 (2003) Lift Code.
- State Pollution Control Commission's "Environmental Noise Control Manual 1985".
- Occupational Health and Safety Act.
- Occupational Health and Safety Bulletin No.:081688/12 - Guidelines for the Control of Synthetic Mineral Fibres (SMF) in the Construction and Other Industries.
- Industry code of Practice for the staff use of Glass Wool and Rock Wool Insulation. 2001
- Work Safe Australia

GUIDELINES TO BE CONSIDERED

The following documents need to be considered when designing a hospital

- HB 260 Infection control
- Design Guidelines for Hospitals and Day Procedure Centres.
- Australian Health Facilities Guidelines (AHFGs)

STATUTORY REQUIREMENTS

The building is assessed under the BCA 2019 class 9a requiring the following provisions:-

- The new building to be provided with zone smoke control in-accordance with the BCA.
- Stair pressurization to AS 1668.1 (2015)
- Smoke exhaust to AS 14668.1 (2015)
- Ventilation to services rooms
- Toilets ventilation to AS 1668.2 (2012).
- Ventilation rates to all new areas with AS 1668.2 (2012)
- All system not engaged in smoke control operation will be provided with fire shut down.
- All systems to be installed in compliance with Section J BCA 2015.
- Ventilation rates to the operating theatres to AS 1668.2 (2012)
- Ventilation rates to the recovery rooms to AS 1668.2 (2012)
- Ventilation rates to the sterile stores to AS 1668.2 (2012)
- Ventilation rates to isolation rooms to AS 1668.2 (2012) , HB260 and AHFGs
- Ventilation rates to the dirty utility rooms to AS 1668.2 (2012)

- Cooling and Heating plant design in compliance with the operational requirements and the AHFGs.
- Essential air handling and essential services operated off the generator.

The building will be subject to the requirements of the BCA, the Local Council, Health Department and the Fire Brigade. Each of these authorities or documents have requirements which have an effect on the design of the building.

Firstly as the building is primarily a hospital the bulk of the building envelop would have a classification of 9A under the BCA. The other major portions of the building would be the admin area and consulting area which in themselves would have a classification of Class 5. We see that all floors of the building will be Class 9A except for stage 2 which would be Class 5.

The height of any building plays an important role in the services required. For this project, the building is over 25 metres and has additional implications of the BCA.

The building will be divided into fire and smoke compartments, with each of the smoke and fire compartments provided with smoke zone pressurisation. The BCA Table E 2.2 Class 9A, requires patient care areas higher than two levels from the ground floor, to be provided with zone pressurisation.

The Health Department and the Fire Brigade require the splitting up of the building into fire compartments of no greater than 2000sqm, each floor will be divided into two or three fire zones to achieve the required escape paths. In the patient care areas the fire compartments also need to be divided up into 500 sqm smoke compartments. To minimise the crossing of the smoke zones and the requirement for smoke dampers, the ventilation and air conditioning systems will be contained within individual fire zones.

Note that each fire zone is also a smoke zone.

As part of the Brigade's requirements in a hospital, the ducted air handling units are provided with smoke detectors in their return and supply paths to provided protection and to minimise the spread of smoke within the building.

The building requirements under the current BCA requirements will be provided with essential services and our assessment of these would include:-

- Fire dampers or sub ducts to all fire rated openings to AS 1668 and AS 1682
- The air conditioning being provided with minimum ventilation rates to AS 1668.2
- All systems within the building not being utilised in fire mode are shut down with the building fire trip.
- Smoke exhaust fans complete with fan fire control panel (FFCP) at the FDCIE (Formerly FIP) will be provided on each level. Motorised dampers will connect the smoke compartments on each level and operate to maintain a zone pressurisation system.
- Zone pressurisation in each smoke compartment complete with the air handling units utilised for the control provided with fan fire control at the FDCIE.

It is envisaged that the following will be provided to operate in smoke clearance pressurisation mode. Three off central smoke exhaust risers with subducts and roof mounted smoke exhaust fans. Subducts and air dampers provided to each fire compartment.

- Basement-1,2, and lower ground will utilise the car park exhaust system and car park supply system.

These fans will provide smoke exhaust to each compartment on the nine floors. Where ductwork for these systems pass through another fire zone they shall be fire rated.

Motorised dampers and horizontal sub ducts (where required) are to be utilised to control the operation of the system.

The air handling units and the outside air preconditioning units are to operate to provide the pressurised air in smoke mode for all floors:

- Basement-1: Medical record on this level is pressurised by the AHU that serves the areas for this level, and is located in basement-2 plantroom.

- Lower ground: Biomedical on this level is pressurised by the AHU that serves the areas for this level, and is located in basement-2 plantroom. Kitchen level is pressurised by the AHU that serves the areas for this level, and is located in lower ground plantroom.
- Ground level: This level is pressurised by the AHU that serves the areas for this level, and is located in the same level plantroom and in the Lower Ground Floor plant room. Including additional make up air from the façade.
- Level-1: The dedicated AHU that serve this ICU level and operating theatres, which is mounted in the level 2 plantroom is to pressurise this level.
- Level-2: The dedicated AHUs that serve the admin, CSSD and staff areas level, which are mounted in the level 2 plantroom are to pressurise this level.
- Level 2 Consulting's separate outside air system is to pressurize this area.
- Wards levels-4 to 8 are to be pressurised by the AHU's which are located in the plantroom at roof level.

Motorised dampers will be utilised for control of the system. These units are to operate in full outside air mode when providing pressurisation. Where ductwork for these systems pass through another fire rated zones they shall be fire rated.
Stair pressurisation is provided to each of the fire stairs through fans mounted at high level of the fire stairs complete with silencers feeding side shafts for each stair.
Each of these units are to be controlled from the FFCP at the FDCIE.

DESIGN PHILOSOPHY

Hospital air conditioning and ventilation systems are to be designed to be cost effective and suitable for the operating conditions required in the space, i.e. individual temperature control for patient and doctor comfort is to be provided.
The theatre plant is to be designed with the ability to maintain the conditions and operation of the theatre at all times including failure of the chiller or power failure. Hence, one of the chillers is to be powered from the generator complete with its associated pumps. On a failure of power supply or chiller, the chilled water system is to close the valves to the non critical areas, these being the wards. The intensive care unit (ICU) on level-1, CSSD on level 2, theatres suites and associated areas such as recovery areas on level-1 are to remain in operation on the reduced flow of water through the system. This is to be achieved by placing motorised valves in the take off from the risers to these areas.
Generally, the air conditioning system proposed are to be simple and effective minimising complicated systems, a Building Monitoring and control system would be provided to automate the control of the mechanical services.

The air conditioning system shall be designed to achieve the following:

- The need to restrict air movement in and out of various departments.
- The specific requirements for ventilation and filtration to dilute and remove contamination in the form of odour, airborne micro-organism and viruses, and hazardous chemical substances.
- The need for different temperature and humidity requirements for various area.
- The need for sophistication in design to permit accurate control of environmental conditions within the theatre area.

DESIGN CRITERIA

The air conditioning systems to be designed to the following parameters to maintain comfort conditions in the conditioned spaces.

Outside summer	32.8^{o}C dB(dry bulb) 22.6^{O}C WB (wet bulb). Non Critical areas 37.6 oC dB 24.5 ^{0}C WB for the operating theatres and ICU

	All condensers shall be selected at 40°C
Outside winter	6 °C DB.
Inside summer	General 22.5°C +/- 1.5°C DB (with 50-55% room relative humidity used to determine the refrigeration load). Note humidity levels are not controlled theatres 18oC +- 1.0oC complete with humidity control 50%RH +-10%
Outside air	Spaces are to be provided with openings to meet the BCA F4.5 of 5% of the floor area, where this does not occur outside air will be provided in accordance with AS 1668.2 (2012)
Occupancy	ward spaces 1 person per bed • Wards 1 person per chair/bed • Office spaces 1 person per 10m2 • ICU 1 person per bed • Staff stations 3 people. • Corridor 1 person per 20m2 • Board Room 1 person per 2 m2 • Theatre 8 people per theatre • Staff Lounge 20 people • CSSD 8 people • Cafe 50 people • Recovery area 1 person per chair or bed. • Consulting/Exam room 1 person per chair (generally 3 people per room; One person per 6m^2) • Waiting rooms 1 person per 1.5m2 • Lounges 1 person per 1.5m2 • Consulting 1 person per 6 m2
Lighting	generally 10 watts /m2 and in accordance with the section J requirements. Theatre 900 watts
Internal Heat loads	ward rooms one TV 150 watts

Office areas	15 w/m2
Theatre	2 kW
Recovery beds	250 watts
ICU	500 watts per bed
Theatre	1,800 watts
Hybrid Theatre	7,700 watts
Hybrid Equipment	10,000 watts
Ultra sound	1000 watts
Xray	2,500 watts
CT scan	7,000 watts
CT scan control	2,700 watts
MRI Equipment	11,000 watts
MRI Scanner Room	4,600 watts
MRI Control Room	2,000 watts
CSSD Autoclave	1500 watts per door
CSSD Autoclave	1500 watts per cabinet
CSSD Low Temp Sterilizer	1,000 watts
CSSD Washer	1,700 watts
CSSD Dryer	1,200 watts

Outside air Requirements

	Wards	Min 10 l/s per person (sufficient outside air to be provided to make up the exhaust)
	Core	Min 10 l/s per person
	CSSD	Min 15 l/s per person
	Recovery	Min 10 l/s per person
	Consulting	Min 7.5 l/s per person
	Theatre	50%
	Note that sufficient outside air is to be provided within the building so that the overall building pressure is maintained as positive to the external condition.	
Filtration	Not less than AS 1668.2 Ventilation Requirements & AS 3666	
	Consulting	Min 20% Dust No1
	Wards	Min 30% Dust No1
	Recovery	Min 50% Dust No1
	Procedure	Min 50% Dust No1
	Theatre intermediate	Min 30% Dust No1
	Theatre Final	Min 99.97% Dust No 1
	Anaesthetic Final	Min 99.97% Dust No 1
	Sterile Store Final	Min 99.97% Dust No 1
	Isolation Rooms Exhaust	Min 99.97% Dust No 1
Toilet exhaust air	Not less than AS 1668.2 Ventilation Requirements Min10 l/s per square metre or 25 l/s per fixture Not less than 50 l/s per ensuite	
Theatre/procedure Exhaust air	Not less than AS 1668.2 Ventilation Requirements Min 40% of supply air per theatre at low level	
Dirty Utility Exhaust	Minimum exhaust 100 l/s or 15 l/s/m2 (note provide 70% air conditioned make up air to dirty utility to reduce heat)	
CSSD	Minimum exhaust 15 l/s/m2 (note provide a minimum of 70% air conditioned make up air to dirty utility to reduce heat)	
Recovery	Minimum Exhaust 4 l/s/m^2	
Ventilation	Minimum Air change per hour	
	• Storage	5 times
	• Garbage Room	30 times
	• Theatres	30-35 times
	• Recovery	101 times
	• Isolation	12 times
Air change rates for mechanical and electrical rooms shall be determined based on the heat dissipation of equipment inside. Temperature difference between inside and outdoor shall be maintained at a maximum of 8°C.		
Windows	In-accordance with section J requirements	
Wall R Value	In-accordance with section J requirements	
Roof R Value	In-accordance with section J requirements	
Floor R Value	In-accordance with section J requirements	
Noise Criteria	refer to acoustic specification by Acoustic engineer	

Noise Criteria

Area	NR
* Theatre	30
* Surgery and Critical Care	35
* Nursing Area	35
* Ancillary Area	40- 43
* Diagnostic and Treatment Area	38
* Offices	38
* Board room	35
* Carpark	50
* Staff Amenities	50
* Toilets and Change rooms	50

External Noise Levels shall not exceed the present boundary noise levels. Obtain boundary noise levels from the acoustic engineer. As a guide for design use AS 1055 Part 3 Appendix A Noise Category.

