Warren Smith & Partners

28th June 2018

# HYDRAULIC SERVICES SCHEMATIC DESIGN REPORT

## Concord Hospital Redevelopment Stage 1

HYDRAULIC SERVICES
SCHEMATIC DESIGN REPORT
Concord Hospital Redevelopment Stage 1

| | | |
|---|---|---|
| 05 | 28th June 2018 | Updated Introduction |
| 04 | 6th June 2018 | Updated Introduction |
| 03 | 28th March 2018 | Schematic Design Issue |
| 02 | 16th March 2018 | Draft Schematic Design Issue |
| 01 | 23rd February 2017 | 70% Schematic Design Issue |
| **Rev #** | **Date** | **Description of Change** |

## APPROVALS

| | | | |
|---|---|---|---|
| **05** | **J. Mousdell** | **Current** | **J. Mousdell** |
| **04** | **J. Mousdell** | **SS** | **J. Mousdell** |
| **03** | **J. Mousdell** | **SS** | **T. Wise** |
| **02** | **J. Mousdell** | **SS** | **T. Wise** |
| **01** | **J. Mousdell** | **SS** | **T. Wise** |
| **Rev #** | **Author** | **Status** | **Reviewer** |

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# Executive Summary

This report describes the schematic design for the Concord Hospital redevelopment phase 1 and the services that this upgrade ties into. Several hydraulic considerations have been analysed and presented in the preparation of this report with the aim of outlining the schematic design process, that is, the reasoning behind our decisions, options considered and ultimately our proposed design method.

The key items discussed in this report detail the locations of the proposed water, stormwater, sewer and gas services. These schematic design options have been based on the locations of existing services as well as the results from appropriate calculations. Appropriate considerations and measures to be taken when conducting proposed developments have been notably mentioned throughout the report and are in accordance with relevant standards of practice.

In addition to the key design items, the report discusses generally the typical design requirements for hydraulic services making specific note of the expected outcome to be achieved for the Concord Hospital redevelopment Stage 1.

In summary:

**Potable cold water services:**
A 157.5kL potable cold water tank will be provided on level 6 with three hours peak storage for both the CSB and existing building 5. The tank will supply the CSB through the two separate risers and also connect back into the building 5 supply. Pump sets are required to supply the tank as well as being required on the outlet to provide sufficient pressure to the uppermost levels. Dual 100 micron, 50 micron and UV filters will be provided to reduce microbial growth.

**Potable hot water services:**
There will be a central hot water plant located on level 6 which will supply the building with a flow and return system through two separate risers in excess of 60degC. TMVs will be provided to each area requiring warm water and dead legs will be kept to a minimum.

**Natural gas:**
The natural gas will extend from the existing building 3 plant room and reticulate through the CSB @ 7kPa supplying the mechanical boilers and domestic hot water heating plant

**Stormwater drainage:**
The stormwater drainage will generally be done using siphonic due to the large catchment areas. There is the exception of small roofs where traditional gravity systems will be used. All primary and secondary systems are sized for a 100 year ARI and include catchment areas, façade runoff and overflows from other catchments.

**Sewer drainage and sanitary plumbing:**
The drainage system will incorporate a reflux valve adjacent to the authority main connection due to it being a sewer surcharge area. Three overflow relief gullies are provided to protect the building; one per each main drain. The sanitary plumbing system will be a fully vented modified system. Clearouts will be provided adjacent to each WC to prevent access into the ceiling space during a blockage.

## Contents

# HYDRAULIC SERVICES

## 1. INTRODUCTION

Warren Smith & Partners (WS&P) has been engaged by Health Infrastructure to assist the design team with the schematic design of the Concord Hospital Phase Redevelopment 1 relating to the hydraulic services.

This report replaces the Wood and Grieve Engineers (WGE) schematic design report. The WGE report was reviewed and adopted where verified and relevant, however as evident in this report there have been changes.

A future phase 2 and 3 of the masterplan has been considered as part of the infrastructure works.

The Concord Hospital site ("the site") is located on Hospital Road, Concord, NSW and is shown in Figure 1.

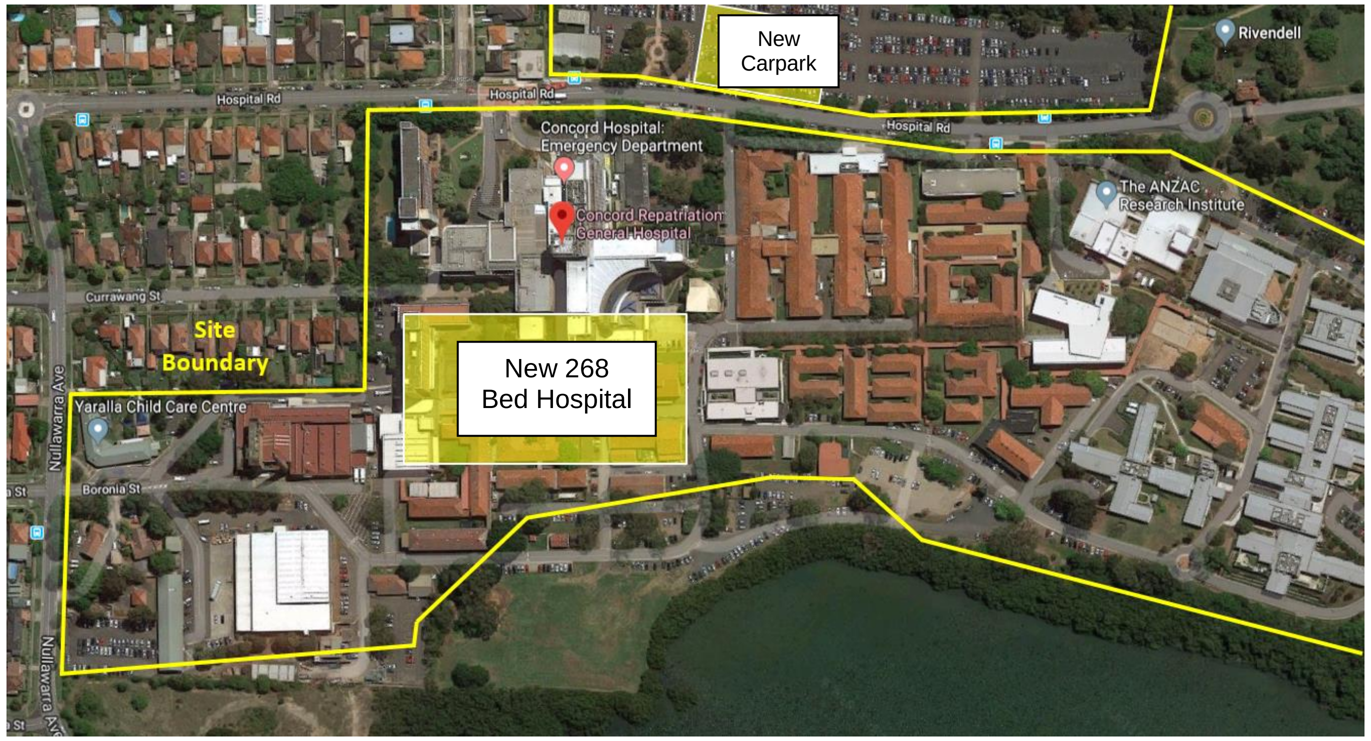



*Figure 1: Aerial View of Property Boundary (Source: Google Maps)*

## 2. BACKGROUND

The Sydney Local Health District (SLHD) is responsible for providing and managing all public health care within the six (6) Local Government Areas (LGAs) of Burwood, Canada Bay, Canterbury, the City of Sydney, Inner West and Strathfield.

The District is located in a growing population corridor within Sydney. The proposed redevelopment is required to improve and replace outmoded facilities to meet the substantial growth in clinical service demand from across the hospital's catchment that has occurred and will occur over the next 10 years.

A masterplan for Concord Hospital was developed in 2015. This report was reviewed and optimised as part of the final business case in 2017 and was endorsed through project governance in November. This masterplan has been prepared to inform the future development and utilisation of Concord Hospital, to ensure it can respond to current and future needs of the population whilst providing appropriate clinical and education services.

This SSDA report seeks consent for the proposed redevelopment of Concord Repatriation General Hospital to improve and replace outmoded facilities to meet the substantial growth in clinical service demand across the hospital's catchment:

- Concept approval is sought for the redevelopment indicatively comprising 82,000sqm GFA, to be undertaken in two (2) stages including:
  - o Clinical Services Building (CSB) and multi storey carpark (Stage 1); and
  - o Acute Services Building (ASB) and multistorey carpark (Stage 2).
- Detailed approval is sought for the Stage 1 construction of the proposed CSB (44,000sqm GFA) and the construction of a multi-storey car park located to the north of Hospital Road.

Detailed development approval for the proposed Stage 2 works will be completed at a later date and does form not part of this SSDA. The Stage 1 Detailed works are estimated to be completed by end 2021.

The proposed Concept redevelopment is in accordance with the concept architectural package prepared by Jacobs.

The proposed Stage 1 detailed development (CSB and multistorey carpark) is in accordance with the architectural drawings prepared by Jacobs.

The areas in the below staging plans have been assessed and are included within this report.

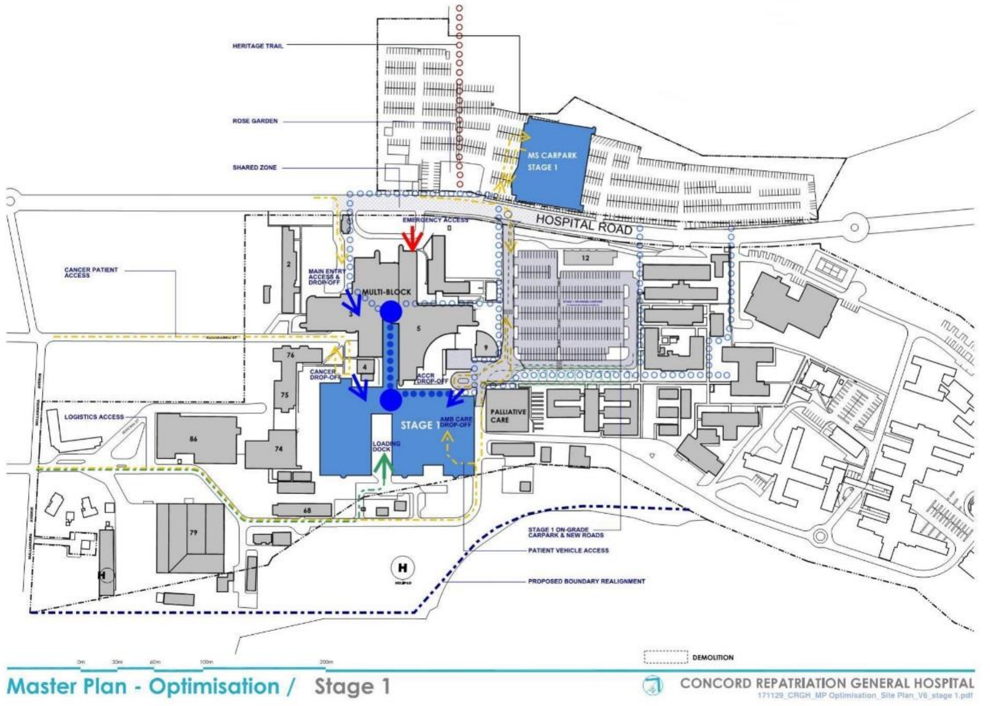



*Figure 2a: Extract of the CRGH Masterplan/ Concept Design Optimisation Report Stage 1 (December 2017)*

*Source: NSW Health Infrastructure/Capital Insight (2017)*

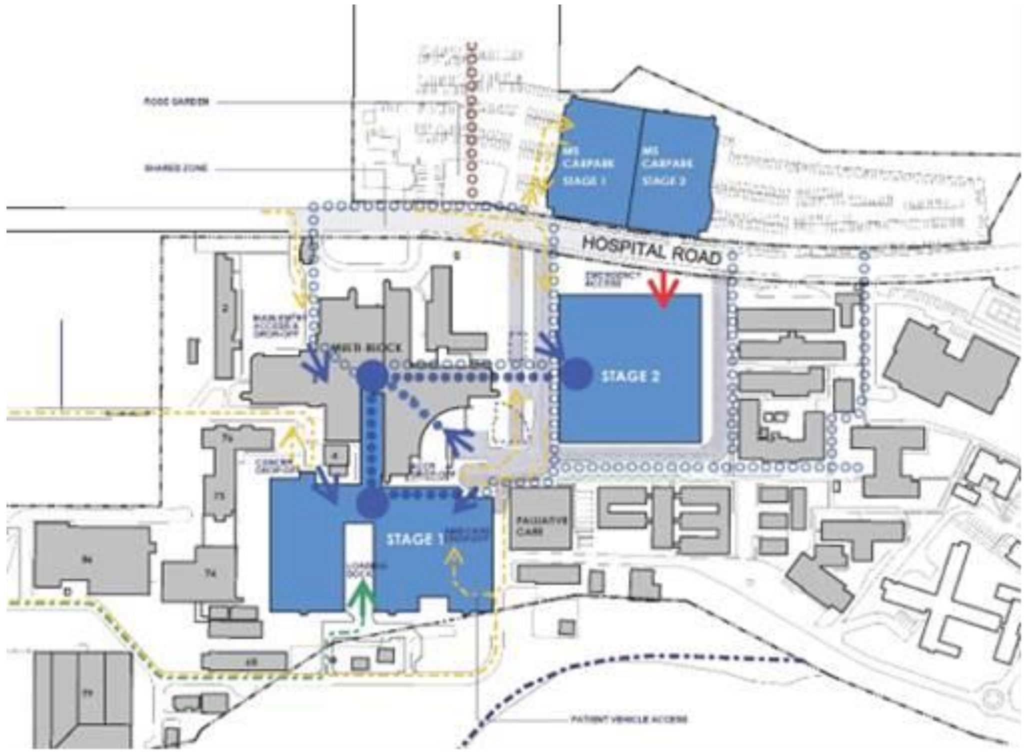



*Figure 2b: Extract of the CRGH Masterplan/ Concept Design Optimisation Report Stage 2 (December 2017)*

*Source: NSW Health Infrastructure/Capital Insight (2017)*

# 3. ABBREVIATIONS AND DEFINITIONS

| | |
|---|---|
| **AHU** | Air Handling Unit (provided by Mechanical Trade) |
| **CSB** | Clinical Services Building |
| **Co-gen** | Co-generation plant |
| **CSSD** | Central Sterile Services Department |
| **DTS** | Deemed to Satisfy |
| **ERG** | Expert Review Group (Health Infrastructure) |
| **ESD** | Environmental Sustainable Design |
| **FCU** | Fan Coil Unit (provided by Mechanical Trade) |
| **FU** | Fixture unit<br>A unit of measure, based on the rate of discharge, time of operation and frequency of use of a fixture, that expresses the hydraulic load imposed by that fixture on the sanitary plumbing installation. |
| **GMP** | Gross maximum price |
| **IL** | Invert level |
| **IPU** | Inpatient unit |
| **L/sec** | Litres per second |
| **m/sec** | Metres per second |
| **Mj/hr** | Megajoules per hour |
| **MSCP** | Multi storey car park |
| **NoR** | Notice of requirements |
| **OSD** | On-Site Detention relating to stormwater |
| **PSD** | Probable Simultaneous Demand<br>The probable maximum flow rate for pipework supplying multiple fixtures based on the usage patterns in specific building installations. |
| **RO** | Reverse osmosis water |
| **RPZD / RPZ** | Reduced Pressure Zone Device |
| **Shell** | An area with the building fabric that is not fitted out with internal walls, ceilings and fixtures |
| **SMH** | Sewer Maintenance Hole |
| **Tri-gen** | Tri-generation plant |
| **TMV** | Thermostatic Mixing Valve |
| **UV** | Ultraviolet |
| **WSC** | Water Servicing Coordinator |

The Use of Must, Shall & Should:

In accordance with the international Organization for Standardization (ISO) Directives, the word "shall" is used to state that a requirement is strictly to be followed in order to conform to a Performance Requirement. Consequently, there can be no deviation from that requirement, other than a specific tolerance.

