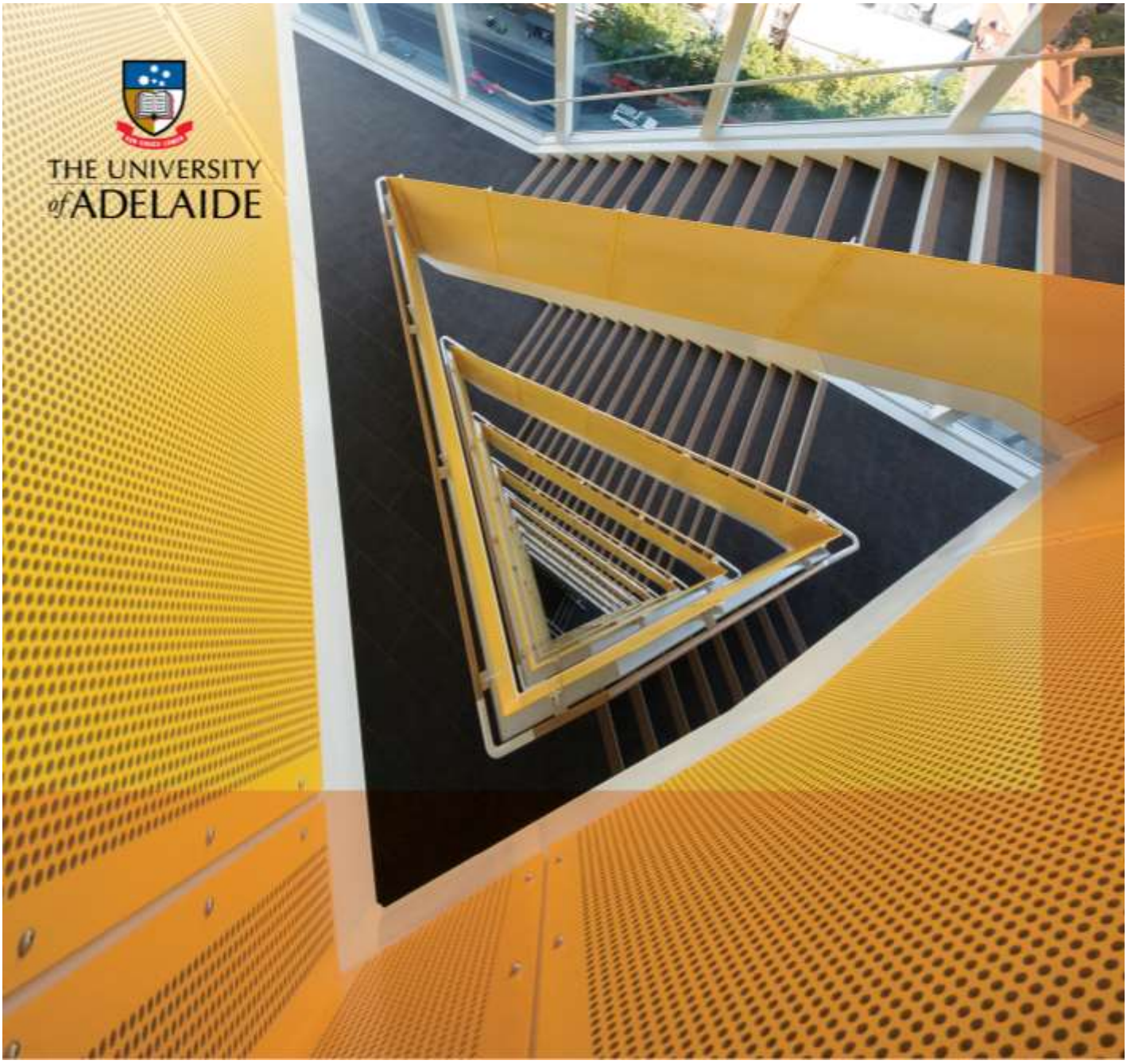



# DESIGN STANDARD

F. Hydraulic Services

# Contents

# Revision log

### Current issue

F. Hydraulic Services - UoA Design Standards. FINAL Version 5. May 2023

### Previous issues

| Version | Authors | Description | Revision | Date |
|---|---|---|---|---|
| 1.0 | John Edge, UoA Service Delivery, UoA | F. Hydraulic Services - UoA Design Standards | DRAFT Version 1 | December 2017 |
| 2.0 | John Edge, UoA Service Delivery, UoA/ GHD | F. Hydraulic Services - UoA Design Standards | DRAFT Version 2 | December 2017 |
| 3.0 | GHD | F. Hydraulic Services - UoA Design Standards | DRAFT Version 3 | March 2018 |
| 4.0 | Vicki Jacobs, Capital Project Delivery, UoA/ GHD | F. Hydraulic Services - UoA Design Standards | FINAL Version 4 | August 2018 |
| 5.0 | Infrastructure, UoA | F. Hydraulic Services - UoA Design Standards | FINAL Version 5 | |

### List of revised items

| Version | Authors | Revised items | Date |
|---|---|---|---|
| 5.0 | Infrastructure, UoA | Abbreviations, 1.Introduction, 2.Gernernal Requirements removed and reference in Vol.A Project Process Checklist | May 2023 |

### Revision management

It is envisaged that revisions to this document will be undertaken at intervals of not more than two (2) years.

### Endorsement body

Director of Infrastructure

### Owner

Capital Projects Delivery

### Contact person

Associate Director, Capital Project Delivery

### Authors and acknowledgements

The standards have been developed by Capital Projects with the assistance of UoA staff, external consultants, contractors, and colleagues from other education institutions. The University conveys its thanks.

# Abbreviations

(refer –Standard Volume A. Project Process Checklist)

# 1. Introduction

(refer –Standard Volume A. Project Process Checklist)

# 2. General requirements

(refer –Standard Volume A. Project Process Checklist)

# 3. Technical requirements

This section outlines the specific technical requirements for F. Hydraulic Services UoA Design Standards.

