



# University of Wollongong

---

Hydraulic Services Design Standards  
Version 2.1 – 17 May 2010



## QUALITY SYSTEM

Reason for Issue:	Client Issue
Client:	University of Wollongong
Director Responsible:	Robert McCallum
Director's Signature:	
Primary Consultants:	
Issue:	Version 2.1 – 17 May 2010

### CONFIDENTIAL

This document contains confidential information solely for use by the University of Wollongong. All reasonable precautionary methods in handling the document and the information contained herein should be taken to prevent any third party from obtaining access without the approval of the University of Wollongong.

### DISCLAIMER

This design standard was prepared using data provided by equipment manufacturers. Whilst every effort has been made to verify the accuracy of the data provided, McCallum PFCA cannot guarantee the accuracy of this information. McCallum PFCA cannot be held liable for any damages or losses that occur from this document.

### **McCallum Plumbing & Fire Consultants Australia**

153 Pacific Highway  
Charlestown  
NSW 2290

Telephone: (02) 4946 2633  
Facsimile: (02) 4946 2611  
ABN: 58 098 124 620



## VERSION CONTROL SYSTEM

Section Modified	Description of Modification	Version	Organisation	Representative	Date
2.1; 2.4; 2.8	Change the term "Design Engineer" to "Designer"	1.01	Asset Technologies Pacific	Donny Yap	10/08/06
2.8; 2.9	Life Cycle Costings changed from Section 1.8 to 1.9	1.02	Asset Technologies Pacific	Tom Poyner	17/11/06
2.8	Section 1.8 Warranty added	1.02	Asset Technologies Pacific	Tom Poyner	17/11/06
Throughout	UOW Logo added to headers	1.02	Asset Technologies Pacific	Tom Poyner	28/11/06
2.2	Add risk assessment activity to conceptual design process.	1.02	Asset Technologies Pacific	Tom Poyner	1/12/06
2.4	Insert OH&S reference link	1.02	Asset Technologies Pacific	Tom Poyner	1/12/06
2.7.13	Added rainwater tanks and pump to equipment listing	1.02	Asset Technologies Pacific	Tom Poyner	1/12/06
2.6.5.3	Added rainwater tanks to installation guidelines	1.02	Asset Technologies Pacific	Tom Poyner	1/12/06
2.7.10	Amended Urinal Schedule – Table 2.12 (Page 21)	1.03	University of Wollongong	Chris Hewitt	26/11/07
2.3.2	Potable water meter requirement added	1.04	University of Wollongong	Chris Hewitt	2/9/09
Throughout	Full document review and update	2.0	McCallum PFCA	Robert McCallum	29/4/10
2.2	Minor clarification of campus and existing services provision requirements	2.1	McCallum PFCA	Robert McCallum	17/5/10



## TABLE OF CONTENTS

<b>2.</b>	<b>HYDRAULIC SERVICES</b>	<b>1</b>
<b>2.1</b>	<b>OVERVIEW</b>	<b>2</b>
<b>2.2</b>	<b>EXISTING INFRASTRUCTURE CAPACITY</b>	<b>2</b>
<b>2.3</b>	<b>DESIGN PROCESS</b>	<b>3</b>
<b>2.4</b>	<b>FUNCTIONAL REQUIREMENTS</b>	<b>4</b>
2.4.1	General	4
2.4.2	Water Services	4
2.4.3	Sewer	6
2.4.4	Stormwater Drainage	8
2.4.5	Fire Services	9
2.4.6	Landscape Water Reticulation	10
2.4.7	Gas Reticulation	10
2.4.8	Metering Connection to UMMS	11
<b>2.5</b>	<b>STANDARDS</b>	<b>12</b>
<b>2.6</b>	<b>MINIMUM PERFORMANCE STANDARDS</b>	<b>15</b>
<b>2.7</b>	<b>INSTALLATION GUIDELINES</b>	<b>16</b>
2.7.1	Potable Water	16
2.7.2	Water Supply Pumps	19
2.7.3	Gas Installation - General	20
2.7.4	Sewer Drainage	21
2.7.5	Trade Waste Drainage	22
2.7.6	Stormwater Drainage	23
2.7.7	Hydrants and Fire Services	24
2.7.8	Water Mains	24
2.7.9	Landscape	24
2.7.10	Special Requirements	24
<b>2.8</b>	<b>EQUIPMENT</b>	<b>25</b>
2.8.1	Environmental & Sustainability	25
2.8.2	Tap Fixtures	25
2.8.3	Basins	26
2.8.4	Hot Water Boilers	27
2.8.5	Water Chillers	28
2.8.6	Safety Showers	28
2.8.7	Cisterns	28
2.8.8	Pans	29
2.8.9	Pan Seating	30
2.8.10	Urinals	30
2.8.11	Valves and Flow Restrictors	31
2.8.12	Pipe/Tubing	31
2.8.13	Rainwater Harvesting	32
2.8.14	Stainless Steel Cabinets	33
<b>2.9</b>	<b>WARRANTY</b>	<b>33</b>



## 2. HYDRAULIC SERVICES

The hydraulic services involve supply, reticulation and fittings for the provision of water and gas. Following are the primary systems:

- Potable Cold Water Reticulation;
- Potable Hot and Warm Water Reticulation;
- Non-Potable Cold Water Reticulation;
- Non-Potable Hot Water Reticulation;
- Non-Potable Water Treatment and Reuse;
- Non-Potable Water Treatment and Reuse;
- Sanitary Drainage and Sanitary Plumbing;
- Trade Waste Drainage;
- Roofwater Harvesting Systems;
- Stormwater and Subsoil Drainage;
- Fire Hydrant Services;
- Fire Hose Reel Services;
- Fire Sprinkler Services;
- Landscape Water Reticulation;
- Natural Gas Supply.



## 2.1 OVERVIEW

This design standard outlines the functional, installation and technical requirements for hydraulic services at UOW.

The designer shall use these standards as the basis for the hydraulic services, however it is incumbent upon the designer to ensure that the hydraulic services satisfy site specific operational, logistical and performance requirements and meet UOW's demand requirements for hydraulic services for the facility.

Where appropriate, obtain local authority approvals during the design process. Include approvals into the final design documentation for the:

- Connection of services to mains;
- All trade waste discharges, including pits arresters etc with copies of trade waste forms completed;
- All natural gas installations including applications made to Jemena;
- Installation of fire hydrant services including applications to NSW Fire Brigade for items of non-compliance;
- All stormwater discharges;
- Any other approval by relevant authorities that may be required before construction can commence.

Where the designer considers that an alternate equipment type is preferred to the equipment type specified in the design standard, the designer will advise the principal of the functional, performance or cost benefit that will be achieved through the use of the alternate equipment type.

## 2.2 EXISTING INFRASTRUCTURE CAPACITY (FOR PROJECTS ON THE WOLLONGONG CAMPUS)

The Designer shall obtain from UOW, the hydraulic services site drawings and any other pertinent information on system loadings available. The designer shall review the information and calculate and confirm that the existing infrastructure for water, fire, sanitary and gas services is sufficient to accommodate the likely increased demand on services due to the proposed project. If the services are deemed to be insufficient then the UOW Project Manager is to be informed and possible rectification measures are to be proposed by the consultant for review and discussion.

Any required services amplification measures are to be coordinated with the UOW Project Manager.



## 2.3 DESIGN PROCESS

This section provides an overview of the design process. The process shall be followed to achieve UOW's desired outcomes.