It is noted that in legislation and specifications it is common to use the work "must" to express a requirement. The word "shall" in this document should be considered as equivalent to "must" in the legislation.

The word "should" introduces a suggestion or recommendation that is not a requirement. It is not necessary that such recommendations or suggestions be followed in order to comply with the Performance Requirement.

# 4. HYDRAULIC SERVICES GENERAL

## 4.1 PURPOSE OF THIS REPORT

The purpose of this report is to describe the hydraulic services in relation to Concord Hospital Phase 1 Redevelopment. This report also provides general performance requirements for the Concord Hospital Phase 1 Redevelopment hydraulic services.

## 4.2 REFERENCE DOCUMENTS

The Brief is based on the reference documents:

- Jacobs Architecture documentation,
- Existing hydraulic services drawings,
- Survey information,
- Wood and Grieve Engineers SD documents.

## 4.3 SCOPE

The hydraulic services scope consists of the following services:

- Sewer drainage,
- Sanitary plumbing and drainage,
- Stormwater drainage (including siphonic),
- Potable cold-water service,
- Potable hot water service,
- Points of connection for other building services including: mechanical, fire sprinklers, irrigation and major medical equipment.

## 4.4 STANDARDS & DESIGN GUIDES

The hydraulic services will be designed to the minimum of the following Standards, except where noted in the deviation list:

- EP&A – ACT & Regulation
- Plumbing & Drainage – Act & Regulation
- National Construction Code (NCC) – 2016
- Plumbing Code of Australia (PCA) – 2016
- AS 3500-2015 – Plumbing and Drainage Set
- AS 5061-2004 – Gas Installations
- Sydney Water / Jemena
- Australasian Health Facility Guidelines (AHFG)
- NSW Health Department Circulars
- Health Infrastructure Engineering Guidelines- GL2016_20
- DIN 1988-300 Drinking water supply systems; pipe sizing
- Hot Water Policy Directive PD2015_008
- 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
- AS 1170.4 Structural design actions Earthquake actions in Australia

## 4.5 PROJECT DESIGN CRITERIA

The basis of the design is to deliver hydraulic services to the project that are fit for purpose and meet the project requirements outlined.

| Design Criteria | Detail |
|---|---|
| Cold-water supply velocity | 1.5m/s |
| Hot water supply velocity | 1.2m/s |
| Hot water return velocity | 0.6m/s |
| Maximum pressure at outlet | 500kPa |
| Minimum pressure at outlet | 250kPa |
| Rainwater pipework storm design | 1:100-year ARI |
| Climate Zone as per AS 3500.4 | Climate Zone A |

| New Building | Floor Levels |
|---|---|
| Building Type | Hospital |
| Number of floors | 9 |
| Kitchen | Within existing building |
| Laundry | Within existing building |
| Central Sterile Services Department (CSSD) | Within existing building |
| Iodine 131 | Not included but there is potential for future inclusion. The requirements of this have been provided in Aconex mail no.: WSAP-GCOR-000124 and we await direction. |

## 4.6 DESIGN CONSIDERATIONS

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

- General business continuity for healthcare facilities
- Maintenance
- Limiting system shut downs
- Reliability
- Energy efficiency
- Environmental best practice
- Safety in design for construction and maintenance
- Authority infrastructure size, age and capacity
- Incorporating spare capacity
- Redundancy and backup
- Systems monitoring
- Plant location (centralised or local)
- Future building zones (ensure new services do not cross through future zones)
- Hydraulic Services best practice for Healthcare

## 4.7 SPARE CAPACITIES

Allowances have been made within the Hydraulic Services plant or pipework system sizing for non-specific potential future modifications. General future allowances are listed below:

**Sewer Drainage:** The system within the building will be sized based on the fixture loads and will include a 5% spare capacity for any main graded pipes. The sewer drainage will be sized to a minimum diameter of 110mm which will allow for additional expansion of the internal planning. The drain pipes to the stacks should be sized to enable 500FU per stack and use a minimum diameter of 160mm.

**Sanitary Plumbing:** The system within the building will be sized based on the current building's fixture loads and will include a 5% spare capacity for any main graded and vertical pipes. Branch lines to individual wet areas will not be provided with a dedicated spare capacity.

**Stormwater Drainage (internal to the building):** The system within the building will be sized based on the current building's footprint and will include a 0% spare capacity for any graded pipes with no spare capacity allowed for vertical pipes. No provisions for stormwater drainage for future internal courtyards have been provided.

**Roof water Drainage:** The system within the building will be sized based on the current building footprint and will include a 0% spare capacity for all gutters & downpipes. Provision for rainwater drains for future Stage 2 roof and open areas will be provided as riser space and a turn up on level 01.

**Cold Water:** The system within the building will be sized based on the current building's fixtures probable simultaneous demand (PSD) and will include a 10% spare capacity for any main horizontal pipes, with 10% spare capacity allowed for main vertical pipes. Branch lines to individual wet areas will not be provided with a dedicated spare capacity.

**Hot Water:** The system within the building will be sized based on the current building's fixtures probable simultaneous demand (PSD) and will include a 10% spare capacity for any main horizontal pipes, with 10% spare capacity allowed for main vertical pipes. Branch lines to individual wet areas will not be provided with a dedicated spare capacity.

**Gas Services:** The system within the building will be sized based on the gas appliance loads and will include a 5% spare capacity for any main horizontal pipes with 5% spare capacity allowed for main vertical pipes with no spare capacity allowed for pipes supplying individual fixtures.

## 4.8 LIMITATIONS OF THE REPORT

This document is based on information provided by the Architects, Design Team, Hospital Facilities Managers, survey drawings and information communicated during user meetings.

WS+P have based this document on the assumption that the information provided can be taken at face value and in general terms accurately reflect the installation on site.

WS+P does not accept any liability regarding the accuracy of the existing documentation.

## 4.9 FIRE STOPPING AND FIRE RATING

Fire stop collars will be provided at each point where non-metallic pipes pass through fire rated floors or walls or other fire rated elements to meet the requirements of C3 of the BCA.

Where metallic pipes pass through fire rated floors or walls or other fire rated elements a fire and smoke stopping system will be used to meet the requirements of C3 of the BCA.

Where services that are not listed in C3.9 of the BCA need to be installed within fire isolated exits such as passages, corridors or stairs the services will be fire separated from the fire isolated exits in accordance with the BCA.

As sanitary fixture outlet pipes, TMVs, in wall water pipes and in-wall cisterns that cannot be fire stopped to meet the requirements of C3 of the BCA the sanitary fixture outlet pipes, TMVs, in wall water pipes and in-wall cisterns will not be installed within structural, smoke or fire walls. The architect will provide a service wall to ensure no elements will be installed within structural, smoke or fire walls.

Section C3.15(c) of the BCA will be used to achieve compliance where metallic pipes pass through fire rated floors or walls or other fire rated elements, however does not allow metallic pipes to pass through multiple fire compartments nor contain flammable gases. The Fire Safety Engineer will need to provide an alternative solution to enable metallic pipes to pass through multiple fire compartments and contain flammable gases within the building.

## 4.10 EARTHQUAKE DEFLECTION AND EXPANSION

All the hydraulic & fire services within the building scope are required to be designed to allow for seismic restraints and expansion requirements.

The seismic restraints will be designed to comply with:

- The Building Code of Australia
- AS 1170.4 Structural design actions Earthquake actions in Australia and all related design parameters
- Hazard factor suitable to the local area
- Importance level specific to the facility

For the earthquake factors used within the structural design refer to the Structural Report.

Expansion provisions will be made for the Services that cross above structural movement joins and will comply with:

- The Building Code of Australia
- The Structural Engineers design criteria

The expansion provisions within the services shall account for a movement of at least ±50mm.

The contractor should engage and undertake consultation with the Structural Engineer and approval from the Structural Engineer will be required for seismic restrains and expansion provisions. Certification of the Design & Installation shall be provided by a Structural Engineer.

## 4.11 MAINTAINING SERVICES DURING CONSTRUCTION

As Hospital buildings are critical and require a continuity of services for both clinical and statutory requirements, consideration needs to be given to the staging of shutdowns during construction.

The Contractor should provide the hospital and their insurance companies' sufficient notice prior to any shutdown including all methodology papers and the like.

The Contractor will generally prefabricate the main connection points with sufficient valving to reduce the shutdown times of the services. Prior to any connection of services pipes to the existing system the new services shall be thoroughly tested and flushed in accordance with the relevant Standards.

## 4.12 UTILITY AND AUTHORITY APPLICATIONS

The Contractor will be responsible for seeking and gaining all approvals from the relevant authorities and the like. This includes the lodgement of a Section 73 for the Concord Hospital Phase 1 Redevelopment, the building plan approval, and the water connection application but not limited to.

A reflux valve is required at the connection to the sewer main as the Sydney Water have confirmed that it is a sewer surcharge area.

# 5. UTILITY SERVICES

## 5.1 SITE PLANT INFRASTRUCTURE LOCATIONS

This section provides an overview of the utility infrastructure accessible to the site.

## 5.2 SEWER MAINS (UTILITY)

#### 5.2.1.1 EXISTING SEWER MAINS

There is currently an existing DN300 sewer main which runs adjacent to Yaralla Bay south of the site. The sewer main does currently cross onto the existing footprint of the proposed building.

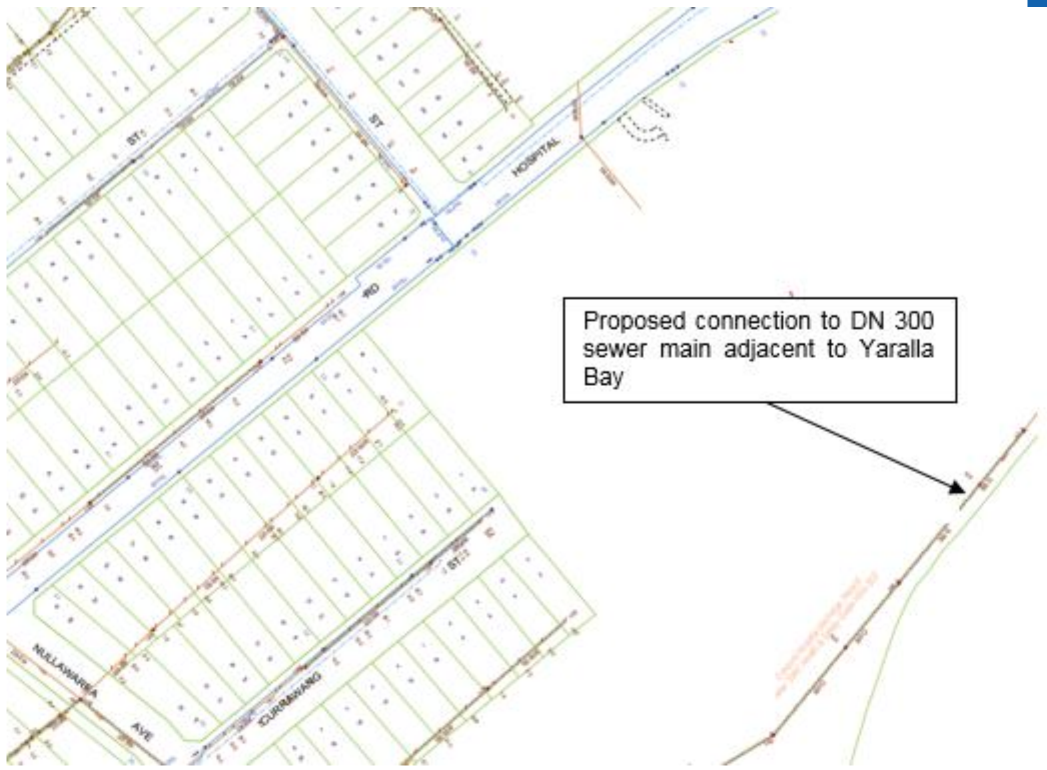



*Figure 3: Existing Sewer Mains (Source: DBYD)*

#### 5.2.1.2 SEWER AVAILABLE CAPACITY

We have proposed to connect to the 300mm sewer main that runs adjacent to Yaralla Bay. A Section 73 feasibility application has been made to Sydney Water to assess the capacity of this sewer main.