## 3.1 Regulatory requirements

All hydraulics work including but not limited to sanitary plumbing, industrial waste systems, property sewers, water supply and fire services and stormwater drainage shall be carried out in accordance with the Water Corporation Plumbing By-laws, National Construction Code (NCC), Department of Fire and Emergency Services (DFES) requirements and local authority by-laws.

All natural gas services work shall be carried out by an authorised installer possessing a current certificate of competency issued by Energy Safety and suitably endorsed in the relevant classes of work.

All plumbing work, fire services and rainwater pipes and stormwater drainage shall be carried out by registered plumber with a full and current license with the Water Corporation.

Applications and permits must be submitted to the relevant authorities before commencement of work.

Trade waste application and plans must be submitted to the Water Corporation (including Radiological Council where applicable). Approvals must be received prior to commencement of any works.

## 3.2 Design considerations

The following shall be given special design considerations:

- Location of machinery and plant – not permitted on roofs without UoA approval
- Access to plant, plant rooms, valves, cleanouts and equipment – confined spaces shall be avoided at all times
- Water quality
- Water and energy efficiency
- Fire hydrant (internal and external) / fire hose reel coverage (Refer to G. Fire Services Design Standards)
- Alternative firefighting solutions
- Stormwater treatment
- Industrial waste pre-treatment
- Design for industrial waste – consult with relevant UoA Faculty or School for chemical discharge data
- Health and safety of building users and operators
- Environmental sustainability
- Whole of life consideration
- Material selection – availability, recyclability, maintainability, disposal.