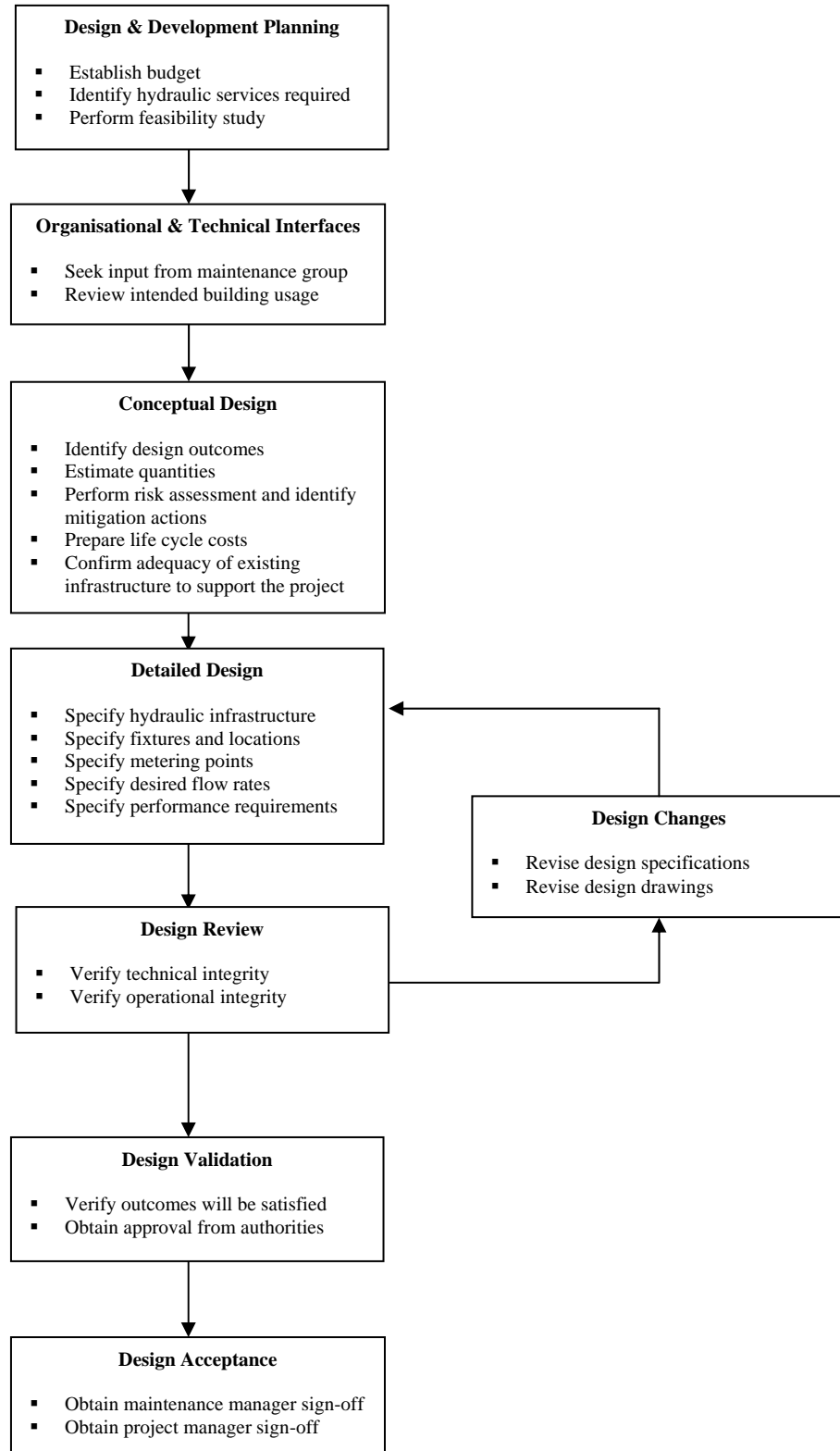


Figure 2.1 - Process Flow



## **2.4 FUNCTIONAL REQUIREMENTS**

### **2.4.1 General**

The hydraulic services design shall ensure efficient functional and operation performance. Each of the functions specified shall be considered in terms of the specific building usage including minimum, average and peak demands.

### **2.4.2 Water Services**

#### **2.4.2.1 Potable Cold Water Reticulation**

The potable cold-water reticulation is to extend from the Authority water main or existing site water service to the proposed project as necessary. Include pumping equipment if water pressures are determined to be insufficient to provide a suitable supply.

The potable water system shall be reticulated through the building via a hydraulic services corridor. Branches shall radiate off the main pipe to service fixtures i.e. basins, sinks and shower facilities. Control Valves are to be installed on each floor level for each area served. Control valves shall also be provided to allow for connection of individual fixtures such as basins, sinks, water closets and the like.

Pipe work shall be labelled “Potable Water” to ensure that cross connection with other systems does not occur.

Pressure control stations if necessary shall be provided on the main droppers at strategic locations to ensure operating pressures in the system are maintained between 350 – 650 kPa.

The potable water system shall include connection to the potable hot water generation plant, mechanical plant and irrigation services as required.

Water meters fitted with pulsed outlet capability shall be installed on potable water supplies to each building and also to any high use specialist systems or areas within the building. All meters are to be connected to the UMMS. Refer to Clause 2.4.8 for additional information.

Install backflow prevention valves to separate the potable water supply from non-potable supplies as necessary.

#### **2.4.2.2 Potable Hot and Warm Water Reticulation**

The potable hot water reticulation system shall extend from the central hot water plant via a hydraulic services corridor. Branches with control valves shall radiate off the main pipe to service potable fixtures. Control Valves are to be installed on each floor level for each area served. Control valves shall also be provided to allow for connection of potable fixtures.



Temperature control devices for non-disabled ablution fixtures shall be provided to ensure 50°C hot water is provided to all fixtures and the entire reticulation system shall be insulated to reduce the heat loss in accordance with Building Code of Australia.

Temperature Control devices for disabled person usage shall be provided at 43°C and comply with the Department of Health requirements. Thermostatic mixing valves are to be installed in lockable recessed proprietary stainless steel cabinets and the entire installation is to comply with the Hosplan Code of Practice for Thermostatic Mixing Valves.

Thermostatic Mixing Valve cabinets shall be located in locations that are readily accessible for inspection and maintenance without the need for ladders or scaffolding. Do not install in false ceilings, ducts or other inaccessible areas. Coordinate locations with the project Architect to ensure building aesthetics are maintained.

Pipework shall be labelled with either 'Potable Hot Water' or 'Potable Warm Water' to ensure that cross connection with other systems does not occur.

Where specified, solar water heating panels for heating water shall be provided and boosted with a gas plant to accommodate low radiation periods.

Where possible and if determined viable due to life cycle costing and subsequently agreed with the client heat recovery from the mechanical plant shall be included.

Specify ring main circulating pumps and connect to the Building Management Control System.

#### **2.4.2.3 Non-Potable Cold Water Reticulation**

Where included on a project, a non-potable cold water reticulation system shall extend to the end use location via a dedicated hydraulic services corridor. Branches with control valves at each level shall radiate off the main pipe to service nominated non-potable equipment. Control valves shall also be provided to allow for connection of individual non potable fixtures.

Connections to the potable water supply shall be protected by appropriate means such as air gaps and backflow protection devices.

Pressure control stations if necessary shall be provided on the main droppers at strategic locations to ensure operating pressures in the system are maintained between 350 – 650 kPa.



Pipework shall be labelled as “Non Potable Cold Water” to ensure that cross connection with other systems does not occur.

Water meters fitted with pulsed outlet capability shall be installed on non-potable water supplies to each building and also to any high use specialist systems or areas within the building. All meters are to be connected to the UMMS. Refer to Clause 2.4.8 for additional information.

#### **2.4.2.4 Non-Potable Hot Water Reticulation**

The non-potable hot water reticulation system shall extend from the central hot water plant via a hydraulic services corridor. Branches with control valves shall radiate off the main pipe to service non-potable fixtures. Control Valves are to be installed on each floor level for each area served. Control valves shall also be provided to allow for connection of non-potable fixtures.

