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## 17.00 Hydraulic Services

*The requirements of this Section are generally Mandatory*

### 17.01 General Requirements

#### 17.01.01 Scope of Hydraulic Services

This Section of the Guidelines outlines the minimum requirements for the following;

- sewer drainage
- stormwater drainage
- sanitary fixtures
- taps
- soil, waste and vent plumbing
- hot and cold water reticulation
- hot water systems
- pumps
- rainwater collection and reticulation
- testing

#### 17.01.02 Underground Pipework & Valves

All underground pipework shall have a minimum of 600mm cover to topmost surface of pipe or pipes. Pipes shall be laid to the requirements of AS 3500. Pipes shall be laid side by side and not one above the other.

Pipes laid in the same trench as electrical or data conduits shall be separated in accordance with the requirements of AS 3000 and AS 3500.

All underground pipework shall be identified by laying continuous PVC marker tape not less than 300mm above the line for its entire length. For all non metallic pipework other than irrigation pipework under 32mm diameter, use 'Wavelay' colour coded and labelled polyethylene tape with integral stainless steel tracer wire. The tracer tape shall be jointed strictly in accordance with the manufacturer's recommendations to maintain electrical conductivity. The marker tape shall run up to every inspection/valve pit on the line where it shall be accessible to allow connection to the detector equipment. Test each run of tape between pits before final backfilling of trenches, and provide test records to the Superintendent.

Trenches shall be backfilled only with selected fill and compacted in layers not exceeding 200mm to a relative density of 90%.

All valves shall be accessible in concrete pits which shall be drained. All bolts, washers etc shall be 316 stainless steel. Thrust brackets in pits shall be hot dipped galvanised. Pipes shall be sleeved where they pass through the pit wall.

All valve pits are to be identified on the surface by a precast concrete pillar with recess for reflective 'V' marker plate.

#### 17.01.03 Reticulation Pipework & Valves

In general, each riser shall be isolated at the bottom or at top in cases of downfeeds. Isolation of downfeeds shall be between 1500 and 1800mm above floor level.

Branch lines shall be isolated at the riser on each level and further where servicing an outlet or group of outlets in a laboratory or on a bench.

In all cases, isolation valves shall be readily accessible at floor level behind suitably sized duct doors or stainless steel access hatches.

Groups of fixtures and single fixtures are to be isolated adjacent to the units.

Ring main distribution pipes should be used wherever possible.

All fittings shall comply with the requirements of SAA MP52 and shall have AS markings and manufacturer's Licence No. stamped into the fitting.

#### **17.01.04 Pipework Support**

Brackets for all pipe supports shall be 'Unistrut' with threaded rod hangers and appropriate saddles or stand-off 'Abbey' clips.

In all cases, the pipework is to be separated from the hanging bracket by the use of an approved tape.

#### **17.01.05 Floor Penetrations**

Floor penetrations for groups of pipes in wet areas shall have a cast concrete upstand or bund.

In all locations, metal pipes shall be sleeved and caulked. The sleeve shall be copper, standing 30mm above the finished floor.

#### **17.01.06 Service Ducts**

Where possible all services shall be run in accessible service ducts, fire rated at the floor. Duct sizes shall be such to allow for the safe and easy removal and repair of pipework and valves.

#### **17.01.07 Laboratory Services**

The water services to each laboratory shall have isolation points located within the laboratory or within reasonable distance to the laboratory.

Isolation of the water services to a laboratory and other research facility shall be possible without the interruption of services to other spaces in the building.

Services to any PC3 Animal or Invertebrate Facilities shall comply with the requirements of AS/NZS 2243.3 – 2002 Safety in Laboratories Part 3; Microbiological Aspects of Containment Facilities.

#### **17.01.08 Identification of Pipework**

All pipes shall be identified in accordance with Australian Standard AS 1345 for the Identification of Piping, Conduits and Ducts; and AS 1318 - Industrial Safety Colour Code and AS 2700 Colour Standards for General Purposes.

