

09 – Hydraulic Systems

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1.1	15 August 2011	Andy Smith/ Jeff Albrecht	Generally revised.
1.2	31 September 2011	Andy Smith	Generally revised.
1.3	5 January 2012	Andy Smith	Generally revised.
1.4	27 February 2012	Andy Smith/ Solomon Elijah	Section and Clause numbering changed. Clauses 12.7, 12.10, 12.12 & 12.17 and.
1.5	12 July 2012	Andy Smith	Minor additions to Sections 12.2, 12.3, 12.4, 12.5 & 12.26.3
2.0	05 February 2016	Andy Smith	General Revision
2.1	02 May 2017	Andy Smith	Amendments to Section 12.26
2.2	13 August 2021	Andy Smith	General Revision
2.3	10 July 2023	Andy Smith	New natural gas banned and DHW equipment

Introduction	2	Neutralising Chambers and Trade Waste	11
Authorities Requirements	3	Sump Pumps and Alarms	13
Specific Design Requirements	3	Identification of in-ground services	14
Water Supply and Reticulation Systems	4	Irrigation	14
Domestic Hot Water Systems	5	Rain Water Harvesting	14
Sanitary Drainage System	6	Signage	15
Natural Gas Service	6	Pipe Markers	15
Storm Water Reticulation	8	Pumps	15
Associated asset and infrastructure requirements	10	Safety Shower and Eyewash Facilities	16
In-ground asset covers, void access and safety lids	10	Maintenance and Service	17
Metering	10	Standard Sanitary Fittings and Fixtures	18
Cisterns and Flushing Valves	11		

Introduction

09.01 The Australian National University (ANU or the University) is responsible for the in-ground services infrastructure on various ANU campuses. These services are quite old in certain areas. Consultants shall assess the need to fully evaluate the impact any proposed new development may have on the existing hydraulics and irrigation infrastructure.

09.02 In evaluating the capacity and condition of in-ground services Consultants shall provide for ANU review in-principal concepts and designs at an early stage. The Principal's Representative (the Principal or the Principal's Project Manager) will provide overview of the designs and proposals to ensure that they incorporate the provisions of the Campus Building and Requirements Manual (CBRM, the Manual or the Requirements) into their design philosophy.

09.03 The scope of hydraulic services shall comprise:

- incoming water supply and tapings (Refer to [Section.08 Fire Protection Systems](#));
- domestic cold-water supply reticulation.
- domestic hot water supply reticulation.
- flusher service reticulation or cistern toilets.
- sanitary plumbing, drainage, and fixtures.
- storm water drainage.
- natural gas supply and reticulation systems.
- laboratory systems and safety equipment.
- roof and rainwater systems.
- rainwater storage systems.
- trade waste drainage systems; and
- pumps and control equipment.

09.04 The CBRM is intended to be read and distributed electronically. This does not preclude printing sections of the Requirements; however, the University takes no responsibility for the completeness and currency of printed/hard copy material distributed amongst the Consultant team. Notwithstanding any Consultant's particular discipline or area of responsibility, each Consultant and/or designer shall consider the document in its entirety.

09.05 The complete CBRM consists of the following Sections which may be referred to within this Section:

Campus & Building Requirements Manual	
Section 01	General Requirements
Section 02	Architectural Requirements
Section 03	Roads, Car Parking & Civil Works
Section 04	Soft Landscaping

Section 05	Roofing, Roof Fabric & Roof Safety
Section 06	Building Management Systems
Section 07	Electrical Services
Section 08	Fire Protection Systems
Section 09	Hydraulic Systems
Section 10	Mechanical Services
Section 11	Lifts, Cranes & Vertical Transportation Systems
Section 12	Security, CCTV & Access Control
Section 13	PV Systems

Authorities Requirements

09.06 All current standards will be mandatory and complied with, except where a higher standard is outlined in the CBRM.

09.07 In the ACT the relevant authorities shall include:

- Icon Water
- Icon Water has contracted Jemena Asset Management for the supply of natural gas to the ACT. Jemena has requirements, some of which are outlined in this Section, which need to be complied with.
- Australian Capital Territory Planning and Land Authority (ACTPLA).
- ACT Fire and Rescue; and
- ACT Government, Territory and Municipal Services (TAMS), specifically the [TAMS Design Standards for Urban Infrastructure: Storm water](#).

09.08 For other States the relevant authorities shall include:

- the water supply authority in that State; and
- standards and regulations in force of that State, as pertinent to the regulatory body/council under whose jurisdiction the work is to comply with.

Specific Design Requirements

09.09 Sanitary plumbing, drainage and fixtures shall be subject to the following:

- no toilets or waste facilities shall be provided below the level of the main sewer lines.
- selection of fixtures and fittings including devices designed to limit water usage should be cognizant of availability and continuity of spare parts supply.
- on refurbishment and replacement toilet pans are to be 6/3 flushing type.
- no waterless type urinals to be used.
- tap-sets installed at basins in common areas are to include hands-free operation Thornthwaite Presto sensor taps, Rada sensor systems, Galvin – Flowmatic Electronic tapware, Enmatic touch type preferred or equal equivalent).
- under bench/sink boiling and chilled water unit are preferred (Zip or equal equivalent) for kitchen installations.