Pipework shall be labelled with ‘Non-Potable Hot Water’ to ensure that cross connection with other systems does not occur.

Where specified, solar water heating panels for heating water shall be provided and boosted with a gas plant to accommodate low radiation periods. Where possible and if determined viable and subsequently agreed with the client heat recovery from the mechanical plant shall be included. Specify ring main circulating pumps and note connection to the Building Management Control System.

#### **2.4.2.5 Water Management System**

Water saving devices shall be specified wherever practical. These shall include:

- Flow control devices.
- Reduced flush toilets.
- Minimum WELS 3 star rated water efficient appliances.

### **2.4.3 Sewer**

#### **2.4.3.1 Sanitary Drainage and Sanitary Plumbing**

Where included on a project or separate external soil (black) and waste (grey) water drainage systems exist or are proposed, the drainage system shall comprise distinct soil and waste systems. The waste system and soil systems shall extend and connect to the existing soil and waste drains either on site or in the street as necessary.

The sanitary plumbing services shall be installed in dedicated hydraulic services corridors throughout the building.



If unable to utilise a single stack system in the above ground drainage design, a single stack modified system is to be used employing relief, group and branch vents as necessary.

Minimise the number of vent penetrations through the roof material where possible by designing vent manifolds to connect multiple vents and using Air Admittance Vents in locations allowable by Sydney Water.

Where a graded drain connection to the existing 'black' or 'grey' water systems cannot be achieved, specify a one piece pump station with integral valve chamber and all necessary dual pumps, controls and ancillary items. Size, locate and vent the pump station in accordance with Sydney Water requirements. If the grey water system is not yet operational for the proposed site show an interim connection to the site sewer system. Connect the pump station control panel to the BMCS.

#### **2.4.3.2 Non Potable Water Treatment and Re-Use**

Where specified, a non-potable water treatment plant shall be provided for the collection and treatment of grey and/or black water. The plant shall be designed to ensure no contact with the sewage is possible.

The water treatment plant shall incorporate controls to allow sewage to overflow to the Sydney Water sewer in the event of the non-potable water treatment plant either being at its capacity, or a failure within these systems.

Water from the non-potable water treatment plant shall be used for all purposes other than consumption and primary contact.

The non-potable water treatment plant shall incorporate all required filtration, oxidation and chemical injection and/or other processes to comply with current Health and Australian Standard requirements. Avoid stagnation; provide automatic backwashing (cleaning) functions, germicidal control and residual disinfection and/or other plant or processes necessary.

The non-potable water treatment plant shall incorporate sensors to determine water quality. Filtering shall remove all trace chemicals, taste and odour to the level required for re-use in the fixtures nominated and as required by Sydney Water.

All pipework associated with these systems shall be labelled as non-potable and coloured lilac. The water chemistry measurements, control, injection and alarm functions shall be completely controlled by the plant and monitored by the BMCS.

The system shall fully comply with all applicable guideline, regulations and standards for the treatment and reuse of water.

Water meters fitted with pulsed outlet capability shall be installed on non-potable treated water supplies to each building and also to any high use



specialist systems or areas within the building. All meters are to be connected to the UMMS. Refer to Clause 2.4.8 for additional information

### **2.4.3.3 Trade Waste Drainage and Sanitary Plumbing**

Where included on a project, a trade waste system shall be provided for commercial facilities, laboratories, food preparation areas etc. as deemed necessary by Sydney Water.

The trade waste plumbing system shall extend from the trade waste drainage system through a dedicated hydraulic service corridor. The system shall be a single stack system where possible. If unable to utilise a single stack system in the above ground trade waste drain design, a single stack modified system is to be used employing relief, group and branch vents as necessary. Do not use Air Admittance Vents on trade waste systems.

Liaise with Sydney Water to determine the appropriate size and type of trade waste apparatus to be used for the installation. Vent all trade waste arrestors separately to atmosphere.

Determine with the user group the chemical make-up of the trade waste discharge and specify the correct pipeline material for the contaminants to be conveyed.

Complete an application to discharge trade waste into the Sydney Water sewer system and issue to the client to sign and submit to Sydney Water with copies of drawings required.

## **2.4.4 Stormwater Drainage**

### **2.4.4.1 Roofwater Harvesting Systems**

The roofwater system where required includes the supply and installation of in-ground pipelines connecting from the base of the downpipes to the roofwater harvest tanks, the roofwater harvest tanks themselves and the 'first flush apparatus prior to the tanks. The final tank locations and types are to be agreed in conjunction with the client and architect. This section also relates to the design of harvested roofwater pumps and controls and reticulation of rainwater pipelines to irrigation points.

Conduct calculations to determine the appropriate size of rainwater harvest tank using the Annual Rainfall Index and the size of the roof area to be harvested and issue to the UOW Project Officer for approval.

Where a recycled water system is available, make connection to the existing supply and extend via a recycled water sub-meter to the building. Where a recycled water system is proposed for the future make an interim connection to the potable cold water system with an isolation valve and backflow prevention device in a location to facilitate easy changeover to the recycled water system in the future.



The roofwater drainage systems shall drain to a rainwater harvest tank via downpipes and in-ground pipelines and where specified discharge into the non-potable water treatment plant for filtration, treatment and re-use.

Use backflow prevention devices to separate the water supplies in accordance with Sydney Water requirements.

Water meters fitted with pulsed outlet capability shall be installed on harvested roofwater supplies to each building. All meters are to be connected to the UMMS. Refer to Clause 3.8 for additional information

The system shall also be provided with an adequate connection to the potable water supply in the event of downtime in the water harvesting or treatment processes and periods of dry weather. Acoustic insulation shall be provided to drainage that is reticulated within habitable spaces in buildings.

#### **2.4.4.2 Stormwater & Subsoil Drainage**

Stormwater drainage shall comprise suitable zones for catchment. Catchment Areas shall include any areas such as upper floor podiums and trafficable roofs. The system shall then be discharged into the non-potable water treatment plant for filtration and treatment if required.

Onsite stormwater detention shall be provided as required by the relevant Authority (over and above the stormwater capture and re-use capacity). Particular attention shall be made to the University of Wollongong water reuse policy and where applicable the existing site stormwater detention and reuse master plan.

The subsoil drainage system shall be provided to the site, with water discharged to the subsoil pump station and then on to the stormwater management system.

### **2.4.5 Fire Services**

#### **2.4.5.1 Fire Hydrant Services**

The fire hydrant system shall extend from the street main or the on-site fire service system as applicable to service hydrants or droppers/risers located within the building.

For projects on Torrens title sites incorporate a fire hydrant booster valve assembly at the property boundary where none exist. Where existing system water pressures are insufficient include a fire booster pump, pump connections, associated valves, piping, exhausts, insulation, ventilation and ancillary items as necessary for a fully operational compliant installation. Where a jacking pump is necessary, connect to the BMCS. Install storz fittings on all hydrant outlets to comply with NSW Fire Brigade requirements.



#### **2.4.5.2 Fire Hose Reel Services**

The fire hose reel system shall extend from the potable cold-water reticulation system with dedicated service pipes connecting to fire hose reels. Position internal Fire Hose Reels within 4 metres of designated exits and other locations as necessary to give total coverage to internal building areas.

#### **2.4.5.3 Fire Sprinkler Services**

The fire sprinkler system shall extend from the street main or the on-site fire service as applicable and shall be piped through the building via a sprinkler valve set.

In the event the supply service is deemed as being unsatisfactory to supply the water to Australian Standard requirements for the fire hydrant and fire sprinkler systems to operate simultaneously design an on-site water storage system complete with Automatic Fill Valves for storage 'top-up'. Include sprinkler pumps as necessary to ensure the required system flows and pressures are met.