The ground colour shall be applied to a length of not less than 300mm and shall be used in conjunction with adhesive labels for identification.

The location of identification marking shall be at intervals of not more than 3m and adjacent to branches, junctions, valves, both sides of walls and control points. Such markings shall be placed so that they are easily seen from all approaches.

Safety colours where required shall be over a length of not less than 75 mm at locations and intervals as nominated for ground colours.

Ground colours used in conjunction with safety colours shall be applied to each side of the safety colour.

The direction of the flow shall be indicated by an arrow adjacent each colour band.

'Safetyman' adhesive labels shall be used for identification and indication of the direction of flow of pipework.

## **17.02 Sewer Drainage**

### **17.02.01 Materials**

Materials shall be uPVC pipes and fittings with solvent welded joints or HDPE for trade waste requirements.

### **17.02.02 Inspection Chambers**

Inspection chambers shall be installed in accordance with Local Authority requirements.

Gas tight chamber covers stamped 'SAN' shall be used throughout and shall generally be 'Gatic' light duty covers except in roadways where medium duty covers shall be used. Brass edged covers shall be used when chambers occur in particular floor or paving finishes. All covers must be compatible with 'Gatic' lifters.

All chambers over 1200mm in depth shall have hot dipped galvanised step irons or ladder.

Tops of chambers in landscaped areas shall be installed 100m above landscaped levels to the same gradients as the landscape.

Chambers in forest areas shall be locatable by means of a white painted 50 x 175 concrete identification post 600mm high above ground with the top 100mm painted black.

### **17.02.03 Inspection Openings & Floor Wastes**

All inspection openings shall be brought to finished ground level and capped with a screwed brass cap.

Floor wastes generally shall have chrome plated brass or stainless steel screwed grates set flush with the floor finish. Grates to floor wastes in laboratories shall be PVC. All floor wastes in concrete floor slabs shall have puddle flanges. All floor wastes shall be capable of being regularly charged via a sink, basin or condensate drain, not by a hose tap.

### **17.02.04 Trade Waste**

Trade waste shall conform to relevant Australian Standards and Codes.

### **17.02.05 Greywater Systems**

Systems for the collection, storage and reticulation of waste 'grey' water for landscaping irrigation and the like, shall be installed strictly in accordance with the Plumbing & Drainage Act 2002.

## **17.03 Stormwater Drainage**

### **17.03.01 Materials**

Materials shall be sanitary grade HDPE pipes and fittings, Class X reinforced concrete pipe, fibre reinforced cement pipe and fittings or F.C. stormwater pipes and fittings.

### **17.03.02 Pipe Sizing**

Flooding frequency shall generally be one in 50 years. All stormwater drainage shall be in accordance with the National Plumbing and Drainage Code AS 3500 and as otherwise amended by these Design Guidelines.

### **17.03.03 Discharge**

The route, point of outlet and method of discharge is to be approved by CLF. Provide a means of dispersal with water energy reduction.

#### 17.03.04 Inspection pits

Inspection pits shall be provided at major changes of direction and junctions. 'Gatic' light duty pit covers stamped 'S-W' shall be used generally except in roadways where medium duty covers shall be used. Brass edged covers shall be used when pits occur in particular floor or paving finishes. All covers shall be compatible with 'Gatic' lifters.

All inspection pits over 1200mm in depth are to have a hot dipped galvanized ladder or step irons installed.

Tops of pits in landscaped areas shall be installed to match finished landscape levels.

Pits in forest areas shall be locatable by means of a white painted concrete post 600 high above ground with the top 100mm painted black.

#### 17.03.05 Grated Drains

All grated drains for the collection of surface run-off shall have the main bars running in the direction of flow, however grates located in pathways or paved areas must be suitable for the passage of wheelchairs.

'Forge-weld' brand grates complete with matching metal frames should be used, not cast iron grates. Square stainless steel grated sumps are preferred in tiled areas.