## 3.3 Co-ordination of services

Ensure co-ordination of the design and installation of hydraulic services with other services to ensure adequate provisions are allowed for and to minimise conflict with other services (e.g., location of access hatches, ceiling space allowances, etc.). This includes:

- Electrical power supply to pump switchboards, hot water units, boiling water units, ice machines, dishwashers, chilled water units, autoclaves, process water pumps, de-ionised water pumps and Fire Drencher Flow switch. Refer to D. Electrical Services.
- Connection of hydraulic services points (meters, solenoids, etc.) to BMCS
- Relaying Fire Drencher flow switched Fire Pump functions and alarms to Fire Indicator Panel
- Connection from gas service solenoid valve in laboratories to emergency stop button
- Provision of hydraulic services for fume cupboards, cool rooms, etc.
- Provision of ceiling access and access panels where required

## 3.4 Mains Water

Each building and major user of water is to be metered for monitoring of water use. The meters are to be connected to the Building Management and Control System (BMCS) and shall enable costs for the service to be charged to the tenant (I.e., All meters must be rated for revenue billing in commercial applications) Consideration must be given to alternate water sources on a project by project basis.

All meters and sub meters assemblies must be smart water meter types with pulsed output.

Domestic Cold water shall be supplied to student, staff and DDA complaint toilets.

Time flow taps shall be used for hand basins in student toilets.

Taps in general shall be provided with flow restrictors.

Consideration must be given to incorporate leak detection via the BMCS within systems where considerable water losses may be likely.

Where under sink boiling / chilled water units are installed, drip trays, interruption sensors and adequate ventilation is required.

### 3.4.1 Hot water

Consult UoA prior to design of hot water system. It is the designer's responsibility to make themselves aware of project specific requirements.

Hot water is not normally provided in student, staff, ambulant or DDA compliant toilets except in cases where it is specifically required. Where hot water is supplied in toilets, there shall be thermostatic control to supply tempered water in accordance with the Standards.

Pressure and temperature reliefs are to be discharged to a trapped drain point, the point shall be safe and be in an easily accessible location.

Thermostatic mixing valves (TMV) must comply with the Australian standards in terms of temperature control. Generally, TMVs shall be located in a stainless steel lockable cabinet, shall be wall mounted or recessed and within the area being served.

Valves shall be chrome plated where exposed.

Re-circulation pumps shall have anti corrosion coating and shall be centrifugal type.

All pumps used for circulation shall have BMS output capability. The purpose of this BMS output is to signal an alarm on BMS upon pump failure. Localised pump failure alarm shall be installed along with wall mounted high level strobe to notify of pump failure (red or yellow strobe) and Pump normal operation (green light) along with the required identification signage.

Insulation shall be of closed-cell insulation 25mm wall. Insulation requiring painting shall be painted with Aerocoat or approved equivalent.

Where under sink hot water units are installed, drip trays, interruption sensors and adequate ventilation is required.

### 3.4.2 Cold water

The designer shall use the best suited material for its application to the project. Consideration must be given to impact to existing system where applicable, where suitability of connection of new material to existing system shall be confirmed.

The domestic cold and hot water shall be designed to a maximum velocity of 1.3 m/s in branches and 1.5 m/s in main runs, pressure to the hydraulically most remote fixture shall not be less than the lowest pressure nominated by the standard plus 50 kPa. The maximum pressure in the system may not exceed to that has been nominated by the standards. Allowances must be made for pressure reducing valves for branch supplies greater than 400 kPa and pressure reducing stations for main runs greater than 500 kPa .

Consideration must be given to reduce water hammer.

Consideration for flow and pressure must be given to project specific fixture outlets, such as laboratory equipment.

Material for cold water pipes shall be:

### 3.4.3 In ground external

- Copper tubing Type B in accordance with AS 1432, AS 3688 Fittings for pipes below DN100.
- PE Pressure pipe (minimum PN16), PE100, in accordance with AS 4130 for pipe greater than DN100

Underground pipe warning tape and trace wire must be installed 150mm above underground service. Line marking identification plates must be installed at change of directions and 50m intervals. Identification plates shall indicate service type, direction off flow, diameter and depth. The identification plates shall be brass, epoxy resin screw flushed with the surrounding surface.