Other factors to be considered

Thermal Conductivity coefficient (K) for walls, floors and roof shall be calculated based on materials that will be used.

Heat dissipation data for lighting and different equipment to be obtained from result of electrical load calculation and inputs given by Owner.

ROOM CONDITIONS

Room Conditions.

Area	Room	Cond	Press Relation to adjacent area	Min total air change rate/ hour	Min O/A change rate/ hour	Air	Filter	Eff
	Temp (oC)	RH (%)				Filter 1	Filter 2	Filter 3
Surgical and Critical Care						**%**	**%**	**%**
Operating rooms	16-24±1°C	55±10	+ve	20	10	10	35	hepa
Procedure rooms	20±1°C	55±10	+ve	20	5	50	50	Hepa
Cath Lab	20±1°C	55±10	+ve	20	5	50	50	hepa
Recovery rooms	22±1.5°C	NC	+ve	10	2	30		
Theatre suite	22±1.5°C	NC	+ve	6	2	30		
Sterile setup	22±1.5°C	NC	+ve	6	2	30		hepa
Delivery rooms	21.5±1.5°C	NC	bal	10	5	50		
Nursery	22-25±1.5°C	NC	+ve	6	2	50		
Nursing area								
Patient ward	22±1.5°C	NC	bal	6	2	30		
Intensive care	22±1.5°C	NC	+ve	6	2	30	50	
Staff Station	22±1.5°C	NC	+ve	6	2	30		
Isolation Rooms	22±1.5°C	NC	+ve	12	2	30		Exh-hepa
Patient corridor	23±1.5°C	NC	bal	2.5	2	30		
Toilets	26±2°C	NC	-ve	10	2	30		
Ancillary areas								
Radiology	22±1.5°C	NC	bal	6	2	30		
Pharmacy	22.5±1.5°C	NC	+ve	6	2	30		
Diagnostic & Treatment								
Treatment room	22.5±1.5°C	NC	bal	6	2	30		
Examination room	22.5±1.5°C	NC	bal	6	2	30		
Medication room	22.5±1.5°C	NC	bal	6	2	30		
Waiting room	22.5±1.5°C	NC	bal	6	2	30		
Imaging room	22.5±1.5°C	NC	bal	6	2	30		
Sterilizing and Supply								
Sterile Store	21±1.5°C	70	+ve	10	2	30		hepa
Sterilizer room	30±3°C	NC	-ve					
CSSD	20±1.5°C	NC	+ve	6	2	30	50	
Decontamination	22±1.5°C	NC	-ve	15l/s/m2	8	30		
Service								
Clean linen	23±1.5°C	NC	bal	6	2	20		
Dirty linen	25±3°C	NC	-ve	10	10			
Office/admin	22.5±1.5°C	NC	bal	6	2	20		
Board Room	22.5±1.5°C	NC	bal	6	2	20		
entry foyer	24±1.5°C	NC	+ve	4.5	1	20		
Kitchen	24±1.5°C	NC	-ve	4.5	1	20		

NC Not controlled Filters efficiency to dust spot test Ashrae 52-76, Hepa high efficiency particle arrestance 99.97% efficiency.

SYSTEM DESIGN

The CSSD Level (Level-2)

The CSSD area is to be provided with 3 separate chilled water air handling units mounted adjacent to the room and in the theatre plant room and connected into the central chilled and hot water systems. The units are to be provided with individual temperature control. The CSSD is also be provided with an exhaust system to remove the heat from the sterilizers and the steam liberated during the cleaning process. The exhaust system is to be sized at 15l/s per square metre in the decontamination area, whilst the air conditioning is to be designed to cater for an expected equipment load of 10,000 watts. CSSD will be provided with exhaust in the decontamination area at 110% of the air conditioning supply air to maintain a negative pressure to this space. The autoclave will also be provided with exhaust to level-2 plant room toward court yard area. We propose that the exhaust from the decontamination area would be discharged into the steriliser plant room to allow additional cooling to this space, before being discharged to the roof of the building. Direct connection of exhaust vents from the disinfectors washers and dryers directly to the mechanical exhaust system. The CSSD autoclaves and washers are to be provided with steam from a steam to steam heat exchanger, as the primary steam is served from the existing steam boilers in the existing building. The interconnecting steam piping between boilers and equipment and the steam header in the sterilizer plant room is to be provided by the mechanical contractor, as are the vents off the CSSD dryer and washing equipment. Also the CSSD is to be provided with relief air fans to operate when the system is operating in economy outside air cycle mode. These relief air fans will also operate as a smoke exhaust fan.

The cooling of the sterilizes drainage cycle will be carried through the central chilled water plant by supplying chilled water through the proprietary heat exchanger of each steriliser. Estimated drainage cooling requirement for each steriliser is 10 kW.

The equipment/dispatching area, and biomedical engineering will be provided with separate ceiling mounted ducted chilled water /heating water fan coil unit.

The pressure gradient in this area: CSSD Sterile store (++ve) → CSSD Packing / Loading / Dispatching (+ve) → CSSD Decontamination area (-ve). Note the Circulation area will be balanced.

The CSSD sterile store shall be provided with terminal HEPA filters.

Imaging (Ground Floor)

Imaging is to be designed with separate chilled water fan coils for each room, as central systems do not work due to the variety of equipment loads in the rooms. Waiting areas, administration and associated areas that serve the imaging area will be served off two common fan coil systems.

The installation for this department will be of cold shell type installation incorporating outside air ductwork, and chilled and hot water connections, without ductwork installation.

The MRI will be provided with quench pipe from the edge of the room and reticulated all the way to level-2 plant room on the eastern side of the building. The pipe size estimated at 350 mm diameter (for equivalence length of 100m) complete with 100 mm external insulation. Exhaust system will be provided for the MRI magnet (scanner) room, in event there is helium leakage in the space. No fan will be provided, but there will be only space provision made for an inline fan on the roof, and no ductwork reticulation will be carried out within the room. Regarding the cooling of magnet, this is again not part of the works, but chilled water pipework reticulation will be provided in the riser reticulated from the edge of the room where space provision will be made for a 50 kW air cooled chiller.

The operating suites (Level-1)

The Operating suite is to be provided with chilled /hot water air handling units. Each of these units is to be connected to the central chilled and hot water systems. An individual unit is to be provided for each theatre, with a separate unit serving the theatre suite, sterile stores, perioperative and recovery. The theatres and sterile stores are to be provided with filtered dehumidified and cooled air. Each theatre system is to be independently operated and capable of providing a selected temperature suitable for each surgeon. The air conditioning system in each theatre is to be provided with remote temperature reset. The units are to be provided with terminal Hepa filtration to provide a sterile environment. When designing the air distribution consideration is given to HB 260 to provide unidirectional flow, i.e. terminal hepa's located around the table. The control systems on each unit are to be capable of maintaining constant humidity in theatres designed to operate at 18-24^{o}C at 55% RH. Each of the theatres are to be provided with an exhaust system capable of removing 20% of the supply air in normal operation and to be also provided with a speed controller so the fan can relief all the extra air when the system is operating in outside air cycle mode. The units are to be sized to provide for a 75% recycle air and 25% outside air. Each of the air handling units are to be provided with automatic speed control of the evaporator fan to maintain constant air supply as the hepa filters dirty. This is to be controlled by velocity, so it remains constant as hepa filters build up pressure.
The whole of the theatre suite shall be pressure graded so that the flow of air conditioned air shall always be towards the dirty areas.
The scrub areas and clean up areas shall be provided with exhaust and supply sufficient to accommodate the equipment and people loads.
The sterile setup spaces within the theatre suite are to be provided with a higher pressure than the surrounding rooms complete with terminal hepa filters
The anaesthetic room is to be provided with low level exhaust to scavenge for spilled vapours. This can be connected to the adjacent theatre exhaust system. The anaesthetic rooms are served off the respective theatre's AHU complete with terminal heap filters.
The theatres, recovery and associated areas are to be provided with remote temperature reset. The recovery and theatre suite are to be provided with high grade filtration and relief fan when the system is operating in economy outside air cycle mode.
The equipment room for the hybrid theatre will be served from a standalone DX split computer room type floor mounted air conditioning system complete with full humidity control. The condensing set is mounted in the L2 plant room.
Stage-1 recovery is to be exhausted in accordance with AS1668.2 (2012). To compensate for this required exhaust air flow rate, the respective AHU for the recovery unit has to be provided with 100% outside air.
The AHUs are to be provided with relief air fans due to high outside air flow rate and for economy cycle.
The pressure gradient is this area: Sterile store (++ve) → Theatres and Anaesthetic rooms / Loading / Dispatching, and Recovery (+ve) → Theatres corridors (balanced).

General Wards (Level-4 to Level-8)

Wards are to be provided with chilled / hot water AHU's for centre and each perimeter zone from eastern and western side. The AHU's will be interconnected to the central chilled water plant and heating water plant on the roof of the building.

The ICU (level 1)

The ICU is to be provided with a chilled /hot water air handling unit. The unit is to be connected to the central chilled and hot water systems. The zonings will be achieved via high select control though reheat using the installation of heating coils for each zone. The unit is to be provided with remote reset of temperature and final filtration. Also the ICU is to be provided with a relief fan to operate when the system is operating in economy outside air cycle mode.

Isolation Rooms

Two isolation rooms would be provided in the ICU, as negative pressure rooms complete with terminal HEPA filtration, each room would be provided with a separate CHW/HHW fan coil unit to allow true isolation.

Comms

Switchroom, Das room and the comms room are provided with Variable volume VRV fan coil units mounted in a vestibule bulkhead to each ward. The individual units will be interconnected to a central condensing set on the roof of level-2.

Comms Room/ Switch room air conditioning

The Comms room for the tower will be provided with air conditioning from a fan coil unit connected to a stand alone condensing set mounted in the lower ground car park level. These units will be ceiling mounted within the rooms. These systems will start whenever the room temperature goes above 27°C and will turn off once the room temperature reaches 25°C.

Building Manager Office – Ground Floor Lobby

The building manager office will be provided with air conditioning from a wall mounted split AC unit connected to a stand alone wall mounted condenser. The system will operate via time schedule or on/off switch, controlling a temperature of 22.5oC in summer and 20oC in winter.

Admin

Admin and associated areas are to be provided with chilled/hot water AHUs for centre and perimeter zones and each operational area. Ie conferences. The AHUs will be interconnected to the central chilled water plant and heating water plant on the roof of the building.

Consulting

The medical consulting areas will be provided with chilled/hot water and/or condenser water as a cold shell fitout. Outside air will also be provided to each suite. Energy will be monitored to each suite. Fitout will be by the tenant.

Humidity Control:

The following areas shall be provided with humidity control:

- Theatres
- Cath Labs
- Endo suite
- Hybrid theatre
- Hybrid equipment room
- Sterile stores
- CSSD Cooling

For systems that have high outside air flow rates such as isolation rooms, recovery areas, CSSD, birthing units etc, reheat will be required to accommodate for dehumidification at lower internal loads.

Outside air:

Basement Plantroom: Outside air is reticulated through a plenum shaft from a louvre on the southern facade of lower ground floor all the way to the basement.
Theatres plantrooms: The outside air to the AHUs that serve the theatres, recovery departments and associated areas will be reticulated through louvres in the external walls of these plantrooms.
ICU: The outside air for this AHU is to be supplied directly from the external wall of the plantroom.
Wards: Ten off AHU's will be provided in the roof plantroom to supply centre and perimeter areas on

the wards levels (L4 to L8).
All AHUs will be provided with outside air economy cycle.
Tenancy outdoor air from the floor plant room.

