
SECTION 6: HYDRAULIC SERVICES

CONTENTS

6.1	INTRODUCTION	2
6.2	HYDRAULIC SERVICES	2
6.2.1	Standards and Regulations	2
6.2.2	Drawings, Documentation and Technical Data Submissions	3
6.2.3	Spare Capacity within Hydraulics Services	3
6.2.4	Sanitary Plumbing Drainage and Fixtures	3
6.2.5	Trade Waste	3
6.2.6	Underground Pipework	4
6.2.7	Roof and Paved Surface Drainage System	4
6.2.8	Isolating Valves and Stop Cocks	4
6.2.9	Thermostatic Mixing Valves	5
6.2.10	Cold Water Services	5
6.2.11	External Drinking Fountains	5
6.2.12	Hot Water/Chilled Water Units	5
6.2.13	Hot Water Services	5
6.2.14	Backflow Prevention Devices	6
6.2.15	Water Traps	7
6.2.16	Water Metering	7
6.2.17	Laboratories	7
6.2.18	Colour Coding	8
6.2.19	Equipment Provided by the Hydraulics Contractor	8
6.2.20	CCTV Pipe Inspection	8
6.2.21	Certification of Completed Work	8
6.2.22	Building Automation System (BAS)	8
6.2.22	Gas Services	8
6.2.23	Gas Metering	9
6.3	DESIGN CHANGE AUTHORISATION	9
6.4	OPERATIONAL MAINTENANCE, AS-BUILTS, WARRANTIES & MANUALS	9

6.1 INTRODUCTION

This section of the Design Standards provides details of the minimum requirements for the design, installation and operation of hydraulic services. The design team is to produce their own project specification which incorporates this section and other sections of the Design Standards as well as all relevant legislation, regulations and codes.

The consultant team must submit all designs to the University for review prior to any tendering or works commencing on site.

6.2 HYDRAULIC SERVICES

6.2.1 Standards and Regulations

Work shall meet all the requirements of national and local authorities and shall be in accordance with the following in so far as they apply to the work:

- Australian/New Zealand Wiring Rules AS/NZS 3000;
- SAA National Plumbing and Drainage Code AS 3500;
- AS 3500 Plumbing and Drainage;
- Gas Installation Code AS5601.1.

The design of hydraulic services shall comply with the latest edition of relevant Australian Standards. Those listed below are specifically highlighted:

System	Standards	Specific criteria to note
Domestic Sewer Drainage & Sanitary Plumbing	AS/NZS 3500.2 Plumbing Code of Australia	Minimum grade of 2.5% for 40-80mm, 1.65% for 100mm and 1% for 150mm pipelines. Fixture units to be assessed and pipework sized accordingly.
Stormwater	AS/NZS 3500.3 Plumbing Code of Australia	<p>Minimum grade of 1% for 100mm. Pipework sized accordingly.</p> <p>All overflows to be sized for the maximum year average (Average Recurrence Interval)</p> <p>Gutters sized to drain at 5% AEP (Annual Exceedance Probability) storm occurrence.</p> <p>In accordance with Green Star Buildings Credit 39 <i>Waterway protection</i>, it is encouraged that projects demonstrate a reduction in average annual stormwater discharge (ML/yr) of 40% (or higher) across the whole project site.</p> <p>In accordance with Green Star Buildings Credit 39 <i>Waterway protection</i>, it is encouraged that projects demonstrate a reduction in the average annual pollutant load by the percentage specified in the "Credit Achievement" level of performance or better, as well as managing risks associated with chemical and other pollutants (e.g. hydrocarbons from car parking) associated with the project.</p> <p>This is to be demonstrated via numerical modelling or stormwater treatment</p>

		performance calculations are provided manually.
Domestic Cold Water	AS/NZS 3500.1 Plumbing Code of Australia	Water velocity not to exceed 2.0m/s. Pressure range to each fixture between 200 – 500kPa. Installed in materials specified.
Domestic Hot & Warm Water	AS/NZS 3500.4 Plumbing Code of Australia	Water velocity not to exceed 2.0m/s. Pressure range to each fixture between 200 – 500kPa. Installed in materials specified.
Fixtures & Fittings	AS/NZS3500, AS1172.2, AS1432, AS1730, MP52	Watermark licensed. Accredited Australian Standards mark. To manufacturers requirements. Ergonomically suited for use. Installed in materials specified.