#### 5.2.1.3 SEWER MAINS AMPLIFICATIONS AND DIVERSIONS

The Section 73 feasibility application will confirm whether an amplification of the main is required. A diversion of the Sydney water sewer main is being undertaken as part of the early works as it will pass under the footprint of the new building.

## 5.3 WATER MAINS (UTILITY)

#### 5.3.1.1 EXISTING WATER MAINS

The site currently has two connections to the Sydney Water water main. It is conenction to both the 200mm main in Hospital Road and the 100mm main in Currawang Street. The connection in Currawang Street currently does not have a water meter. The connection has a normally closed isolation valve and is intended to only ever be used in the event of a failure in the Hospital road water main.

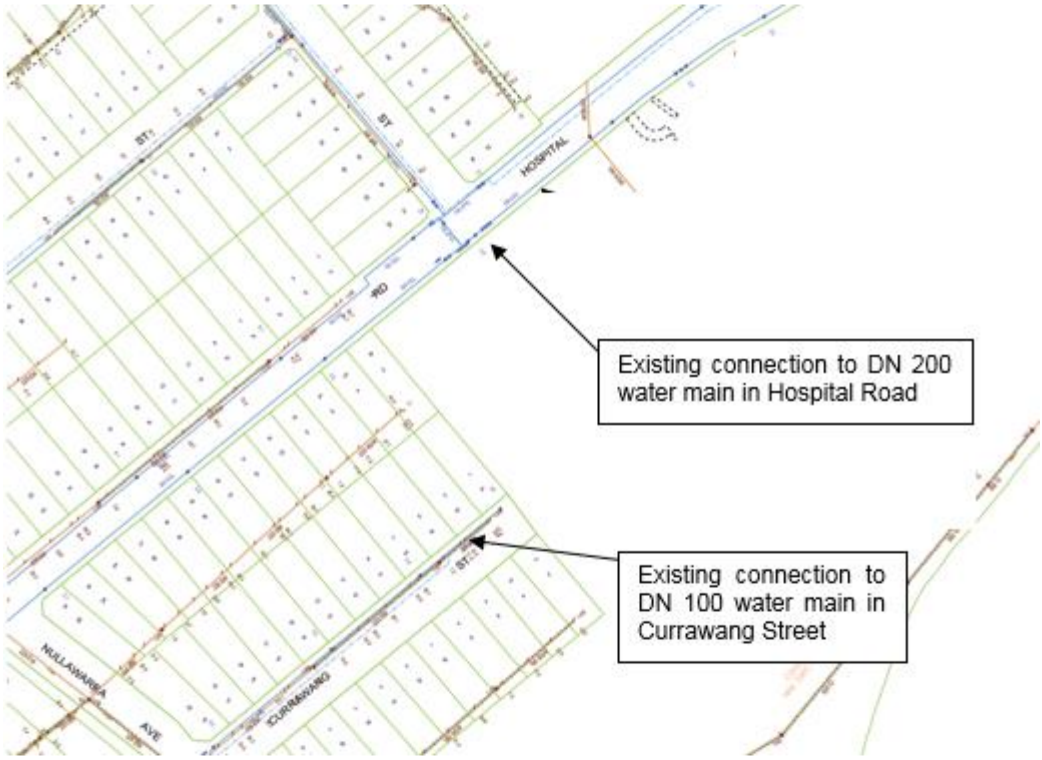



*Figure 4: Existing Water Mains (Source: DBYD)*

#### 5.3.1.2 WATER AVAILABLE CAPACITY

A Section 73 feasibility application has been made to Sydney Water to assess the capacity of this water main.

#### 5.3.1.3 WATER MAINS AMPLIFICATIONS AND DIVERSIONS

The Section 73 feasibility application will confirm whether an amplification of the main is required. There will no be requirement to divert the main.

## 5.4 NATURAL GAS MAINS (UTILITY)

#### 5.4.1.1 EXISTING NATURAL GAS MAINS

The site has access to Jemena Gas mains that range in size from 50mm – 150mm diameter and pressures from 210-1050kPa. These gas mains are located as follows:

- 50mm 210kPa on near side of Nullawarra Avenue
- 50mm 210kPa on near side of Hospital Road
- 75mm 210kPa on near side of Hospital Road
- 50mm 210kPa on near side of Currawang Street
- 150mm 1050kPa on near side of Nullawarra Avenue

However, the site currently has a connection to the Jemena 1,050kPa natural gas main located on the near side of Nullawarra Avenue. The meter number is 21001344 and there is a 100kPa metering pressure.

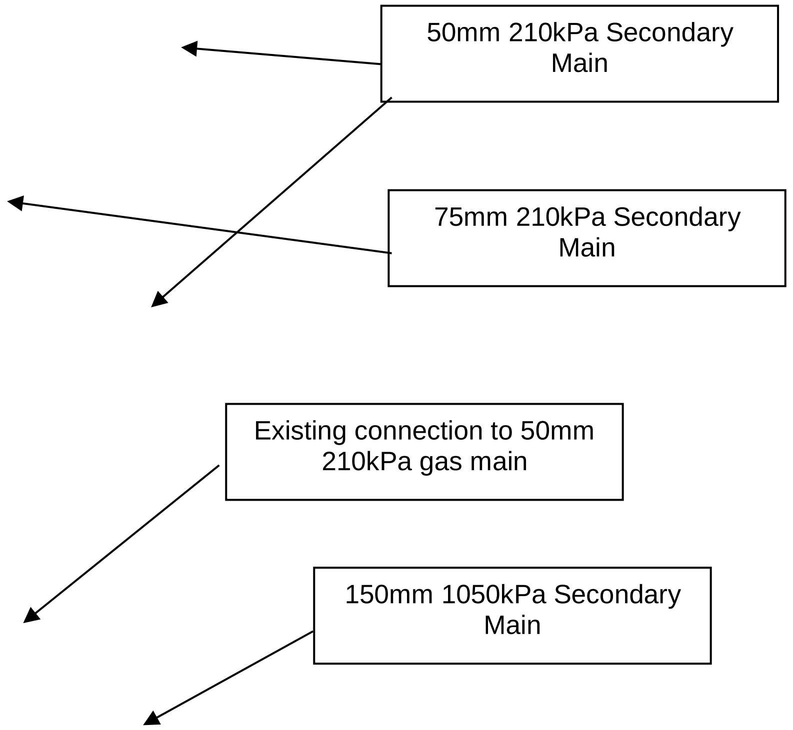



*Figure 5: Existing Natural Gas Mains (Source: DBYD)*

#### 5.4.1.2 NATURAL GAS AVAILABLE CAPACITY

Jemena have no process to preliminary assessing the capacity of their main. An application will need to be made to Jemena during the delivery stage of the project.

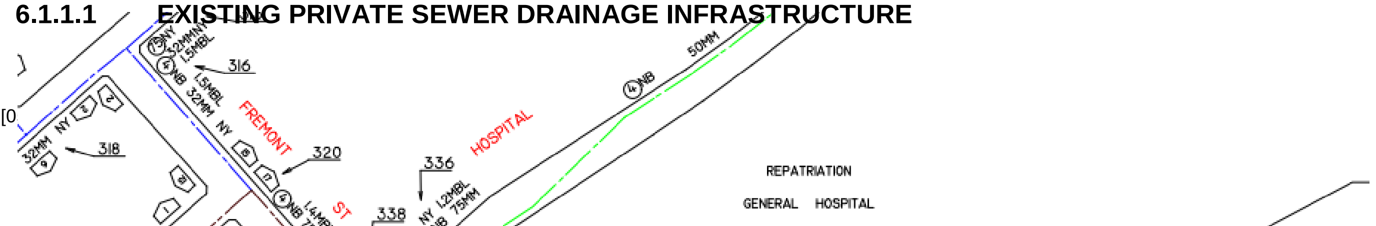
#### 5.4.1.3 NATURAL GAS MAINS AMPLIFICATIONS AND DIVERSIONS

Jemena have no process to preliminary assessing the capacity of their main. An application will need to be made to Jemena during the delivery stage of the project. The contractor will be responsible for making an application to the gas utility.

# 6. PRIVATE INFRASTRUCTURE

## 6.1 SEWER DRAINAGE

#### 6.1.1.1 EXISTING PRIVATE SEWER DRAINAGE INFRASTRUCTURE



There is existing private infrastructure servicing the existing buildings on site.

#### 6.1.1.2 EXISTING SEWER DRAINAGE SERVICES INFRASTRUCTURE WITHIN THE PROPOSED BUILDING ZONE

There is sewer drainage within the proposed building zone. This is being diverted as part of the enabling works package.

#### 6.1.1.3 PROPOSED SEWER DRAINAGE INFRASTRUCTURE

Sewer drainage infrastructure will need to be extended from the sewer main connection to the new building. A new sideline needs to be provided by a Sydney Water accredited contractor as part of the enabling works.

A reflux valve is required at the connection as the Sydney Water have confirmed that it is a sewer surcharge area.

Provisions to the future stages 2 and 3 have been provided with an approximate capacity of 2,000 FU. This has been hard to determine due to the lack of existing documentation. The contractor is to firm up the numbers as part of the enabling works.

#### 6.1.1.4 SIZING

The sewer drainage infrastructure sizing calculations will be based on the fixture unit method, pipe sizes, and pipe grades described within AS 3500.2.

#### 6.1.1.5 MATERIALS

The sewer drainage infrastructure for waste water less than 60˚C un-plasticised polyvinyl chloride (uPVC) pipes and fittings with solvent welded joints, will be used. Where the sewer is deeper than 3m the sewer drainage will be constructed from SN8 un-plasticised polyvinyl chloride (uPVC) pipes and fittings with rubber ring joints.

## 6.2 COLD WATER SERVICES

#### 6.2.1.1 EXISTING COLD WATER SERVICES INFRASTRUCTURE

There is existing private infrastructure servicing the existing buildings on site.

#### 6.2.1.2 EXISTING COLD WATER SERVICES INFRASTRUCTURE WITHIN THE PROPOSED BUILDING ZONE

There are cold water services including a cold water storage tank which acts as a backup supply for building 5 within the proposed building zone.

Building 5s existing cold water filters are located near the new lift core but will remain unaffected.

#### 6.2.1.3 PROPOSED COLD WATER SERVICES INFRASTRUCTURE

This pipework is being diverted as part of the enabling works package with a temporary storage tank being provided for building 5. The new building's potable cold water storage tank will then be sized to cater for this additional demand.

The new buildings pumps will be sized to provide sufficient pressure to replace these pumps. The existing filters will become redundant once the new building is connected and will need to be removed.

Pressure reduction valves are to be provided to match the existing supply pressure on the outlet of the pumps.

Provisions to the future stages 2 and 3 have been provided with a full flow 3000 l/sec capacity.

#### 6.2.1.4 SIZING

The Probable Simultaneous Demand (PSD) for the Proposed Cold Water Services Infrastructure will be calculated based on the methods specifically for hospitals described within DIN 1988-300 "Drinking water supply systems; pipe sizing" due to Tables 3.2 and 3.3 within AS 3500.1 "Plumbing and Drainage Set" only being suitable for multiple dwelling and single dwelling.

This will be an alternative solution carried out as per the prescribed verification method BV1(a) of the Plumbing Code of Australia to achieve compliance with the performance requirements stated in Part B1 of the Plumbing Code of Australia.

Pipe work will be sized to achieve flows with a maximum velocity of 1.5m/sec to minimise noise and water hammer.

#### 6.2.1.5 MATERIALS

The cold water services infrastructure, will be constructed from multiple materials depending on whether or not the pipes are above or below ground and the pressure rating of the material.

Polyethylene (PE100) pipes and fittings with fusion welded joints will be used below ground.

Copper (Cu) pipes and fittings with silver soldered or press fit (incorporating leak identification) joints will be used above ground.

## 6.3 NATURAL GAS

#### 6.3.1.1 EXISTING NATURAL GAS SERVICES INFRASTRUCTURE

The site is serviced by an existing 100kPa natural gas infrastructure located in Nullawarra Avenue which extends around the site.

#### 6.3.1.2 EXISTING NATURAL GAS SERVICES INFRASTRUCTURE WITHIN THE PROPOSED BUILDING ZONE

The existing infrastructure from the onsite gas meter does not enter the proposed building zone.

#### 6.3.1.3 PROPOSED NATURAL GAS SERVICES INFRASTRUCTURE

It is proposed that the gas lines servicing the boiler room are disused and removed. Additionally, the existing line that services the Level 3 plantroom is to be replaced with a new line which will then service the phase 1 development.

# 7. SERVICES WITHIN THE BUILDING

## 7.1 SEWER DRAINAGE

#### 7.1.1.1 CONSIDERATIONS & CONSTRAINTS

As part of the enabling works, it was assessed whether to run the sewer drainage through the new building's footprint or around and down the road. It was decided that the sewer drainage should run around the footprint of the building as it would provide provisions to the future redevelopment stages as well as being best practice design due to keeping the sewer outside the footprint of the building and ensuring ease of access without interrupting business continuity.

#### 7.1.1.2 PROPOSED SEWER DRAINAGE WITHIN THE BUILDING

The sewer drainage system internal to the building will be designed in accordance with AS 3500.2 and installed below the slab. Drainage principles will be utilised for the inground drainage only.

A minimum of 110mm diameter pipe will be used inground to ensure future flexibility and to minimise the risk of blockages.

Clear outs will be provided adjacent to each WC or group of WCs for ease of rodding.

An overflow relief gully has been provided for compliance with AS 3500.2 Additional overflow relief gullies have been provided at the end of each main drain to protect the building from overflows.

The sewer drainage makes connection to main via gravity, therefore no pump out pit is required.

#### 7.1.1.3 SIZING

The sewer drainage system sizing calculations will be based on the fixture unit method described within AS 3500.2.

#### 7.1.1.4 MATERIALS

The sewer drainage system consisting of drainage and vents will be constructed from multiple materials depending on the waste water discharge temperature received by that material.

For waste water less than 60˚C un-plasticised polyvinyl chloride (uPVC) pipes and fittings with solvent welded joints, will be used. Where the sewer is deeper than 3m the sewer drainage will be constructed from SN8 un-plasticised polyvinyl chloride (uPVC) pipes and fittings with rubber ring joints.

For waste water less than 80˚C high density polyethylene (HDPE) pipes and fittings with fusion welded joints will be used.