Sizing of drains shall be to the Superintendent's discretion and the current AS 1428.

### 17.04 Sanitary Fixtures

#### 17.04.01 Standard Fixtures

All sanitary fittings and fixtures shall be WELS compliant and 'White' unless noted otherwise.

<b>Vanity Basins</b> (particular applications only as directed by CLF)	'Caroma Laser' semi-recessed basin with tap holes to suit application and D250 Brackets
<b>Wall Hung Basins</b> (all toilets and hand wash stations)	'Caroma Flora 500' basin with single centre or 3 tap holes to suit application, and D200 fixing kit
<b>Wall Hung Basin to Disabled Toilet</b>	'Caroma Care Flora 500' with single centre tap hole and trap shroud and D200 fixing kit
<b>Toilet Pans</b>	'Caroma Concorde Concealed' standard S or P trap pan
<b>Toilets Seats</b>	'Caroma Caravelle Commercial' double flap seat, colour to be white only except for accessible toilets which shall be single flap and colour of a minimum luminance contrast of 30% to the pan colour
<b>Backrest</b> (accessible toilets)	'Caroma Care' backrest unit
<b>WC Suites</b> (for refurbishments only or as directed by CLF)	'Caroma Caravelle 2000' 'Smartflush' 4.5/3 litre dual flush close-coupled suite with vandal resistant conversion kit.
<b>Disabled Toilet WC pans</b>	'Caroma Care' S Trap or Trap pan, with 'Colani' double flap white seat
<b>Cleaner's Sink</b>	'Caroma' wall mounted sink with D1520 Wall Bracket and CP hinged grate and rubber rest pad
<b>Urinals</b>	'Uridan Cadet' water free wall mounted ceramic urinal with wall waste fitting, Model no. KHC-6.
<b>Shower</b>	Showers in disabled toilets shall meet the full requirements of the current AS 1428
<b>Drinking Fountain (internal)</b>	'Zip Chill Fountain CFB140FWA' double tier fountain to serve both adults and wheelchair users to comply with AS 1428.1. One chiller unit is to supply the double tier unit and a cup/bottle filler is

	to be mounted on the bowl of the lower unit (Refer <a href="#">Section 15.00</a> )
<b>Drinking Fountain (external)</b>	'Street & Garden Furniture Co.' FL001 with galvanised finish.
<b>Bottle Filler</b>	Modified 'Zip Chill Fountain CFB140FWC' with fixed gooseneck spout in lieu of bubbler (Refer <a href="#">Section 15.00</a> )
<b>Kitchenette &amp; Tea Prep Sinks</b>	'Clark Model 3007' double bowl drainer flushline sink unit to kitchenettes, 'Clark Model 1003' single bowl single drainer flushline sink unit to tea preparation stations (Refer <a href="#">Section 15.00</a> for chilled / boiling water units).

#### 17.04.02 Laboratory Sinks

Unless otherwise stated in the SDFs, single bowl laboratory sinks shall have a centre bowl 600 x 450 x 350mm deep and double bowl laboratory sinks shall each be 450 x 450 x 350mm deep, all with draining boards and a 350mm high integral splashback.

Sinks shall be fabricated from Type 316 stainless steel and shall be certified as such by the sink supplier. Copies of such certification shall be provided to CLF. Laboratory users must be consulted as to the chemicals that will be placed in the sinks, to establish if the sinks should be fabricated from another material such as PVC in particular situations such as the use of Hydrochloric acid.

Self-draining PVC runnel sinks shall be installed in benches where required by the SDFs.

#### 17.05 Taps

##### 17.05.01 Standard Taps

To ensure compatibility with fittings and fixtures across the campus, the University has standardised on the following fittings which shall be specified. All taps shall be WELS compliant.

Departures may only be made with the prior agreement of CLF.

All handles except hose cocks will be anti vandal, and all taps shall be chrome plated brass.