THE CENTRAL ENERGY PLANT

The central energy plant shall consist of a water cooled chilled water plant and gas fired hot water plant. The main building estimated cooling will require 4000kW, the chilled water plant consisting of one water cooled chiller sized at 600 kW for the low load chiller, and three off 1800 kW with dedicated primary chilled water pumps. The secondary circuit consists of three sets of risers. One riser serves critical areas such as ICU level, isolation rooms, theatres levels and the CSSD, one set of risers for the inpatient levels, one set for the remaining areas. Each secondary circuit is provided with two off chilled water pumps each sized at 50%. The chilled water control valves through the BMCS are to close off all areas other than the critical areas when a chiller suffers from reduced capacity during failure.
The chillers are to be of centrifugal magnetic bearing chillers, consisting of two compressors each, with turndown capacity of 10%. The chilled water plant is to be provided with a storage tank sized at 10000 litre (indicative size 2.5x2.5x2.16H) delivering minimum capacity of 9000 litre to accommodate for the low load night operation and staged up to meet the maximum demand requirements. The storage tank will ensure the maximum chiller start-up is twice an hour for each compressor of the same respective chiller. The chillers are to be staged up through the BMCS based on building load, chiller operation to be handled by the individual chiller.
Condenser water cooling will be provided by five (5) cooling towers located on level 9 roof at 1150 kW each. Each of the towers will be connected to a common header with separate condenser water pumps connected for each chiller. The condenser water system will be optimised for chiller control.
The main building heating estimated at 2000 kw, the hot water (HHW) plant is to consist of two single gas fired hot water heaters sized at 1000 kW each with dedicated primary HHW water pumps and hydraulic separator. The secondary circuit consists of:

- Two off HHW pumps sized at 50% to provide HHW to the fan coil units, HHW coils and air handling units.
- Two off HHW pumps sized at 50% to provide domestic hot water to two off storage tanks, through a plate heat exchanger sized at 512 kW. Each storage tank is sized at 1500 litres (500mm diameter 2m high) that provide minimum 1200 litres.

Chilled Water Distribution System

The primary pumps shall start on cool demand for a chiller and shall be interlocked to each individual chiller.
The pump and chiller systems shall be provided with a common bypass line fitted with a pressure differential valve and control system to maintain flow though the chiller(s) in low flow conditions. The bypass to be fitted at the bottom of the riser to allow water capacity to the loop.
Modulating two way control valve shall control chilled water flow to AHU's and FCU's.

VENTILATION

In addition to the ventilation systems mentioned in earlier sections of this report, following ventilation systems are proposed:-

- Toilet exhaust system ducted to ceiling grilles in each ensuite and discharging through a common toilet exhaust riser which is discharged to atmosphere at high level of the plantroom through the preconditioner units where required as per BCA and where possible. The toilet exhaust ductwork and riser shall be insulated as it will be used for energy recovery with the outside air.
- Theatre relief is to be provided in each theatre and discharge through the level 2 facade.

- The dirty utility rooms are to be provided with exhaust with a minimum of 100 l/s connected into the ensuite exhaust system. Conditioned make up air is to be provided to the dirty utilities at a rate of 70 l/s to accommodate the heat load from equipment.
- Grease arrestor will be provided with an explosive proof exhaust fan discharged on level-9 roof. Since this exhaust is an objectionable effluent then the exhaust from this room will be diluted with at least 130% outside air before it is exhausted on roof. Make-up air will be provided from the car park make up plenum
- A separate exhaust system is to be provided for each of the bins storage room, and the infected waste / clinical waste rooms. A common outside air system is to serve these rooms and the adjacent equipment store.
- The fire pump room will be provided with supply and exhaust fans wired to the Essential AS1668 and generator power supply. The exhaust is to be discharged on level-9 roof.
- The generator will be provided with supply air to offset the radiator discharge.

KITCHEN EXHAUST

Kitchen Exhaust risers and fans will be provided in two locations for the retail tenancies at either end of the building. Risers will be fire rated to the roof of the building with duct capped top and bottom for future tenant connection.

The hospital kitchen will be provided with a separate exhaust system to the roof of the building including a roof mounted exhaust fan. Tempered make up air will be provided from an air handling unit mounted in the plant room on Lower Ground Floor.

HOLDING ROOM

The holding room will be provided with ventilation and air conditioning to maintain the room at 18^{o}C.

STEAM PLANT

The steam plant will consist of two gas fired steam boilers located in level 2 plant room, sized at 250 kW each with 380 kg/h each, complete with hot wells for preheat. We suggest the roof will have two 250 diameter flues to discharge. The steam plant is provided with a water polishing system, heated hot well and blow down tank.
The primary steam is to be reticulated from the steam boiler plant in the level 2 plant to the steam to steam heat exchangers, which will be located in a fire rated plantroom next to the CSSD.

We have estimated a likely steam usage as follows:-

- Three sterilisers at 100 kg/hr each
- Three washers at 120 kg/hr each

Based on the above we require 660 kg/hr of steam for the building.

BUILDING MANAGEMENT & CONTROL SYSTEM

The air conditioning systems in the building is to be provided with an open protocol Niagara BMCS which is accommodate the proposed scope of works for the mechanical services, complete with an internet connection for man machine interface. The BMCS is to be an open protocol using either BacNet or Lon. The system to be open from input device to HMI.
The use of after hours air conditioning and energy usage is to be logged for the consulting area and tallied on a page in the HMI for billing on a monthly basis.
The control system for the air conditioning shall be an electronic sensor (wall Mounted) type system with each discrete area controlled as a separate thermal zone either using separate units or a ducted VAV system (only on ground floor) or reheat hot water coils. In addition for core areas, the areas/rooms that are provided with VAV thermal diffuser and temperature sensors then control will

be based on high select or low select as required to meet the specified conditions. The DDC controllers shall be pier to pier using distributed logic.
The foyer and lobby air conditioning is to controlled by BMCS controllers and wall mounted sensors, the controllers are to be mounted in the respective MCCs. The foyer, lobby and corridor air conditioning is to be operated by time schedule control only. AOM switches on the MCC are to provide manual operation if required.
The system is to be provided with a web browser interconnected to the Internet and to the Hospital Local Area Network.
All fans and ventilation systems are to be operated by the BMCS.
The BMCS is also to interface to the common lighting control for control and to monitor the hydraulic and fire systems.
The BMCS internet connection and head end are to be provided with a UPS (sized for a minimum of 20minutes operation)

CSSD

Shall be controlled by an electronic sensors and switch board mounted controllers as part of the BMCS system
A remote panel will be provided in the CSSD to provide after hours operation complete with green run light.
The temperature sensor to be wall mounted in each of the three area in the CSSD, separate air handling units have been provided for each zone. The hepa filter terminals for the sterile store are to be monitored for static condition and an alarm raised when they are 200 pa above the clean resistance.
In the auto position the unit shall operate under time schedule control in air conditioning mode, at times nominated by the hospital, outside these times the air conditioning set point shall be altered to 26°C when the ambient condition is above 20°C and 16°C when the ambient condition is below 20°C, (i.e a dead band between 28-16°C) when the system is switch off ie outside the time schedule or not in after hours mode the space temp is to be monitored if the temp increases above 28°C the air conditioning is to be reactivated for a period of 3 hours (adjustable). If the system is operating in the cool down mode until the next time schedule start then this mode shall be cancelled and the system operated in auto mode.
Once running the systems shall operate under the control of the temperature and humidity controllers mounted in the switch board.
Temperature shall be controlled to the setpoint 20oC and humidity at 65%RH +- 10 %.
Cooling shall be controlled as modulating chilled water valve and heating as modulating hot water valve.
Dehumidification shall be high selected with the cooling signal.

Imaging

Each of the specific imaging room within the suite will have to the ability to heat or cool as the required and if necessary the air conditioning to any room can be switched off. Each system is to be provided with an individual hard wired wall mounted controller interfaced with the BMS to control the respective CHW/HHW fan coil that serve the room. The controller shall have temperature display adjustable set points and run and fault lights and to be able to start and stop the system. However, it can be overridden from the BMS.

Recovery

The theatre recovery unit shall be provided with a after hours start/stop switch with indication light mounted at the nurses station in the recovery and in the staff lounge (switches and lights in parallel). These lights shall be controlled from the fan contactor.
Provide a remote panel for each area incorporating the on/off after hours switching, run light .
The air conditioning BMCS Time Schedule channel 3 shall start and stop the recovery air conditioning

from 6.00 am till 8.00pm. The after hours time function shall run the air conditioning for a further 10 hours (adjustable 1-12 hours).

Theatres

Each theatre unit will be provided with one control zone.
The theatres will be controlled by electronic sensors and switch board mounted controllers.
A remote panel is to be provided in the theatres incorporating an after hours push button, touch screen LCD Display Panel (70 x 70 back lit), run indication, final filter dirty indication, temp and humidity indication and a remote reset for temperature. The remote reset shall provide control from 16^{O}C to 24^{O}C in 0.5oC increments. The dirty filter indication shall be controlled from a pressure switch across the final filter.
The temperature sensor to be wall mounted adjacent the controller with the combination return air and temperature sensor mounted in the low level duct behind the filter grille to provide access for cleaning.
The theatre suite area shall be provided with a momentary after hours start/stop switch with indication light mounted at reception in the theatre suite area. This light shall be controlled from the fan contactor.
The sensors for the theatre suite unit shall be wall mounted type.
The Theatre suite air conditioning shall operate whenever any of the theatre systems are in operation.

Wards

Each room is to be provided with an individual hard wired wall mounted controller interfaced with the BMS to control the respective CHW/HHW fan coil that serve the room. The controller shall have temperature display adjustable set points and run and fault lights and to be able to start and stop the system. However, it can be overridden from the BMS.

ICU

The ICU will be provided with an after hours start/stop switch with indication light mounted at the nurses station (switches and lights in parallel).
The ICU area will be controlled for temperature and generally operate 24 hours 7 days per week. The air conditioning BMCS Time Schedule shall start and stop the recovery air conditioning Monday to Saturday. The after hours time function shall run the air conditioning for a further 24 hours (adjustable 1-24 hours).
The ICU unit is provided with multiple hot water zone control, and thermal VAV diffusers (only for core areas where provided). The system is to high select the cooling from each zone and to modulate the heating coils to maintain temperature within each zone. ICU rooms that are on the same façade are to be combined into one thermal zone, the signals from theses are to be high selected to the BMCS to decide the zone temperature requirements. Each of the zone control is to be high selected back to the air handler and the leaving air control used to operate the cooling and heating requirements at the air handler. The air handling unit heating coil shall only operate when there is a call from all zones for heating and with low ambient condition.

Isolation Rooms

Each FCU shall be monitored for operation and interface to the exhaust fan.
The filters shall be monitored and alarmed when dirty 75 pa above clean resistance of 125 pa.
Pressure control, alarm and indication are to be provided for the room.
Failure of the exhaust fan is to shut the fan coil unit down.
Alarms are to be raised when the pressure falls below 10pa between the isolation room and the corridor.
Pressure is to be displayed at the front entry complete with a switch to switch between isolation mode and normal mode. In normal mode all alarms are to be isolated.
The display shall be indicate the mode of operation, the room pressure and state normal if pressure

in the room is within the normal range of operation i.e. 30pa and not less than 10 pa to the corridor. The isolation room pressure is to be monitored between the corridor and each room, the information is to be displayed on the BMCS head end and the wall mounted LCD panel at the door and used to generate alarms for low pressure.
An LCD panel mounted at the entrance to the ante room is to be provided to display the pressure of the isolation room and the ante room and to cycle through this display. It is also to display messages that the room is operational or not operational or a fault message i.e. fan failure, pressure low. A switch on the panel is to be used to switch the room from normal mode to isolation mode. In isolation mode the BMCS is to signal the doors to operate in lock mode (i.e. one set open at a time), when in normal mode no signal is sent allowing both doors to be open. This switch is also to be used to mute the alarm buzzer in the panel. The audio alarm is to sound on any failure that results in the room no longer maintaining pressure.