## 7.2 SANITARY PLUMBING

#### 7.2.1.1 CONSIDERATIONS & CONSTRAINTS

The use of a reduced velocity stack was considered to be implemented to reduce the cost and space requirements of the system. It was decided that unless the budget was looking to be reduced then a common system which the contractors are familiar with should be utilised.

#### 7.2.1.2 PROPOSED SANITARY PLUMBING

The sanitary plumbing system for the building will be designed as a fully ventilated modified system utilising positive atmospheric venting.

Generally, a minimum pipe size of 110mm will be used to drain both waste and soil fixtures, which allows future flexibility for the installation of additional soil fixtures during refurbishments without the need to upgrade pipe sizes.

The stacks and relief vents will not be any smaller than 110mm.

Within the building the stacks and relief vents will be positioned against columns and in the instances where these stacks must offset to a different face of the column, this shall be done using 45s to negate the additional relief vents. The stacks, and relief vents will be cast into the slab with fire stop collars. Back vents will generally rise within partition walls on the floor plate.

The above proposal is a departure from HI's Design Guidance Note No. 1, as the pipes will be cast in with fire stop collars in lieu of a fire rated shaft.

Clear outs with circular caps will be provided adjacent to each WC or group of WCs for rodding and maintenance as entering the ceiling space of the floor below is not permitted.

Capped junctions shall be provided on both the stack (just above the ceiling) and relief vents (just below the slab above) should there be no connections to the stacks and relief vents on the floor level. This will allow for future connections without damaging the integrity of the stack and vent.

#### 7.2.1.3 SIZING

The sanitary plumbing system sizing calculations will be based on the fixture unit method described within AS 3500.2.

#### 7.2.1.4 MATERIALS

The sewer drainage system consisting of drainage and vents will be constructed from multiple materials depending on the waste water discharge temperature received by that material.

For waste water less than 60˚C un-plasticised polyvinyl chloride (uPVC) pipes and fittings with solvent welded joints, will be used. Where the sewer is deeper than 3m the sewer drainage will be constructed from SN8 un-plasticised polyvinyl chloride (uPVC) pipes and fittings with rubber ring joints.

For waste water less than 80˚C high density polyethylene (HDPE) pipes and fittings with fusion welded joints will be used.

#### 7.2.1.5 DRAINAGE AND SANITARY PLUMBING FOR OTHER TRADES

Mechanical plant/equipment such as, fan coil units (FCU) air handling units (AHU), cooling tower drain downs, chilled and heating water drain downs will drain to the sewer system.

Where waste discharges are infrequent and evaporation of the water seal in the trap is a risk and it is not possible to route a waste fixture to top up the traps, waterless traps will be used outside of plant room areas.

All drainage within the plant rooms will generally drain to a floor waste without a top up device. Hose taps will be provided to fill floor waste traps when required.

Tundishes and floor drains will be coordinated to suit the final mechanical plant/equipment locations. Condensate drains shall be piped from the mechanical plant/equipment to the tundish and or floor waste by the Mechanical Contractor.

Fire system drain down water should discharge in to suitably sized drainage points next to each fire stair and within the Plantrooms.

## 7.3 STORMWATER, SUBSOIL & ROOF RAINWATER DRAINAGE

#### 7.3.1.1 CONSIDERATIONS & CONSTRAINTS

The main consideration for stormwater was whether siphonic or gravity system should be used. In consultation with the architect, it was agreed that a siphonic system would better suit the clinical planning requirements of the building due to the decreased number of downpipes.

#### 7.3.1.2 STORMWATER & ROOF RAINWATER DRAINAGE (INTERNAL TO THE BUILDING)

The hydraulic scope will only extend to stormwater and roof water drainage within the building and the stormwater associated external to the building required to convey the internal stormwater into the external stormwater system or onsite detention.

The on-site detention and associated on-site detention stormwater drainage, filtration devices and external stormwater drainage system will be documented by the Civil Engineer. The subsoil drainage will also be documented by the civil engineer.

All external downpipes will be installed by the Roofing Contractor, however design and certified by the hydraulic consultant.

The general design intent and approach for the different stormwater and roof rainwater drainage systems is to move the water from within the building to the edge where robust overflows can be provided. Where this is not possible piped overflow systems have been provided. In some instances, the internal courtyards could overflow onto the courtyard below, however this has been avoided to reduce the likely hood of flooding caused by an excessive amount of water entering a small land locked space.

#### 7.3.1.3 ROOF RAINWATER DRAINAGE

#### 7.3.1.4 METAL DECK ROOF RAINWATER DRAINAGE (SIPHONIC)

The siphonic metal deck roof drainage system will collect rainwater using rectangular gutters which will drain via siphonic outlets connected to horizontal siphonic drainage pipes with central vertical siphonic downpipe droppers.

The rainwater will be piped through the building and connect to the civil stormwater system where it is capable of receiving a 1:100 year storm event.

The pipes shall not be cast into columns as a method of concealing.

A suitably qualified person with a verified computer model shall be engaged to undertake the siphonic system design.

The following areas will be drained using the above system;

- Level 6 roof,
- Level 3 roof,
- Atrium roof.

Where the atrium abuts the existing building 5 and 3, generally the existing building 5 and 3 overflows are not blocked. However, the new lift core does block one overflow from building 5. This did not appear a problem and an overflow of at least the same cross-sectional area at the same invert and overt levels will need to be provided.

The overflows from all surrounding roofs have been allowed for in both the primary and secondary system within the new building.

##### 7.3.1.4.1 SIZING

The siphonic metal deck roof drainage system will be sized for a 1:100 year rainfall intensity and shall be sized to include any higher contributing catchments, wall catchments, other roof overflows and floor areas open to the sky.

The Deemed to Satisfy (DTS) pre-calculated tables within AS 3500.3 will not be used as they do not cater for siphonic drainage systems and the tables are only really applicable to residential and small commercial buildings in relation to gutter sizing.

A fully calculated method based on recognised formulas within a verified computer model will be used to size the siphonic system.

The gutter will be calculated based on recognised formulas, such as Manning's, using a roughness coefficient of 0.018 to cater for dirt within the gutter and achieving a free board of 25mm between the top water level and overflow device.

Overflows shall be designed to allow for a fully blocked piped stormwater system. The overflow shall be sized based on achieving a 50mm free board between the gutter overflow level (top of the gutter) and the head required to achieve the hydraulic capacity through the overflow.

A siphonic and or gravity piped overflow system will be required for the areas where external discharge is not possible via overflow slots.

An Alternative Solution carried out as per the prescribed verification method DV1(a) of the Plumbing Code of Australia to achieve compliance with the Performance Requirements stated in Part D1 of the Plumbing Code of Australia.

#### 7.3.1.4.2 MATERIAL

The siphonic metal deck roof drainage system, will be constructed from multiple materials depending on whether or not the pipes are exposed to view or are external to the building fabric.

Where not exposed to view or external to the building fabric the siphonic system will be constructed from high density polyethylene (HDPE) pipes and fittings with fusion welded joints.

Where exposed to view or external to the building fabric the siphonic system will be constructed from stainless steel (S/S) pipes and fittings with welded or press fit joints.

### 7.3.1.5 SIPHONIC STORMWATER DRAINAGE (INTERNAL TO THE BUILDING)

The concrete roofs, exposed concrete areas, cooling tower areas and the like will have their surfaces fall away from the building entries.

The areas will be drained by combinations of rainwater outlets or trench drains using siphonic outlets. The rainwater will be piped through the building and connect to the civil stormwater system where it is capable of receiving a 1:100 year storm event.

Trench drains will be provided at door thresholds when there is a risk of rain running down the façade and entering the building.

Depending on the areas adjacencies to the edge of the building a combination of letter box overflows and piped overflows will be used.

In accordance with F1.2 of the BCA the drainage and overflow system must not allow stormwater to enter the building. It is to be ensured that a 150mm set down between the internal surface level and the area exposed to rain is provided. Where the 150mm set down cannot be achieved a hob shall not be installed and a continuous overflow at the edge of the building provided.

The following areas will be drained using the above system;

- Level 7 roof,
- Level 6 plant roof,
- All terraces and courtyards,
- Ground floor flat roofs.

#### 7.3.1.5.1 SIZING

The siphonic drainage system will be sized for a 1:100 year rainfall intensity and shall be sized to include any higher contributing catchments, wall catchments and floor areas open to the sky. A fully calculated method based on recognised formulas within a verified computer model will be used to size the siphonic system.

Rainwater outlets and trench drains shall be sized based on a maximum of 50mm head above the grate.

Overflows shall be designed to allow for a fully blocked piped stormwater system. The overflow shall be sized based on achieving a 50mm free board between the internal surface level and the head required to achieve the hydraulic capacity.

A piped overflow system will be required for the areas where external discharge is not possible via overflow slots.

#### 7.3.1.5.2 MATERIAL

The siphonic drainage system, will be constructed from multiple materials depending on whether or not the pipes are exposed to view or are external to the building fabric.

Where not exposed to view or external to the building fabric the siphonic system will be constructed from high density polyethylene (HDPE) pipes and fittings with fusion welded joints.

Where exposed to view or external to the building fabric the siphonic system will be constructed from stainless steel (S/S) pipes and fittings with welded or press fit joints.

### 7.3.1.6 GRAVITY STORMWATER DRAINAGE (INTERNAL TO THE BUILDING)

Some concrete roofs and courtyard areas which are too small for the use of siphonic drainage or have planter boxes incorporated will need to drain via conventional gravity stormwater drainage.

The rainwater will be piped through the building using a material with a pressure rating capable of catering for a fully blocked pipe's vertical static pressure and connect to the civil stormwater system where it is capable of receiving a 1:100 year storm event.

Depending on the areas adjacent to the edge of the building a combination of letter box overflows and piped overflows will be used.

In accordance with F1.2 of the BCA the drainage and overflow system must not allow stormwater to enter the building. It is to be ensured that a 150mm set down between the internal surface level and the area exposed to rain is provided. Where the 150mm set down cannot be achieved a hob shall not be installed and a continuous overflow at the edge of the building provided.

These areas include:

- The roof of the bunkers
- The lift core roof

#### 7.3.1.6.1 SIZING

The stormwater drainage system will be sized for a 1:100 year rainfall intensity and shall be sized to include any higher contributing catchments, wall catchments and floor areas open to the sky.

Rainwater outlets and trench drains shall be sized based on a maximum of 50mm head above the grate.

Overflows shall be designed to allow for a fully blocked piped stormwater system. The overflow shall be sized based on achieving a 50mm free board between the internal surface level and the head required to achieve the hydraulic capacity where possible.

A piped overflow system will be required for the areas where external discharge is not possible via overflow slots.

#### 7.3.1.6.2 MATERIAL

The stormwater drainage system will be constructed from high density polyethylene (HDPE) pipes and fittings with electro-fusion welded joints when run internally to achieve the required pressure rating during a blockage and to minimise the risk of leaks at joints.

### 7.3.1.7 STORMWATER DRAINAGE FOR FIRE TEST WATER

A stormwater drain capable of 60 L/sec. shall be provided for the fire test water discharge adjacent to the fire pumps within the fire pump plantroom.

## 7.4 RAINWATER REUSE AND NON-POTABLE WATER

### 7.4.1.1 RAINWATER HARVESTING

A rainwater reuse/harvesting system will not be provided due to the long payback period, risk to public health and the further excavation of contaminated fill for below ground reuse storage.

When reviewing the payback period, it should be noted that; HI is committed to delivering projects which will deliver the best value energy performance and will commit funding to implement initiatives and schemes which are economically responsible and deliver proven and significant energy improvements. This means achieving the optimum energy improvement return for capital investment. HI requires all ESD initiatives to provide;

- A further 5% improvement on NCC Part J Performance from the standard, and
- A 7-year payback period on investment.

On previous projects, HI has undertaken holistic life cycle reviews on rainwater reuse systems. These reviews have generally found that rainwater reuse systems have not provided a cost-effective use of the project's ESD budget and with a payback of greater than 7 years (in the order of the year 2095).

The team have reviewed the use of rainwater reuse for irrigation and have concluded that a rainwater reuse system would not be a cost-effective implementation.

Further to the cost considerations above, within a clinical environment the prevention of infection is a priority. The storage of collected rainwater may contain or breed legionella, dead animals, mosquitoes, chemicals, microbial hazards and Escherichia coli.

The maintenance involved with the general upkeep of rainwater reuse tanks and ensuring the stored collected rainwater is not harbouring infections is laborious and often budget driven which may reduce the prudent level of maintenance to ensure the public and Hospital are comfortable with the level of public health.

## 7.5 POTABLE COLD, HOT & WARM WATER SERVICES

### 7.5.1.1 POTABLE COLD WATER CONSIDERATIONS & CONSTRAINTS

The main consideration on the potable cold water system was connecting to existing building 5 from the new supply. This was adopted as the supply would be off a new main and the level of filtration is improved

### 7.5.1.2 POTABLE COLD WATER SERVICES WITHIN THE BUILDING

The potable cold-water service will extend from the infrastructure described within section 6.2.1.3 and service the fixtures.

Accessible isolation valves will be provided for the isolation of all the systems and plant. Isolation valves will be provided at the inlet and outlet of all plant and serviceable devices to allow for ease of replacement and AS 3500.1 compliance. The building will be provided with main isolation valves that will isolate the water supply to the entire building, further isolation valves will be provided on each floor level to isolate the specific floor the valves are located on.

The main water services within the building will be provided with two separate ring mains on each floor level with isolation valves within the ceiling to allow partial shutdowns for future connections. The isolation increments will be 100%, 75%, 50% and 25% of the floor area. These isolation valves will be provided with access panels when a set ceiling is installed below the valve.

All connections to the main in ceiling pipework (branch off-takes) will be provided with isolation valves directly adjacent to the main supply pipework. These isolation valves do not require access panels as there intended for use only during refurbishments and are installed adjacent to the main supply pipework to minimise dead legs should they become permanently isolated if the service down stream of them becomes redundant.

A set of individual zone isolation valves will be provided either in the TMV boxes or RPZ boxes where required. These isolation valves will be readily accessible for everyday use without the need for a ladder.

Final fixture isolation valves (mini cistern taps) will be provided where required by AS 3500.1 & 4.