All tapware shall have ceramic disks unless directed otherwise by CLF.

Flow regulators shall be fitted to all tapware to minimise water consumption.

<b>Wall Basins Generally</b>	'Enware CS Series' half basin set with gooseneck aerated spout or full set if hot water required (6 l/m regulated flow to tap)
<b>Wall Basins to Toilets</b>	'Delabie Tempostop' or 'Galvin Engineering Ezy Push' time flow chrome plated brass pillar tap with coloured insert for 6 l/m flow and set for 3 second water cut-off.
<b>Disabled Basin</b>	'Enware' long lever action pillar cock with aerator spout or disabled single lever mixer where hot water nominated on SDF (6 l/m regulated flow to tap)
<b>Cisterns</b>	'Enware CS Series' vandal proof right angle stop cock
<b>Cleaners Sink</b>	'Enware CS Series' vandal proof bib cock with aerated spout and 50mm BIB extension
<b>Safety Shower &amp; Eyewash</b>	'Enware Model ECN240' freestanding hand operated shower and eye/face wash basin
<b>Showers</b>	'Enware CS Series' shower set with anti vandal shower head (9 l/m max. regulated flow to taps)

<b>Toilets</b>	'Enware' vandal proof 13mm hose cock with shroud (to one toilet only per building level)
<b>Flush Valves</b> (exposed model)	'Zip' 47004 or equal manual 3/6 litre dual flush valves and flush pipe with c.p. finish to all WC pans. Flush pipe is to be supported off the wall with c.p. brackets mounted between the valve and the pan.
<b>Laboratory Tapware</b>	'Broen', 'Enware LF Series' or 'Galvin Engineering' taps, spouts and gas turrets to suit user requirements with chemical resistant coating. Handles shall be to International Colour Coding except for hot water.
<b>Kitchenette &amp; Tea Prep Sinks</b>	'Enware CS Series' forward bowl sink set (8 l/m regulated flow to taps)
<b>Flow Restrictors</b>	'Brasshards', 'Conserv' or 'Water Wizz' flow restrictors to suit water efficiency standards required by local water service provider and the most current Qld Water Commission guidelines

### 17.05.02 Laboratory Safety Showers

Safety showers and eyewash stations are to be provided in accordance with relevant Australian Standards. Refer to the previous Clause for details of the preferred station.

Consideration must be given to the location of the safety shower and eyewash station to ensure their use does not constitute a slip hazard for other laboratory users. They should not be located in the main exit from the laboratory.

A floor drain under the shower is to be provided to remove the bulk of the water when used. The floor is to be sloped towards the drain and in all directions around to direct water into the drain.

Eye wash stations are not to be drained onto the floor but to waste.

### 17.06 Soil, Waste & Vent Plumbing

#### 17.06.01 Materials

Materials for pipework above ground shall be uPVC, HDPE, or copper subject to Building Act requirements.

#### 17.06.02 Pipework Installation

Pipework shall be concealed where possible in accessible ducts and ceiling spaces.

The installation shall be designed to gain full benefit of the systems as set out in the current Queensland Standard Sewerage Law, Standard Water Supply Law and AS 3500.

Provide waste plumbing to laboratory equipment such as glass washers, autoclaves and ice maker units, and to drinking fountains in accordance with the equipment manufacturers' requirements.

#### 17.06.03 Access

Access to serviceable items (I.O's, valves, etc) shall not be obstructed and be readily accessible.

#### 17.06.04 Condensate Waste Pipework

Pipework for draining condensation water from large or multiple Air Handling Units, ice machines, cold rooms, freezers, constant temperature rooms and the like, must be insulated and vapour sealed from the unit waste point to the ground level drainage connection. Long horizontal runs of pipework shall be avoided. The use of heat traces to treat condensate lines is not permitted.