6.2.2 Drawings, Documentation and Technical Data Submissions

All contractors are to submit full design shop drawings to the University of Melbourne Project Manager and consulting engineer for review and approval prior to commencing works on site.

The technical data for any equipment proposed by the consultant/contractor must be submitted to the University Project Manager with full details including the following: -

1. Shop drawings including weights and dimensional sizing.
2. Pump curves (where applicable)
3. Maintenance schedule recommendations.
4. Life cycle of equipment

Model numbers together with relevant information are to be installed on equipment for referencing on site.

6.2.3 Spare Capacity within Hydraulics Services

Provisions for 20% additional capacity shall be allowed for in all hydraulic services designs to cater for any future upgrades. Consideration of diversity must be factored in when designing such systems.

6.2.4 Sanitary Plumbing Drainage and Fixtures

No toilets or waste facilities shall be provided below the level of main sewer lines.

In situations where gravity drainage cannot be achieved a proprietary sewer pump chamber shall be provided. For individual bathroom groups a SaniFlo unit shall be specified.

6.2.5 Trade Waste

Trade waste shall be in accordance with the Australian Standards AS4494 and local water authority trade waste requirements. All trade waste applications to be submitted by project team prior to handover of completed works. Applications are to be made in the University's name.

Grease interceptor trap (GITs) locations are preferred to be located externally away from all operable intakes and main entrances. However, grease traps that are located internally must be provided with sufficient ventilation in accordance with AS1668.2. A suitable and readily accessible location is to be provided for the GIT pump out.

The location of neutraliser tanks shall be convenient for vehicular access when pumping out is necessary. Generally, neutraliser tanks shall not be located in plant rooms. Associated dosing tanks shall be located where maintenance staff can gain access independently of any laboratory or office areas.

An adjacent cold water point and general purpose outlet shall be provided for mixing purposes. Ventilation of neutraliser tanks shall be such that any fumes do not re-enter the building.

Under bench neutralising tanks must be mobile with barrel unions on the inlets and outlets and be easily removable for cleaning.

6.2.6 Underground Pipework

All pipework laid underground alongside electrical cabling is comply with AS3500 and AS3000. The pipework shall be laid side by side and not on top of each other. Refer to colour coding section 6.2.18 for identification of pipework.

All trenches are to be backfilled to an appropriate level of compacting.

All underground stormwater and sewer pipework to be CCTV tested prior to practical completion.

The consultant is to ensure co-ordination of all in-ground services.

6.2.7 Roof and Paved Surface Drainage System

The stormwater drainage system from roof and deck areas shall be designed in accordance with AS 3500.3. The rainfall intensity for design calculation shall use Bureau of Metrology 100 year return rainfall intensity plus 20% increase factor to allow for the potential effects of climate change. Provide drainage from planter boxes, and other hard and soft paved areas using a 1 in 20 year return rainfall intensity + 20% increase factor. Generally, drains shall gravitate to the legal point of discharge provided by the local council. Provide stormwater treatment as required by Council prior to connection to the legal point of discharge.

It is desirable that rainwater collected from roof areas shall be stored in tanks of sufficient size to provide a water supply for irrigation. Toilet flushing and cooling tower use should also be considered.

The design of the roof drainage system shall generally utilise a gravity downpipe system. Where site constraints limit the feasibility of gravity drainage the designer shall consider the use of a syphonic drainage system.

6.2.8 Isolating Valves and Stop Cocks

All spurs off campus mains for water and gas supplying buildings, shall be fitted with tested isolating valves.