Common corridors and lobbies

These spaces will be ventilated with tempered air supplied at 20oC to the space. Generally these systems will operate 24 hours, controls will be stand alone with interface to the central chilled water system.

Common Ventilation systems

These systems will operate 24 hours.

Life Safety

The Stair pressurization system will operate in accordance with AS 1668.1 (2015) maintaining a pressure of between 50 pa in the stair shafts and 1m through the fire affected floor door and the exit door. The fans for each shaft will be pressure controlled with variable speed drives.

The smoke exhaust systems will operate in accordance with AS 1668.1 (2015) providing exhaust from the corridor. The smoke exhaust fans will be operated on pressure with a variable speed drive.

All fire fans shall operate from the FDCIE with brigade control.

ESD

To meet the SSDA requirements for energy efficiency and green credentials, the mechanical services will be designed to include energy efficient initiatives including:

- Outside air economy cycle
- High COP variable flow water cooled chillers
- Variable flow condenser water system
- Variable flow high efficiency condensing boilers and/or electric high efficiency heat pumps
- BMCS system
- Low flow low temperature chilled water systems
- Localised air handling to minimise system operation to area operating hours only
- Energy recovery

Green Credentials

- Greenstar compliance to 4 stars
- HFO refrigerants with low GWP

And

  - Low VOC products
  - Low green house gas utilized in the mechanical systems.

Initiatives to be considered

- Exhaust heat recovery to pretreat incoming outside air utilizing the ward exhaust systems
- Energy recovery ventilators for the high outside areas including:

  - Theatres
  - CSSD
  - Recovery
  - Isolation
- Carbon dioxide electric heating systems
- Chilled beams to ward spaces

ELECTRICAL SERVICES

ESTIMATED ELECTRICAL EQUIPMENT REQUIREMENTS - HIGH LEVEL

GENERAL

All services are to be installed to meet (but not limited to) the requirements of:

- NSW Service and Installation Rules
- Ausgrid Network and Installation standards
- AS3000
- AS3003
- AS/NZS3008.1
- AS3009
- AS1670 Series
- NCC 2016 Amendment 2
- ACMA Manuals and associated Australian Standards
- All other relevant standards for MATV, Access Control and CCTV systems.

Electrical services zones will be required for lighting and distribution systems. A dedicated 150mm (minimum) lighting zone is required. The horizontal electrical distribution is in the order of 150mm (this may be shared with other services as required. Coordination will be required). These zones may need to be increased where there are critical clinical areas (ie Theatres) as required to house all required services and allow for coordination.

All vertical riser locations will be dedicated to the nominated services that rise through it. Risers and cupboards cannot be utilised for storage or the installation of other services (ie. Hydraulics, etc).

All nominated electrical and communications rooms will be dedicated for the nominated service only unless noted otherwise.

Full lighting, power, horizontal communications systems, etc. are required to all levels to suit any room data sheets and the like.

ESD AND GREENSTAR CONSIDERATIONS

A Preliminary Greenstar and ESD review was carried out by Umow Lai. The consideration related to electrical services are:

Energy Metering

Accessible energy metering is proposed to allow for monitoring of the separate areas or functions of the project. Floor-by-floor metering will suffice if the entire floor has a single use. If a floor has multiple tenants, each separate tenancy or property will be individually sub-metered.

Metering is proposed for energy uses for the building as listed below which includes the capability of monitoring of energy consumption on a quarterly basis, at a minimum, in accordance with CIBSE TM39 Building Energy Metering. All meters and automated monitoring systems is to be commissioned as part of the commissioning works.

Where an energy load for a single item exceeds 5% of the total energy use for the building, or 100kW, it will be independently metered. Supplementary equipment can be installed on the same measured circuit as a major use item provided that their combined energy use does not contribute more than 10kVA to the overall energy use.

Metering Inclusions (but not limited to):

- Mechanical Plant (gas and electricity consumption to be separately metered)
- Lifts
- Lighting
- Power
- Hot Water

In addition, utility meters must meet metering guidelines under the weights and measures legislation, as outlined under the current National Measurement Regulations. Project teams must verify if existing meters meet these requirements as well as any other utility meters being installed. Non-utility meters (including sub-meters) must follow the requirements described in the most current 'Validating Non-Utility Meters for NABERS ratings' protocol, issued by the NSW Office of Environment and Heritage.

Meters will be located in an area that allows regular monitoring and maintenance by facilities managers and other facilities management personnel.

Monitoring Systems
Energy information is proposed to be monitored through an electronic system capable of capturing and processing the data produced by the installed energy meters, and presenting it in an accurate and easy to read format, clearly illustrating consumption trends. The automatic monitoring system is to be able to record the consumption and demand of energy and to produce reports on a quarter hourly, hourly, daily, monthly and annual energy use for all meters. The installed meters must be capable of producing an output that can be transmitted to a central location. The automatic monitoring system must be capable of:

- Collecting data from all meters;
- Alerting to missing data due to failures;
- Recording and processing of data on energy use consumption at user adjustable levels;
- Raising an alarm when the energy use increases beyond certain parameters and automatically and instantly issue an alert to the facilities manager;
- Provide a breakdown of the information by building system type;
- Include the energy consumption, the load versus time (load profile) and the power factor
- Producing, as a minimum a quarterly report that is automatically emailed to the facilities manager responsible for the building

A monitoring strategy is to be developed by the Head Contractor in accordance with a recognised standard, such as CIBSE TM39 Building Energy Metering. The monitoring strategy will provide information to facility management staff on how to read and understand the metering data. The monitoring strategy will outline roles and responsibilities for the monitoring program, and define the locations of each meter within the building.

Schedule: The monitoring strategy must include a metering schedule, where the metering schedule shall address the estimated energy loads and must list at least the following:

- The incoming input (electricity, gas, etc.);
- The end use (lighting, HVAC, fans);
- The estimated energy consumption for the end use;
- Which meter(s) provide the required information; and
- The estimated total demand.

Minimum Lighting Comfort
Lighting colour rendition index will have a rating CRI >= 80.

General Illuminance and Glare Reduction
Due to the nature of the facility, there are exemptions given in the AS1680 series of standards for

medical areas. Glare will be reduced where possible and “best practice” methods put into place to minimise glare impact issues.

Localised Lighting Control
Ward areas and care areas are generally exempted from lighting control requirements under the NCC. However, a system will be proposed to suit “time of day” in ward corridors and the like (ie. daytime lighting levels, night time lighting levels).

Individual Wards are generally all locally switched via traditional light switches at the room entrance. We can utilise localised controls in medical suite areas.

Peak Energy Demand Reduction – On Site Energy Generator – PV Cell Installation
A Photo Voltaic (PV) system will be investigated as part of the ESD consultants review. It is anticipated a small PV cell installation could be considered for the site, subject to available roof space and orientation.

Low Emissions Vehicle Infrastructure
5% of the carpark positions will have electrical car charging facilities nominated. An allowance of 23 electric vehicle charging stations will be documented during the detailed design phases. Final locations and composition of groups of stations to be confirmed with the building owners / operators.

Light Pollution to Neighbouring Properties – Lighting Strategy
External and Carparking Lighting

An external lighting system will be required for the proposed new Northside Private Hospital at Gosford as proposed below.

The design and installation of a system of lighting to operate from dusk to dawn via a photo-electric switch within areas where the public have general access will be implemented (external carparking, public vehicle/pedestrian drop-off areas and pathways). Internal carparks will be controlled via movement sensor systems, and/or via the Building Management System.

Any lighting to the facade and accent lighting to highlight the external features of the building, will be incorporated into the design where requested by the design architect. This lighting will be timer controlled via a Building management system, and linked to a photo-electric switch.

The obtrusive effects of lighting will be controlled in accordance with the requirements of AS4282. This standard outlines the requirements to limit/remove light spill to neighbouring properties from external lighting sources.

Lighting to the external areas of the development will be designed to the minimum following requirements:

- AS/NZS1158.3.1 – Pedestrian Area (Minimum Category P11c External Carpark / Driveway Lighting)
- AS/NZS1158.3.1 – Pedestrian Area (Category P4 for General External Lighting)
- AS/NZS1680 Series – Interior and Workplace Lighting (AS/NZS 1680.2.1 – for Indoor Carparks)

Lamp type will be a combination of Metal Arc and/or LED.

Light Polution to Night Sky
Lighting will be designed to minimise light spill to the night sky.

SUBSTATION

Preliminary calculations based on area methods, give a preliminary maximum demand of 5000kVA (for Stage 1 and Stage 2). We have estimated the building will require 3 x 1500 kVA transformer substation with a second chamber substation (2 x 1500kVA). The second chamber will be required for

all stations, but the required for the future Stage 2 and Stage 3 *(ie. Stage 3 size and extent is an unknown as requires future development and review as part of those works when considered. No consideration has been given for any future Stage 3 loads).*

Final supply arrangements are required to be negotiated by the successful contractor with the local supply authority, Ausgrid through the contestability process.

Note: Demand calculation will be revisited upon confirmation of final internal make-up/usage of building.

It is anticipated that chamber type substations will be required to service the site. The substation chambers are to be minimum 3hr fire rated. All constructional requirements are subject to the detailed criteria as outlined by the supply authority to suit the supply authority standards and appropriate building codes.

Final substation arrangements and design will be carried out by an authorised Level 3 Accredited Services Provider (ASP) during the detailed design phases of the project.

Level 3 ASP considerations:

- Review of impact on existing Ausgrid Assets.
- Dial Before You Dig request and review around the proposed development site.
- Provision of noise assessment report to Ausgrid.
- Compliance with ICNIRP for limiting exposure to time-varying electrical and magnetic fields (1hZ – 100kHz) – ICNIRP 2010
- Compliance with Tree Safety Management Plan (Ausgrid 2007)
- Development carried out in accordance with ENA EG1-2006: Substation Earthing Guide (Energy Networks Association 2006)
- Prepare and infrastructure plan detailing information on the existing capacity of any augmentation and easement requirements of the development for the provision of utilities including any staging to infrastructure.
- Review and assessment of any impact of existing underground assets, in relation to depth of services changes and landscaping over assets.

Substation to be sited so access is from street level to allow for natural ventilation and ready access from the street. Substation to be designed to Ausgrid NS114 and other application Ausgrid Network standards, and Australian Standards.

MAIN SWITCHBOARD/S

The site is required to be serviced via site Main Switchboards (MSBs).
Main switchboard/s minimal requirements:

- All base building loads, including lifts, house services, etc.
- All hospital loads, including supplies to Theatres, Wards, BOH areas, etc.
- Unmetered sections for supplies to medical suites, retail shops, Radiology Department, etc.
- Bulk metering of hospital and house services (provision to be made to allow for separate house metering if requested by the client).
- MSBs to be arranged into BCA essential, unmetered, hospital essential and hospital non-essential sections.

- Inclusion of Automatic Transfer Switching (ATS) system for diesel generation system. Diesel generator section/s to cater for all BCA essential systems supplies and essential hospital loads.
- A dedicated diesel generator switchboard for distribution of diesel generator loads.

Main switchboards (including main diesel generator switchboard) are to be house in 2hr fire rated dedicated rooms to satisfy BCA and AS3000 requirements.

Interface to any solar array system will be implemented into the main switchboard and/or distribution system.

DIESEL GENERATION SYSTEM

The site is to be serviced via a diesel generation system to supply standby power to BCA essential supply systems to the BCA and AS3000 requirements.

The generator system supplies generator supply to all hospital clinical, administration and circulation areas to a minimum of AS3009.

Selected lighting to carparking and common areas on all levels is required to allow for circulation and egress from non-critical areas and continued access to all hospital areas. (Note: it is anticipated that 100% lighting will be available on all clinical levels)

100% lighting to all fire / egress stairs.