### **17.06.05 Installation of Waterless Urinals**

The design for the installation of waterless urinals shall satisfy the requirements of AS/NZS 3500.0:2003 Part 2 to eliminate or minimise the build up of Struvite deposits in waste pipes or drains. A minimum of two fixtures generating water waste e.g. hand basins, shall be connected upstream to the same waste pipe or drain servicing waterless urinals as a means of flushing the pipes to prevent the build up of deposits.

The Hydraulics Consultant must liaise with the Architect on the layout of any toilet space with waterless urinals to achieve the above requirement.

## **17.07 Water Reticulation Generally**

### **17.07.01 Water Systems**

All water systems shall be designed to include back flow prevention devices to comply with the latest versions of AS 2845.3 and AS 3500.1 and other relevant Australian Standards. Refer to Clause 17.07.05 of this Section.

### **17.07.02 Pipe materials**

Reticulation within buildings shall be in copper tube to AS 1432.

Mains and fittings buried in the ground shall be either:

- Class K9 concrete lined ductile cast iron in polythene wrapping
- Type B copper with 'Polylag' or 'Denso' tape wrapping
- HDPE for mains 100mm diameter or above

Buried mains less than 100mm diameter, shall be copper with 'Polylag' or 'Denso' tape wrapping. Where the integrity of the 'Polylag' is broken by joints, fittings etc, the area shall be completely wrapped in Denso tape to a minimum of 100mm each side of the break.

All mains within buildings shall be Type B copper. uPVC pipework shall be used for deionised and distilled water only.

Where mains pass through walls and floors they shall be sleeved and caulked.

All exposed pipework and fittings in toilets, changerooms, showers and kitchens shall be chrome plated.

### **17.07.03 Pipe Fittings and Jointing**

Screwed fittings, barrel unions and flanged connections only shall be used for easy removal of all fittings. Compression fittings shall not be used under any circumstances.

Copper Pipe Jointing shall be silver soldered capillary fittings containing not less than 15% silver.

All junctions are to be by use of fittings, no pulled junctions will be allowed.

### **17.07.04 Valves**

Isolation valves shall be Norcast or RMC resilient seat gate valves where service exceeds 80mm diameter. Dezincified brass Ball valves shall be used on services less than 80mm diameter. Balance valves shall be globe valves. Stat valves shall be used for hot water balance valves.

Brass stop cocks, chrome plated where exposed, can only be used to isolate sanitary fixtures.

Valves shall be tagged to identify areas served.

Valves shall not be buried in the ground and shall be located either in service ducts or easily accessible pits. Pit covers shall be compatible with 'Gatic' lifters.

All RPZ valves shall be 'Tyco' or 'Fabco'. The Contractor shall ensure that all RPZ valves installed on a project are tested and registered with the Local Authority and provide copies of the test and registration certificates to the Superintendent. The Contractor shall also ensure that the RPZ valves are tested just prior to Final Completion and that the test results are submitted to the Superintendent.

#### **17.07.05 Back Flow Prevention**

All water systems shall be designed to include back flow prevention devices as previously described in Clause 17.07.01 of this Section.

Backflow devices are to be installed in locations that permit access for servicing and testing from floor level without ladder assistance.

#### **17.08 Cold Water Service**

Buildings shall be supplied through a two-piped system from mains pressure except when deemed undesirable by GU, one for potable water and the second via an RPZD in the Valve Room for non-potable supplies.

All laboratories shall be supplied from the non-potable system except for safety showers, eyewash stations and hand wash basins. The installation shall comply with AS 3500 and other relevant Australian Standards such as AS 2243.3.

Branch line sizing and outlet pressures shall also comply with the latest versions of AS 3500 and other relevant Australian Standards.

Generally cold water shall be run in minimum 20mm NB pipe. Short branches up to 1.5m may be 15mm NB if serving only one outlet.

The cold water service to laboratory glass washers, autoclaves and ice maker units shall be terminated in an appropriately sized ball valve.