### 3.4.4 Above ground external

- Copper tube to be minimum Type B to AS 1432, AS 3688 Fittings
- Stainless steel 316 min 2mm in accordance with ASTM A269-02a
- High density cross-linked polyethylene (PEX) pipe on branch pipework to bathroom and kitchen fixtures

### 3.4.5 Internal pipe

- Copper tubing Type B to AS 1432
- Cross linked poly-ethylene, to be clipped rigid. Pipe to be installed with service colours as available.
- Chrome plated copper when exposed within tea sinks, toilets, etc.
- Isolation valves 15 to 65mm inclusive shall be of stainless steel ball, stem and handle.

### 3.4.6 Potable Water Filtration

Domestic cold water service is not required to be filtered. Specialised equipment shall be filtered individually as per manufacturer's recommendations.

### 3.4.7 Plant Water Filtration

Specialised equipment shall be filtered individually as per manufacturer's recommendations. Consideration must be given to the requirements of specialised equipment filtration, where activated carbon, pressurized sand, water softening and/or UV filtration maybe required.

### 3.4.8 Non- Potable Water

Consideration must be given to use of TSE network or Rainwater reuse

Consideration must be given to WC water supply as non-potable source (TSE or Rainwater reuse)

### 3.4.9 Backflow

As per code requirements

All documents associated with approvals inclusive of CoCs (certificate of compliance) to the OTR (office of the technical regulator) or AHJ (Authority having jurisdiction) must be provided at project handover as part of contract documentation.

### 3.4.10 De-ionised water / reverse osmosis

Plant and equipment shall be provided from a potable metered supply with high and low level alarms, connected to BMCS.

## 3.5 Natural gas

As per code requirements

Gas meters must be diaphragm type meters. Connection to site wide BMS monitoring is to be provided. Service isolation points must be provided which enable isolation to each building, each plant room and/or laboratory spaces.

All meters must be rated for revenue billing in commercial applications. Additionally, they shall be suitable for monitoring of gas supply network.

Sub-metering must be provided to the following systems (refer to project specific requirements for any additional systems): centralised hot potable water system, hot water boilers for primary loops, hot water boilers for mechanical equipment, steam boilers, laboratory supplies, commercial kitchens and all spaces proposed for tenancy leasing agreements.

Meters must be installed in fully accessible position to allow for ease of access, serving and meter reading. Individual isolation must be provided for each gas meter and sub-meter assembly.

### 3.5.1 In ground

- Copper tubing Type B in accordance with AS 1432, AS 3688 Fittings
- Nylon tube in accordance with AS2944.1, class 400

Underground pipe warning tape and trace wire must be installed 150mm above underground service. Line marking identification plates must be installed at change of directions and 50m intervals. Identification plates shall indicate service type, nominal pressure in kPa, direction off flow, diameter and depth. The identification plates shall be brass, epoxy resin screw flushed with the surrounding surface.

### 3.5.2 Above ground external

- Copper tube to be minimum Type B to AS 1432, AS 3688 Fittings

## 3.6 Private Sewer

The designer must allow to investigate and obtain all available details of the existing sewer, trade waste infrastructure applicable to the project, including the location survey of underground services, pits, silt arrestors, etc. as required.

All sanitary and trade waste discharged to sewer must meet the requirements of SA Water.

### 3.6.1 External

All connections as per code requirements. Inspection openings must be provided at change of directions and at intervals not exceeding 30m. Underground pipe warning tape and trace wire must be installed 150mm above underground service. Line marking identification plates must be installed at change of directions and 50m intervals. Identification plates shall indicate service type, nominal pressure in kPa, direction off flow, diameter and depth. The identification plates shall be brass, epoxy resin screw flushed with the surrounding surface.

### 3.6.2 Internal wet areas

Exposed under bench pipes shall be of DWV PVC pipe or HDPE.

Pipes in ceilings and ducts shall be DWV PVC or HDPE.

### 3.6.3 Plant rooms

All plant room floor waste outlets shall be a minimum of 150mm diameter. All plant room drains to have a minimum of 100mm waste and grate and shall discharge to sewer.