In multi storey buildings each floor shall have its own flow switch to activate an alarm and shall be directly wired to the main fire indicator panel. Pumps, indicators and valve tampers switches etc shall be illuminated on the main fire panel and connected to the BMCS as appropriate.

Sprinkler heads are to be selected and specified based on the sprinkler location, the hazard being protected, University of Wollongong Insurance requirements, BCA and Australian Standard requirements, aesthetic appeal and environmental conditions.

#### **2.4.6 Landscape Water Reticulation**

The landscape water reticulation shall utilise moisture sensed drip or sub-surface irrigation, suitably signposted as being recycled water.

Refer to the University of Wollongong 'Landscape' design standard for clarification and additional requirements.

#### **2.4.7 Gas Reticulation**

The natural gas service is to include connection to the site or subdivision gas supply as necessary at the boundary. Determine the pressure of the natural gas main to which the site supply is being connected. Design the appropriate size regulator set and meter taking into account the existing supply gas pressure. Supply low pressure fixture supply pipelines from the meter/regulator set to the mechanical services boiler, the potable hot water unit and other items of equipment. Include all required safety items in



---

accordance with AS 5601. Connect the gas meter to the UMMS for remote reading. Refer to clause 2.4.8.

Gas services shall be installed in accordance with AS 5601 to the connection points as specified.

As part of the works package, gas meters are to be monitored and connected to the existing, Utiligy Pty Limited, Utility Metering and Management System (UMMS). The hydraulics contractor is to coordinate the meter and output selection, and their locations, with the electrical works contractor to ensure correct data measurement and collection by the UMMS.

Gas meters, fitted with pulsed output capability, shall be installed on the supply to each building and to monitor the total consumption of gas fuelled space heating equipment located within the building.

Additional gas sub-meters are to be installed to monitor areas of major usage such as mechanical boilers, hot water generation plant and areas of major use by a specific user group. Connect all meters to the UMMS.

#### **2.4.8 Metering connection to site-wide Utility Metering and Management System (UMMS).**

As part of the works package, water meters are to be monitored and connected to the existing, Utiligy Pty Limited, Utility Metering and Management System (UMMS). The hydraulics contractor is to coordinate the meter and output selection, and their locations, with the electrical works contractor to ensure correct data measurement and collection by the UMMS.

All major plant items and separate floors to have individual potable and non potable water meters connected to the UMMS to provide real time series data for toilets, showers, irrigation, cooling towers, blackwater and grey water re-use etc.



## 2.5 STANDARDS

The design shall comply with the latest versions of all relevant codes and standards in force at the time of specification. Where the designer considers a standard to be inappropriate to the circumstances, the designer shall advise the principal and seek direction. Table 2.1 below contains a list of the relevant codes and standards.

Issuing Body	Document Number	Title
Standards Australia	AS MP78	Manual for the assessment of risks of plumbing products
Standards Australia	AS 1172	Water closets
Standards Australia	AS 1260	PVC-U pipes and fittings for drain, waste and vent application
Standards Australia	AS 1271	Safety valves, other valves, liquid level gauges and other fittings for boilers and unfired pressure vessels
Standards Australia	AS 1357.1	Valves primarily for use in heated water systems
Standards Australia	AS 1428	Design for access and mobility
Standards Australia	AS 1432	Copper tubes for plumbing, gasfitting and draining applications
Standards Australia	AS 1628	Water supply - Copper alloy gate, globe and non-return valves
Standards Australia	AS 1851.2	Maintenance of fire protection equipment - Fire hose reels
Standards Australia	AS 1851.3	Maintenance of fire protection equipment - Automatic fire sprinkler systems
Standards Australia	AS 1851.4-1	Maintenance of fire protection equipment - Fire hydrant installations
Standards Australia	AS 2032	Code of practice for installation of UPVC pipe systems
Standards Australia	AS 2118	Automatic fire sprinkler systems
Standards Australia	AS 2129	Flanges for pipes, valves and fittings



Issuing Body	Document Number	Title
Standards Australia	AS2419.1	Installation of fire hydrant systems
Standards Australia	AS 2941	Fire hydrant pumpsets
Standards Australia	AS/NZS	Fire hose reels
Standards Australia	AS 2441	Installation of fire hose reels
Standards Australia	AS/NZS 2845	Water supply - Backflow prevention devices
Standards Australia	AS/NZS 3350.1	Safety of household and similar electrical appliances - General requirements
Standards Australia	AS 1056	Storage water heaters
Standards Australia	AS/NZS 3350.2.35	Instantaneous water heaters
Standards Australia	AS 3500	Plumbing and drainage (set)
Standards Australia	AS/NZS 3662	Water supply - Water efficient mains pressure shower sprayheads
Standards Australia	AS/NZS 3666	Air handling and water systems of buildings - Microbial control
Standards Australia	AS 3688	Water supply - Copper and copper alloy body compression and capillary fittings and threaded-end connectors
Standards Australia	AS/NZS 3718	Water supply - Tapware
Standards Australia	AS/NZS 3982	Urinals
Standards Australia	AS 4032	Water supply - Valves for the control of hot water supply temperatures
Standards Australia	AS 4130	Polyethylene (PE) pipes for pressure applications
Standards Australia	AS/NZS 4936	Air admittance valves (AAVs) for use in sanitary plumbing and drainage systems



Issuing Body	Document Number	Title
Standards Australia	AS 5200	Technical specifications for plumbing and drainage products
Standards Australia	AS/NZS 6400	Water efficient products - Rating and labelling
Standards Australia	AS RUL PL	Rulings to plumbing and piping systems standards (Ruling to AS 3500 set)
UOW	OHS064	OH&S Consideration for Design ( <a href="http://staff.uow.edu.au/workingsafely/design/OHS064-OHS_Design_Guidelines.pdf">http://staff.uow.edu.au/workingsafely/design/OHS064-OHS_Design_Guidelines.pdf</a> )

*Table 2.1 - Codes and Standards*



## 2.6 MINIMUM PERFORMANCE STANDARDS

The minimum performance standards as outlined in the documents specified in Section 2.4 shall apply. In addition, the services shall be designed to meet or exceed the following:

Functions	Performance Requirement																																								
Hydrant Design Rates	Minimum of 250kPa at all hydrant outlets (700 Kpa for pumped systems). Where new hydrants are added, the effect on all hydrants in the system shall be checked.																																								
Hose Reel Design Rates	Minimum 19.8 litres/min at 210 kPa at the nozzle of each fire hose reel.																																								
Type of Backflow Protection	Individual Backflow Protection:- Protection provided at the water connection to a fixture or appliance.																																								
	Zone backflow Protection:- Protection provided at the connection to specified sections of a plumbing system within a building or facility.																																								
	Containment Backflow Protection:- Protection provided in the property service connection to the property boundary.																																								
Hot Water Reticulation Insulation	Insulate with expanded PVC black nitrile foam in sleeve form. Branch Lines – 13mm wall thickness minimum Main Flow and Return Lines – 25mm wall thickness minimum																																								
Copper Tubing	Minimum AS1432 Type B pipe thickness/construction																																								
Polyethylene Pipe	Minimum SDR 17 for pressurised applications Minimum SDR 26 for non-pressurised applications																																								
Pipe Supports	<table border="1"> <thead> <tr> <th>Pipe</th> <th colspan="2">Horizontal or Vertical Pipe</th> <th colspan="2">Graded Pipe</th> </tr> <tr> <th>Material</th> <th>Internal</th> <th>External</th> <th>Internal</th> <th>External</th> </tr> </thead> <tbody> <tr> <td>Cast Iron</td> <td>2.0m</td> <td>2.0m</td> <td>3.0m</td> <td>2.0m</td> </tr> <tr> <td>Copper</td> <td>1.8m</td> <td>0.9m</td> <td>1.8m</td> <td>1.8m</td> </tr> <tr> <td>UPVC</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>40-50mm</td> <td>1.0m</td> <td>1.0m</td> <td>2.0m</td> <td>2.0m</td> </tr> <tr> <td>UPVC</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>65-150mm</td> <td>1.2m</td> <td>1.2m</td> <td>2.5m</td> <td>2.5m</td> </tr> </tbody> </table>	Pipe	Horizontal or Vertical Pipe		Graded Pipe		Material	Internal	External	Internal	External	Cast Iron	2.0m	2.0m	3.0m	2.0m	Copper	1.8m	0.9m	1.8m	1.8m	UPVC					40-50mm	1.0m	1.0m	2.0m	2.0m	UPVC					65-150mm	1.2m	1.2m	2.5m	2.5m
	Pipe	Horizontal or Vertical Pipe		Graded Pipe																																					
	Material	Internal	External	Internal	External																																				
	Cast Iron	2.0m	2.0m	3.0m	2.0m																																				
	Copper	1.8m	0.9m	1.8m	1.8m																																				
	UPVC																																								
	40-50mm	1.0m	1.0m	2.0m	2.0m																																				
UPVC																																									
65-150mm	1.2m	1.2m	2.5m	2.5m																																					
Insulated Pipe: Support by the pipe directly and/or by using timber ferrules, not by the insulation.																																									
Faucets, Cocks and Outlets	Water Supply – Copper Alloy Screw-Down Pattern Taps Dimensions, dezincification resistant copper alloy, pressure tested to 20 MPa chrome plated on brass finish with vandal proof or anti-tampering devices.																																								
Water Conservation Measures	Dual flush toilet cisterns to water closets.																																								
Fixture Outlet Flow Rate Requirements	Basins WELS 4 Star (minimum)																																								
	Sinks WELS 4 Star (minimum)																																								
	Showers WELS 3 Star (minimum)																																								
Water metering	All buildings, separate floors and major plant items are to have individual potable and non potable, pulse output capable water meters installed to provide real time series data for toilets, showers, irrigation, cooling towers, blackwater and grey water re-use etc. Consumption pulses are to be provided via voltage free contacts and the meter configuration selected for a maximum pulse rate of 5 Hz at the meter maximum design flow rate.																																								



Functions	Performance Requirement
Gas metering	All buildings and space heating equipment total consumption are to be fitted with gas meters, complete with pulsed outputs to provide real time series data for gas consumption. The consumption pulses are to be provided via voltage free contacts and the meter configuration selected for a maximum pulse rate of 5 Hz at the meter maximum design flow rate.

*Table 2.2 – Additional Performance Standards*

The hydraulic systems shall be designed to achieve the following service lives:

System	Lifetime
Pipework	50 years minimum
Valves	20 years minimum
Fixtures including taps, basins, pans and urinals	15 years minimum

*Table 2.3 – Minimum Lifetime*

## 2.7 INSTALLATION GUIDELINES

### 2.7.1 Potable Water

#### 2.7.1.1 Pipework

Copper pipelines or high grade poly pipelines equal to ‘Aquatherm’ or ‘Rehau’ shall be installed throughout the project unless an alternative material is agreed with the UOW Project Officer prior to installation. If an alternative material is selected particular attention shall be made to ensuring that pipes are sized in accordance with the alternative materials internal bore.

Straight lengths of pipework shall be installed with uniform grades and without sagging. To accommodate directional changes, bends and sets shall be used.

Unions, flanges and isolating valves shall be provided to facilitate ease of removal for maintenance purposes.

Separation must be maintained between copper pipes and fittings and other metal likely to cause electrolytic, galvanic or corrosive action. Junctions between dissimilar metals shall only be made using purpose designed fittings manufactured for the specific metal types.

Isolation valves shall be provided to provide local isolation of water service without interference to other areas. In general, one (1) valve should be provided to control water service to each bathroom, laboratory or major water end-use (e.g. cooling towers). One (1) valve should also be provided to control water service to each floor of a building, and one (1) valve should



be provided at the perimeter of a building to control water service to the entire building. Stop valves shall be provided to isolate fittings. Mini stop valves shall be fitted to all fixtures and appliances

Joints shall be tight and leak proof and all burrs and obstructions shall be removed. The following jointing methods may be employed where considered appropriate:

- Compression fittings;
- Silver braised slip joints;
- Screwed joints;
- Flanged joints.

Pipework shall not be embedded in concrete wherever possible. Where there is no other option, pipework embedded in concrete shall be continuous lengths, without fittings and shall not cross any movement joints or joints between two adjoining sections of reinforced concrete through which the reinforcing does not extend. The pipe shall be sheathed with 'Kemlag' prelag or equivalent to allow lateral movement.

#### **2.7.1.2 Fittings**

Taps shall be copper alloy and be dezincification resistant. Unless otherwise specified control valves shall be:

- Loose jumper valve type with 'O' ring seals fitted to the spindle.
- Constructed of suitable materials and have suitable methods of connection.
- Fitted with unions on each side to facilitate ease of removal for maintenance.

Unless otherwise specified:

- All balancing valves shall be tagged with valve number and setting of the valve.
- Installed adjacent to the gate valve.
- Bronze construction.
- Fitted with unions on each side to facilitate ease of removal for maintenance.



Laboratory taps shall have a universal seating action.

### **2.7.1.3 Insulation**

Before insulating hot water pipes ensure that all scale, rust, grease and debris is removed.

Thermally insulate all hot water pipework, and cold water pipework exposed to the risk of condensation.

Provide kemlag sheathed pipework to form an insulation barrier to all hot and cold water pipework concealed in masonry wall chases.

### **2.7.1.4 Hot and Warm Water Temperatures**

Hot water shall be provided by water heaters of appropriate sizes and distribution. Water shall be provided at a temperature setting of 60 degrees C. to non-ablution hot water outlets.

Tempered water at 50 degrees C. shall be provided to all ablution fixtures using tempered water valves (unless for disabled usage).

Hot water to childcare facilities shall be provided with 38 degrees C. warm water with the use of thermostatic mixing valves.

Disabled persons amenities shall be provided with thermostatic mixing valves to deliver 42 degrees C warm water.

Thermostatic mixing valves to be designed in accordance with the Hosplan Code of Practice for the Installation of Thermostatic Mixing Valves.

Boiling water units shall be provided in designated tea making areas.

### **2.7.1.5 Special Requirements**

Where appropriate the following shall apply:

- 200mm plastic riser for all branch line isolating valves with cast iron lid appropriately marked.
- Cisterns to be mounted externally providing easy access for maintenance.
- Standard valves fitted to toilets and sinks; i.e. jumper valves.
- All risers to be mounted free of the pipe or main involved.
- All make up water lines and cooling water lines to A/C plant are to have backflow prevention.



## 2.7.2 Water Supply Pumps

### 2.7.2.1 Water Supply Pumps

Specify pump, motor and pressure vessel package to maintain the pressure at the pump discharge between the maximum and operating pressures. Factory assemble on a steel base.

Use dual pump units where continuity of supply is critical. Include the following.

Control mechanisms: Provide a device which alternates the pumps after each cycle of operation, starts the idle pump if the other fails, and activates an audible alarm and a flashing warning light to indicate a failure.

- Control panel: Mount the control panel on the wall inside the room in which the system is installed, next to the door. Degree of protection IP54 or better.
- Alarm bells: Mount on an external wall. Provide bells which can be muted.
- Warning lights: Mount on the control panel, to indicate the following:
  - . Pump no.1 failure.
  - . Pump no.2 failure.
  - . Mains pressure low.
  - . Power on.
- Selector: Provide manual/automatic pump selector for on/off control of the pumps.
- Cut-out circuit: Provide an over-riding automatic cut-out circuit with manual restart which operates when suction pressure falls below the stated limit.
- Isolating switches: Provide an isolating switch next to each pump motor.
- Overload: Provide necessary thermal overload protection.
- Meters: Provide an hours-run meter to each motor.