#### **17.09 Hot Water Service**

Generally hot water services shall be run in minimum of 20mm NB pipe. Short branches up to 1.5m may be 15mm NB if serving only one outlet. Dead legs should be restricted to 3m maximum.

Laboratory hot water services shall be separate from all other hot water requirements to the remainder of the building. The water supply to the hot water systems servicing the laboratories shall come from the non-potable system except for hot water to any hand wash basins in laboratories, if required, which shall be taken from the potable water system.

All hot water pipes shall be insulated with preformed sectionalised fibreglass insulation wrapped with 'Sisalation 450' or 'Bradflex/Armaflex'. Under no circumstances will 'Polylag' be permitted.

Insulation shall be installed in strict accordance with manufacturer's recommendations. In plant rooms, walk-in ducts and wherever else exposed to view, the pipework and insulation shall be metal sheathed to a height of 2700mm only with zinc annealed sheathing, edges swaged and overlapped. Wooden blocks shall be used at all supports.

The minimum insulation thickness to hot water piping shall be 25mm for pipes less than 50mm nominal bore and 38mm for pipes of 50mm and above. Hot water lines should not be encased in walls, however, where this is unavoidable, 'Bradflex/Armaflex' with maximum wall thickness and glued joints to manufacturers recommendations should be used. Joint sealing using tape will not be permitted.

In addition to areas specifically noted in the SDFs, hot water shall be provided to the following points:

- All showers
- Kitchenette and tea preparation station sinks. An additional outlet shall be provided for a dishwasher viz. 20mm diameter copper, 200litres/hour if required. These facilities



shall have their own hot water system which shall not be less than 315 litre capacity where high turnover dishwashing facilities are required.

- Laboratory Glass Washers. This service shall terminate at an appropriately sized ball valve.

Toilet Hand Basins are **not** to be provided with hot water unless specifically called for in the SDFs.

Thermostatic mixing valves are required to all showers and any other areas required by the relevant Australian Standard e.g. in Child Care Centres. Valves shall be equal to 'Grohe' and shall be located to permit easy access for servicing and testing from floor level without ladder assistance.

## **17.10 Hot Water Generation Systems**

### **17.10.01 General Hot Water**

Where there is a significant requirement for hot water in a project, then a centralised hot water generation system similar to that as described later herein for laboratories shall be incorporated.

Sufficient storage shall be provided to allow provision of hot water for four (4) hours when heating elements are shed by the CCMS for energy management purposes. Provide Auto/Off/Manual controls at the hydraulics switchboard for all electric hot water systems and hot water circulating pumps.

Where hot water is generated by energy sources other than Solar energy, provision shall be made in the design of the hot water storage for the future installation of solar panels and associated pumps unless advised otherwise by CLF.

### **17.10.02 Laboratories**

Hot water for laboratories shall be centralised using a number of mains pressure Hot Water Systems in parallel with insulated flow and return lines incorporating both circulating and stand-by pumps. The hot water supply to hand washing basins, if required, shall be taken from a separate hot water unit connected to the potable water supply, and not from the general laboratory hot water generation system.

### **17.10.03 Hot Water Systems**

**Solar Hot Water Systems** - Prime consideration should be given to the installation of electrically boosted solar hot water units. In all cases, the Consultant should check that the flows and temperatures available are suitable to the application. If solar hot water is not viable, the use of electric or gas systems may be adopted.

**Heat Pump Systems** - Hot water may be provided by single or multiple 'Quantum Titan Commercial Solar' or approved equal mains pressure hot water generation units. The location of the evaporators must be approved by CLF.

**Gas Hot Water Systems** - Gas fired hot water units shall be 'Rheem' or approved equal mains pressure units in single or multiple installations.

**Quick Recovery or Boiling Water Units** - Hot water to single isolated applications such as tea preparation stations, may be provided by the use of a local quick recovery unit such as 'Zip' or approved equal, under sink mounted units.