- all materials shall be approved by the Watermark certification trademark.
- all sanitary fittings and fixture will be WELS compliant.
- the Consultant will supply details for all/any sanitary fittings and fixtures selected to the Principal's Representative for review.
- all wet areas must have a floor waste.
- each toilet on the ground floor must have an Inspection Opening (IO) access to the sewer system; and
- drainage systems from toilets on the lowest floor of a building must be accessible via brass IOs.

Water Supply and Reticulation Systems

09.010 All spurs off campus mains for water and natural gas supply to buildings shall be fitted with isolating valves.

09.011 On all services supplied by a ring main or the Icon Water service, the main shall be capable of being isolated on either side of the tee-off position.

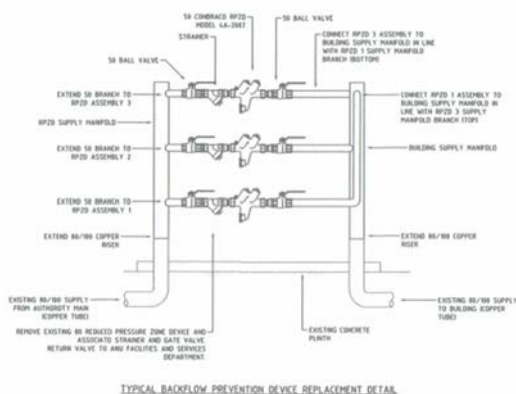
Supply and Install a WaterGroup SIM water logger to all Icon Water meter and connect to the ANU data system

09.012 Stop cocks in hot and cold-water lines and natural gas services shall be easily accessible and clearly marked. Separate stopcocks are required for each floor and for each laboratory on each floor of a building. These stopcocks shall be located within a lockable AISI grade 304 stainless steel cabinet at 2.0 m from the finished floor level.

09.013 A designated cold water stop cock is required in all plant areas for the purposes of mechanical equipment servicing and cleaning.

09.014 Backflow prevention devices must have by-pass valves installed on water services of 40 mm and higher size (Conbraco Apollo valves are preferred or equal equivalent).

09.015 Backflow devices on building supply (Containment protection) over 50mm must be installed in a multi parallel installation



09.016 Where an irrigation system is not installed, stopcocks or quick coupling devices shall be provided on the perimeter of the building for hard time irrigation and cleaning purposes. These shall be spaced at no more than 20.0 m apart.

09.017 All sanitary fittings such as cisterns, hand basins and sinks shall be fitted with isolating valves to the hot and cold-water supply respectively.

09.018 All water services below the ground must be of a product that can be located. No trace wires shall be used, for example copper and Ductile Iron Concrete Lined (DICTL). The only exception being irrigation pipework that is downstream of the master valve on irrigation systems.

09.019 Potable water services having pipe sizes of 25 mm and larger, must be of copper Type B as classified within *AS 1432 Copper tubes for plumbing, gas fitting and drainage applications*.

09.020 Identification labels shall be secured to all pipe work. Signage shall be supplied and installed as per the requirements of *AS 1345 Identification of the contents of pipes, conduits, and ducts* exception for exposed vent pipe work above the finished roof level.

09.021 Fire hydrant systems where located above the ground shall be constructed with heavy duty mild steel piping jointed by approved patented rolled grooved pipe and fittings; equal to all respects to Victaulic systems.

09.022 Fire hydrant systems below the ground must be of approved copper pipe and fittings.

09.023 Provide filtration to the incoming water supply and any automatic back wash system using a filter with minimum mesh size of 5 microns.

09.024 Aquafil flexi-Fountains/bottle filling stations are to be used in the landscape with approved ANU signage only.

09.025 As a general requirement, externally provide quick coupler valves installed at 20.0 m spacings throughout garden beds supplying potable water, which may be used for plant establishment.

Domestic Hot Water Systems

09.026 Domestic hot water services shall be selected to ensure that the balance between energy source, location and long-term running costs is properly evaluated. To ensure that the most efficient operation of the hot water is achieved, the unit standing heat losses through long flow and return pipework shall be avoided. Low GWP, heat pump systems shall be selected in preference to direct electric or solar units. Life cycle costing shall be provided so that all options are evaluated.

09.027 Domestic scale hot water units are typically installed in most buildings to supply hot water to bathrooms and kitchens. They can range from small under-bench units, through to large (>300 L) storage tanks or high-volume instantaneous heaters.

09.028 Exposed pipework must have a metal sheathing over the installation where it is exposed to sunlight, bird, or vermin attack.

09.029 Sheath shall be 0.5 mm thick zincalume. Spring over the insulation in one piece with at least 30 mm lap; the whole tightly clamped in position and fastened with either approved self-tapping screws; zinc plated, or snap head type rivets spaced not greater than 150 mm centres. Raw metal must be painted. The longitudinal joints shall be approximately 4 o'clock position with the top lap outermost to prevent water penetration.

09.030 Hot water circulating pumps are to be Grundfos UPS20-60B (or equal equivalent) and are to have a dual system running in parallel with all installations.