### **2.7.2.2 Hot Water Circulating Pumps**

Specify in-line circulator pump and motor with bronze housing and stainless steel or corrosion-resistant interior fittings.

Standard: To BS EN 1151

After hours control: Specify time clock.

- Changeover: Provide an automatic changeover facility at 12 hours between pumps.

### **2.7.3 Gas Installation - General**

Gas pipes passing through walls, floor beams and columns shall be fitted with purpose made metal or plastic sleeves with 12mm all-round clearance and shall be packed with silicone rubber joint sealer. Alternatively the correct size pexal pipe shall be utilised.

Fittings shall be manufactured to AG 601 and AGA and ALPGA "Approved Appliances and Components".

Pressure shall be regulated by the installation of regulators manufactured AGA and ALPGA "Approval Appliances and Components" and installed to AG 601. Regulators are to be installed at the property boundary, at the building, at each zone and at each appliance as appropriate.

Control valves shall be installed to control and cut off gas flow in accordance with AG 601. Control valves shall be manufactured in accordance with AGA and ALPGA "Approved Appliances and Components".

Gas services shall be installed in accordance with AS 5601 and by suitably qualified personnel. Where appropriate nylon mains shall be installed in ground and ball type isolating valves used.

Gas meters are to be positioned in locations to ensure protection from physical damage and to be readily accessible for maintenance, manual meter reading and in case of emergency.

During the conceptual design phase an assessment is to be made of the projects overall design risk in conjunction with the design team and the UOW Project Officer.

Where deemed desirable install a solenoid valve on the main building supply pipeline to enable the main supply to be isolated via a 'panic' button installation arrangement within the building. Liaise with the project Electrical engineer to facilitate this operation. Interface the solenoid valve with the F.I.P. if required by the relevant codes and standards locate the item in conjunction with the UOW Project Officer.



Flues shall be provided as follows:

- Coordinated with the project Architect to ensure aesthetically acceptable.
- Suitable dual skin stainless steel flues shall be fitted to individual appliances.
- Flues shall comply with AG 601.
- Terminate flues individually through the roof fabric with approved cowls.
- Flue sections exposed externally (including the cowl) shall be in 316 stainless steel.

## **2.7.4 Sewer Drainage**

### **2.7.4.1 Pipework**

The standard sizes to be employed shall be 100mm and 150mm in DWV grade pipeline. Solvent Cement joins shall be constructed in accordance with AS 2032. Construction shall be in accordance with AS 2032, Part 5.

### **2.7.4.2 Access Chamber Lids**

Access chamber lids for manholes, pits and sumps installed in finished surface areas such as paved, exposed aggregate, concrete, vinyl or similar must be fitted with a lid suitable to accept the material proposed and be fitted with a brass rim flush with the nominated surface level.

Clearouts are bolted trap screws and are to be finished flush with the finished floor/surface area. In trafficable areas install cast iron items. In internal areas install chrome-plated brass screwed items. In external areas where not subject to loading, install UPVC items.

### **2.7.4.3 Sewer System**

Sanitary drainage pipework shall be installed to accept the discharge from all fixtures and outlets. Connections to sanitary fixtures shall be by jointing methods appropriate to the pipework and fixture. All WC pans shall be connected via 100mm pan collars.

### **2.7.4.4 Floor Waste Assemblies**

Riser pipes to floor wastes are to be a minimum of 100mm diameter. Floor Wastes are to be manufactured from metal and the grate is to be either Chrome Plated or Polished Nickel Bronze. Floor Wastes for vinyl flooring



areas shall be a 'Vinyl Clamp' type. Floor Wastes located in Kitchen areas are to be fitted with a stainless steel mesh basket made specifically by the manufacturer of the Floor Waste. Install 'Sud-Saver' foaming inhibitors to all laundry floor wastes where tubs are connected directly to the floor waste.

Grated Drains located in Kitchen and bar areas are to be Stainless Steel with Wedgewire Grate and are to be fitted with a removable stainless steel mesh basket made specifically by the manufacturer of the Floor Waste.

## **2.7.5 Trade Waste Drainage**

### **2.7.5.1 Pipework - Polypropylene (Vulcathene) or Heavy Duty Polyethylene**

Pipes and fittings for above ground waste and ventilation systems and underground drainage shall be to British Board of Agreement (BBA) Certificate 92/8205.

Pipework and fittings are to give chemical resistance to the appropriate issued manufacturers charts.

All jointing between pipes and/or fittings shall be undertaken with an approved mechanical jointing system in accordance with the manufacturer's procedures and instructions. Jointing with adhesives or solvent cements will not be permitted under any circumstances.

Provision shall be made for thermal expansion and contraction. Proprietary stress relief units are to be used to cater for expansion and contraction. Compression fittings are not acceptable.

Thermal expansion fittings shall be fitted in the following positions:

- In all vertical waste stacks at which fixtures are connected. They shall be fitted adjacent to and above the function.
- In vertical vent pipes where a branch vent is fitted.
- In graded and vertical vent pipes where the distance between fixed points is greater than 1.2m and less than 6m an expansion joint shall be fitted to the downstream end of the pipe.

When encased in concrete the waste pipe is to be sleeved in a larger diameter pipe so that the waste pipe is neither restricted nor abraded when subjected to thermal expansion movement.

All underground installations of polypropylene mechanical jointed pipes and fittings shall be surrounded by a minimum of 75mm of free running coarse sand.

All polypropylene pipes passing through floors or walls shall be protected by a minimum thickness of 15mm of suitable flexible material.



Identify the appropriate trade waste arrestor for the project in conjunction with Sydney Water. Indicate the arrestor in the appropriate location and vent accordingly.

### **2.7.6 Stormwater Drainage**

As a minimum 100mm DWV Grade piping shall be used. Pipes are to be laid to uniform gradients falling to the outlets straight between required changes to direction properly supported with water tight joints aligned flush at internal surfaces and with spigot ends pointed in the direction of the flow.

All necessary fittings including junctions, branches, inspection and cleaning openings, expansion joints shall be provided. Eaves gutters shall be preferred to box gutters.

Drainage lines shall be laid to meet the Authorities requirements for levels and gradients. Concealed down pipes shall have an I.O. in the storm water line within 5 metres of the building.

Inspection openings shall be provided as required by the regulatory authority.

#### **2.7.6.1 Underground Installation**

Where appropriate, pipework shall be bedded on appropriate pipe bedding material of 150 bed of blue metal or sand as per Australian Standards. Standard sizes 100mm, 150mm and 225mm shall be used.

Jointing shall be by solvent cement or rubber rings to AS 2032. Construction shall be to AS 2032 Part 7.

#### **2.7.6.2 Pit Covers**

All stormwater pit grates are to be light weight cast iron in non-vehicular traffic areas and heavy weight in possible vehicular traffic areas (AS 3996).

#### **2.7.6.3 Rainwater Tanks**

All above ground rainwater tanks shall be Colorbond steel tanks in a colour approved by the Project Officer following consultation with UOW Senior Management. All tanks should come fitted with a strainer and overflow. A level reinforced concrete slab of minimum thickness 120mm shall be used as the foundation for rainwater storage tanks.

Below ground tanks shall be purpose made tanks suitable for underground installation. Tanks shall be engineered if necessary by a structural engineer to confirm their capacity to withstand the forces of an underground installation. Incorporate 'anti floatation' measures where sub-surface water



could be found. Extend access openings to flush with finished surface level and ensure all tanks are watertight. Comply with all Workcover requirements for access and confined spaces. Lids are to be appropriate to the location where the tanks are to be installed such as capacity to hold loadings or have landscaping or paving installed over. Confirm tank locations are acceptable with the project Architect, UOW Project Officer and project Structural Engineer. Take all measures necessary to install in a location devoid of existing services or where services exist, design services diversions around the tank.