In the case where a building is supplied by a ring main, the main shall be capable of being isolated on either side of the tee-off position.

Stop cocks in hot and cold water lines and gas services shall be easily accessible and clearly marked. Separate stop cocks are necessary for each floor, groups of fixtures and for each laboratory on each floor of a building.

Ministops shall be fitted to connections for individual basins and sinks.

Isolating valves shall be fitted to all floors of a building to provide for domestic cold water and domestic hot water where applicable for any future connections.

Valves must be tagged to identify all service areas. Valves shall not be installed directly underground, they shall be in easily accessible areas for serviceability and isolation.

Isolation valves are to be provided at each floor when serving buildings that are multiple levels. If isolation valves are to serve laboratories then one (1) isolation valve per laboratory is required.

All cold-water isolation valves are to be in a location that is easily accessible for maintenance purposes. If they are to be in public areas then these isolation valves are to be lockable to avoid tampering.

Provisions for underground valves at each connection to buildings is a mandatory requirement, if the contractor is connecting into ring mains ensure that there are valves underground within the relevant spacing. All in ground valves are to be the anti-clockwise closing type.

6.2.9 Thermostatic Mixing Valves

Thermostatic mixing valves shall be provided to all ablution areas to reduce the hot water temperature to 50°C and, 42°C in disabled ablution areas. The mixing valves shall be in fully accessible locations within lockable stainless-steel wall boxes or accessible ducts complete with isolation valves. Mixing valves shall be located so that a maximum dead leg of 6 meters is not exceeded. Each TMV to be labelled with a traffolyte label indicating the area its serving. Tempering valves are acceptable in non DDA areas.

Mixing valves shall be Aquablend as supplied by Enware.

6.2.10 Cold Water Services

All cold-water systems must be designed in accordance with the latest edition of relevant Australian Standards and must comply with the University Design Standards.

If a new connection is required, the application must be submitted to the relevant water authority.

The velocity of the water flow rate for cold water service must not exceed 2.0 m/s.

6.2.11 External Drinking Fountains

The standard type of external drinking fountains is the non-refrigerated type. These shall have cold water and sewer services connections to each fountain.

Drinking fountains must be installed on a hard surface. As a minimum a concrete pad shall be provided or if applicable they should be installed to any surface other than landscape floor.

Drinking fountains shall be by Aqua Bubbler – Classic model (AB12) in rich blue or approved equivalent. They shall be installed in accordance with the manufacturer's specifications.

6.2.12 Hot Water/Chilled Water Units

Hot and chilled water units shall be Zip brand. However, the 4 in 1 type Zip units are not to be used.

6.2.13 Hot Water Services

All hot water systems shall be efficient and designed to suit the building demand with additional spare capacity of at least 20% for future connection.

The University's preference is for hot water to be provided by solar hot water systems using evacuated tube type collectors with electric booster units. The reticulation system shall be a flow and return system fully insulated to comply with all requirements of the Building Code of Australia Section J and AS3500.4

An alternative option is heat pump domestic hot water units where suitable for the hot water duty required. The units are best located in warm environments such as boiler plant room to improve the efficiency of the heat pump.

Fixtures that are not practically served by a centralised system shall be supplied from electric hot water unit sized appropriately for the number and type of fixtures served.

Electrically operated hot water units shall not have automatic release buttons which operate on power failure. If these are provided on the unit they shall be removed before the unit is installed.

Hot water units shall be easily accessible for maintenance.

Hot water units shall be provided with safe trays. A waste connection is not required when a "Terminator" automatic shut off valve is fitted to the water inlet connection point.

Consultants and designers are to specify balancing valves that are to be installed on the return line to control and minimise any potential air noises and turbulence that may occur. This will also ensure that the temperatures that are controlled within the system are maintaining at least 60°C as a minimum.