Sanitary Drainage System

- Major sewer bends or junctions to include a manhole installed outside the building footprint.
- all manhole lids must finish 150 mm above the finished ground level in landscaped areas.
- all sewer branches entering the building footprint will have Inspection riser and will terminate at finished ground level.
- toilet drainage must exit the building independent of the wastewater system.
- all traps and floor wastes are to be self-cleaning" S and P" type only.
- High Density Polyethylene (HDPE) pipe work is to be used on all trade waste and Vulcathene (PP) is to be used on laboratory specialised drainage systems; and
- all in-ground sewer drainage shall be of a minimum nominal diameter size of 100 mm.

Natural Gas Service

Natural Gas Distribution Networks: The ANU have made a Below Zero commitment. Part of this commitment is to electrify natural gas equipment and eliminate natural gas consumption from campus.

09.031 No new gas infrastructure or equipment is to be designed, scoped, or conceded in any ANU structures or ANU sub-core business.

09.032 Any existing gas infrastructure hot water systems must be replaced with electric systems, unless approval is received from Facilities and Services Technical team.

09.033 The ANU preferred domestic hot water systems are to be low GWP (Global warming potential) heat pump technology.

09.034 Natural gas is available on the Acton, Northbourne Ave, Mount Stromlo and NARU Campuses and is distributed as follows:

Acton Campus:	Polyethylene/nylon mains deliver gas at 210 kPa to each meter set from the natural gas network. It is then required to be reduced after each meter set to pressures that are one of the following: 2.75 kPa, 5.0 kPa, 35 kPa or 100 kPa.
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Northbourne Ave:	The steel mains deliver gas at 1,050 kPa pressure up to the secondary meter set. Thereafter the pressure is to be reduced to 100 kPa.
Mt Stromlo:	Polyethylene/Nylon mains deliver gas at 210 kPa to each meter set and that pressure is to be reduced after each meter set to either 2.75 kPa, 5.0 kPa 35 kPa or 100 kPa.
NARU Campus:	

Note: Siding Spring Observatory & Kioloa Campuses do not have natural gas available, but bottled gas in the form of LPG is available.

09.035 All work carried out to install or repair any of ANU's natural gas system must be done in accordance with *AS 5601 Gas Installations*, any other applicable Australian Standard, all Jemena requirements, and the Gas Supply (Safety and Network Management) Regulation 2008.

09.036 Natural gas meter enclosures shall be installed to prevent unauthorised access or damage to the meter/regulator set. Figure.1 indicates a standard ANU enclosure. No other equipment such as water meters, irrigation control boxes and electrical items shall be placed within this compound.

09.037 Such enclosure or protection must:

- have enough clearance to allow changing and servicing of the meter set.
- locked with a Jemena/AGL gas padlock.
- be powder coated a yellow biscuit colour.
- clearance from the ground to the bottom of the structure is to be 100 – 250 mm.
- the floor of the meter set / regulator set must be constructed of concrete and be level; and
- appropriate permanent safety barriers such as Armco railing and bollards must be installed between a gas/regulator/structure set and any adjacent vehicular traffic path.