**Overflows** - Overflows to hot water units shall discharge over stainless steel safe trays under all units at sufficient height to face the overflow pipe to a drainage connection point. Units shall be mounted within the safe tray and the tray drained in accordance with the current addition of AS 3500.4.

**Space Requirements** - Allow for sufficient space around the unit for removal of elements and above the unit for the withdrawal of anodes.

### 17.11 External Hose Cocks

All external hose cocks shall be 20mm nominal, brass, mounted on a white painted 75 x 75mm hardwood post, finishing 600mm above ground and located away from the building facade. External hose cocks shall be not more than 30m apart. Final locations shall be determined in consultation with CLF.

In circumstances where hose cocks are unavoidably mounted on the face of the building, these shall be stood off the face by not less than 50mm with an aluminium bracket approved by the Superintendent, and shall discharge over an ORG or stormwater sump.

Groups of hose cocks shall be capable of being isolated by ball valves.

All external hose cocks shall be serviced by a separate water supply isolated from the general building supply via an isolation valve and backflow prevention device located in the Valve Room.

### 17.12 Pumps

**General** - Pumps shall be 'Ajax 2000 Series' or 'Southern Cross' *back-end-pull-out* type. Close coupled pumps shall not be used. All seals shall be mechanical seals. Pumps shall be mounted on a concrete inertia base complete with spring mounts.

Pumps used in campus water reticulation shall have variable speed drives.

**Cold Water Booster Pumps** - Dual cold water pumps shall be provided. One pump shall be capable of providing the flow and pressures required. The other pump shall act as standby. Controls shall include for automatic 24hr changeover for duty and standby pumps. Provide control switching positions for 24hr automatic pump changeover, manual switching and 'off' for both pumps. Hours-run meters shall be provided for each pump.

Pressure gauges with a nominal 75mm diameter face of the bourdon-tube type complete with an isolation ball valve shall be provided on each side of the pumps. Pumps shall be activated by a drop in system pressure. Fit a 'Binda' cock adjacent to all pressure gauges.

Loss of suction control is to be provided to all pumps.

**Hot Water Pumps** - Hot water circulating pumps shall be provided in hot water loops to minimise dead legs, where a central system is installed.

The hot water circulating pumps shall be installed in the return water loop. Care shall be taken to ensure that pressure in the hot water circuit is not greater than the pressure in the cold water main. Pumps shall be of the 'Grundfos' *in line* model with totally enclosed single phase motor. Pump casings shall be bronze with bronze impellers and mechanical seals. Open motors are not acceptable.

Hot water circulating pumps shall be controlled by the CCMS for hours of operation. 240V contactors shall be provided on the pump control panel for this purpose. Control via the CCMS shall be 24V a.c.

**Rainwater Supply Pumps** – storage tank installations supplying rainwater to buildings for toilet flushing shall be provided with pumps which have a dual feed from both the stored rainwater and the mains water make-up supply, with an automatic switch over from the primary rainwater supply to mains water in the event of pump failure or loss of electrical power. The pump shall incorporate a built-in dual check valve for backflow prevention to each supply, and be installed in accordance with AS/NZS 3500.

The pump shall be operational only when drawing rainwater from the storage tanks, and shall not operate once the automatic switch over to mains water has occurred. It is essential that the switch over in water supply is clearly indicated by an appropriate means.

The pumps shall have 'Watermark' certification and comply with the following product approvals;

- Endurance test ATS 5200.030 50,000 Cycle
- AS/NZS 4020 – testing of products for use in contact with rainwater.

- N16113C – Tick Compliance
- Dual Check Valve fitted low hazard AS 2845

### 17.13 Water Meters

Water meters are required on all potable and non potable cold water supply pipelines as follows:

- Supply to building.
- Supply to Laboratories.
- Supply to commercial tenancies.
- Supply to centralised circulating hot water systems.
- Supply from building to landscape irrigation system.

Water meters shall be 'ABB Helix 4000', and shall be installed in an accessible location for easy reading such as a plant room or services pit.