Hot water service temperature deliveries shall be as follows: -

Area	Temp (°c)
Hot water plant	65
Return Water Temperature	60
Staff Showers & Staff Rooms	45
Staff Kitchen and Kitchenettes	50
Accessible Showers & Bathrooms	42
Commercial Kitchens	60

All heating hot water services pipework is to be provided with insulation that shall comply with AS3500.4. The insulation around bends shall be pulled as one piece where possible. All insulation is to be the high-performance type which shall also be provided to all joints, elbows and valves.

All hot water services installations must comply with the energy efficiency measures contained within the National Construction Code (NCC). All calculations are to be submitted to the University's Project Manager for review.

6.2.14 Backflow Prevention Devices

The required backflow prevention devices must be installed for each area that is deemed to be a high hazard. This should be installed at each property/site/building within the University to ensure containment protection is in place.

'Zurn' backflow devices are to be installed.

Backflow prevention devices must be tested every 12 months to ensure that they are operating effectively and to an acceptable standard. Accordingly, the following items are to be tested on each backflow prevention device prior to the expiry of the defects liability period.

- A) Isolation valve
- B) Upstream non-return valves
- C) Relief valve
- D) Downstream non-return valve

Care needs to be taken regarding the cumulative pressure loss through multiple backflow devices or gravity fed systems. Pressure pumps may be required to overcome the system losses in some cases.

6.2.15 Water Traps

All water traps must be primed to prevent smells from drip trays. Where possible floor wastes shall be primed from a local hand basin waste. Where no suitable primer source is available, an automatic trap primer valve shall be installed.

6.2.16 Water Metering

All new water meters and sub-meters shall be supplied with pulsed outputs to ensure that real time data is available to University stakeholders. These meters shall be connected to the site wide University BAS system.

Where the location of the meter precludes direct connection to the BAS system, the meter will be supplied and fitted with a Low Power Wide Area Network (LoRaWAN) data logger. The data logger must support a pulse input, be compatible with the AS923 band-plan and implement over-the-air-activation OTAA. The Consulting Engineer shall consult with the University's Smart Campus team in relation to specific communications requirements.

Water meters are to be provided for potable and non-potable supplies for the following areas -:

Buildings, precinct hot water systems, laboratories, commercial tenancies.

Sub meters are to be assembled within buildings to measure the following, but not limited to: -

1. Centralised domestic hot water systems
2. Centralised potable and non-potable systems
3. Rainwater harvesting systems
4. Irrigation systems
5. Tenancy areas
6. Cooling Towers

All meters are to be in fully accessible locations for servicing and maintenance.

6.2.17 Laboratories

All laboratory tapware is to be selected from Enware or equal and approved colour coded tapware range with associated fixtures. The type of laboratory outlets is to be chosen in consultation with the University Project Manager.

All laboratories that include a wet area must be provided with safety showers and eye wash designated areas as per the Australian Standards and the manufacturer's instructions. The location of the safety shower is to ensure that it is easily accessible, does not restrict access within the laboratory and does not cause a slipping hazard to other occupants.

Each eye wash and safety shower installations shall be fitted with the appropriate isolation valve. In addition, the drainage shall be connected to sanitary plumbing via a floor drain. The design consultant shall avoid placing these systems near entrances/exits.

All systems that are designed/constructed must comply with the relevant laboratory standards. Refer to Design Standards Section 2 - Occupational Health and Safety. Performance of shower heads, section 6.2 of AS 4775-2007, details critical installation

and operational requirements for the installation to be compliant. Key points to be considered are height of shower head, flow rate, spray pattern and obstruction.

RO pipe systems must incorporate valves at each level to ensure shutdown without affecting the building water supply. The water quality requirements shall be in accordance with AS4187. All RO systems designed to include a storage tank to prevent the impurity of the RO water.

6.2.18 Colour Coding

Plumbers, Mechanical and Electrical Subcontractors shall colour code and mark their services.

The design is to be in accordance with AS1345 for the identification and labelling of the services.