Figure.1: Typical ANU gas meter enclosure

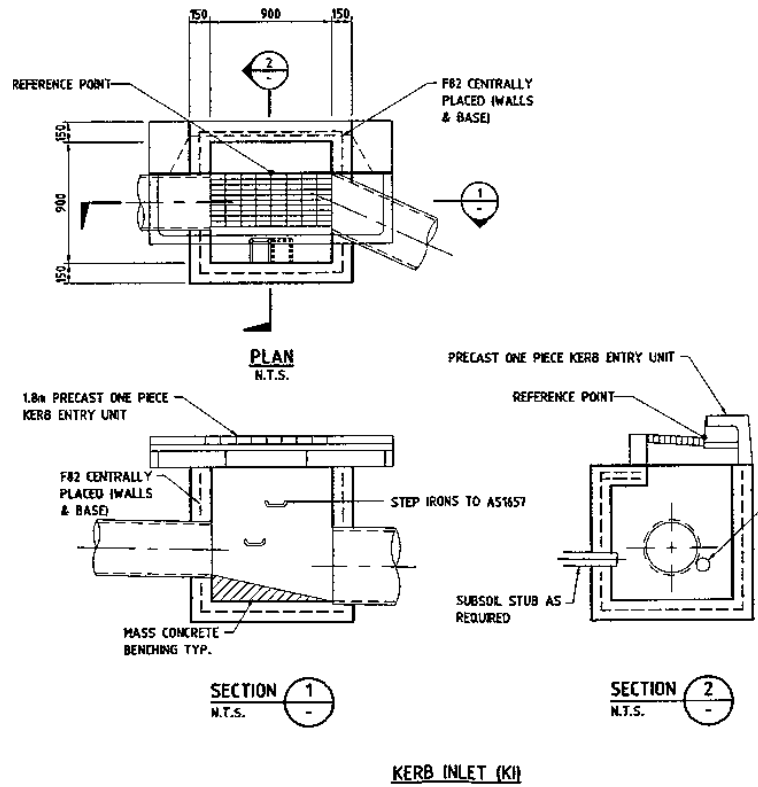
Storm Water Reticulation

09.038 Consultants shall ensure the entire storm water reticulation system complies with the following requirements:

1. Storm water drainage systems shall be subject to the following:
 - the system shall be designed in accordance with the CSIRO recommendation for 1:100-year return rainfall intensity, storm duration 5 minutes, rainfall intensity 200 mm/hour with drainage gravitating to appropriate storm water drains. Consultants shall provide the Principal's Representative with calculations demonstrating the adequacy (or otherwise) of the existing drainage system relating to its capacity to cope with the proposed new storm water load.
 - all manhole lids must finish 150 mm above the finished ground level in landscaped areas.
 - all sumps and inspection pits shall have a silt chamber below the lowest invert level.
 - shoes of downpipes shall not be mortared in place but shall discharge into a separate trap with grating. The trap will be designed to minimise splashing at the downpipe discharge point.
 - rainwater heads shall be readily accessible and shall have adequate overflow capacity; Overflow from rain head must be lower than the gutter.
 - no internal box gutters shall be used, and the external box gutters must be 50 mm lower on the external than the internal edge of the gutter.
 - gutters shall be designed to minimise the build-up of leaf litter and debris.
 - siphonic systems must not be used where there is leaf litter and debris from trees as this will affect the system; and
 - gutters are to be designed so that flashing/gutters are higher internally than externally and eliminates water entering the building.
2. The condition and position of existing storm water mains to which a new building is to be connected, will be checked to ensure that they can be serviced and easily accessed for maintenance, the sizing is correct and true and in the correct location.
3. All grated drains in pedestrian areas that collect surface water must be a type that has a locking system, and the grate has a heel guard finish. Halgan kid safe (or equal equivalent) are the preferred type, cast iron or stainless steel (heel guard type) only.
4. Gutters and downpipes discharge into a sump at the ground level to be a physical break with the storm water system or blockage caused by vegetable detritus and hail. Down pipe to finish 100 mm above the grate to allow cleaning and leaves to be removed.

Gutters are to be designed so that flashing/gutters are higher internally than externally and eliminates water entering the building.

5. All storm water kerb side sumps (Side Entry Pit or SEP) are to be 1.8 m precast one-piece kerb entry units, Type QS and R side entry pits, depth to base of sump must not exceed 1.8 m from top of kerb, F82 steel in the centre and base of the sump with subsoil PVC stubs minimum 300 mm. Refer typical Drawing 09.1 and Figure.2.



Drawing 09.1



Figure.2

6. All storm water pipework 150 mm and above must have a manhole, grated sump or kerb type sump installed at the change of direction and or junctions. No bend construction or bandage joint will be accepted.

Associated asset and infrastructure requirements

In-ground asset covers, void access and safety lids

09.039 Pits housing in-ground assets; sewer pumps, stormwater infrastructure and the like; shall be designed with user access and safety in mind. Accessible sub-surface pits will have an integrated pit lid and safety enclosure installed meeting the following minimum requirements:

- McBerns (or equal equivalent) as indicated in Figure.3.
- Aluminium lid parts and folding componentry.
- Flush finished to the finished surface level with no slip or trip hazards.
- Vehicular trafficable lightweight lid/s.
- integrated hinged safety grates acting as void protection when in position;
- a sealed lock devise with an ANU standard lock installed;
- gas sampling port on the lid for confined space monitoring; and
- Adjacent to pit/void, cast in recessed davit post sleeve for confined space entry/retrieval.



Figure.3

Metering

09.040 All incoming cold water and natural gas services shall be metered and all meters must connect to the ANU BMS, refer to [Section.06 Building Management Systems](#).

09.041 Smart type water meters with Mod Bus interface are to be used only

09.042 Commercial metering must be placed in a secure location outside the tenanted space, where multiple tenancies are located close, a designated metering room is to be installed.

09.043 All major uses and users of water must be individually metered. Meters are to be installed on the following uses as a minimum:

- Evaporative heat rejection systems.
- Irrigation Systems.

- Centralised domestic hot water systems
- Commercial kitchens
- Rainwater Supply; and
- Recycled grey water.

09.044 Paint finishes on water meter lids as follows:

- potable water meter lid: 2-pack blue; or
- Non-potable water meter lids: 2-pack lilac.

09.045 All lids are to be complete and fixed with stainless steel screws having hexagonal type heads.

Cisterns and Flushing Valves

09.046 The use of exposed half flush cisterns is preferred in buildings solely occupied by ANU staff, or a mixture of staff and research personnel. Recessed (or in-wall) cisterns shall be used wherever these are primarily used by undergraduates and/or the public.

09.047 All toilet flushing should be supplied via a header tank such that recycled water can be supplied to the header tank. Flushing valves are preferred where toilets are subject to peak usage, e.g. toilets adjacent to a lecture theatre or a large teaching laboratory.

09.048 Where possible these systems are to be fed from a non-potable water supply or storage tank from recycled water or rainwater.