The ring mains will be a single size to enable fixture loads to be relocated to other areas of the floor plate, which allows for flexibility, ease of maintenance and system reliability.

Non-clinical areas will be provided with a dead leg system that diminishes in size.

Where the static pressure exceeds 500kPa pressure reduction valves will be provided, to meet the requirement of Clause 3.3.4 of AS 3500.1 these valves shall not be installed within a ceiling or when ladder access would be required. Point of use pressure reductions valves will be provided within the thermostatic mixing valve boxes or backflow prevention device boxes.

Backflow prevention valves will be provided in each area where zone protection is required in accordance with AS 3500.1 these valves shall not be installed within a ceiling or when ladder access would be required.

Hose taps are to be provided throughout the building's plant rooms, loading dock and the like for wash down. Hose taps and irrigation connection points with backflow prevention devices will also be provided within the gardens and courtyard area.

There will be two potable cold water risers in the building to minimise the pipe sizes required through the corridors.

The cold water rising pipework, pumps, filters and tanks are proposed to cater for both the new building and building 5. A strategy will need to be implemented to ensure this switchover is efficient.

### 7.5.1.3 POTABLE COLD WATER PUMPS

A pressure and flow enquiry has been obtained and to achieve sufficient pressure at the potable cold water storage tank on Level 6, a booster pump is required in the basement.

Additionally, a booster pump is required on the outlet of the tank to provide sufficient pressure to the topmost levels of the building. Where the pressure exceeds 500kPa on the lower levels, pressure reduction valves will be provided in the TMV or RPZ boxes. It is important this pump is sized to match the pressure on the outlet of the existing building 3 pump in the services tunnel.

### 7.5.1.4 PRESSURE & TEMPERATURE GAUGES

Pressure and temperature gauges shall be provided on the system to facilitate fault finding within major plant areas and located at the most advanced and disadvantaged pressure and temperature areas.

A pressure gauge must be installed on the inlet and outlet of each pressure reduction valve with a pressure gauge provided at the domestic hot water plant cold water supply for the North building.

### 7.5.1.5 SIZING

The Probable Simultaneous Demand (PSD) for the potable cold water service within the building will be calculated based on the methods within DIN 1988-300 "Drinking water supply systems; pipe sizing" due to Tables 3.2 and 3.3 within AS 3500.1 "Plumbing and Drainage Set" only being suitable for multiple dwelling and single dwelling.

Pipe work will be sized to achieve flows with a maximum velocity of 1.5m/sec to minimise noise and water hammer.

Water systems shall achieve a minimum water pressure of 250kPa and a maximum water pressure of 500kPa when the fixture is fully open or operational. Pressure reduction valves will be installed to achieve this pressure on the lower levels.

#### 7.5.1.6 ESTIMATED COLD WATER SUPPLY DEMANDS

| Level | PSD (L/s) | |
|---|---|---|
| | Riser 1 | Riser 2 |
| **B1** | | 0.89 |
| **LG** | 1.36 | 2.02 |
| **G** | 2.11 | 2.50 |
| **1** | 2.15 | 2.97 |
| **2** | 2.04 | 3.03 |
| **3** | 2.02 | 2.24 |
| **4** | 1.03 | 0.87 |
| **5** | 2.08 | 2.16 |
| **6** | | 3 |
| **7** | | |
| **TOTAL** | 4.65 | 8.85 |
| **COMBINED PSD** | **10.25** | |

The PSD values are for a demand with allowance for future capacity (10%).

The PSD for the existing building 5 is expected to be similar. Complete floor plans have not been made available so therefore cannot be fully calculated. It has been estimated that the full flow will be somewhere between 300-1,000L/sec and therefore a 150mm pipe has been selected.

#### 7.5.1.7 MATERIAL

The potable cold water system, will be constructed from multiple materials depending on whether or not the pipes are above or below ground and the pressure rating of the material.

Polyethylene (PE100) pipes and fittings with fusion welded joints will be used below ground.

Copper (Cu) pipes and fittings with silver soldered or press fit (incorporating leak identification) joints will be used above ground.

Stainless steel (S/S) pipes and fittings with welded joints or press fit (incorporating leak identification) joints will be used where the static pressure exceeds the safe working pressure of the copper (tabled in AS1432) or the polyethylene PN rating.

REHAU cross-linked high-density polyethylene (PE-Xa) PN20 SDR7.4 pipes used together with RAUTITAN MX (DZR Brass) & RAUTITAN PX (polymer PPSU) fittings will be used for fixture rough-ins.

#### 7.5.1.8 DOMESTIC COLD WATER STORAGE AND REDUNDANCY

A total of 156.24kL of water storage will be provided. This will provide three (3) hours of domestic cold water storage for both the new building and existing building 5. Building 3 which is supplied from the building 5 system will not be accounted for as it has an existing storage tank. In the event of a failure in the supply, the top up to this tank will need to be isolated to prevent it diminishing the new tanks supply. This will be done via solenoid valves connected to the BMS system.

The domestic cold water tanks will be located within the enclosed plant rooms in accordance with AS3666 and constructed from stainless steel panels, with an internal 50% division wall.

The domestic cold water tanks will be separate from any fire services water tanks required and cannot be combined with non-drinking fire water tanks.

#### 7.5.1.9 SIZING

The domestic cold water tank will be based on a 3 hour domestic water supply and 3 hours of cooling tower water supply.

*Table X: Potable Cold Water Demand*

| No of Units (Bed) | Demand per unit | Demand L/hr | Total Demand (3 hours) |
|---|---|---|---|
| 568 | 60 | 34,080 | 102,240 |

*Table Y: Cooling Tower Demand*

| Cooling Tower demand (L/s) | Cooling Tower demand (L/hr) | Total Demand (3 hours) |
|---|---|---|
| 5 | 18,000 | 54,000 |

Therefore, the required tank size to supply a 3 hour domestic water supply is 156,240 Litres.

#### 7.5.1.10 MATERIAL

The domestic cold water tank, will be constructed from stainless steel (S/S) panels and flanges with bolted joints.

#### 7.5.1.11 POTABLE HOT WATER CONSIDERATION & CONSTRAINTS

Casting the dead legs in the slab to remote fixtures. This is likely to be adopted as it significantly enhances user experience in relation to wait times and microbial growth, it also reduces the number of TMVs and therefore maintenance. This will be firmed up once fixtures are shown on the architecture.

#### 7.5.1.12 POTABLE HOT WATER SERVICES WITHIN THE BUILDING

The hot water services within the building will be provided with two separate 60-65°C flow and return risers and ring mains on each floor level.

The pipework will be insulated with 38mm insulation to reduce the heat loss within the system.

Heat lost from hot water within the potable hot water flow and return pipe work systems will be replenished by a pump recirculating the water back to the hot water generation plant for reheating. The design criteria for return pipework to the plant will be 5°C loss with a maximum velocity of 0.6m/sec.

Accessible isolation valves will be provided for the isolation of all the systems and plant. Isolation valves will be provided at the inlet and outlet of all plant and serviceable devices to allow for ease of replacement and AS 3500.1 compliance. The building will be provided with main isolation valves that will isolate the water supply to the entire building, further isolation valves will be provided on each floor level to isolate the specific floor the valves are located on.

The main water services within the building will be provided with two separate ring mains on each floor level with isolation valves within the ceiling to allow partial shutdowns for future connections. The isolation increments will be 100%, 75%, 50% and 25% of the floor area. These isolation valves will be provided with access panels when a set ceiling is installed below the valve.

All connections to the main in ceiling pipework (branch off-takes) will be provided with isolation valves directly adjacent to the main supply pipework. These isolation valves do not require access panels as there intended for use only during refurbishments and are installed adjacent to the main supply pipework to minimise dead legs should they become permanently isolated if the service down stream of them becomes redundant.

A set of individual zone isolation valves will be provided either in the TMV boxes or RPZ boxes where required. These isolation valves will be readily accessible for everyday use without the need for a ladder.

Final fixture isolation valves (mini cistern taps) will be provided where required by AS 3500.1 & 4.

The flow and return mains will be a single size to enable fixture loads to be relocated to other areas of the floor plate, which allows for flexibility, ease of maintenance and system reliability.

Non-clinical areas will be provided with a system that diminishes in size.

#### 7.5.1.13 PRESSURE & TEMPERATURE GAUGES

Pressure and temperature gauges shall be provided on the system to facilitate fault finding within major plant areas and located at the most advanced and disadvantaged pressure and temperature areas.

A temperature gauge must be installed on the flow and return pipework at the domestic hot water plant. A pressure gauge must also be provided each side of the domestic hot water circulating pump on both the existing and new systems.

#### 7.5.1.14 SIZING

The probable simultaneous demand (PSD) for the potable hot water service within the building will be calculated based on a standard hot and cold water mixing calculation to determine the mixing ration and the methods specifically for hospitals described within DIN 1988-300 “Drinking water supply systems; pipe sizing” due to Tables 3.2 and 3.3 within AS 3500.1 “Plumbing and Drainage Set” only being suitable for multiple dwelling and single dwelling.

This will be an alternative solution carried out as per the prescribed verification method BV2(a) of the Plumbing Code of Australia to achieve compliance with the performance requirements stated in Part B2 of the Plumbing Code of Australia.

Pipe work will be sized to achieve peak flows with a maximum velocity of 1.2m/sec to minimise noise and water hammer as per AS 3600.4:2017 Draft Standard.

#### 7.5.1.15 ESTIMATED HOT WATER SUPPLY DEMANDS

| Level | PSD (L/s) | |
|---|---|---|
| | Riser 1 | Riser 2 |
| **B1** | | 0.75 |
| **LG** | 1.09 | 1.62 |
| **G** | 1.72 | 1.96 |
| **1** | 1.56 | 2.23 |
| **2** | 1.48 | 2.26 |
| **3** | 1.49 | 1.70 |
| **4** | 0.81 | 0.72 |
| **5** | 1.52 | 1.62 |
| **6** | | |
| **7** | | |
| **TOTAL** | 3.57 | 4.53 |
| **COMBINED PSD** | **5.60** | |

The PSD values are for a demand with allowance for future capacity (10%)

#### 7.5.1.16 MATERIALS

The potable hot water system, will be constructed from multiple materials depending on the pressure rating of the material.

Copper (Cu) pipes and fittings with silver soldered or press fit (incorporating leak identification) joints will be used for the flow and return system.

Stainless steel (S/S) pipes and fittings with welded joints or press fit (incorporating leak identification) joints will be used where the static pressure exceeds the safe working pressure of the copper (tabled in AS 1432).

REHAU cross-linked high-density polyethylene (PE-Xa) PN20 SDR7.4 pipes used together with RAUTITAN MX (DZR Brass) and RAUTITAN PX (polymer PPSU) fittings will be used for fixture rough-ins.

#### 7.5.1.17 DOMESTIC HOT WATER HEATING PLANT

The domestic hot water heating plant will be sized for the peak hour with storage tanks to assist with the peak demand.

The peak hour capacities of the components are as follows:-

- 100% burner capacity for the peak hour supplied by the mechanical heating plant
- 15% of the peak hot water stored

#### 7.5.1.18 SIZING

*Table Z: Hot Water Demand*

| No of Units (Beds) | Demand per unit | Demand (L/hr) |
|---|---|---|
| 268 | 30 | 8040 |

Select CPI 10 or CPE 10 which offer 8,230L/hr recovery rate at 50ºC.

The storage tanks have been sized based on 15% of the 8040 L/hr demand which is 1,206L. Therefore, select 3 x 610 430 tanks which offer 1,230L of storage.

#### 7.5.1.19 THERMOSTATIC MIXING VALVES

Warm water to all patient care and staff area fixtures will be mixed and temperature limited using localised Thermostatic Mixing Valves (TMV). The TMVs will generally be shared between adjacent similar wet areas.

The TMVs are generally installed and accessible from within the wet areas. The TMVs associated with the isolation rooms shall be installed external to the wet areas where possible. The TMVs are to be set at a height of 1500mm to the top of the box except for where this requirement is unable to be achieved. The TMVs must be easily accessible and not installed in inaccessible positions.

Temperature limitation to outlets will be applied as follows:

| | |
|---|---|
| Staff | 43.5˚C |
| Operating Theatres | 43.5˚C |
| Public | 43.5˚C |
| Disabled Public | 43.5˚C |
| Patient care | 43.5˚C |
| Staff Beverage Bays | 45.0˚C |
| Staff Room Kitchen Sinks | 45.0˚C |

Hot water temperature to all dirty utility, cleaners' rooms and fixtures as required by the room data sheets will be 60°C using the hot water circulating flow and return system detailed above.

#### 7.5.1.20 THERMOSTATIC MIXING VALVES TEMPERATURE TREND MONITORING

The Hospital Local Health District have advised of a preference to include a monitored TMV system. This will be followed through the design stage and a definite answer will be provided.

#### 7.5.1.21 LIMITING HOT & WARM WATER DEAD LEGS AND HOT/WARM WATER SUPPLY TIMES

The HI Engineering Guideline required dead legs to be kept as short as practicable and of recent has been updated to state no greater than 10m in length. PD2015_008 "Water Requirements for the Provision of Cold and Heated Water", NSW Health Policy Directive requires dead legs within pipework to not exceed 10m in lineal length or 2L, whichever is lesser. The Policy states, "A dead leg is defined in AS/NZS3500 as a branch pipe in a hot water system containing dead water. Dead water is the cold water drawn off before hot water commences to discharge from a hot water outlet".

The Architect should consider this requirement when laying out the sanitary fixtures that are supplied from a hot water reticulation system located within the corridor.

The requirements of PD2015_008 will be followed, however the dead leg length based on WS+P experience needs to be extended to 15m when measured from the main supply pipework to the fixture which is made up of 5m to the TMV and 10m from the TMV to the fixture.

In order to reduce the wait time and minimise the dead water for domestic hot/warm water at the fixture outlets in the dead leg. It is proposed to provide 15mm nominal bore pipework in lieu of 20mm nominal bore pipe where the PSD calculations and velocities are acceptable for use with 15mm nominal bore pipe. This will ensure the water contained in the dead leg is less than 2L.