Consideration must be given to trap primers in areas of low discharge and where depth of seal maybe compromised through evaporation.

Plant room floors shall grade to waste and grate to avoid pooling.

Plant rooms floors will be water proof, consideration must be given to making good of penetrations.

### 3.6.4 Mechanical waste

Mechanical waste shall be discharged into tundishes /floor wastes located adjacent to mechanical. Waste run across floors shall be avoided where practical.

Mechanical plant that produces waste must be plumbed on an separate pipework to sanitary drainage, with continuous fall to termination and having a diameter of no less than DN25. All drainage termination must be to a gully, a trapped tundishes or above the water seal of a waste trap having a diameter of no less than DN50.

### 3.6.5 Trade waste

Trade waste, shall meet or exceed SA Water, AHJ requirements.

Pre-treatment installations may include, but not be restricted to, the following:

- Passive / aggressive grease arrestor
- Petrol / oil separator
- Bucket traps and filters
- Dilution / neutraliser pits
- Cooling pits

To avoid creating a hazard, industrial waste sampling points shall not be located within pedestrian paths.

Pre-treatment installations shall be located to allow for general cleaning and maintenance. Non-potable hose cock and an external switch socket outlet shall be provided nearby.

## 3.7 Stormwater

Stormwater reuse shall be considered and assessed for its feasibility in all projects. Refer Civil Works standard for further information.

### 3.7.1 Stormwater drainage

Refer Civil Works standard for further information.

### 3.7.2 Gutters and downpipes

Refer Architectural Design Standard for further information.

Box gutter overflow shall have an equivalent area to downpipes. Refer Australian Standards.

Box gutters shall be designed and installed for 1 in 100 year rainfall intensity (Refer Australian Standards for rainfall intensities for geographical locations) and shall penetrate the wall (full cross section) and project over into an external rain head with a relief overflow installed below the base of the box gutter.

Downpipes shall be sized to be twice the cross sectional area of connected gutter. Downpipes shall be supported with standoff clips of stainless steel or of the same material as the downpipes. Discharge shall be over grated gullies, 240 x 240 x 150mm deep. Outlets shall be twice the cross sectional area of downpipes.

Consideration must be given in building stormwater hydraulic design to allow for a fail safe system, with the intend to divert rainwater away from buildings during an event of stormwater blockage.

## 3.8 Waste water

Waste water reuse must be considered and assessed for its feasibility in all projects. Possible sources of waste water include discharge from reverse osmosis or deionised water plants, rain water.

## 3.9 Plumbing fixtures / tap ware

Safety dump shower / eyewash Safety showers and eye washers shall be approved by UOA. 150 x 100mm floor waste shall be installed under showers where practical. Duress flow alarms must be considered for each installation. Bunding must be provided in hazardous areas to contain hazardous mixture of water deluge. Where impractical, the floor drain shall be drained to a holding pit.

For all above fixture titles listed refer to Architectural Design standards.

- Pans and cisterns
- Urinals
- Hand basins
- Cleaners sink
- Drinking fountains
- Boiling / Chilled water units
- Laboratory sink units
- Laboratory taps
- Stainless steel sinks
- Taps
- Shower rose.

## 3.10 Identification of services

Identification of hydraulic services shall be by:

- Painting of pipework
- Labelling of pipework
- Tagging and labelling of valves and equipment
- Indicator tile tag on ceilings indicating concealed cleaning points on waste systems and valves (tags may not be installed on ceiling tiles to avoid change of locations of tagged service)
- Type of service
- Direction of flow

### 3.10.1 Pipework

Provide permanent identification to all hydraulic services in accordance with AS 1345. Labels are to be a durable proprietary type.

Labels shall be 6m apart on exposed soffits and 3m apart in plant rooms, ducts, ceiling and roof space and on pipes immediately upon entry though doors and hatches.

Labels shall state the type of service and indicate directional flow arrows.

All exposed services are to be painted. Refer Section 4.1 of this document. If in doubt, consult UoA.