09.049 If flushing valves are installed, consideration shall be given to providing ease of access for maintenance purposes and sound attenuation.

Neutralising Chambers and Trade Waste

09.050 Consultants shall be required to ascertain the type, quantities, and concentration and dilution levels of chemicals that are likely to be discharged into the sanitary drainage system. Users have an obligation to provide accurate information to assist Consultants in determining the need for a neutralising chamber. The local water supply and drainage authority shall also be consulted regarding their requirements. If a neutralising chamber is required, it shall be located to provide easy vehicular access were pumping out or cleaning procedures are necessary.

09.051 Generally, neutralising chambers shall not be located within plant rooms. Preferred chambers are concrete or PanelTrim (or equal equivalent lightweight) chambers.

09.052 Associated dosing tanks shall be located where maintenance staff can gain access independently of any laboratory or office area.

- 09.053** All dosing equipment and control systems should be external to the pit itself and located within a weatherproof enclosure. This enclosure shall be suitably bunded and a floor waste that drains into the pit provided. All enclosures should have a standard water supply with tap and appropriate electrical supply. The enclosure must have a minimum floor space of 5.0 x 4.0 m with a minimum ceiling height of 2.5 m.
- 09.054** Supply portable spill response kit for a chemical type of accident in the space provided.
- 09.055** Install an MSDS storage centre made from a durable outdoor grade material with a self-closing lid.
- 09.056** Supply and install all signage to ANU Work Health and Safety (WHS) requirements.
- 09.057** A cold-water supply and general-purpose outlet shall be provided for mixing purposes.
- 09.058** Ventilation of the neutralising chambers shall in accordance with *AS 1668 The use of ventilation and air-conditioning in buildings*.
- 09.059** Ventilation of the Trade waste plant room needs to comply with AS 1668.
- 09.060** All pH controller/monitor/alarm are to be located outside the neutralising chamber.
- 09.061** Solenoid diaphragm pumps (SERA type ANU standard) are to be used and chemical storage is to be bunded.
- 09.062** A primary circulation pump drawing from the inlet side of the treatment pit.
- 09.063** Air blower and sparge is to be installed in the inlet treatment chamber (Model HP-120 ANU standard)
- 09.064** Secondary circulation pump draws a sample from the outlet side of the treatment pit are to be ANU standard system Model complete LCA-TWTS-1 (Diaphragm pumps), refer to Figure 04.
- 09.065** PH sensor mounted in the suction line will operate an alarm if sample readings are outside the required parameters. The sample is returned to the inlet side of the treatment pit. This process creates a re-circulation of the treatment pit and helps maintain correct pH levels in times of minimal
- 09.066** PH Controller is to be a LIQUITRONICS MCD-301 Series Dual Controller (ANU Standard system).
- 09.067** A safety eye wash/shower station is to be installed within 20.0 m and requires the Principal's Representative be consulted to review any proposed installation.
- 09.068** All new work will need the approval from the Icon Water trade waste section

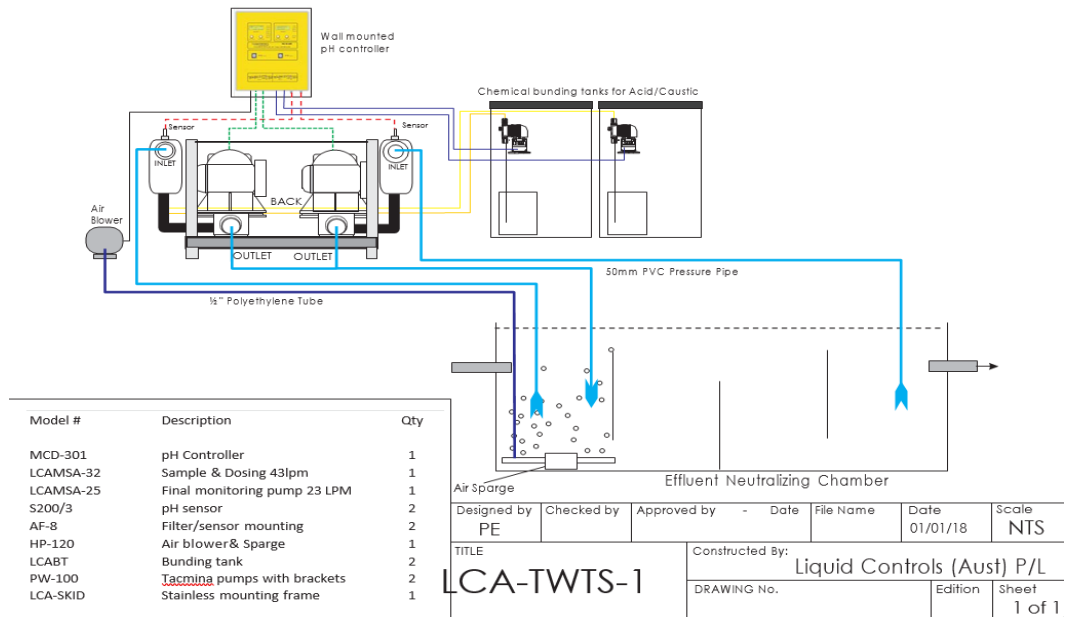


Figure.04: Indicative ANU standard dosing system

Sump Pumps and Alarms

09.069 Duplicate pumps shall be provided in storm water and sewer pits. Each pit shall be controlled by a common control panel with automatic run/standby/alternating facilities together with multi-mode level sensing probes, which shall sense:

- high level alarm;
- pump 1 start;
- pump 2 start; and
- pumps 1 and 2 stop.
- Manual operation on pump 1 & 2.