### **2.7.7 Hydrants and Fire Services**

Hydrants and fire services shall be installed in accordance with AS 1861. All fire hydrant flange bolts and galvanised or copper risers to be wrapped in Denso to stop corrosion.

### **2.7.8 Water Mains**

The water mains shall be installed in accordance with the quoted standards and Authority requirements. Where appropriate a minimum 100mm heavy duty approved plastic pipe shall be used. Isolation valves shall be provided on all floor levels. Hose cocks shall be installed no further than 60m apart.

### **2.7.9 Landscape**

All new buildings are to have a hose-cock outlet every 60 metres along perimeter walls or as directed by the projects landscape architect.

Refer to the UOW Landscape Design Guide for clarification of requirements.

### **2.7.10 Existing Services**

Locate existing services in the area of the proposed works in conjunction with the client and/or client's surveyor. The location of services may require the use of existing documentation procured for the relevant authorities and use of electronic detection equipment suitable for the task. Contact 'Dial Before You Dig' within appropriate areas of operation.

Indicate existing services on drawings and denote which are to become redundant or be renewed or relocated.






## 2.8 EQUIPMENT

### 2.8.1 Environmental & Sustainability

The material used for the system shall be environmentally considerate such as polybutylene, polypropylene or cross linked polyethylene.

### 2.8.2 Tap Fixtures

Table 2.4 below contains a list of tap fixtures.

Device	Function	Make	Model	Image
Hose Cock	<ul style="list-style-type: none"> <li>Spring action tapware</li> </ul>	Enware	BUB228C	N/A
Bib Cock	<ul style="list-style-type: none"> <li>Spring action tapware</li> </ul>	Enware	BUB208C	N/A
Bib Cock	<ul style="list-style-type: none"> <li>Spring action tapware</li> </ul>	Enware	BUB208L	N/A
Bib Cock	<ul style="list-style-type: none"> <li>Spring action tapware</li> </ul>	Enware	BUB208B	N/A
Stop Cock	<ul style="list-style-type: none"> <li>Spring action tapware</li> </ul>	Enware	BUB207	N/A
Basin Tap Anti Vandal	<ul style="list-style-type: none"> <li>Electronic tapware</li> </ul>	Enware	ENM2001	N/A
Tempstop Basin Tap (Push Button)	<ul style="list-style-type: none"> <li>Time flow tapware</li> <li>Schell Petit Timed Flow Mixer (shown in image)</li> </ul>	Enware Starion	TFC745P 21300699	
Tempstop Basin Tap (Lever)	<ul style="list-style-type: none"> <li>Time flow tapware</li> </ul>	Enware	TFC745L	N/A
Type 16 Stop Valve with swivel outlet and aerator	<ul style="list-style-type: none"> <li>Laboratory tapware</li> </ul>	Enware	LF110	N/A
Expo Adjustable Basin Set with SP001 Fixed Aerated spout	<ul style="list-style-type: none"> <li>Lever tapware</li> <li>G Series (shown in image)</li> </ul>	Enware Caroma	EXN306 G71120CA	
Single Lever Mixer Basin Kit with Disabled Handle	<ul style="list-style-type: none"> <li>Single lever mixers</li> <li>Hansa Medica "Green" Basin Mixer 6A (shown in image)</li> <li>Hot &amp; Cold or Warm Cold</li> </ul>	Enware Hansa	SLM306D 014222760037 Hot & Cold 014222764737 Warm & Cold	









Device	Function	Make	Model	Image
Single Lever Mixer Basin Kit with Blade Handle	<ul style="list-style-type: none"> <li>Single lever mixers</li> <li>Caroma Nordic Basin Mixer (shown in image)</li> </ul>	Enware Caroma	SLM306 90965C5A	
Oras Basin Mixer	<ul style="list-style-type: none"> <li>3 Star (8 lpm) water efficiency rating</li> </ul>	Enware	SLM606	
Single lever basin mixer	<ul style="list-style-type: none"> <li>Flow controlled to 6 lpm</li> <li>3 Star (8 lpm) water efficiency rating. Can be 4 or 5 star on request</li> </ul>	Enware	SLM606D	

Table 2.4 - Tap fixtures

### 2.8.3 Basins

Table 2.5 below contains a list of basins.

Device	Function	Make	Model	Image
Vanity Basin (One Taphole - Centre)	<ul style="list-style-type: none"> <li>Basin</li> </ul>	Caroma	Concorde 500 Code 654110W	
Vanity Basin (Three Tapholes)	<ul style="list-style-type: none"> <li>Basin</li> </ul>	Caroma	Concorde 500 Code 654130W	
Care Wall Basin For Disabled Use	<ul style="list-style-type: none"> <li>Basin</li> </ul>	Caroma	Integra 500 Code 648210W	






Device	Function	Make	Model	Image
Heavy Duty Sink	<ul style="list-style-type: none"> <li>Sink</li> </ul>	Caroma	Cleaners Sink 811953 Sink 811593 Grate 811595 Bkts 811494 Bkts 687031 Plug & waste	
Kitchen Sink (950mm Single End Bowl) Available in 1 2 or 3 Taphole	<ul style="list-style-type: none"> <li>Sink</li> <li>Sink</li> </ul>	Clark Clark	LH 1003 RH 1004	
Laboratory sink	<ul style="list-style-type: none"> <li>Sink</li> </ul>	Clark	4004316	

Table 2.5 - Basins

## 2.8.4 Hot Water Boilers

Table 2.6 below contains a list of hot water boilers.

Device	Function	Make	Model	Image
Boiling Water Unit	<ul style="list-style-type: none"> <li>Instant boiling water</li> </ul>	Enware	WBLU050	N/A
Classic White Enamel	<ul style="list-style-type: none"> <li>Instant boiling water</li> </ul>	Rheem	771050	N/A
Autoboil / Econoboil / Hydroboil	<ul style="list-style-type: none"> <li>Instant boiling water</li> </ul>	Zip	Various	N/A

Table 2.6 - Hot Water Boilers

## 2.8.5 Water Chillers

Table 2.7 below contains a list of water chillers.



Device	Function	Make	Model	Image
Freestanding Chilled Water	<ul style="list-style-type: none"> <li>Instant chilled water</li> </ul>	Zip	CMBCF140S FV	N/A
Wall Mounted Drinking Fountain	<ul style="list-style-type: none"> <li>Instant chilled water</li> </ul>	Zip	CFB140FWA 39076	N/A
Wall Recessed Drinking Fountain	<ul style="list-style-type: none"> <li>Instant chilled water</li> </ul>	Zip	WRWFBCF 140SFV63018	N/A

Table 2.7 - Water Chillers

### 2.8.6 Safety Showers

Table 2.8 below contains a list of safety showers.

Device	Function	Make	Model	Image
Free Standing Hand Operated Shower & Eye/Face Wash	<ul style="list-style-type: none"> <li>Safety Shower</li> </ul>	Enware	EC 240	N/A

Table 2.8 - Safety Showers

### 2.8.7 Cisterns

Table 2.9 below contains a list of cisterns.