When a smaller pipe is installed there is less dead water within the pipe which in turn reduces the time it takes to drain the cold dead water when the tap is open allowing the hot/warm water to arrive at the outlet quicker. This also reduces the amount of water any legionella can multiply in. Generally, in order to further control legionella and justify an extension in pipe length, filters have been added to the cold water supply to remove the organic material the legionella consumes with UV being provided to kill the legionella as it passes through the UV lamp.

It is also proposed to cast in conduits within the slab containing the warm water pipe to reduce the distance between the TMV often found in the ensuite and the remote basin located at the far end of the bedroom.

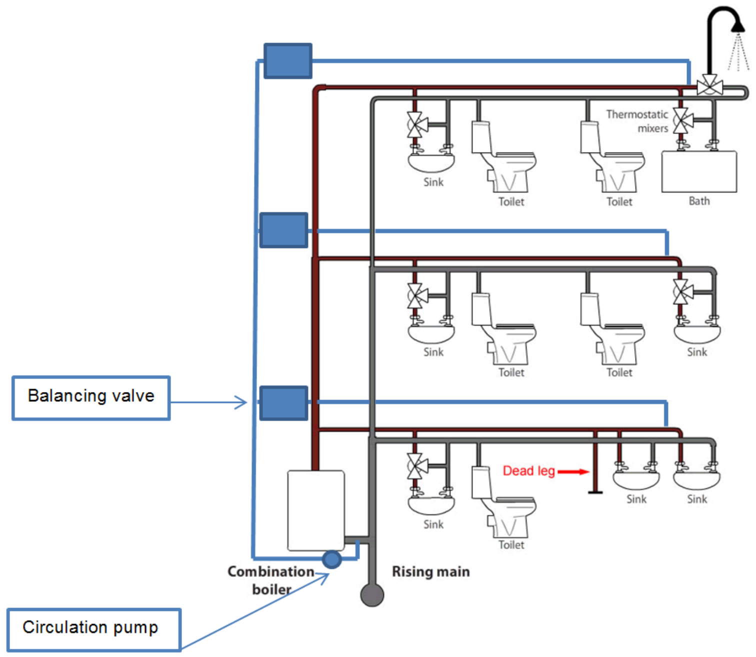
The reduced in pipe sizes has the following benefits:

- The pipework will be more accessible than in the ceiling with less disruption required to service
- Less TMVs will be required for improved aesthetic architectural appearance
- Less TMVs will be required which has an ongoing financial benefit to the hospital (monthly checks, annual maintenance and 5 year replacement)
- Less wait time for warm water as identified by the calculation above. Generally an 8m dead leg has a reduction in wait time by 54% when comparing 15mm rehau to 20mm copper.
- Less microbiological growth in the pipe due to the reduced capacity which is a critical design factor in healthcare environments
- Less heat loss so the microbiological growth is slowed down, this also decreases wait time in between uses
- The velocities will be compliant with AS3500 as outlined to be designed to in the first meeting. The velocity in a 15mm pipe is compliant with the simultaneous flow of two showers and one basin running at the same time

Due to the above benefits, this improves user experience and exceeds the client expectation as well as providing value for money.

The general wait time for 43.5°C water at a standard 7L/minute tap with varying pipe lengths and amount of water within the dead leg is tabled below:

| Pipe Length (m) | Pipe Size Copper Tube (mm) | Litres within pipe (L) | Wait time for Warm Water (sec) |
|---|---|---|---|
| 5m | 20mm | 1.16L | 10sec |
| 8m | 20mm | 1.85L | 16sec |
| 10m | 20mm | 2.30L | 20sec |
| 12m | 20mm | 2.76L | 24sec |
| 15m | 20mm | 3.44L | 30sec |
| 5m | 15mm | 0.5L | 5sec |
| 8m | 15mm | 0.75L | 7sec |
| 10m | 15mm | 0.93L | 8sec |
| 12m | 15mm | 1.12L | 10sec |
| 15m | 15mm | 1.4L | 12sec |




Example Diagram: Dead Leg

#### 7.5.1.22 NON POTABLE HOT & COLD WATER (HOSPITAL UTILITY WATER)

Non-potable cold water will be supplied from the potable cold water service with a reduced pressure zone device 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, and Cleaners' Rooms. The RPZ's are to be set at a height of 1500mm (to the top of the box) and must be easily accessible and not installed in inaccessible positions. The must be a clear height above the valve to allow the test gauge to be positioned above the top level of the valve during the annual test.

#### 7.5.1.23 WATER QUALITY

A combination of backwash and UV filters will be installed to achieve the desired water quality.100-micron backwash filters are to be provided on the inlet to the tank to reduce sediment in the tank. 50 micron and UV filters shall be installed on the outlet of the tank.  Thermal flush will be provided on the TMVs.

#### 7.5.1.24 WATER METERING

The development will be metered by both utility-owned water meters at the property boundary, and client-owned and read water meters.

These water meters will have the capability for connection to the BMCS via pulse read-out and will be monitored by the BMCS for water demand and leak monitoring.

Privately owned (and read) sub meters will be provided to meter the usage of the following:-

- Main cold water supply to the building
- Supply to building 5
- Cooling towers
- Mech equipment
- Domestic hot water plant cold water supply (Section J requirement)

## 7.6 NATURAL GAS SERVICES

#### 7.6.1.1 NATURAL GAS SERVICES CONSIDERATIONS & CONSTRAINTS

The gas provisions to the future stages were going to be left within the basement for future connections to Stage 2 & 3 extension. However, this was decided against due to the fire rated shaft and ventilation requirements this would entail due to the high pressure.

#### 7.6.1.2 PROPOSED NATURAL GAS SERVICES WITHIN THE BUILDING

The natural gas supply will extend from the 100kPa provision left as part of the enabling works in the building 3 plant room. This will step down to 7kPa and extend onto the atrium roof and enter the ceiling space. The natural gas services will be limited to 7kPa within the building to avoid fire rated ventilated shafts and 5.5kPa will be provided to the gas appliances regulator inlets.

#### 7.6.1.3 SIZING

The natural gas system will be sized based on the methods described within AS 5601.

#### 7.6.1.4 ESTIMATED NATURAL GAS SUPPLY DEMANDS

| Location | Equipment | Gas Consumption (MJ/hr) |
|---|---|---|
| Level 6 | Hot Water Plant | 2,050 |
| Level 6 | Mechanical Loads | 10,000 |
| | Total Consumption = 12,050 MJ/hr | |

The pipe sizing will need to reflect the loads tabled above and any future capacity requirements.

#### 7.6.1.5 MATERIALS

The natural gas system, will be constructed from multiple materials depending on whether or not the pipes are above or below ground.

Polyethylene (PE100) pipes and fittings with fusion welded joints will be used below ground.

Copper (Cu) pipes and fittings with silver soldered or press fit (incorporating leak identification) joints will be used above ground.

#### 7.6.1.6 SYSTEM 3 GAS SHUT OFF SYSTEM

Manual gas shut off valves will be used in lieu of automatic Gas shut-off, as manual systems are more robust and not susceptible to nuisance trips when power is lost. The use of manual gas shut off valves meet the requirements of the BCA and AS 5601.

Manual gas shut-off isolation valves will be provided at the, but not limited to:

- Boundary
- Meter set
- Entry to plant rooms, with gas equipment / appliances
- Adjacent to each appliance

All appliances within the building are required to be fitted with flame failure devices to shut the gas supply down to the burner, should the flame be extinguished.

#### 7.6.1.7 GAS METERING

The development will be metered by both utility-owned gas meters and client-owned and read gas meters. These gas meters will have the capability for connection to the BMCS via pulse read-out and will be monitored by the BMCS for gas usage.

Privately owned (and read) sub meters will be provided to meter the usage of the:

- Mechanical heating plant
- Domestic hot water plant

## 7.7 SHELL SPACES

The future proofing strategy relates to levels 4 and 5 and consists of the following:

**Level 4:**

Project Scope - Office fitout Future Scope - Conversion into two IPU's

Timeframe - Assumed longer term at this stage

Sanitary plumbing – a junction will be provided on the local stack and relief vent for connection to (if not required for office fitout)

Water services – the pipes have been sized for the future IPU level to minimise disruption in the future

**Level 5:**

Project Scope - Cold shell Future Scope - Fitout into two IPU's

Timeframe - Assumed short - medium term

Sanitary plumbing - will be installed to suit a general IPU layout with the fixture connections and all sanitary plumbing and vents installed and capped at slab

**Appendix A – Concord Hospital Phase 1 Redevelopment Drawings**

Water services - will connect to the capped provisions provided at the risers

# 8. BMCS POINTS

The following list of hydraulic equipment will be connected to the BMCS:

- Domestic hot water circulation pump set
- Domestic cold water pump sets
- Thermostatic mixing valves - TBC
- Gas and water meters
- Domestic hot water temperature probes
- Domestic water storage tank levels
- Automatic backwash filters
- UV filters
- Solenoid valve for building 3 tank supply shut-down

# 9. KEY ELECTRICAL REQUIREMENTS

The following list of hydraulic equipment will require generator backed power for business continuity:

- Domestic hot water circulation pump set
- Domestic cold water pump sets
- Water filtration devices
- Sensor taps within clinical areas

# 10. SERVICES PROVISIONS FOR OTHER TRADES

- Cooling tower water supply
- Mechanical hot and chilled water top-up supply
- Fire services water storage tank makeup water
- Mechanical equipment sewer drainage points
- Mechanical gas supply
- Fire services flow switch and drain down sewer drainage points
- Fire services test water stormwater drainage pit
- Fire Services tank overflow and drain down points

# 11. APPENDICES

A. Concord Hospital Phase 1 Redevelopment drawings
B. Pressure and Flow Inquires
C. Safety in Design
D. Risk register
E. NSW Health Engineering Guidelines Departure Schedule

**Appendix A – Concord Hospital Phase 1 Redevelopment Drawings**

**Appendix B - Pressure and flow enquiries**

# Statement of Available Pressure and Flow

**Warren Smith**
**123 Clarence Street**
**Sydney, 2000**

**Attention: Warren Smith** Date: 14/11/2017

**Pressure & Flow Application Number: 332863**
**Your Pressure Inquiry Dated: 2017-10-17**
**Property Address: Concord Repat Hospit Hospital Rd, Concord 2137**

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

**ASSUMED CONNECTION DETAILS**

| | |
|---|---|
| Street Name: Hospital Road | Side of Street: East |
| Distance & Direction from Nearest Cross Street | 153 metres North from Fremont Street |
| Approximate Ground Level (AHD): | 9 metres |
| Nominal Size of Water Main (DN): | 200 mm |

**EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT**

| Normal Supply Conditions | |
|---|---|
| Maximum Pressure | 66 metre head |
| Minimum Pressure | 32 metre head |

| WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS | Flow l/s | Pressure head m |
|---|---|---|
| Fire Hose Reel Installations (Two hose reels simultaneously) | 0.66 | 32 |
| Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time) | 5 | 36 |
| | 10 | 35 |
| | 15 | 34 |
| | 20 | 33 |
| | 26 | 31 |
| | 30 | 30 |
| | 40 | 27 |
| | 50 | 23 |
| Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main) | 5 | 31 |
| | 10 | 30 |
| | 15 | 29 |
| | 20 | 27 |
| | 26 | 26 |
| | 30 | 24 |
| | 40 | 21 |
| | 50 | 16 |
| Maximum Permissible Flow | 74 | 4 |

**(Please refer to reverse side for Notes)**

**For any further inquiries regarding this application please email :**

**swtapin@sydneywater.com.au**

# Statement of Available Pressure and Flow

Sydney WATER

**Warren Smith**
**123 Clarence Street**
**Sydney, 2000**

**Attention: Warren Smith** Date: 04/12/2017

**Pressure & Flow Application Number: 341839**
**Your Pressure Inquiry Dated: 2017-10-30**
**Property Address: CONCORD REPAT HOSPIT Hospital Rd, Concord 2137**

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

**ASSUMED CONNECTION DETAILS**

| | |
|---|---|
| Street Name: Nullawarra Ave | Side of Street: West |
| Distance & Direction from Nearest Cross Street | 1 metres South from Boronia St |
| Approximate Ground Level (AHD): | 7 metres |
| Nominal Size of Water Main (DN): | 150 mm (As per sketch provided) |

**EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT**

| Normal Supply Conditions | |
|---|---|
| Maximum Pressure | 68 metre head |
| Minimum Pressure | 36 metre head |

| WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS | Flow l/s | Pressure head m |
|---|---|---|
| Fire Hose Reel Installations (Two hose reels simultaneously) | 0.66 | 36 |
| Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time) | 5 | 39 |
| | 10 | 38 |
| | 15 | 37 |
| | 20 | 35 |
| | 26 | 33 |
| | 30 | 31 |
| | 40 | 26 |
| | 50 | 20 |
| Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main) | 5 | 35 |
| | 10 | 33 |
| | 15 | 32 |
| | 20 | 30 |
| | 26 | 28 |
| | 30 | 26 |
| | 40 | 20 |
| | 50 | 13 |
| Maximum Permissible Flow | 54 | 10 |

**(Please refer to reverse side for Notes)**

**For any further inquiries regarding this application please email :**

swtapin@sydneywater.com.au

**Appendix C – Safety in Design**

| | | | | | | |
|---|---|---|---|---|---|---|
| Project No. | | | Project Name | **Australian Rugby Development Centre** | Site | |
| Prepared by | | | Position(s) | | Date | |
| | | | | | Ongoing Consultation | |

| REVIEW DATE | REVISION (Y/N)<br>IF ***YES*** PLEASE STATE REVISION | AUTHORISATION | REVIEW DATE | REVISION (Y/N)<br>IF ***YES*** PLEASE STATE | AUTHORISATION |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

This form is to be completed prior to start of work and issued to sub-contractors prior to requesting a safe work method statement (SWMS) from a subcontractor. If a risk has been identified, the relevant safe work method statement must include details of how the identified risks will be controlled. The SWMS is to be reviewed for adequacy in addressing identified risks.