09.070 The control panel shall include terminals to provide remote control indication to the ANU’s BMS for pump operation and high-level alarm. A local audible and visual alarm shall also be included in the control panel for high level condition.

09.071 Pump motors shall be installed to permit disconnection by simple plug withdrawal. Power outlets shall be located a minimum of 600 mm above finished floor level.

09.072 Pumps shall be labelled. Labels shall include pump number, circuit number and switchboard location, all in accordance with labelling of equipment.

09.073 Pump and control switches shall be installed to allow easy access for inspection and testing procedures.

09.074 Where duty and standby pumps are installed, each pump shall be provided with a duty hour run meter.

09.075 Check valves and isolating valves shall be installed as appropriate.

09.076 Sumps and submersible pumps shall be designed to facilitate easy pump removal by the provision of:

- adequate lighting above the sump; and
- lifting eye above the sump.

09.077 Submersible pumps and all fittings required for installation shall be specified as being completely corrosion resistant.

09.078 Non-submersible pump motors shall be located a minimum of 600 mm above floor level.

09.079 Internal and external ground water systems shall be kept separate. The ANU prefers external sumps and pumps (if required) for ground water disposal and internal sumps for basements, lift wells and the like.

Identification of in-ground services

09.080 All in-ground services are to be identified by installing continuous warning tape in the ground 100 mm directly above the service. Provide a means of tracing non-metallic in-ground services, such as by using tracer wire which is easily identifiable.

Irrigation

09.081 Refer to [Section.04 Soft Landscape](#) for irrigation system requirements.

Rain Water Harvesting

09.082 Rainwater collection is to be installed on all major projects and used within and around the building to replace use of potable water. Rainwater collection tanks (ANU preferred systems are the Stormtech rainwater storage or equivalent) to be appropriately sized such that a minimum of 2 months of average annual rainfall on the building can be captured and stored.

09.083 Captured rainwater is to be provided, in order of preference to:

- toilet flushing.
- process cooling or heat rejection systems;
- irrigation.

Signage

09.084 Green coloured identification tape marked “CAUTION RAINWATER LINE BURIED BELOW” should be used to identify in-ground storm water pipes to the tank and in-ground water supply pipes from the tank. Identification tape is to be laid above the pipes and within the trench. Identification markings should comply with AS 1345. The tape shall be placed longitudinally along the pipe so that the marking is visible from all viewing directions.

09.085 All external hose taps that are supplied with rainwater are to be identified with a metallic safety sign (100 x 75 mm) labelled “RAINWATER” which shall be securely fixed above the rainwater hose tap outlet. The words and symbol are to be black in writing on a yellow background. The hose tap shall be fitted with a hose connection vacuum breaker or backstop valve. Signs shall comply with *AS 1319 Safety signs for the occupational environment*.



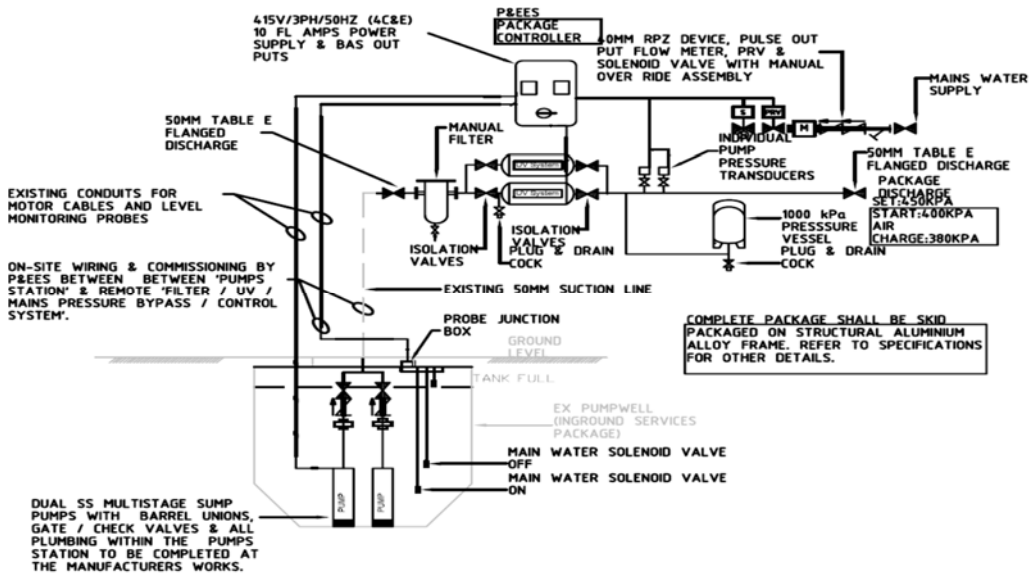
Pipe Markers

09.086 Pipework less than 40 mm in diameter shall have a continuous green pipe marker band/tape around the circumference of the pipe with the word “RAINWATER”. Identification markings should comply with AS 1345. The tape shall be placed longitudinally along the pipe so that the marking is visible from all viewing directions.