Medical tenancy suites, Radiology tenancy and retail tenancies will not have generator standby supply. *(Note: the only exception will be for any MRI installation where supply to the MRI chiller system is to be maintained)*

A preliminary assessment has estimated a requirement for a minimum of 2 x 1400kVA/1600kVA generator sets (to be confirmed). Final size of the generator to be determined via detailed maximum demand by the contractor.

To accommodate future stages, a further space provision should be allocated for an additional generator of the same size as the initial two generator sets.

The diesel generators shall be housed in a dedicated 2hr fire rated room. Allow for all attenuation and ventilation requirements to satisfy the running requirements of the generator and acoustic performance requirements.

Diesel fuel tank bulk storage system to be within a 4hr fire rated enclosure.

UNINTERRUPTABLE POWER SUPPLY (UPS) SYSTEM

The hospital is to be serviced by a dedicated UPS system for hospital critical power requirements to Theatres, any ICU/CCU and other clinical critical loads. Alarm indicators and sounders to AS3003 are required to all areas serviced by the UPS.

The UPS is to be located in its own dedicated 2hr fire rated room.

A preliminary assessment has estimated a requirement for a minimum of 150kVA – 200kVA UPS system. Autonomy (battery) requirements are to the requirements of AS3009. Final size of UPS system is to be determined via detailed maximum demand by the contractor.

CONSUMERS AND SUBMAINS

Consumers mains, Submains from standby generator, submains from generator switchboard, BCA essential supplies and hospital essential supplies are to be WS53 to AS3013, BCA and AS3000 requirements.

Non-essential submains are to be of the XLPE/PVC type.

Dedicated submains are required for all mechanical plant, medical gases plant, etc. Provide separate BCA Essential, hospital essential and non-essential supplies as required.

All major power supplies will be metered/monitored to minimum NCC Section J8 requirements, and to any agreed greenstar assessment/ESD requirements.

GENERAL DISTRIBUTION REQUIREMENTS

Electrical risers are requested to be in a straight line vertically up the building where possible to minimise offsets and bends to the rising cable system/s.

Electrical risers will need to back onto a 2hr fire rated structure.

Carpark – Basement 2, Basement 1 and Lower Ground Floor
Essential and non-essential supplies to each carparking level. Carparking areas to be divided into east and west distribution sections.

A riser and t-off distribution system can be utilised for carparking areas.

Dedicated supplies to carpark mechanical ventilation supplies (fire rated where required)

Basement 1 – Dock and Back of House
Essential and non-essential supplies to dock areas.

Essential and non-essential supplies to hospital back of house, administration areas and to general circulation.

Dedicated supplies to dock mechanical ventilation supplies (fire rated where required)

Dedicated generator (food refrigeration loads only) and non-generator supplies to kitchen

Lower Ground Floor
Essential and non-essential supplies to carparking. Carparking areas to the east portion of the floor.

Essential and non-essential supplies to hospital back of house, administration areas and to general circulation.

Dedicated supplies to BCA essential systems

Dedicated Hospital essential and non-essential supplies to mechanical services (ventilation minimum on hospital essential)

Stage 1b - Separately metered supplies for each retail tenancy – non-essential supply.

Ground Floor
Essential and non-essential supplies to hospital back of house, administration areas and to general circulation.

Dedicated supplies to BCA essential systems

Dedicated Hospital essential and non-essential supplies to mechanical services (ventilation minimum on hospital essential)

Separately metered non-essential supplies to radiology tenancy.

Separately metered non-essential supplies to Pathology tenancy.

Separately metered supplies for each retail tenancy – non-essential supply.

Stage 1b & Stage 2 - Separately metered supplies for each retail tenancy – non-essential supply.

Level 1
Dedicated hospital essential, non-essential and UPS supplies to Theatre Suite (eastern distribution section)

Dedicated hospital essential, non-essential and UPS supplies to Pre-Op, Recovery and ICU/CCU areas (western distribution section)

Dedicated hospital essential and non-essential supplies to mechanical services switchboards to plant areas (Mechanical systems for Theatre suite and critical clinical areas on hospital essential – final extent to be determined and advised by mechanical trades)

Stage 2 - Dedicated supplies (non-essential) to medical suites. Local metering to each medical suite on level)

Level 2
Dedicated Hospital essential (limited) and non-essential supplies to CSSD (western distribution section)

Dedicated hospital essential, non-essential to Administration areas (western distribution section)

Dedicated supplies (non-essential) to medical suites. Local metering to each medical suite on level)

Dedicated hospital essential and non-essential supplies to mechanical services switchboards to plant areas (Mechanical systems for Theatre suite and critical clinical areas on hospital essential – final extent to be determined and advised by mechanical trades)

Stage 2 - Dedicated supplies (non-essential) to medical suites. Local metering to each medical suite on level)

Levels 3 & 4
Hospital essential and non-essential supplies to ward areas. Ward floors to be divided into East and West distribution sections.

A riser and t-off distribution system can be considered for ward floors.

Levels 5 to 8
Hospital essential and non-essential supplies to ward areas.

Note west section will be future as part of unknown Stage 3 works

A riser and t-off distribution system can be considered for ward floors.

Level 9 & 10 Plantrooms
Hospital essential (limited to partial lighting only) to circulation areas. Non-essential supplies to remainder of circulation areas.

Dedicated BCA Essential, hospital essential and non-essential supplies to mechanical services switchboards to plant areas and stairs (final extent to be determined and advised by mechanical trades).

Dedicated BCA essential supplies to lifts and lift motor room.

COMMUNICATION SYSTEMS

Data and Telephony

A typical star type communications distribution system is to be implemented across the site. Telephony system to originate from site MDF room.

NBN shall be allowed for.

Combination copper and fibre optic backbone system distributed to dedicated communication frames on each level / hospital department as required. Hospital communication systems to originate from a nominated hospital main communications room. A telephony service and fibre optic service from the MDF to the hospital communications room is required.

An NBN backbone system is to be provided to all tenancies and to the main hospital. All spatial and

equipment provisions, including required conduiting, will be allowed for. Installation by NBNCo.

Systems to meet the requirements of the ACMA Manuals and standards.

MATV
An MATV distribution system is to be installed to all areas (riser cupboards only for radiology, retail and medical suites only). MATV to distribute all Free-to-air (FTA) and Pay TV channels/requirements.

Nurse Call
Data backbone to support nurse call backbone system. Nurse call to each hospital level to be connected to backbone system to allow for hospital inter-departmental interconnection.

ACCESS CONTROL / MONITORING / CCTV SYSTEM

Access control to all external entries is and lift services is anticipated.

Access control provisions to carparking levels, including access control to a potential dedicated staff carparking area.

CCTV to all entries / dock / and carparking levels.

CCTV to public spaces and pathways on site to EIS requirements.

All external doors to be monitored under the access control system.

All systems are to be expandable to allow for dedicated hospital and future medical tenancy suite requirements.

DRY FIRE AND EWIS

A full dry fire and EWIS system is to be provided to all areas as required by the BCA. System to be designed and installed complete to suit hospital tenancy requirements.

Open plan layouts to radiology, retail and medical suite tenancy areas.

Fire Indicator Panel (FIP) and EWIS Panel to be located in the fire control room.

All systems design and installed to meet the AS1670 series of standards.

HYDRAULIC & FIRE SERVICES

Description of Building

This Report covers the DA Planning requirements for Hydraulic and Fire Protection Services systems and plant to be provided at the new Northside Private Hospital Development. The proposed Northside Private Hospital is in the catchment of the Central Coast Council N.S.W. The Northside Private Hospital (NPH) development project shall comprise a 224-bed hospital, inclusive of core departments and areas such as:

Basement 2	**Carpark**
Basement 1	Carpark, Back of house, Loading Dock
Lower Ground 1 (STAGE 1A)	Carpark
Lower Ground 1 (STAGE 1B)	Carpark, Retail, Ancillary Tenancy, Cold drinking water tanks, Combined Fire water tanks, Fire pump room, Gas meter room, Rainwater Harvesting plant room, Rainwater Tank.
Ground Floor Stage 1 A	Admissions, Radiology, Pathology, Retail, Waiting area, Electrical Plant room, Plant Room, fire Control Room, Sprinkler and Hydrant Booster Assembly, Support areas.
Ground Floor Stage 1 B	Ancillary tenancy, Admissions, Radiology, Pathology, Retail, Waiting area, Electrical Plant room, Plant Room, fire Control Room, Booster Assembly, Support areas.
Ground Floor Stage 2	Ancillary tenancy, Admissions, Radiology, Pathology, Retail, Waiting area, Electrical Plant room, Plant Room, fire Control Room, Booster Assembly, Support areas.
Level 1	Operating Theatres, ICU, Medical Tenancy.
Level 2	Medical Tenancies, Plantroom, CSSD
Level 3-4	56 x IPU beds/floor.
Level 5	28 x IPU Beds, Roof top courtyard
Levels 6 – 8	28 x IPU Beds/floor.
Level 9	Roof and Plantroom.

Statutory Regulations

The Hydraulic and Fire Protection services shall be subject to the following Standards and Regulations:

- Central Coast Council for Water Supply and Sewage/ Jemena for Gas;
- Building Code of Australia (NCC 2016);
- State Pollution Control Commission's "Environmental Noise Control Manual 1985";
- Occupational Health and Safety Act;
- SafeWork NSW;
- AS 1670 Fire Detection, Warning, Control and Intercom Systems—System Design, Installation and Commissioning;
- AS 1851 Maintenance of Fire Protection Equipment;
- AS 1850 Portable Fire Extinguishers;
- AS 2243.3-2010 Safety in Laboratories Microbiological Safety and Containment;
- AS 2419.1- 2017 Fire Hydrant Installations - System Design, Installation and Commissioning;
- AS 2441-2005 AMDT 1-2009 Installation of Hose Reels;
- AS 2118.1-2006 AMDT 1-2010 Automatic Fire Sprinkler Systems - General Systems;
- AS 2444 Portable Fire Extinguishers and Fire Blankets—Selection and Location;
- AS/NSZ 3500 Parts 1-5 National Plumbing Code;

- AS/NZS 3662:2005 Showers;
- AS/NZS 3718:2005 Tapware;
- Toilets: AS 1172.1-2005, AS 1172.2-1999, ATS 5200.020-2004, ATS 5200.021-2004 and ATS 5200.030-2007;
- AS 5061-2004 – Gas Installations;
- WELS standard: AS/NZS 6400:2016.

Health Publications and Guidelines

- Australasian Health Facility Guidelines (AHFG);
- HB 260 – Hospital Acquired Infections-engineering down the risk;
- NSW Health Department Circulars;
- Health Infrastructure Engineering Guidelines Final June 2016;
- DIN 1988-300 Drinking Water Supply Systems; pipe sizing;
- DVGW W551-2004 Drinking Water Heating and Drinking Water Piping Systems; technical measures to reduce Legionella growth; design, construction, operation and rehabilitation of drinking water installations.

Design

The design philosophy covers the following services:

- Sewer drainage and plumbing;
- Trade waste treatment, drainage and plumbing;
- Rainwater drainage and plumbing, sub-soil drainage;
- Rainwater harvesting and reticulation;
- Drinking and non-drinking cold water;
- Water treatment, filters and sterilisers;
- Heated drinking and non-drinking water, including thermostatic mixing valves TMV's;
- Reduced Pressure Zone Devices RPZD for non-drinking water;
- Reverse Osmosis RO and softened water;
- Natural Gas.
- Wet fire protection systems including Fire Hydrants, Fire Hose Reels, Fire Sprinklers, Fire Extinguishers;
- Points of connection for other building services including mechanical, fire services and irrigation.

Formulate appropriate design solutions for implementation for the following outcomes:

- Health and safety within the building during construction;
- Reducing dust, vapours or any other airborne contaminants;
- Green Star Pathway.