Device	Function	Make	Model	Image
Smartflush Invisi II Series Cistern 4A 4.5/3 Litre	<ul style="list-style-type: none"> <li>Cistern Invisi II</li> </ul>	Caroma	237001	
Dual Flush Remote mounting Box.	<ul style="list-style-type: none"> <li>Remote Box Suite Push buttons Invisi II</li> <li>Used when Cistern Installed in Ceiling or Induct.</li> </ul>	Caroma	237006	N/A
Dual Flush Rectangular Button	<ul style="list-style-type: none"> <li>Push buttons Push buttons Invisi II</li> </ul>	Caroma	237020C C/P 237020S Satin	
Large Access Panel	<ul style="list-style-type: none"> <li>Panel Stainless Steel Dual Flush</li> </ul>	Caroma	237030	



Table 2.9 - Cisterns

**2.8.8 Pans**

Table 2.10 below contains a list of pans.




Device	Function	Make	Model	Image
Leda Invisi II 2000 Back Inlet Toilet Suite	<ul style="list-style-type: none"> <li>Standard Suite Includes Pedigree II Seat</li> </ul>	Caroma	Suite 712100W Button Option 237020C C/P 237020S Satin	
Caroma Care Leda Invisi II Suite.	<ul style="list-style-type: none"> <li>Standard Care Pan Includes Caravelle Care Double Flap Seat</li> </ul>	Caroma	Suite719100W Button Care 237011S	
Leda 2000 Suite (Where Water Wafer Cisterns are not practical)	<ul style="list-style-type: none"> <li>Pan and cistern</li> </ul>	Caroma	989100W	
Vandal Resistant Conversion Kit (For use with Leda 2000 Suite)	<ul style="list-style-type: none"> <li>Locking mechanism Vandal Kit</li> </ul>	Caroma	413276	N/A

Table 2.10 - Pans



## 2.8.9 Pan Seating

Table 2.11 below contains a list of pan seating.







Device	Function	Make	Model	Image
Pedigree II Toilet Seat	<ul style="list-style-type: none"> <li>Pan seating</li> </ul>	Caroma	320020	
Colani Toilet Seat (For Disabled Toilets)	<ul style="list-style-type: none"> <li>Pan seating Single or Double Flap</li> </ul>	Caroma	813000 S/Flap 813100 D /Flap	
Accessible toilet seat	<ul style="list-style-type: none"> <li>Accessible toilet seat, single flap (<u>without lid</u>) and B84 institutional hinges</li> </ul>	Dania	R2000B84	
Commercial toilet seat	<ul style="list-style-type: none"> <li>Commercial toilet seat <u>without lid</u> and stainless steel universal hinges</li> <li>Max. Weight loading 240kg, 10-year guarantee</li> </ul>	Objecta	EP54000BN3	

Table 2.11 - Pan Seating

## 2.8.10 Urinals

Table 2.12 below contains a list of urinals.

Device	Function	Make	Model	Image
Caroma Leda Smartflush	<ul style="list-style-type: none"> <li>Urinal Suite (electronic)</li> </ul>	Caroma	678230W	
Caroma Cube 0.8L Smartflush	<ul style="list-style-type: none"> <li>Urinal Suite</li> </ul>	Caroma	678660W	




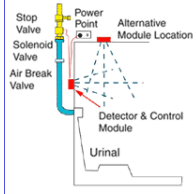
Device	Function	Make	Model	Image
Caroma Torres	<ul style="list-style-type: none"> <li>Wall Hung Urinal (Cistern-Stainless Steel Metal Craft Mod-SCC)</li> </ul>	Caroma	Back Inlet 666102W + 687121 Fixing  Top Inlet 661101W + 687120 Fixing	
Starion	<ul style="list-style-type: none"> <li>Enduro Flush (Infra red)</li> </ul>	Starion	UAF-03  SV-6.1 Additional Flush Valve	N/A
RBA	<ul style="list-style-type: none"> <li>Watermiser</li> </ul>	RBA	WMS6	N/A
Enware	<ul style="list-style-type: none"> <li>Enmatic microwave urinal flushing system</li> <li>3 Star (2L/Flush) water efficiency rating.</li> </ul>	Enware	EMF103-3	

Table 2.12 - Urinals

### 2.8.11 Valves and Flow Restrictors

Table 2.13 below contains a list of valves.

Device	Function	Make	Model	Image
Thermostatic Mixing Valve In A Metal Box	<ul style="list-style-type: none"> <li>Thermostatic valve</li> </ul>	Rada	215dk 40861RB300	N/A
Thermostatic Mixing Valve In An Exposed Stainless Steel Box	<ul style="list-style-type: none"> <li>Thermostatic valve</li> </ul>	Rada	215bk 40863EB200	N/A

Table 2.13 - Valves

### 2.8.12 Pipe / Tubing

Table 2.14 below contains a list of piping.

Device	Function	Make	Model
UPVC	<ul style="list-style-type: none"> <li>Piping</li> </ul>	Various	Various
SH UPVC	<ul style="list-style-type: none"> <li>Piping</li> </ul>	Various	Various
Polybutylene	<ul style="list-style-type: none"> <li>Piping</li> </ul>	Various	Various
Polypropylene	<ul style="list-style-type: none"> <li>Piping</li> </ul>	Various	Various



Device	Function	Make	Model
Cross Linked Polyethylene	<ul style="list-style-type: none"> <li>Piping</li> </ul>	Various	Various
Polyethylene	<ul style="list-style-type: none"> <li>Piping</li> </ul>	IPLEX Vinidex	Various
Plastic	<ul style="list-style-type: none"> <li>Piping</li> </ul>	Various	Various
Copper Tubing	<ul style="list-style-type: none"> <li>Piping</li> </ul>	Various	AS1432 Type B thickness
Insulation Pipe	<ul style="list-style-type: none"> <li>Thermal insulation</li> </ul>	Armaflex	Various

Table 2.14 - Piping

### 2.8.13 Rainwater Harvesting

Table 2.15 below contains a list of water tanks.

Device	Function	Make	Model	Capacity
Water Tank*	<ul style="list-style-type: none"> <li>Rainwater harvesting</li> </ul>	BlueScope Water	Waterpoint Ultraslim	950 - 2400 Litres
Water Tank*	<ul style="list-style-type: none"> <li>Rainwater harvesting</li> </ul>	BlueScope Water	Waterpoint Slimline	1350 - 5500 Litres
Water Tank*	<ul style="list-style-type: none"> <li>Rainwater harvesting</li> </ul>	BlueScope Water	Waterpoint Classic	1170 - 8200 Litres
Water Pump	<ul style="list-style-type: none"> <li>Pump water from water tank</li> </ul>	Davey	XJ50T	90 Lpm

Table 2.15 - Rainwater Tanks

\*All tanks are fitted with a strainer and overflow.

Preference should be given to Slimline or Ultraslim rainwater tanks where the installation is constrained by physical size or aesthetic requirements.



### 2.8.14 Stainless Steel Cabinets

Table 2.15 below contains a list of stainless steel cabinets.



Device	Function	Make	Model	Image
Aquablend 1500 lockable recessed Stainless Steel Cabinet	<ul style="list-style-type: none"> <li>Lockable recessed Stainless Steel Cabinet</li> </ul>	Aquablend  Note: Other options and models available, (i.e. 4-hole with cold water by-pass)	ATMS700R	
Aquablend 1500 lockable Exposed Stainless Steel Cabinet	<ul style="list-style-type: none"> <li>Lockable Exposed Stainless Steel Cabinet</li> </ul>	Aquablend  Note: Other options and models available. i.e. 4-hole with cold water by-pass)	ATMS700E	

Table 2.16 - Stainless Steel Cabinets

## 2.9 WARRANTY

The designer shall ensure that all components are supplied with the following minimum warranty periods:

System/Equipment	Warranty Period
Piping	5 Years
Electronic Tapware	12 Months
Manual Tapware	5 Years
Basins	2 Years
Instant Boiling Water Units	12 Months
Instand Chilled Water Units	12 Months
Showers	5 Years
Cisterns/Pans	2 Years
Valves & Flow Restrictors	5 Years

Table 2.17 - Warranty Periods