Pumps

09.087 All rainwater tank pumps must be installed so noise levels do not create a nuisance to occupants and/or any neighbouring properties.

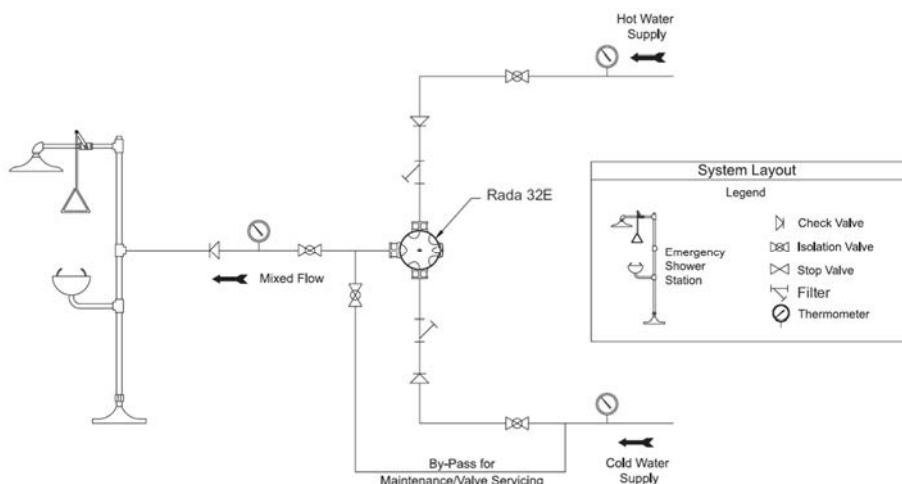
09.088 The plumbing system is to be designed to ensure that the maximum static pressure at any outlet does not exceed 500 kPa and the minimum pressure at the most disadvantaged outlet or fixture is not less than 50 kPa at the minimum flow rate required, refer to *AS 3500 Plumbing and Drainage*.



Typical below ground installation and filter/Pump package.

Safety Shower and Eyewash Facilities

- 09.089 All safety shower are to be 25mm in size and type.
- 09.090 Any unusual situations associated with safety showers and eye wash stations, or their installation shall be discussed with the Principal’s Representative.
- 09.091 At least one safety shower and eyewash or eye/face wash facility shall be installed, in each laboratory where hazardous substances are used, and shall be specified by the user group. In addition, hand-held drench hoses may be installed as specified by the user.
- 09.092 GEMS FS200 Flow Switch (set point 7.5 LPM) connected to the buildings BMS/Alarm system.
- 09.093 Signage shall be highly visible in compliance with AS 1319 and visible throughout the area serviced by the shower/eye wash.
- 09.094 All safety showers are to be fitted with RADA 32E or BROEN-LAB 17513009 temperature control devise No. 17460.009 and it must be installed as per manufacture recommendations / as per drawings below. Where a RADA valve is used, install 20/25mm diameter reduction piece at each inlet and Outlet. Also ensure sufficient pressure is available to combat pressure drop across the valve.



09.095 The ANU design requirement is for a travel distance not exceeding 15.0 m (corresponding to approximately 10 seconds walking travel time) to such devices from any point in the laboratory is considered good practice. Shorter travel distances may be appropriate for high-risk applications. The equipment must be installed on the same level as the hazard, accessing the equipment should not require going up or down stairs or ramps. The path of travel from the hazard to the equipment should be free of obstructions and as straight as possible. Distances more than 15.0 m (between the hazard and safety shower/eye wash) shall be reviewed by the WHS Branch.

09.096 Standard product list for the ANU is Enware, Broen items or equal equivalent.

09.097 Consultants must consider where wastewater will go. In particular, care must be taken that wastewater does not create a hazard.

09.098 Connect any drain piping from the emergency equipment or floor drain to the building's acid waste disposal system or to a neutralizing tank.

09.099 Where possible all safety showers must have a floor waste and the water must flow into the trade waste drainage system.

Maintenance and Service

09.0100 Consultants are to ensure that the specification will include provision for the hydraulics and services contractors to coordinate and discuss project details and specific requirements with the Principal's Representative.

Standard Sanitary Fittings and Fixtures

09.0101 The following sanitary fittings (or equal equivalent) are to be used. Must be commercially warranted. Alternatives can be offered with full documentation and technical details to be provided to the Principal's Representative for review.