| No. | Stage of Works (Enabling / Main) | Building Element / Location / Item / Trade | Construction Risk (Specific Hazard Identification) | Uncontrolled Risk Rating: Likelihood | Uncontrolled Risk Rating: Consequence | Uncontrolled Risk Rating: Risk Rating | Action and/or Solution Undertaken | Controlled Risk Rating: Likelihood | Controlled Risk Rating: Consequence | Controlled Risk Rating: Risk Rating | Hierarchy of Control | Person Responsible | Date Action/ Due Date | Risk Status 'Open' OR 'Closed' OR 'Transferred' | Draw/Doc Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Hydraulic** | | | | | | | | | | | | | | | |
| 1 | Main | Hydraulic | Water tanks - above ground: During maintenance of the tank there are fall risk from the water tank, besides, there could be slipping and difficult breathing risk when people inside the tank | Possible | Moderate | High | Tank access clearances:<br>1) Allow for sufficient access on top of the tank to view and maintain filling valves.<br>2) Provide two side access panels for annual cleaning.<br>3) Provide inclined ladder to top of tank. | Rare | Major | Medium | | | | | |
| 2 | Main | Hydraulic | Maintaining gutters and downpipes on roofs and awnings | Likely | Major | Extreme | Harness points and eyes provided to allow safe maintenance to be carries out | Rare | Major | Medium | | | | | |
| 3 | Main | Hydraulic | Internal stormwater pipes are required due to courtyards and also the architects preference from the roof | Possible | Major | Very high | The internal stormwater pipes will be HDPE pipes with electrofusion welded joints. This reduces the risk of leaks and the pipes will take the shortest route out the building and avoid critical rooms. | Rare | Major | Medium | | | | | |
| 4 | Main | Hydraulic | Maintenance access to valves in risers, ceilings has the potential of injury and inefficient shutdowns | Possible | Major | Medium | Ensure serviceable items are accessible and show access equipment on drawings, access panels, riser shuttle etc. | Rare | Moderate | Low | | | | | |
| 5 | Main | Hydraulic | UV filters oversized and remove all chlorine from the water supply | Possible | Major | Very high | The UV filter will need to be sized correctly and the contractor demonstrate the water quality in both peak and non peak scenarios are not negatively affected. | Rare | Moderate | Low | | | | | |
| 6 | Main | Hydraulic | Legionella growth in dead legs | Likely | Major | Very high | Dead legs will be kep to a minimum. Where fixtures are not used for lengthy periods of time, the fixtures need to be flushed to prevent Legionella and other microbiological growth | Rare | Major | Medium | | | | | |
| 7 | Main | Hydraulic | Stagnant water in potable cold water tank during non peak times due to serving building 3 & 5 | Possible | Major | Very high | An automatic chloring dosing system will be provided to reduce microbial growth in the pipes | Rare | Major | Medium | | | | | |
| 8 | Main | Hydraulic | Plant room which will require floor waste adjacent to grid H1 located over electrical plant room | Likely | Major | Very high | Coordination of FW and tundish locations will need to be undertaken to avoid the electrical room below | Rare | Major | Medium | | | | | |
| 9 | Main | Hydraulic | Protecting the building from a blocked sewer drain due to the three main drains and generally only one overflow gully at the connection to the main | Possible | Major | Very high | Provide three overflow gullies (one per each main drain) due to the risk of the boundary gully becoming ineffective should there be a blockage between the boundary gully and the upstream end of one of the main drains | Rare | Major | Medium | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

**Appendix D – Risk Register**

## Risk Category Table

| No | Risk Type | Risk | Risk Description | Risk / Opportunity Identification | Likely-hood | Impact | Risk Rating | Tracking ID | Proposed Solution - Comments/ Discussions | Action Taken (if different to proposed solution) | Responsible | Accountable | Action When | Status | Status Changing Date |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Project / Design | Contact with the Network Utility Operators | The SD report does not appear to demonstrate that the Network Utility Operations have been contacted to confirm adequacy. They may be costly upgrades to the Sydney Water sewer and water mains or the Jemena gas mains or meter set. | Risk | | | | | During the SD review period, a Sydney Water feasibility application for water and sewer should be made and verbal contact with Jemena should be undertaken to understand any gas main or meter set upgrades. | Jemena not yet confirmed. | WS+P | | | Open | |
| 2 | Project / Design | New building being constructed over an existing Sydney Water sewer main | The new building is constructed over a Sydney Water sewer main. According to the structural drawing S-03-01 at least two footing will hit this sewer and therefore a diversion will be required. Additional cost to undertake this work will be required. | Risk | | | | | Further investigate the options to avoid a diversion with the structural engineer during the design development phase. During the SD review period provide a cost to design and a budget for the diversion works. | Sewer to be diverted | WS+P | | | Closed | |
| 3 | Project / Design | Gas supply to the Palliative Care Unit | The Demo of building 12 will disconnect the gas supply to the Palliative Care Unit. | Risk | | | | | Investigate and plan in a diversion / connection for the Palliative Care Unit as part of the SD review period. | To be reconnected during enabling works. Not yet confirmed. | WS+P | | | Open | |
| 4 | Project / Design | Services within existing services tunnel | The SD report does not appear to clarify if there are or are not any hydraulic or fire services within The services tunnel that crosses The Building zone. | Risk | | | | | Investigate identify and plan in a diversion / connection for the services found in the services tunnel as part of the SD review period. | Diverted as necessary | WS+P | | | Closed | |
| 5 | Project / Design | Boring the water & fire supply from the water main to the new building | Boring below an existing clinical building for a water service is generally not an acceptable practice given the risk associated with hitting existing sewer drainage or structure below the existing clinical building. | Risk | | | | | Investigate during SD review period and propose a cost effective conventional solution. | Rediverted | WS+P | | | Closed | |
| 6 | Project / Design | Atrium rainwater drainage and existing rainwater drainage and overflows | The Atrium design does not appear to have considered the risk to flooding from the local buildings it abuts and the overflows from adjacent buildings that will contribute to the catchment or overflow within the new atrium space. | Risk | | | | | Work with the architect and surveyor to identify the existing overflow locations and heights. Work with the architect during the early design development stages to design in adequate drainage and overflow diversions for the existing and new atrium roof structures. | Allowed for in atrium drainage | WS+P | | | Closed | |
| 7 | Project / Design | Excessive cost and riser space for the domestic hot water heating plant | The domestic hot water heating plant is shown in the basement of the building. Given the building height specifically engineered flues will be required with power fans to exhaust the produce of combustion from the gas hot water plant. Risers do not appear to be identified for these large flues and the cost associated we these flues may not have been allowed for. | Risk | | | | | Investigate a more passive option to remove the reliance on power fan flues and potentially relocate the domestic hot water plant to the roof matching other healthcare facilities. This will be undertaken as part of the SD review period. And further developed during the design development phase. | Located on L6 | WS+P | | | Closed | |
| 8 | Project / Design | Authorities water main supply for fire services | Does not supply simultaneous flows for sprinkler and hydrant system. | Risk | | | | | Investigate actual performance during Concept Design phase and make suitable recommendations. | | WS+P | | | | |
| 9 | Project / Design | Configuration of current fire services water supplies | The current arrangement does not consider a total campus solution and is inefficient. | Risk | | | | | Investigate opportunities to create a single site-wide infrastructure within Stage 1 that could be used to benefit future stages. | Enabling works ongoing | WS+P | | | Open | |
| 10 | Project / Design | Existing fire detection and alarm system | Age and condition of existing Fire Indication Panels plus field devices may not support expansion requirements. | Risk | | | | | Investigate with maintenance contractors during the Feasibility phase. | | WS+P | | | | |
| 11 | Project / Design | Lack of attention to the existing services infrastructure, its replacement and consolidation into reliable and compliant infrastructure. | We understand that one of the project drivers was to address the poor condition of buildings and infrastructure. Assuming this extends to the services infrastructure the SD does not appear to address this at all nor address the services infrastructure in a manner that optimises the campus for future development. | Risk | | | | | As part of the SD review period we will investigate the original scope and how we should access the infrastructure and develop up any revised designs during the design development period. | Enabling works ongoing | WS+P | | | Open | |
| 12 | Project / Design | Existing servives documentation | Limited existing servives documentation | Risk | | | | | Will rely heavily on detailed survey information via pipe detection and unintrusive excavation | No comment | WS+P | | | Closed | |
| 13 | Project / Design | Existing building services | Existing building services are old and generally in poor condition with a risk of failure | Risk | | | | | A separate investigation and report be undertaken assessing the existing sevices reliability and redundancy. | Reconnect to new services where feasible | WS+P | | | Closed | |
| 14 | Project / Design | Disruption to main hospital building | Relocation of existing drainage mains within loading dock area during enabling works without disruption to main hospital building | Risk | | | | | Detailed staging plan to be incorporated based on full knowkledge of all existing services via detailed survey | To be completed by contractor during D&C | WS+P | | | Closed | |

**Appendix E – NSW Health Engineering Guidelines Departure Schedule**

# Hydraulic Services Health Infrastructure - Departure List
## Concord Hospital Redevelopent - Phase 1

| Reference Number | Clause Reference | Eng. Guide Requirement | Design Compliance | Comment |
|---|---|---|---|---|
| 1 | 8.4.1 Water Systems | Very early investigations should be made with the local supply authorities to confirm mains water supplies are available and reliable. | Yes | Section 73 Feasibility lodged but response not received |
| 2 | 8.4.1 Water Systems | Cold water storage should be provided only in those instances where the public utility main is inadequate to supply the hospital complex or it is known to be unreliable and the hospital is required to deliver service continuity in the event of civil emergencies. | Yes | |
| 3 | 8.4.1 Water Systems | Where main supplies are doubtful, 24 hour storage for domestic consumption should be provided. | Yes | Watermains are not doubtful 3 hours peak storage provided |
| 4 | 8.4.1 Water Systems | The storage tank should be divided to allow for cleaning. | Yes | |
| 5 | 8.4.1 Water Systems | The designer should critically assess the storage requirements for other supply such as cooling towers. | Yes | Strategy agreed with the Design Team and documented within the SD Report |
| 6 | 8.4.1 Water Systems | The design of water piping systems will achieve 200kPa minimum static water pressure at any outlet and a maximum water pressure of 500kPa at any outlet. | Yes | |
| 7 | 8.4.1 Water Systems | The maximum velocity of water within pipework will be limited to 1.5 m/seconds irrespective of the piping material in the water supply system. The velocity for the circulation in hot water systems will be in the range of 0.6 m/second to 1.0m/second. | Yes | |
| 8 | 8.4.1 Water Systems | Dead legs should be kept to a minimum (LESS THAN 10M) to ensure that sufficient water is flushed out of the pipe system at every use. | Performance Solution | Fixtures are not yet documented but the ring main will be extended should a fixture be documented in an unexpected location. We have adopted the 2L of dead leg to be the governing factor in dead leg lengths. This is due to the 10m rule being ambiguous as 9m of 25mm copper pipe has more than double 11m of 15mm PEX pipe. Therefore in some instances, we may have 10-15mm of dead leg but never more than 2L. |
| 9 | 8.4.1 Water Systems | The design of water system isolation valve should provide for isolation valves to local groups of fixtures, or where the architectural layout is such that group isolation to basins is not economical, individual mini taps will be used for hot and cold service flow control where required. | Yes | |
| 10 | 8.4.1 Water Systems | Multiple ring-main isolation valves should be located to ensure that during maintenance the minimum number of fixtures is isolated at any time. | Yes | |
| 11 | 8.4.1 Water Systems | Isolation valves should also be provided at the branch take off from the ring main to facilitate servicing or modification of local distribution pipe work. | Yes | |

# Hydraulic Services Health Infrastructure - Departure List
## Concord Hospital Redevelopent - Phase 1

| Reference Number | Clause Reference | Eng. Guide Requirement | Design Compliance | Comment |
|---|---|---|---|---|
| 12 | 8.4.1 Water Systems | The inclusion of ring mains will be considered as part of the design process. The ring-mains will perform both performance and maintenance roles. | Yes | |
| 13 | 8.4.1 Water Systems | Water meters should be provided to all main water users such as cooling towers, hot water systems, CSSD, kitchens and laundries. | Yes | No CSSD, laundries or kitchens within Stage 1 |
| 14 | 8.4.1 Water Systems | Suitable filters/treatment should be provided to the domestic cold water main incoming water service downstream of the water meter. The filters/treatment should be set up in dual to allow for servicing of one filter/treatment at the time. | Yes | Dual backwash and UV filters and chlorine dosing provided |
| 15 | 8.4.1 Water Systems | For warm water systems, the use of thermostatic mixing valves with remote monitoring is the preferred method of delivering warm water. This provides a more reliable method of controlling legionella, and will minimise the affected area in case of any issues arising. | Yes | Hot water systems with TMVs |
| 16 | 8.5 Sanitary Plumbing & Drainage | Very early investigations should be made with the local supply authorities to confirm adequate sewer mains are available and reliable. | Yes | Section 73 Feasibility lodged but response not received |
| 17 | 8.5 Sanitary Plumbing & Drainage | The designer should consult with the users to determine the nature of all chemical discharges to ascertain the project requirements for trade waste retention and treatment. | Yes | Awaiting direction on the inclusion of Iodine 131 |
| 18 | 8.5 Sanitary Plumbing & Drainage | Gravity drain systems will be installed wherever possible. | Yes | |
| 19 | 8.5 Sanitary Plumbing & Drainage | If pumping systems for the disposal of sewerage or effluent are installed they will be installed in duplicate and will be connected to the hospital standby generator power supply to operate as duty/assist/standby, all pumps are to be linked to he BMCS for fault, low and high level alarms. | N/A | |
| 20 | 8.5 Sanitary Plumbing & Drainage | The storage volume of a pump-out system will be as AS3500 or local authorities' requirements; however the system will ensure a minimum of 4 hours storage up to 24 hours subject to a risk analysis. | N/A | |
| 21 | 8.5 Sanitary Plumbing & Drainage | The storage volume of a pump-out system will be as AS3500 or local authorities' requirements; however the system will ensure a minimum of 4 hours storage up to 24 hours subject to a risk analysis. | N/A | |
| 22 | 8.5 Sanitary Plumbing & Drainage | All level sensors should be wired to the BMCS system and a local audible and visual alarm be provided near the pit of outside the door if the pit is in a room. An alarm should be raised in case of power failure. | N/A | |

