SECTION 6: HYDRAULIC SERVICES

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6.1 INTRODUCTION

This section provides details of minimum requirements for the design, installation and operation of hydraulic services. The Designer is expected to produce their own specification incorporating the elements of the following information and submit all designs to the University for review prior to any tendering or works commencing on site. This design standard sets out the University's minimum requirements and shall be considered an adjunct to all relevant statutory regulations.

6.2 HYDRAULIC SERVICES

6.2.1 Standards and Regulations

All 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 table of relevant Australian Standards below:

<table>
<thead>
<tr>
<th>System</th>
<th>Standards</th>
<th>Specific criteria to note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Sewer Drainage &amp; Sanitary Plumbing</td>
<td>AS/NZS 3500.2 Plumbing Code of Australia</td>
<td>Minimum grade of 2.5% for 40-80mm, 1.65% for 100mm and 1% for 150mm pipelines. Fixtures to be assessed and pipework sized accordingly.</td>
</tr>
</tbody>
</table>
| Stormwater                       | AS/NZS 3500.3 Plumbing Code of Australia  | Minimum grade of 1% for 100mm. Pipework sized accordingly. All overflows to be sized for the maximum year average (Average Recurrence Interval) Gutters sized to drain at 5% AEP (Annual Exceedance Probability) storm occurrence. In accordance with Green Star Credit 26.1, it is encouraged that the storm water systems are designed such that the storm water discharge does not exceed the pre-development peak event stormwater discharge using the average recurrence interval specified in the green star design. Management of storm water peak flows may include the following:
  - Storm water reuse
  - Water Detention
  In accordance with Green Star Credit 26.2, it is encouraged that the storm water systems are designed such that the storm water pollution does not exceed the pre-determined pollution targets value in table 26.2 of the green star for untreated runoff. This is to be demonstrated via numerical modelling or
The scope of hydraulic services includes the following systems. Each is to be designed in accordance with the relevant Australian Standards and University of Melbourne Design Standards.

- Incoming water supply and tappings including fire protection services;
- Domestic cold water supply reticulation and backflow prevention;
- Sanitary plumbing, drainage and fixtures;
- Stormwater drainage;
- Rainwater collection storage and treatment for reuse;
- Greywater / Blackwater collection for treatment and reuse;
- Solar hot water generation;
- Tempered water reticulation.
- Gas supply and reticulation.
- RO water plant and reticulation.
- Recycled water plant and reticulation.

### 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 which must be inclusive of the following:

1. Shop drawings including weights and dimensional sizing.
2. Pump curves (where applicable)
3. Maintenance schedule recommendations.
4. Life cycle of equipment
5. Relevant model numbers with all information 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.

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.

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.

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 may 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 heating 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 contractor must provide one (1) isolation valve per laboratory.

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 relevant Australian Standards and must comply with this guide the University Design Standards.

If a new connection is requested the application must be submitted to 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 are not to be installed directly on landscape floor, 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 (AB128) in rich blue or approved equivalent. They shall be installed in accordance with the manufacturers specifications.

6.2.12 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 connections when required.
The University’s preference is for hot water to be provided by solar hot water systems using evacuated tube type collectors with gas fired 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 and all internal gas hot water systems shall be ventilated.

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:

<table>
<thead>
<tr>
<th>Area</th>
<th>Temp (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot water plant</td>
<td>65</td>
</tr>
<tr>
<td>Return Water Temperature</td>
<td>60</td>
</tr>
<tr>
<td>Staff Showers &amp; Staff Rooms</td>
<td>45</td>
</tr>
<tr>
<td>Staff Kitchen and Kitchenettes</td>
<td>50</td>
</tr>
<tr>
<td>Accessible Showers &amp; Bathrooms</td>
<td>42</td>
</tr>
<tr>
<td>Commercial Kitchens</td>
<td>60</td>
</tr>
</tbody>
</table>

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.

### 6.2.13 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.

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

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

6.2.14 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.

6.2.15 Neutraliser Tanks

The location of neutraliser tanks shall be convenient for vehicular access where 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.

6.2.16 Water Metering

All new water meters and sub-meters are to be the smart type with pulsed outputs to ensure that real time data is as accurate as possible. These meters must be able to connect to the site wide BAS system.

Water meters are to be provided for potable and non-potable 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 hot water systems
2. Centralised potable and non-potable systems
3. Rainwater harvesting systems
4. Irrigation systems
5. Tenancy areas
6. Cooling Towers
7. Boilers

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 manufacturer’s instructions. The location of the safety shower is to ensure that this does not cause a slipping hazard to other occupants.
Each eye wash/safety shower 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.

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 Certification of Completed Work
The hydraulic contractor shall issue upon practical completion of the works a Plumbing Industry Commission Certificate of Compliance nominating the works carried out on the project and hand the completed certificate to the University’s Project Manager.

6.2.21 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 Natural Gas Services
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 enquiries 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.
6.3 PROVISION OF GENERAL AMENITIES

6.3.1 Toilets

The number of WCs, urinals and lavatory basins shall be based on the expected population of the building. The distribution of anticipated students by sex shall be advised by the University Project Manager for the projects. Refer also to the Building Code of Australia.

Toilet paper and soap dispensers as detailed below. These will be supplied by the University however the project documentation is to provide for the building contractor to install.

- Twin Mini Toilet Roll Dispenser: TORK 472028
- Foam Soap Dispenser: TORK 561500

Hand dryers are to be specified. Paper towel dispensers are not to be installed except in exceptional circumstances (refer Section 5.2.11 of the Building Fabric section of the Design Standards). In such instances the dispensers will be supplied by the University and are to be installed by the building contractor.

- Slimline Handtowel Dispensers: TORK 552030

Toilet cubicle doors shall be in hold open position. Hinges shall allow for the ability to remove shut doors (cubicle occupied) in an emergency situation where the occupant becomes incapacitated.

Urinals shall be wall hung porcelain units unless otherwise approved by the University’s Project Manager.

In female toilets, a space shall be made available for sanitary disposal units. These are supplied and installed by the University’s Cleaning Services Manager. These units are free standing.

A shelf shall be provided in the wash-up area on which to rest books or bags.

Hooks and mirrors shall be provided.

A shower shall be provided in each building in a location approved by the University’s Project Manager.

Indicator bolts shall be provided to all cubicle doors.

6.3.2 Toilet Flushing Systems

For toilet pans, install ‘Zurn’ flushers, or equal and approved equivalent, connected either to mains pressure or gravity fed flushing systems.

Consultants/contractors are required to provide dual flush valves for WC pans.

For urinals, install ‘Zip Infrared Water Savers for Urinals,’ or equal and approved equivalent. The infrared sensors shall be located over the urinal area and not in path of ingress/egress to avoid unnecessary flushing.

The Principal Consultant and Hydraulics Consultant shall discuss proposals based on the above guidelines with the University’s Project Manager before commencing detailed design.

6.4 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.
6.5 OPERATIONAL MAINTENANCE, AS-BUILTS, WARRANTIES & MANUALS

For those projects targeting a Greenstar 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 details of the formatting and submission requirements for as-built drawings, manuals and warranties. The CAD Standards can be found in the Associated Documents Section of the Design Standards web page.

Upon completion of projects all as-builts to be submitted to the University of Melbourne in both hard copy and soft copy format.

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;
- Name 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.