Meter counters shall be capable of providing data interpretation with regard to water volume over a specified time period. Building supply meters shall be fitted with an approved wireless data logging station mounted in a secure enclosure, and shall be capable of communication with 'Redlion' interface controls.

The meter to a Campus main water supply shall be an 'ABB Aquamaster' or 'Magflow' installed in accordance with Local Water Authority requirements complete with lockable vandal proof cabinet and shielded electrical supply cable.

### 17.14 Rainwater Collection, Storage & Reticulation

For every new building, rainwater shall be collected from the roof and stored in a holding tank/s for reuse to flush toilets and irrigate landscaping. The collection of waste water from RO systems, fire hose reel testing and air conditioning condensate shall also be considered.

Storage tank/s shall be sized to reflect the building population with a minimum capacity of 30,000 litres available for flushing purposes. Tanks may be either 'in' or 'above' ground as appropriate to the building design. Prefabricated above ground tanks must have a 20 year 'in-use' warranty. Polythene tanks shall be 'Duraplas' or approved equa.

Tanks shall incorporate mains water make-up activated by a float valve, and each tank shall be fitted with an external 'Water Level' indicator. Where multiple tanks are installed, the mains water make-up shall be provided to the flushing tank only.

Separate irrigation tank/s shall be connected to the flushing tank via a single 50mm dia. pipe with a check valve and two ball valves, to allow water from the irrigation tank/s to automatically flow to the flushing tank when its water level has fallen to less than that in the irrigation tank/s.

Water from the flushing tank shall be reticulated through a separate pipe system, clearly marked at 1 metre min. intervals with in coloured lettering to read 'Rainwater', to all flush valves and toilet cisterns. Provide all pumps required in accordance with the requirements previously outlined in Clause 17.12 of this Section. The Contractor shall test and certify that the reticulation pipework is not cross connected to any of the other water reticulation systems in the building.

Any taps serviced with rainwater from the tanks shall be clearly labelled with a green indicator with the letters RW.

The installation of the whole system shall be to the requirements of the Local Authority.

### 17.15 CCMS Control & Alarm Points

**Alarms** - Provide alarms, grouped as one alarm for each of the following to be connected to the CCMS via a DDC control panel in the building:

- |                                      |                             |
|--------------------------------------|-----------------------------|
| Booster pump(s) alarms               | - failure and low pressure. |
| Cold and Hot water circulating pumps | - failure.                  |

**Controls** - Provide the following control points to be connected to the CCMS via a DDC control panel:

- |                             |                      |
|-----------------------------|----------------------|
| Hot water heater elements   | - for load shedding. |
| Hot water circulating pumps | - for load shedding  |

## **17.16 Inspection & Testing**

### **17.16.01 General Requirements**

Contractors shall carry out all the necessary and required tests including the payment of fees, provision of labour and test equipment. All tests shall be carried out to the applicable Australian Standard, the requirements of any Act or Authority having jurisdiction or these Guidelines, whichever is the greatest.

No piping work, fixtures or equipment shall be concealed or covered by any means before they have been pressure tested, flow tested and inspected by the Superintendent. All work shall be completely installed and tested as required by this Section and the Code requirements and shall be leak tight before inspection of the particular work is requested. Tests shall be repeated to the satisfaction of the authorities having jurisdiction.

All defects shall be remedied immediately and the tests reapplied to the satisfaction of the Superintendent and the Authorities.

At least 72 hours' notice shall be given prior to the carrying out of tests. Where construction vehicles or similar equipment is used on site, allowance shall be made for retesting pipelines under concrete slabs on ground immediately prior to placing membrane and reinforcing steel.

Inspections of all under slab pipework shall be carried out by the Local Authority, the Hydraulics Consultant or the Superintendent before backfilling of trenches.

### **17.16.02 Testing Pressures**

Water supply pipelines shall be tested at 2.1 MPa for twelve (12) hours and generally kept charged thereafter.