09.0102 Vanity Basins - White Only

Wall Mounted Basins

- Duravit D Code 550mm Wall Basin
- Caroma Caravelle

Semi Recess Basin

- Duravit D Code 550mm Wall Basin
- Caroma Caravelle 550

Under Counter Basin

- Duravit D Code 560x400mm Under Counter Basin
- Caroma Caravelle

Insert Recess Basin

- Duravit D Code Vanity Basin 545mm
- Caroma Caravelle

Disable Basin (AS1428.1)

- Duravit D Code 550 & Shroud
- Integra 500 wall basin One Tap Hole

09.0103 Toilet Suites – White Only

- Duravit Darling New Wall Faced Pan & Seat
- Leda Wall Faced Invisi 11 Suite
- Duravit Darling New Wall Faced Suite
- Leda Wall Faced Pan
- Enware Toilet Infill's (AS1428.1 disable)
- Care 800 Invisi 2 Suite – Care Button & Back Rest

09.0104 Toilet Pans –White Only

- Duravit Darling New Wall Hung Pan & Seat
- Walvit Wall Hung Pan & D760 Bracket
- Duravit Darling New Wall Faced Pan & Seat
- Caroma Leda
- Caroma Flex Wall Faced Back Inlet Pan
- Caroma Caravelle
- Caroma Trident

09.0105 Toilet Seats – White Only

- Duravit Darling New Seat
- Caravelle or Caravelle Care Seat
- Colani Care Seat
- Caravelle Care Seat (Blue Seat)
- Avolon Soft Close Seat
- Metro Toilet Seat
- Caravelle Care Seat

09.0106 Squat Toilets

- Caroma Caravelle squat Invisi 11 Toilet suites
- Alternatives need approval

09.0107 Urinals

- No waterless products.
- Cube Invisi Series 2 Urinal (1.8lt Flush)
- Cube 0.8lt Electronic Urinal (0.8lt Flush)
- Duravit D Code Urinal with
- Zip 41091 Flushmaster Solo WS005 Ceiling Sensor, Solenoid Kit & Battery
- Zip 99024 Flushmaster Direct Injection Air Break Kit 25mm
- Rada Mono 122 wall urinal flushing system (1 stall) – Part No. 850911
- Rada Mono 125 ceiling urinal flushing system (1 stall) – Part No. 850931
- Rada Mono 126 ceiling urinal flushing system (2 stalls) – Part No. 850941 automatic electronic flush.
- passive infra-red sensor.
- adjustable time selector for flush delay and cistern fill cycles.
- power source 240V mains.

09.0108 Showers

- Liano Rail Shower
- Liano Shower
- Rada VR 105 vandal resistant shower head 8.5L/min
- Rada VR 106 vandal resistant shower head 5L/min
- Rada VR2 vandal resistant shower head
- Rada SF1 10 or SF1 20 Hand held shower and rail with hose slide and rail
- Mira 360 showerhead with hose and rail
- Hansgrohe Croma 100 Multi Hand Shower with Porter E shower Holder with Integrated Hose Connection
- Hansgrohe Crometta 100 Shower on Rail
- Hansgrohe 100 Multi Overhead Shower

09.0109 Tap Sets

- Retro or Liano Range

- Manor House or Eltoro Range
- Linkware Kirra Beach or Elle Lever Ranges
- Enware School Pattern
- Linkware Noosa or Design Ranges
- **Timed flow taps option**
 - Option 1
 - Presto timed flow taps
 - Option 2
 - Presto 2000 basin mounted timed flow tap – Part No. P20024
 - Presto 2010 wall mounted timed flow tap – Part No. P20118
 - Presto 605 basin mounted timed flow tap (cold) – Part No. P64608
 - Presto 605 basin mounted timed flow tap (warm) – Part No. P64626
 - Presto 705 basin mounted timed flow lever tap – Part No. P64654

09.0110 **Mixing Taps**

- Enware Vega Range
- RBA Range RBA4L50-7070 + RBA5935-1900
- Caroma Nordic Range
- Presto 2020, 3000 or 7000 range of basin mounted timed flow mixer tap

09.0111 **Electronic Tapware**

- Enware – Enmatic 1000 series basin Tap
- Enware Enmatic 2000 Series Basin Tap with Anti-Vandal Proof
- Dyson Airblade Tap AB09 Short, AB10 Long & AB11 Wall
- Presto Volta sensor tap – Battery
- Presto Volta sensor tap – Mains
- Presto Volta sensor tap - Lever Mixer Battery
- Presto Volta sensor tap - Lever Mixer Mains
- Hansgrohe Focus Electronic Basin Mixer
- Rada PULSE sensor systems
- Rada 215 and 320 sensor systems

09.0112 **Thermostatic Mixing Valves**

- Enware – Aqua blend Series.
- Broen – Stabitherm Series.
- Rada - thermostatic mixing valves

09.0113 **Laboratory Safety Equipment**

- Enware.
- Broen.
- RBA.
- Thornthwaite B-Safety equipment
- Safety Showers temperature control devices to be used only Rada 32E and Broen NO. 17460.009

09.0114 **Boiling/Chilled Water Units- Must be air cooled only and must provide a commercial warranty period of 5 years from commissioning**

- Zip products.
- Billi product

09.0115 Floor wastes

- Stainless steel proprietary items.
- Minimum 100 mm diameter inlet with screw in gratings.
- Floor wastes complete with puddle flanges shall be epoxy grouted into the penetration.