| Reference Number | Clause Reference | Eng. Guide Requirement | Design Compliance | Comment |
|---|---|---|---|---|
| 23 | 8.5 Sanitary Plumbing & Drainage | Drain pipes should be of a suitable material and designed and installed to suit the type of waste or wastes carried and the temperature of same waste. Where possible, it is highly recommended that pipework is concealed and vents are interconnected in roof or ceiling spaces to reduce the number of roof penetrations | Yes | |
| 24 | 8.5 Sanitary Plumbing & Drainage | It is highly recommended that drainage piping is not installed within the ceiling or exposed in operating and delivery rooms, nurseries, food preparation areas, food serving facilities, food storage areas, computer centres and other sensitive areas. | Yes | |
| 25 | 8.5 Sanitary Plumbing & Drainage | Where overhead drainage piping in these areas is unavoidable, special provisions should be made to protect the space below from leakage. This is to include the use of drip trays and leak detection devices linked back to the BMCS. | N/A | |
| 26 | 8.5 Sanitary Plumbing & Drainage | Inspection and cleaning openings should be positioned external to the building fabric. | N/A | |
| 27 | 8.5 Sanitary Plumbing & Drainage | Where this is not possible, inspection and cleaning openings will be positioned in ducts or within the wet areas it serves. | Yes | |
| 28 | 8.5 Sanitary Plumbing & Drainage | Inspection and cleaning openings will not be positioned in ceiling spaces. | Yes | |
| 29 | 8.5 Sanitary Plumbing & Drainage | Access pits suitable for cleaning and pumping out are recommended in service areas rather than clearout openings within pipes and junctions. | Yes | |
| 30 | 8.5 Sanitary Plumbing & Drainage | All access pits are to have airtight covers | Yes | |
| 31 | 8.5 Sanitary Plumbing & Drainage | Grease traps should be located on site in a position accessible from outside of the building without need to interrupt any services and which is easily accessible for tanker vehicle access. | N/A | |
| 32 | 8.5 Sanitary Plumbing & Drainage | Should the grease arrestor be located internally of the building, a suitably sized and ventilated room should be provided above the arrestor to allow cleaning and to ensure objectionable odours do not escape into other areas of the health care facility. | N/A | |
| 33 | 8.5 Sanitary Plumbing & Drainage | Grease arrestors should be sealed and provided with a chamber vent that extends to the roof. | N/A | |
| 34 | 8.5 Sanitary Plumbing & Drainage | The direct pumping of grease waste should be avoided; where provision for pumping of the grease arrestor for maintenance purposes only, then a permanent pump-out pipe link to a disposal point should be provided if no alternative exists. | N/A | |

**Hydraulic Services Health Infrastructure - Departure List**
**Concord Hospital Redevelopent - Phase 1**

Warren Smith & Partners

| Reference Number | Clause Reference | Eng. Guide Requirement | Design Compliance | Comment |
|---|---|---|---|---|
| 35 | 8.5 Sanitary Plumbing & Drainage | Pumps should be a positive displacement helical screw type. | N/A | |
| 36 | 8.5 Sanitary Plumbing & Drainage | Where practicable, above stainless steel traps should be considered. | N/A | |
| 37 | 8.5 Sanitary Plumbing & Drainage | Trade waste substances intended to be disposed via sewer systems should be reviewed to determine if there are alternative ways of removal from buildings or if on site treatment is required before discharge. | N/A | |
| 38 | 8.5.1 Storm, Subsoil and Roof Water Drainage | Gutters and downpipes should be designed to 1 in 100 year rainfall intensity with overflows to cater for blocked outlets at the maximum flow. | Yes | |
| 39 | 8.5.1 Storm, Subsoil and Roof Water Drainage | External eaves gutters should be considered instead of internal box gutters. | Refer to the Architectural report | |
| 40 | 8.5.1 Storm, Subsoil and Roof Water Drainage | Where internal box gutters are designed, the designer should demonstrate the effective overflow strategy | Refer to the Architectural report | |
| 41 | 8.5.1 Storm, Subsoil and Roof Water Drainage | Gravity downpipes should be used where possible. | Yes | Used where possible, however syphonic generally drains the majority of the building due to its height and constraints |
| 42 | 8.5.1 Storm, Subsoil and Roof Water Drainage | If a syphonic drainage system is proposed, the design and installation responsibility should be with a single company with a demonstrated track record. | TBC by the delivery team | |
| 43 | 8.5.1 Storm, Subsoil and Roof Water Drainage | Roof outlets in concrete roofs should be located to allow for visual inspection and be kept clear of any plant installed on the roof. | Yes | |
| 44 | 8.5.1 Storm, Subsoil and Roof Water Drainage | The outlets should be provided with domed grates to allow for a higher water level should debris build up around the outlet. | Yes | |
| 45 | 8.5.1 Storm, Subsoil and Roof Water Drainage | All flat concrete roofs should have overflow provisions that match 1 in 100 year rainfall intensity | Yes | |
| 46 | 8.5.1 Storm, Subsoil and Roof Water Drainage | Subsoil drainage should be provided to all retaining walls, planters and areas where potential ground water ingress | N/A | Documented by Civil Engineer |
| 47 | 8.5.1 Storm, Subsoil and Roof Water Drainage | Sub soil drainage should gravitate where possible to the stormwater drainage system | N/A | |
| 48 | 8.5.1 Storm, Subsoil and Roof Water Drainage | Where subsoil drainage water is pumped, the pits should have sufficient size to allow for the proper operation and maintenance of the pumps. | N/A | |
| 49 | 8.5.1 Storm, Subsoil and Roof Water Drainage | Pumps should be installed in a dual or triplex configuration with at least one pump on standby. | N/A | |
| 50 | 8.5.1 Storm, Subsoil and Roof Water Drainage | All level sensors should be wired to the BMCS system and a local audible and visual alarm be provided near the pit of outside the door if the pit is in a room. | N/A | |
| 51 | 8.5.2 Natural and LPG | Gas systems should comply with the relevant Australian Standards and local supply authority. | Yes | |
| 52 | 8.5.2 Natural and LPG | Authority gas meter sets are should be located external to the building where possible and gas distribution pressure inside a building should comply with AS 5601 | Yes | |

**Hydraulic Services Health Infrastructure - Departure List**
**Concord Hospital Redevelopent - Phase 1**

| Reference Number | Clause Reference | Eng. Guide Requirement | Design Compliance | Comment |
|---|---|---|---|---|
| 53 | 8.5.2 Natural and LPG | Zone isolation valves for plant rooms and kitchens should be installed at a height that does not require ladder access. | Yes | |
| 54 | 8.5.2 Natural and LPG | Internal gas meter rooms generally require mechanical ventilation | Yes | |
| 55 | 8.5.2 Natural and LPG | Isolation valves to be accessible | Yes | |
| 56 | 8.5.2 Natural and LPG | Internal pipework shall not be plastic | Yes | |
| 57 | 8.6 Renal and RO Water Systems | Special consideration should be given to the design of the renal and RO water systems in regard to the water quality requirements, pipe loop design, material and plant selection. | N/A | |
| 58 | 8.6 Renal and RO Water Systems | The designer should confirm with the pipe and fitting material manufacturer that the material is suitable and is ISO or Australian Standard certified with the renal or RO water and that the use in these systems does not void the warranty. | N/A | |
| 59 | 8.6 Renal and RO Water Systems | Where fittings are manufactured to be used in renal water system, these fittings will need to have traceability of material and manufacturing process to an accepted pharmaceutical component manufacturing process. | N/A | |
| 60 | 8.6 Renal and RO Water Systems | The pipe loops should have minimal dead legs that do not allow for stagnant water. Fittings that allow water circulation up to the isolation valve should be considered in the installation. | N/A | |
| 61 | 8.6 Renal and RO Water Systems | For RO water systems serving renal dialysis equipment, the design should be undertaken in collaboration with the equipment supplier to ensure system compatibility. | N/A | |
| 62 | 8.6 Renal and RO Water Systems | A separate RO water system should be provided to the CSSD in compliance with AS 4187 | N/A | |
| 63 | 8.7 General Material Selection | The designer should carefully consider all impacting and contributing environmental factors which affect the materials used in the hydraulic systems. | Yes | |
| 64 | 8.7 General Material Selection | Materials will be selected that are suitable for both the specific environmental characteristics of the locality of the facility and the service being installed. | Yes | |
| 65 | 8.7 General Material Selection | Issues such as water quality and hardness, piping materials in locations which experience temperatures below zero degrees, exposure to sunlight, proximity to coastal waterways (exposure to salt water spray) etc. will all be considered prior to the final selection of materials. | Yes | |

**Hydraulic Services Health Infrastructure - Departure List**
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| Reference Number | Clause Reference | Eng. Guide Requirement | Design Compliance | Comment |
|---|---|---|---|---|
| 66 | 8.7 General Material Selection | Materials should be specifically suitable for:<br>* Temperature – e.g. drains from CSSD sterilisers and washers;<br>* Chemical waste – e.g. from laboratories, cleaning chemicals;<br>* RO water in dialysis suites; and,<br>* Acoustic treatment of downpipes etc. | Yes | |

| Design Note Number | Reference Number | Clause Reference | Design Note Requirement | Design Compliance | Comment |
|---|---|---|---|---|---|
| DGN1 | 1 | Detail 1 | Slab penetration | No | The DGN does not consider the fire rating and installation of drainage services. The pipework will be cast into the slab with fire stop collars |
| DGN2 | 1 | Hyd Section | The preference of TMV over warm water | Yes | |
| DGN2 | 2 | Hyd Section | The choice of roof gutters HI prefers to not bring roof drainage systems inside the building envelop to achieve a fail safe solution. | By Jacobs | |
| DGN3 | | | Not applicable for Hydraulics | N/A | |
| DGN4 | | | Not applicable for Hydraulics | N/A | |
| DGN5 | | | Not applicable for Hydraulics | N/A | |
| DGN6 | 1 | Hyd Section | VE savings for warm water system in lieu of hot water system with TMVs not acceptable. | Yes | |
| DGN6 | 2 | Hyd Section | Symphonic drainage in lieu of conventional to rationalise No of downpipes / inground drainage. | Yes | |
| DGN6 | 3 | Hyd Section | Use lower cost sanitary fixtures. | By Jacobs | |
| DGN6 | 4 | Hyd Section | Minimise Group 1 furniture items (don't shift FFE from Group 3 to Group 1). | Yes | |
| DGN6 | 5 | Hyd Section | Group a number of outlets off TMV's. | Yes | |
| DGN6 | 6 | Hyd Section | Use PVC for sewer pipes rather than HDPE (except for very hot discharges). | Yes | |
| DGN6 | 7 | Hyd Section | Consider gel clean rather than increasing density of hand basins. | By Jacobs | |
| DGN7 | | | Not applicable for Hydraulics | N/A | |
| DGN8 | | | Not applicable for Hydraulics | N/A | |
| DGN9 | | | Not applicable for Hydraulics | N/A | |
| DGN10 | | | Not applicable for Hydraulics | N/A | |
| DGN11 | 1 | General Section | 10% improvement on NCC (formerly BCA) Part J requirement. | Yes | |
| DGN12 | | | Not applicable for Hydraulics | N/A | |
| DGN13 | | | Not applicable for the design of Hydraulics | N/A | |
| DGN14 | | | Not applicable for Hydraulics | N/A | |
| DGN15 | | | Not applicable for the design of Hydraulics | N/A | |
| DGN16 | 1 | General Section | Prior to actual occupation and operation, flush and clear the whole system ( or part of the system) serving such area, conduct water sample testing to ensure water quality prior to occupation. | By Contractor | Contained with the specification |

| Standard Name | Reference Number | Clause Reference | Requirement | Design Compliance | Comment |
|---|---|---|---|---|---|
| Plumbing and Drainage Water Services | AS 3500.1 | Section 3 | Calculate the PSD in accordance with tabel 3.2 and 3.3. | Via an Alternative solution | The probable simultaneous demand (PSD) for the water services within the building will be calculated based on a standard hot and cold water mixing calculation to determine the mixing ration and the methods specifically for hospitals described within DIN 1988-3 “Drinking water supply systems; pipe sizing” due to Tables 3.2 and 3.3 within AS 3500.1 “Plumbing and Drainage Set” only being suitable for multiple dwelling and single dwelling.<br><br>This will be an alternative solution carried out as per the prescribed verification method BV2(a) of the Plumbing Code of Australia to achieve compliance with the performance requirements stated in Part B2 of the Plumbing Code of Australia. |
| PD2015_008 “Water Requirements for the Provision of Cold and Heated Water”, NSW Health Policy Directive | | | dead legs within pipework to not exceed 10m in lineal length or 2L, whichever is lesser. | Via an Alternative solution | The HI Engineering Guideline requires dead legs to be kept as short as practicable.<br>PD2015_008 “Water Requirements for the Provision of Cold and Heated Water”, NSW Health Policy Directive requires dead legs within pipework to not exceed 10m in lineal length or 2L, whichever is lesser. The Policy states, “A dead leg is defined in AS/NZS3500 as a branch pipe in a hot water system containing dead water. Dead water is the cold water drawn off before hot water commences to discharge from a hot water outlet”. The Architect should consider this requirement when laying out the sanitary fixtures that are supplied from a hot water reticulation system located within the corridor.<br><br>The requirements of PD2015_008 will be followed however the dead leg length based on WS+P experience needs to be extended to 15m when measured from the main supply pipework to the fixture. Areas like food services and CSSD will have longer dead legs than 15m due to the size of the department.<br><br>In order to reduce the wait time and minimise the dead water for domestic hot/warm water at the fixture outlets in the dead leg. It is proposed to provide 15mm nominal bore pipework in lieu of 20mm nominal bore pipe where the PSD calculations and velocities are acceptable for use with 15mm nominal bore pipe. This will ensure the water contained in the deal leg is less than 2L. |
| Plumbing and Drainage Stormwater and Roof Draiange | AS 3500.3 | | Roof drainage systems are to be designed to the precalculated tables | Via an Alternative solution | The Deemed to Satisfy (DTS) pre calculated tables within AS 3500.3 will not be used for the sizing of the gutter and downpipes due to their limitations when applied to large commercial systems, as the tables are only really applicable to residential and small commercial buildings.<br><br>A fully calculated method based on recognised formulas using will be used.<br><br>This will be an Alternative Solution carried out as per the prescribed verification method DV1(a) of the Plumbing Code of Australia to achieve compliance with the Performance Requirements Standard in Part D1 of the Plumbing Code of Australia. |