Building Design Parameters

Building Classification	9a
Rise in Storeys	8; building height above 25m (TBC)
Type of Construction	A
Fire Hazard	Light Hazard

Wet Fire System Design Parameters

Item	Location	Area
Sprinkler Protection **- Light Hazard Occupancy 2118.1 A2 (e) Hospitals** **- Operating Theatres - Ordinary Hazard 1** **Patient Care - Light Hazard** **Storage Areas - Ordinary Hazard 3** **Plantroom- Ordinary Hazard 2** **Ambulance and Awning – Ordinary Hazard 2** **Wall Drenchers - where required**	Throughout new building including plantroom	Light Hazard 21m2 Ordinary Hazard 12m2
Fire hose reels	Within 4m of an exit until coverage is met (30m of hose coverage and 6m of spray -hose coverage must include 1m into every room).	1m2
Fire hydrants	Fire Stairs of all levels. 1m clear space in front 0.1m space around valve handwheel (AS2419.1-Clause 3.5.2)	1.5m2
Fire Extinguishers	Significant Switchboards, Comms within 2 to 20m and requiring 1:A:E Classification Kitchens, Boilers, Gas Equipment	0.3m x 0.3m

Fire Hydrant System

A new combined fire hydrant and sprinkler system shall protect the hospital consisting of both external and internal fire hydrants. The hydrants shall provide building coverage in accordance with AS2419.1-2017.

A fire hydrant booster valve assembly shall be provided adjacent to the main entry for the brigade to operate during a fire emergency. Pump suction points shall be provided at the booster valve assembly from the onsite storage tank.

A new 368,000 litre dual compartment combined fire sprinkler/fire hydrant storage tank shall serve the fire hydrant system via a dual pump assembly in accordance with current requirements. To minimize the size of the tank, we have assumed 10l/sec rapid inflow into the tank to reduce the storage capacity 230,000 litres. Fire hydrant supply from the storage tank shall be pressurised via a duty & stand-by booster pump assembly located adjacent to the storage tank. The pumps shall be located within building in accordance with current requirements.

Fire Hose Reel System

Hose reels shall be supplied from the pressurised fire hydrant system. Fire hose reels shall be located within 4 metres of exits within each fire and smoke compartment and then where needed to providing coverage requirements in accordance with AS2441. Appropriate backflow prevention devices will be provided where a cross connection hazard exists.

Fire Sprinkler System

In accordance with Health Infrastructure guidance note 2, the Hospital have a sprinkler system that is compliant with AS2118.1-1999. The sprinkler system is proposed to be installed throughout the entire building.

The system shall incorporate a booster assembly to enable Fire and Rescue NSW (FRNSW) to draw water from the watermains. This shall be located adjacent to the fire hydrant booster assembly.

It is proposed to store 85,000 litres for fire sprinkler services (combined with the hydrant water

storage tank). The tank shall be located on the lower ground floor. Fire sprinkler supply from the storage tank shall be pressurised via a diesel and electric pump set located adjacent to the tank.
The fire sprinkler alarm control assemblies shall be located at adjacent to the pumps. Monitored isolation valves shall be provided for each floor/wing of the building. The fire sprinkler system shall extend from the alarm valves throughout the ceiling space of the buildings. Ceiling and void space sprinklers shall be provided throughout.
Sprinkler test water shall be stored and harvested for irrigation.

Hydraulic/Plumbing System Design Parameters

General

The basis of the design is to deliver Hydraulic Services to the project that are fit for purpose and meet the requirements outlined for: NSW Health private licencing obligations relevant Standards and Guidelines.

Services Design Criteria

Cold-water velocity	1.5m/s
Heated-water velocity	1.2m/s
Heated water return velocity	0.8m/s
Reverse Osmosis velocity	1.5m/s to 3.0m/s
Sewer pump rising main	1.0m/s
Maximum pressure at outlet	500kPa
Minimum pressure at outlet	100kPa
Rainwater pipe work storm design	1:100 year ARI

The following considerations and issues have been incorporated within the hydraulic services design:

- Maintenance;
- Limiting System shut downs;
- Reliability;
- Energy Efficiency;
- Environmental Best Practice;
- Safety in Design for Construction and Maintenance;
- Alternative Systems considered and assessed;
- Authority infrastructure size, age and capacity;
- Incorporating spare capacity;
- Redundancy and backup;
- Future Expansion (vertical and horizontal);
- Systems monitoring.

N+1 redundancy is a form of resilience that ensures system availability in the event of component failure. Components (N) have at least one (1) independent backup component (+1).

Schedule of Main Hospital Plant and Redundancy

Plant Item	Plant Description	Meets N+1 Definition	Description of Redundancy Provided
Drinking cold water Pressure Pump & Control Panel	Triplex cold water pump set which pressurises the water from the water storage tank	Yes	**Triplex pump 2 Duty / 1 Standby**
Drinking cold water Pressure Pump Control Panels	Associated control panel with the cold water pump	No	**Independent control to each pump from panel**
Drinking hot Water Circulating Pumps	Dual pumps that circulate hot water through flow and return system	Yes	**Duty / standby provided**
Hot Water Circulating Pumps Control Panels	Associated control panel with hot water circulating pump	No	**Independent control to each pump from panel**
Subsoil Pumps	Dual ground water pumps within subsoil drainage collection pit	Yes	**Duty / standby provided**
Subsoil Pumps Control Panels	Associated control panel	No	**Single control panel wired to dual pumps**
Water Filters	Dual water filters treating potable water on inlet and outlet of tank	No	**Dual (2) filters provided for 100% peak flow**
Drinking Water Storage Tank	24-hour total drinking cold water storage tank with a 50% division wall	No	**50% of tank can be emptied and cleaned while 50% available**
Drinking Hot Water Storage Vessels	Gas fired hot water units	No	**Sized for 90% peak flow with 1 hour storage**

Sewer and Trade Waste Drainage

The system within the building shall be sized based on the fixture loads and shall include a 20% spare capacity for any main graded pipes. The sewer drainage shall be sized to a minimum diameter of 110mm which shall allow for additional expansion of the internal planning. The sewer drainage system internal to the building shall be designed in accordance with AS 3500.2 and installed below the slab to drain all wet areas. The use of Air Admittance Valves (AAVs) shall not be permitted as per Clause 7.10.00 within TS11. A minimum of 110mm diameter pipe shall be used to ensure future flexibility, should additional WCs be added to soil drainage system.

The sewer drainage system shall be constructed from un-plasticised polyvinyl chloride (uPVC) pipes and fittings with solvent welded joints. Fire stop collars shall be provided at each point where non-metallic pipes pass through concrete floor slabs or fire rated walls.

For all drainage receiving discharge from areas such as CSSD, AHU humidifiers and Dirty Utility Rooms, where the waste water exceeds 65°C, high density polyethylene (HDPE) shall be utilised as these pipes and fittings are capable of accepting higher discharge temperatures than un-plasticised polyvinyl chloride (uPVC). In other areas such as CSSD where high volume high temperature discharges occur (70°C to 80°C) a more heat resistant metal pipe system shall be incorporated.

A sewerage drainage pump pit which shall be installed in Basement 2 and fitted with dual submersible pumps fitted with high, low and fail alarms wired back to the BMCS.

Acoustic lagging shall be provided on all pipe work in noise-sensitive areas as prescribed by the

Acoustic Report.

Grease Waste	A 5,000 (TBC) Litre capacity grease arrestor located in the building on the Basement level is proposed for the Hospital's trade waste requirements. Addition 1,000 litre capacity grease arrestor may be required located within the building pending further information regarding Tenancy area requirements.
Plaster Traps	Provide where required and located under the sink within the room where the fixture they service is located. The plaster traps shall be provided with castor wheels and a custom kick-board fitted to the joinery unit to allow for removal and cleaning the plaster trap.
CSSD Cooling Tank	A 15,000 litre cooling tank is proposed to cool the waste from the CSSD. The tank shall be located within the Ground floor plant room. The cooling tank has been sized based on a peak demand over an operation period of 12 hours, to ensure cooling capacity within the pit is maintained using an inlet temperature of 95˚C and an outlet temperature of 38˚C in accordance with the trade waste regulation. The BMCS shall monitor the water temperature within the cooling pit and send an alarm should the temperature exceed the requirements.
Silver Arrestors	No silver arrestor shall be provided to the drainage system as this type of waste is typically water- collected and treated offsite.
Iodine 131	No treatment plant or system shall be provided to drain and treat Iodine-131 which can be contained within bodily discharges for some time after clinical therapies; these specific therapies shall not be undertaken by the Stakeholder.
Oral Health	If required chairs within the Oral Health Department shall include an amalgam trap and segregation of waste amalgam and cuspidor system.
Decontamination Shower	A 1,000 Litre capacity underground decontamination shower collection tank will be required if a Nuclear medicine facility is nominated for this hospital. The capacity of the tanks calculated based on two (2) showers @ 80 L/min each and run for five (5) minutes.

Sanitary Plumbing

The system within the building shall be sized based on the current Building's fixture loads and shall include a 15% spare capacity for any main graded and vertical pipes. Branch lines to individual wet areas shall not be provided with a dedicated spare capacity.

Stormwater and Roof Water Drainage (internal to the Building)

The system within the building shall be sized based on the current Building's footprint and shall include a 5% spare capacity for any graded pipes with no spare capacity allowed for vertical pipes.
The building rainwater drainage system shall be sized for a 1:100-year rainfall intensity. The provision of external eaves gutters shall allow 100% overflow provision, should downpipes block. The building rainwater system shall connect to the Civil stormwater infrastructure mains 2 metres for the building.
A system of piped subsoil drainage shall be provided at the base of all retaining walls and at the base of all battered banks and as required by the Structural Engineer. The subsoil drainage shall be piped to a pump out pit connected to the stormwater system.
The subsoil drainage pump pit which shall be installed in Basement 2 and fitted with dual submersible pumps fitted with high, low and fail alarms wired back to the BMCS.

Rainwater Harvesting

Nominated roof areas shall drain to a 30,000L rainwater harvesting storage tank located in Basement 1. A first flush system prior to the tank inlet shall filter out dust, debris, leaves and rubbish.
The recycled rainwater shall be utilised for landscape irrigation purposes only.
Non-drinking water from the tank shall be pumped to the required irrigated landscaped areas as nominated by the Landscape Consultant.

Drinking Water

The system within the building shall be sized based on the current Building's fixtures Probable Simultaneous Demand (PSD) and shall include a 5% spare capacity for any main horizontal pipes, with approx. 15% spare capacity allowed for the entire hospital. Branch lines to individual wet areas shall not be provided with a dedicated spare capacity. No additional capacity shall be provided for Cooling Tower make-up water supply.
Water systems shall achieve a minimum water pressure of 150kPa and a maximum water pressure of 500kPa when the fixture is fully open or operational. Backflow prevention valves shall be provided into each area where zone protection is required in accordance with AS 3500.1.
The towns water supply in the area is currently being upgraded. The reliability of water supply is critical and therefore water storage is proposed. Water storage shall be provided in accordance with the requirements of Engineering Services and Sustainable Development Guidelines - Technical Series TS 11. The guidelines stipulate a figure of 1,000 litres of storage per bed, per day as a general guide. The new hospital shall have up to 224 beds with the future expansion provision. Therefore a 250,000L water storage tank shall be provided as a standalone system to serve the hospital's requirements.
The hospital shall draw off the tank supply permanently which shall be continuously topped up by the mains pressure supply. The pressure pump assembly serving the drinking water service shall be fitted with a manual control valve to switch to mains pressure during any power outage.
Non-drinking cold water shall be supplied from the drinking cold water service with a reduced pressure zone device RPZD preceding the first take off where zone protection is required in accordance with AS 3500.1 as required to areas such as Dirty Utility Rooms, Clean-up Rooms, Cleaners' Rooms, Laboratories, and Mechanical Plant.
In order to control pathogens, such as legionella, biofilm, endotoxins and general microbiological growth it is proposed to provide water treatment devices such as filters which shall be used to treat the water before the water is delivered to the fixtures.
The water treatment devices are as follows:

- 2 x 100-micron automatic backwash filters installed in parallel (pre-water storage tank);
- 2 x 50-micron automatic backwash filters installed in parallel (post water storage tank);
- UV filters installed in parallel (post water storage tank);
- Automatic chlorine circulating dosing unit and monitoring fitted to the domestic water storage tanks (2-4ppm).