6.2.19 Equipment Provided by the Hydraulics Contractor

All equipment and materials supplied for incorporation into hydraulic services shall comply with the requirements of the relevant Australian Standards and University. All equipment shall be locally supported for spare parts and maintenance.

6.2.20 CCTV Pipe Inspection

For large projects a CCTV inspection of all pipes is to be carried out in the period immediately prior to practical completion. The inspection is to extend not less than 50 metres from the building perimeter. The University Project Manager is to be consulted regarding the need for a CCTV inspection for smaller sized projects.

6.2.21 Certification of Completed Work

The hydraulic contractor shall issue at practical completion a Plumbing Industry Commission Certificate of Compliance nominating the works carried out on the project and provide the completed certificate to the University's Project Manager.

6.2.22 Building Automation System (BAS)

The following equipment where applicable shall be monitored under the BAS system but not limited to.

1. All tanks (rainwater, potable and non-potable) inclusive of low and high alarm.
2. Hot water plant (domestic hot water units) – temperature and fault status
3. All supply pumps – fault status.
4. Water Meters (where applicable).
5. Gas Meters (where applicable)

Refer to Design Standards Section 10 - BAS and Controls for more information about interfacing with other services and monitoring requirements.

6.2.22 Gas Services

Natural gas systems are only to be considered where required for laboratory purposes.

The natural gas supply and reticulation shall be designed in accordance with Australian Standards AS5601. The consultant/designer shall ensure that the gas supply demand for their project is adequate and that the existing infrastructure can meet the demands.

Any enquires must be submitted to the University and regulatory authority. Any new gas meters or regulators that are required to be installed shall be included within the projects scope and detailed design.

Laboratory gas manifolds shall comply with AS 2896. They shall be installed with isolation valves and backup regulators.

6.2.23 Gas Metering

All new gas meters and sub-meters are to be supplied with pulsed outputs to ensure that real time data is available to University stakeholders. These meters shall be connected to the site wide University BAS system.

Where the location of the meter precludes direct connection to the BAS system, the meter will be supplied and fitted with a Low Power Wide Area Network (LoRaWAN) data logger. The data logger must support a pulse input, be compatible with the AS923 band-plan and implement over-the-air-activation OTAA. The Consulting Engineer shall consult with the University's Smart Campus team in relation to specific communications requirements.

6.3 DESIGN CHANGE AUTHORISATION

All requests for changes to the requirements of the Design Standards must be made on the Modification Request Form. No design work is to proceed on the basis of a proposed modification until the modification request has been approved in writing.

A schedule of all design change requests and a signed copy of all approved requests is required to be provided to the University at the time of project handover,

6.4 OPERATIONAL MAINTENANCE, AS-BUILTS, WARRANTIES & MANUALS

For those projects targeting a Green Star rating, the design consultant is to refer to Design Standards Section 3 - Sustainable Design for system commissioning requirements.

The design consultant **MUST** ensure that the project documentation includes a requirement for all hydraulic items to be provided with a full routine and regulatory maintenance period for 12 months from the date of practical completion. Any registrations of equipment are to be placed in the University's name prior to practical completion.

The University of Melbourne CAD Standards provide details of the formatting and submission requirements for as-built drawings, permits, manuals and warranties. The CAD Standards can be found in the Associated Documents section of the Design Standards web page.

The Contractor shall provide operation and maintenance manuals containing (as a minimum) the following information for each item of equipment.

- Position/location;
- Duty;
- Means of isolating in an emergency;
- Complete manufacturer's details of unit and motor for the University's maintenance records, including Make and Model No.;
- Manufacturer's recommended maintenance procedures;

- Any other items, such as a spare parts list, provided with the unit;
- Guarantee and warranty information (including a schedule of all);
- Name and contact details of the company from which the item was purchased, the normal supplier and local service agent;

Draft manuals are to be provided four weeks prior to practical completion and final manuals are to be provided a maximum four weeks after practical completion.