Heated Drinking Water

The system within the building shall be sized based on the current Building's fixtures Probable Simultaneous Demand (PSD) and shall include a 5% spare capacity for any main horizontal pipes, with approx. 15% spare capacity allowed for the entire hospital. Branch lines to individual wet areas shall not be provided with a dedicated spare capacity.
The heated water system for the Hospital shall consist of a central natural gas hot water plant with a 65^{o}C circulating piping system. The capacity of the hot water plant shall provide limited hot water (less than 1 hour's storage) should the gas supply or burners fail.
All internal flow and return ring mains shall be located within the corridor ceilings adjacent the cold water main. All branch off-takes shall be provided with isolation valves to allow Engineering Staff to shut off areas for maintenance or for future upgrades as necessary.
Pressure sensitive zones shall be fitted with pressure reduction valves.

Backflow prevention valves shall be provided into each area where zone protection is required in accordance with AS 3500.1.
Heated water pipe work shall be insulated with 38mm thick fire rated non-toxic FPI thermal insulation. This shall achieve a 26% reduction in heat loss compared with standard 25mm insulation. Heat lost from hot water within the heated water flow and return pipe work systems shall be replenished by a pump recirculating water back to the hot water generation plant for reheating. The design criteria for return pipework to the plant shall be 5ºC loss with a maximum velocity of 0.6m/sec.
Hot water temperature to all dirty utility, cleaners' rooms and fixtures shall be 60ºC using the hot water circulating flow and return system detailed above.
Warm water to all patient care and staff area fixtures shall be mixed and temperature limited using localised Thermostatic Mixing Valves (TMV). The TMV is to be installed no closer than 1m and no further than 10m from the point of use. Dead legs should not be any longer than 3m and prohibited on pipe sizes larger than 15mm diameter.
Temperature limitation to outlets shall be applied as follows:

- Staff 43.5^{o}C
- Public 43.5^{o}C
- Disabled Public 43.5^{o}C
- Patient care 43.5^{o}C
- Neonatal Patient care 40.0^{o}C (or as required by the Hospital Director)

Non-drinking heated water shall be supplied from the drinking hot water flow and return main with a reduced pressure zone device RPZD preceding the first take off where zone protection is required in accordance with AS 3500.1 as required to areas such as Dirty Utility Rooms, Clean-up Rooms, Cleaners' Rooms and Laboratories.

CCSD Reverse Osmosis RO Water Plant

The CSSD will be provided with a flow and return RO plant capable of heat sterilising the system by use of the CSSD steam plant. This RO plant shall be installed with N+1 redundancy on all filters and pumps.
The CSSD department RO loop shall supply the washers, sterilisers and bench top points.
The water quality for the CSSD RO unit shall be designed to meet the minimum requirements of AS4187-2014 specifically Table 7.2.
The CSSD RO loop and storage tank shall be heat sanitized each evening as required by AS4187-2014.
A softened hot and cold water system identified within AS4187-2014 shall be provided to the CSSD area.
Water systems shall achieve a minimum water pressure of 300kPa and a maximum water pressure of 500kPa when the fixture is fully open or operational.
The estimated CSSD RO water demand is 3L/sec based on the peak flows of all equipment. The CSSD RO water system, will be constructed from stainless steel (S/S) pipes and fittings with welded joints or food grade press fit (incorporating leak identification) joints will be used.

Drinking Cold Water Dialysis Unit Connection Points

Potable cold water supplied from the utility water main will be installed as indicated on the Architectural drawings. The potable cold water dialysis unit connection points will be provided with local or central backflow prevention and a method of draining the dead water as the system is not likely to be used often. Dead legs are to be kept to a minimum. The potable cold water connection point will have an associated tundish to drain the waste water.
As part of the group 3 dialysis unit supply water filtration trollies must be supplied.
This method of service is equal to that at the Royal North Shore PPP, Westmead Hospital, Sydney Adventist Hospital and St George Hospital.
A flow of 30l/min is estimated from these connection points.

Water Metering

The development shall be metered by both utility-owned water meters at the property boundary and client-owned and read water meters. These water meters shall have the capability for connection to the BMCS pulse read-out to allow for water demand and leak monitoring.
A Utility-owned water meter shall be installed to record the consumption and wired to the BMCS for remote monitoring and leak detection evaluation. Hospital-owned (and read) water meters shall be installed to record the water consumption and wired to the BMS for remote monitoring and leak detection evaluation for:

- Cooling Towers
- Landscape watering
- Mechanical heating and chilled water top-up
- Outlet of drinking water storage tanks
- Private Tenancies
- Inlet to hot water heater
- Inlet to fire services storage tank

Natural Gas Services

A new natural gas service will need to be extended from the medium pressure 210kPa gas main located on the corner of Hely St & Donnison St West, approximately 600m from the hospital. The natural gas services will be limited to 5kPa within the building to avoid fire rated ventilated shafts.
The gas system shall be sized based on the gas appliance loads and shall include a 5% spare capacity. (NOTE: no spare capacity allowed for pipes supplying individual fixtures). All appliances within the building are required to be fitted with flare failure devices to shut the gas supply down to the burner, should the flame be extinguished. Automatic Gas shut-off systems that are connected to the fire system shall be provided.
Sub meters are proposed to meter the usage of the:

- Mechanical.
- Domestic hot water plant.
- Kitchen.
- Retail/Café.

All meters shall be wired to the BMCS to allow for energy monitoring.

Sanitaryware and Faucets

Sanitaryware shall be selected by the Architect with guidance and review from the Hydraulic Consultant. As part of the user group process, the Project Manager and Architect shall supply the selected schedule to the users for sign-off. The sanitary fixtures selected are to be clinical type fixtures that can be easily cleaned. Basins and bathtubs shall not contain integral overflow. In-wall cisterns and flusherette systems should to be avoided.
Any accessible ensuites shall have fixtures selected to comply with sole units as required by AS 1428.1, which are:

- Basin with shelf on the side.
- Toilet.
- Backrest.
- Taps & Water Outlets

Taps and water outlets shall be documented by the Architect with guidance and review from the Hydraulic Consultant.
As part of the user group process, the Project Manager and Architect shall supply the selected schedule to the users for sign-off.
The taps and water outlets selected with be, clinical type fixtures that can be easily cleaned. Reputable brands shall be used to ensure spare parts are available on the Australian market.

AS1428.1 compliant tap arrangement for areas where anti-ligature taps are required.

- Cold water tap Blue
- Hot water tap Red
- Warm water tap Yellow

Flow rates for water outlets shall be controlled by flow restrictors. Water taps shall have the following AS/NZS 6400:2016 WELS ratings:

- Taps-general 6 star
- Toilets 5 star
- Urinals 6 star
- Showers 3 star

Service Requirements

The following information is presented for the Northside Private Hospital development hydraulic and wet fire services requirements.

Spatial Requirements

Equipment	Description	Location	Preliminary Dimensions (mm)
Fire Protection Services			
Combined Hydrant and Sprinkler Water Tank	230,000 L	Lower Ground Floor	L: 12000 W: 6500 H:3000
Combined Fire Pumps & Sprinkler Alarm Valve Room	Diesel and Electric Hydrant Pumps	Lower Ground Floor; Access with fire rated stairs from street level	L:11500 W:5500 H:2400
Combined Hydrant and Sprinkler Water Booster Assembly Enclosure	150mm Booster	Ground Floor	L:2400 W:1000 H:1800
Fire Control room		Ground Floor	L:4000 W: minimum 2500 H:2400
Fire Hose Cupboard		Throughout Building, within 4m of fire stairs	L:900 W:450
Hydraulic Services			
Water Tank	250,000L	Lower Ground Floor	L: 13000 W: 7500 H:3000
Drinking cold water plant	Water Meter, Pump and Filters	Lower Ground Floor	L:7500 W:3500 H:2400
Gas Meter room	Gas meters and regulators	Lower Ground Floor 1	L:3500 W:3000 H:2400
Central Hot Water Plant	9,000l/hr instantaneous gas HW System	Roof Plant Room	L:4500 W:3000 H:2400
Kitchen Hot Water Plant	2000 l/hr instantaneous gas HW system	Level 2 roof	L:3000 W:2500 H:2400
RO and Soften Water Plant	1,000l/hr RO 3,000l/hr SW	Level 2 Plant Room	L:5000 W:4000 H:2400
CSSD Discharge Tank	6,000 L	Ground Floor plant room 1	L:4000 W:3000 H:1500
Rainwater Harvest Tank	30,000L tank	Lower Ground Floor	L:5000 W:6000 H:2400
Re- use Rainwater Harvest Pumps and Filters Pump Room	Rainwater Harvest Pumps and Filters Pump Room	Lower Ground Floor	L:5000 W:3000 H:2400

Equipment	Description	Location	Preliminary Dimensions (mm)
Kitchen Grease Arrestor	5,000L	Basement 2 in Mech ventilated room	L:5500 W:3000 H:2400
Additional Grease Arrestor (If required) Café Grease Arrestor	1,000L	Basement 2 in Mech ventilated room	L:3500 W:4000 H:1800
Sewage Pump Pit	Cast-insitu concrete	Basement 2	L:2000 W:2000 H:1500
Carpark Drainage pump out Pits	Cast-insitu concrete	Basement 2	L:2000 W:2000 H:1500
Seepage Water Pits	Cast-insitu concrete	Basement 2	L:1000 W:1000 H:1500
Typical Riser Duct		Throughout Building	L:300 W:600

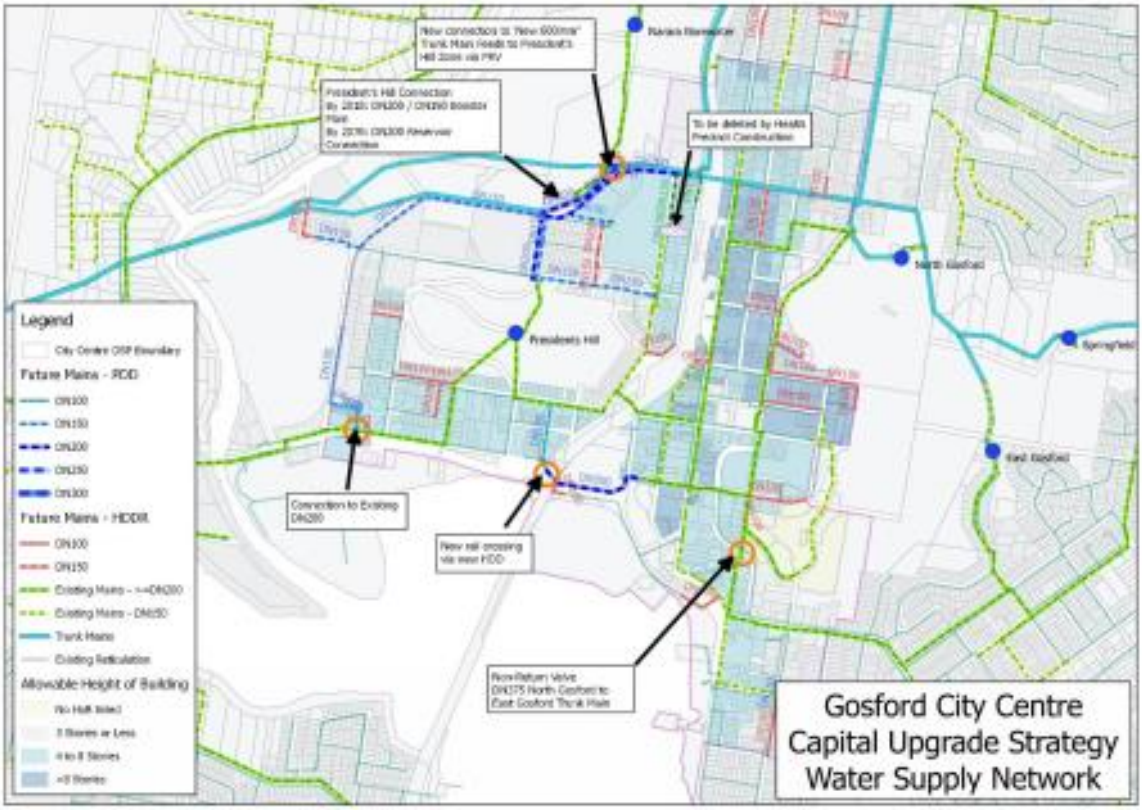
Electrical and BMSC Requirements

Item	Location	Hydraulic Component	Phase	Volts	kW/ Amps	Emerg-ency Back-Up Supply	BMSC ConnectIon
1	Lower Ground	Drinking Water Pumps- Triplex Pump Set 2 x 50% duty/1x 50 % standby	3	415	6kW/ pump	YES	YES
2	Roof Plantroom	Hospital Heated Water Plant- GPO next to each HWU	1	240	2x GPO	YES	NO
3	Roof Plantroom	Hot Water Circulating - 1 x duty/1 x stand-by	1	240	1kW/ pump	YES	YES
4	L2 Plantroom	Hot Water Circulating - 1 x duty/1 x stand-by	1	240	1kW/ pump	YES	YES
5	LG -L4	Hot Water Unit in each Tenancy	1	240	3.6kW	NO	NO
6	L2 Plantroom	RO and Soft Water Plant	3	415	35A	YES	YES
7	Lower Ground	Rainwater Harvesting Pumps and Equipment 1 x 100% duty/standby	3	415	2.0kW	NO	YES
8	Basement 2	Sewer Pumps- 1 x duty/1 x standby	3	415	1.5kW	YES	YES
9	Basement 2	Seepage Water and Carpark drainage pumps- 1 x duty/1 x standby	3	415	1.5kW	YES	YES
10	Various locations	Dedicated 10A power for cold and gas water data logger system in a lockable enclosure (400x400 double GPO panel) in the electrical / comms room.	1	240	10A	NO	YES
11	Lower Ground	Fire hydrant and sprinkler pump control panel, including jacking pump. Control switch to be provided from pump room to booster cupboard.	1	415	30kw	YES	YES

Assumptions and Clarifications

- We have assumed gas shall be required supplied to kitchens, mechanical plant and HW heaters.
- Individual gas and drinking-water meters shall be installed for each tenancy. The meters must be accessible on a common area.
- Commercial tenancies are separate fire compartments

ATTACHMENT 1- Water and Gas Utilities Documents



Central Coast Council- Water Upgrade Strategy August 2017

Central Coast Council-Watermain upgrade currently construction

Central Coast Council- Existing Sewer mains

JEMENA- Location of existing gas mains near site

LIFT SERVICES

BUILDING FORM

The intention is to provide a lift to transport for the two main functions of the hospital.
The first is for back of house lifts to provide bed/patient transport between bed units floors and theatre, provide food delivery between these floors and general staff access.
The minimum car size required to meet NCC Emergency Lift Dimensions in Class 9a Buildings and Disabilities (Access to Premises – Buildings) Standards 2010 would be 1600mm W x 2280mm D x 2300mm H. In addition to this requirement provide allowance for Bariatric Hospital Bed Dimensions 2400mm L x 1190mm W.
Allowance also for CSSD – Theatre clean and dirty goods lifts.

The second is to provide for general visitor service to the hospital bed unit floors for relatives, provide for outpatient/visitor transport to specialist medical suites.

The general from of the building is:

- Lower Ground 2 – 149 car parking places
- Lower Ground 1 – 112 car parking places, Kitchen, loading dock
- Ground – Main entry, 63 car parking places, Medical suites and Radiology
- Mezzanine – 85 car parking places
- Level 1 – 14 Operating Theatre Suites and associated services
- Level 2 – CSSD, hospital services and 4 specialist medical suites
- Leve 3 & 4 – 12 specialist medical suites
- Level 5 to 8 – 28 inpatient beds per floor
- Level 9 – plantroom (Restricted access)

DESIGN CRITERIA

The following design criteria are based upon recommendations from CIBSE Guide D - Transportation Systems in Buildings for the expected level of performance: -

- Floor to floor heights – 4.0 metres (Theatre floor 4.2 metres)
- Estimated population
    - Hospital visitors – 2.5 persons per bed
    - Inpatients – 1 person per bed primarily use back of house lifts
    - Hospital Staff – 1.5 persons per bed - primarily use back of house lifts
    - Theatres – 10 persons per theatre primarily use back of house lifts
    - Medical Centre – 6-8 m^2 per person, only use front of house lifts
    - Car Park – 2.5 persons per vehicle, only use front of house lifts
- Arrival rate of 8-9% in five-minute interval.
- Up peak interval not more than 50 seconds

RESULTS AND COMMENTS

Front of House
In terms of performance the front of house, this can be adequately served by two (2) passenger lift as follows: -

Number of lifts	- 5
Lift car capacity	- 1600kg / 21 passenger
Load Rating	- Class A (passenger)

Operating speed - 2.0m/s

Main Results		
Interval (s)	37.9	
Capacity Factor by Mass (%)	77.2	
Capacity Factor by Area (%)	95.7	
Additional Results		
Car Capacity (persons)	21	
Average No. of Stops (including Home Floor)	9.9	
Lowest Reversal Floor (where 1 = lowest floor)	1.0	
Highest Reversal Floor (where 1 = lowest floor)	11.8	
Average Passenger Transfer Time (s)	1.2	
Distance Between Reversal Floors, Excluding Express (m)		43.0
Time Consumed When Stopping (s)		10.0
Round Trip Time (s)	189.3	

Back of House

In terms of performance the front of house, this can be adequately served by two (2) passenger lift as follows: -

Number of lifts - 3
Lift car capacity - 2500kg / 33 passenger
Load Rating - Class A (passenger)
Operating speed - 2.0m/s

Main Results		
Interval (s)	50.3	
Capacity Factor by Mass (%)	20.0	
Capacity Factor by Area (%)	27.7	
Additional Results		
Car Capacity (persons)	33	
Average No. of Stops (including Home Floor)	5.5	
Lowest Reversal Floor (where 1 = lowest floor)	2.3	
Highest Reversal Floor (where 1 = lowest floor)	11.3	
Average Passenger Transfer Time (s)	4.0	
Distance Between Reversal Floors, Excluding Express (m)		36.1
Time Consumed When Stopping (s)		9.9
Round Trip Time (s)	151.0	

RECOMMENDED LIFT CONFIGURATION - FRONT OF HOUSE

No. of Lifts	One, Two, Three, Four and Five
Type	Passenger
Drive	VVVF Gearless PM
Control	Microprocessor Multicar Group
Floors Served	LG2, LG1, G, M, 1-8, Plantroom
Travel	Approx. 48200 metres
Minimum Speed	2.0 m/s
Load	Min - 1600kg 21 Persons As defined by EN81

Size of Lift Car (To Meet BCA and DDA requirements)	Min clear size 1750mmW x 1950mmD x 2400mmH
Car Finishes	Two side wall COPs one on each side, floor to ceiling. Lift Car manufacturers premium design LED down lighting
Size of Shaft (Maximum) **Clear internal**	2550mmW x 2400mmD per lift 13350mmW x 2400mmD Overall assuming 150 mm trimmer beam or wall
Lift Doors	Min 1100W x 2100H mm Stainless Steel
Top Overrun	Maximum 5200mm
Pit Depth	Maximum 2400mm
Pit Reaction	150,000N
Shaft Reaction	3,500N
Car Finishes	Manufacturers standard design
Buttons and Indicators	Standard range DDA compliant
Power Requirements (Max)	45 Amps per lift

Special Requirements	
Access control in lifts	**Required**
Regenerative "Green" Drives	**Required**
Protective Blankets	**Required – one set**
Fire Service	**Required**
Automatic Rescue Device (ARD)	**Required**
NBN duel Sim auto-dialer	**Required**
Hospital priority response	**Required**

RECOMMENDED LIFT CONFIGURATION - BACK OF HOUSE

No. of Lifts	**Six, Seven and Eight**
Type	Passenger
Drive	VVVF Gearless PM
Control	Microprocessor Triplex
Floors Served	LG2, LG1, G, M, 1-8, (Plantroom, 1 Lift only)
Travel	Approx. 48200 metres
Minimum Speed	2.0 m/s
Load	Min - 2500kg 33 Persons As defined by EN81
Size of Lift Car (To Meet BCA and DDA requirements)	Min clear size 1800mmW x 2700mmD x 2400mmH
Car Finishes	Two side wall COPs one on each side, floor to ceiling. Lift Car manufacturers premium design LED down lighting
Size of Shaft (Maximum) **Clear internal**	2700mmW x 3100mmD per lift 8400mmW x 3100mmD Overall assuming 150 mm trimmer beam or wall
Lift Doors	Min 1400W x 2100H mm Stainless Steel
Top Overrun	Maximum 5200mm
Pit Depth	Maximum 2400mm
Pit Reaction	150,000N
Shaft Reaction	3,500N
Car Finishes	Manufacturers standard design
Buttons and Indicators	Standard range DDA compliant
Power Requirements (Max)	65 Amps per lift

Special Requirements	
Access control in lifts	**Required**
Regenerative "Green" Drives	**Required**
Protective Blankets	**Required – one set**
Fire Service	**Required**
Automatic Rescue Device (ARD)	**Required**
NBN duel Sim auto-dialer	**Required**
Hospital priority response	**Required**

RECOMMENDED LIFT CONFIGURATION - CSSD

No. of Lifts	Nine and Ten
Type	Passenger
Drive	VVVF Gearless PM
Control	Microprocessor Simplex
Floors Served	Level 1 and 2
Travel	Approx. 4.200 metres
Minimum Speed	1.0 m/s
Load	Min - 1000kg 13 Persons As defined by EN81
Size of Lift Car (To Meet BCA and DDA requirements)	Min clear size 1600mmW x 1400mmD x 2300mmH
Car Finishes	Two side wall COPs one on each side, floor to ceiling. Lift Car manufacturers premium design LED down lighting
Size of Shaft (Maximum) Clear internal	2200mmW x 1800mmD per lift
Lift Doors	Min 900W x 2100H mm Stainless Steel
Top Overrun	Maximum 3900mm
Pit Depth	Maximum 1400mm
Pit Reaction	150,000N
Shaft Reaction	3,500N
Car Finishes	Manufacturers standard design
Buttons and Indicators	Standard range DDA compliant
Power Requirements (Max)	25 Amps per lift

Special Requirements	
Access control in lifts	**Not Required**
Regenerative "Green" Drives	**Required**
Protective Blankets	**Not Required**
Fire Service	**Not Required**
Automatic Rescue Device (ARD)	**Required**
NBN duel Sim auto-dialer	**Required**
Hospital priority response	**Not Required**

RECOMMENDATIONS

Our recommendation would be to go to select tenderers on this project, the following is a list of the companies that currently have good representation in and around the Gosford Area.

- Kone Elevators
- Schindler Lifts Australia
- Otis Elevator Company
- ThyssenKrupp