### 3.10.2 Valves

All valves, meters and devices, below or above ground, shall be identified, round custom brass valve tags (50mm diameter) secured to valve stem. Engraving shall identify purpose and extend of control and shall correspond with as constructed information and schedules.

On ceiling tiles / hatches provide ceiling indicator tag identifying system waste cleaning point or valve.

## 3.11 Building works

### 3.11.1 Access

All cabinets, plant room doors, etc. with locks are to be keyed to the UoA EMA key system.

Plant rooms and equipment shall be easy to access for maintenance and replacement.

All pipework, plant, equipment, fixtures, valves, instruments etc., shall be protected against the entry of foreign matter and damage at all times.

Pipework on columns, in storerooms, loading areas and plant rooms, shall be protected with a purpose made heavy duty galvanised steel cover panel, securely fixed to the building structure. Height of cover panel shall be 2100mm. Access openings in the panel shall suit components requiring service access.

Concealed valves, flushing units etc., in ceiling spaces shall have minimum 600mm x 600mm access panels with identification stickers.

Services in laboratories which are exposed or under benches shall be supported with a minimum 25mm gap from walls or other surfaces where practical.

### 3.11.2 Acoustic attenuation

Generally, consult with the environmental or acoustic consultant (If appointed) for extent of acoustic attenuation works. This may include:

- Sanitary pipework located in ceiling space above meeting rooms, offices and lecture theatres, or as directed.
- Rainwater pipes located in ceiling space of all areas. - rainwater pipes in ducts need not be insulated if duct cladding is sufficient.
- Flushing cisterns valves – silent fill valves to be used. Acoustic fixings for cisterns located between the cistern and the wall are required.
- Pipework above or within offices, meeting rooms, lecture theatres or as directed - acoustic insulation shall be provided.

Bracket fixings must be considered.

## 3.12 Metering

Metering is required for all hydraulic services at each building with sub-metering of the following services:

- Potable cold water
- Non-potable cold water
- Reverse osmosis system
- Natural gas
- Mechanical plant
- Wash down

Meters shall be suitable for tenant on charging, fit for purpose for commercial revenue collection. They shall be 'smart water meter' type with pulsed output.

Meters shall be correctly calibrated and connected to the BMCS. Detectors and alarms shall be tested prior to handover.

Metres shall not to be installed in ground and shall be readily accessible for reading and maintenance.

### 3.12.1 Approvals

The contractor shall provide evidence from relevant authorities of:

- Sections of property sewer, sanitary plumbing and industrial waste systems and storm water down pipes tested by the WC.
- Sections of potable and non-potable hot and cold water systems and fire hydrant services tested by WC prior to concealment
- Sections of the rainwater pipe system tested and approved by the Superintendent prior to concealment
- Sections of the natural gas services installation tested by the installer prior to concealment
- Fire stopping of penetrations approved by the manufacturer and DFES prior to concealment
- All approvals in accordance with AHJ (Authority having jurisdiction)

Installations shall include all necessary works to complete the project including and not restricted to paying all associate fees, levies, taxes and headwork charges. Headwork charges may be reimbursed by UoA.

As constructed marked up drawings are to be kept on site and made readily available at all times. Drawings are to be forwarded upon request at nominated stages throughout the project.

### 3.12.2 In ground services

Service mains infrastructure to be laid at equal depth with required horizontal spacings at a depth 750mm minimum cover.

Services are to be located within hard landscape where practical.

### 3.12.3 Covers and grates

Consideration must be given to location of covers and grates where preference is given to accessibility, i.e, take care to avoid high traffic areas.

Covers and grates shall be trafficable cast iron construction supported on minimum 150mm concrete raised 100mmm to suit paving surround. The specification for the class of trafficable cover must be assessed on project by project basis.

Finish levels shall be flush with surrounding hard landscape and raised 100mm within garden beds.

### 3.12.4 Excavation and backfill

See J. External Works.

### 3.12.5 Redundant services

All services made redundant (internal/external) must be removed and made good.

Cut and seal off services at the source of supply.

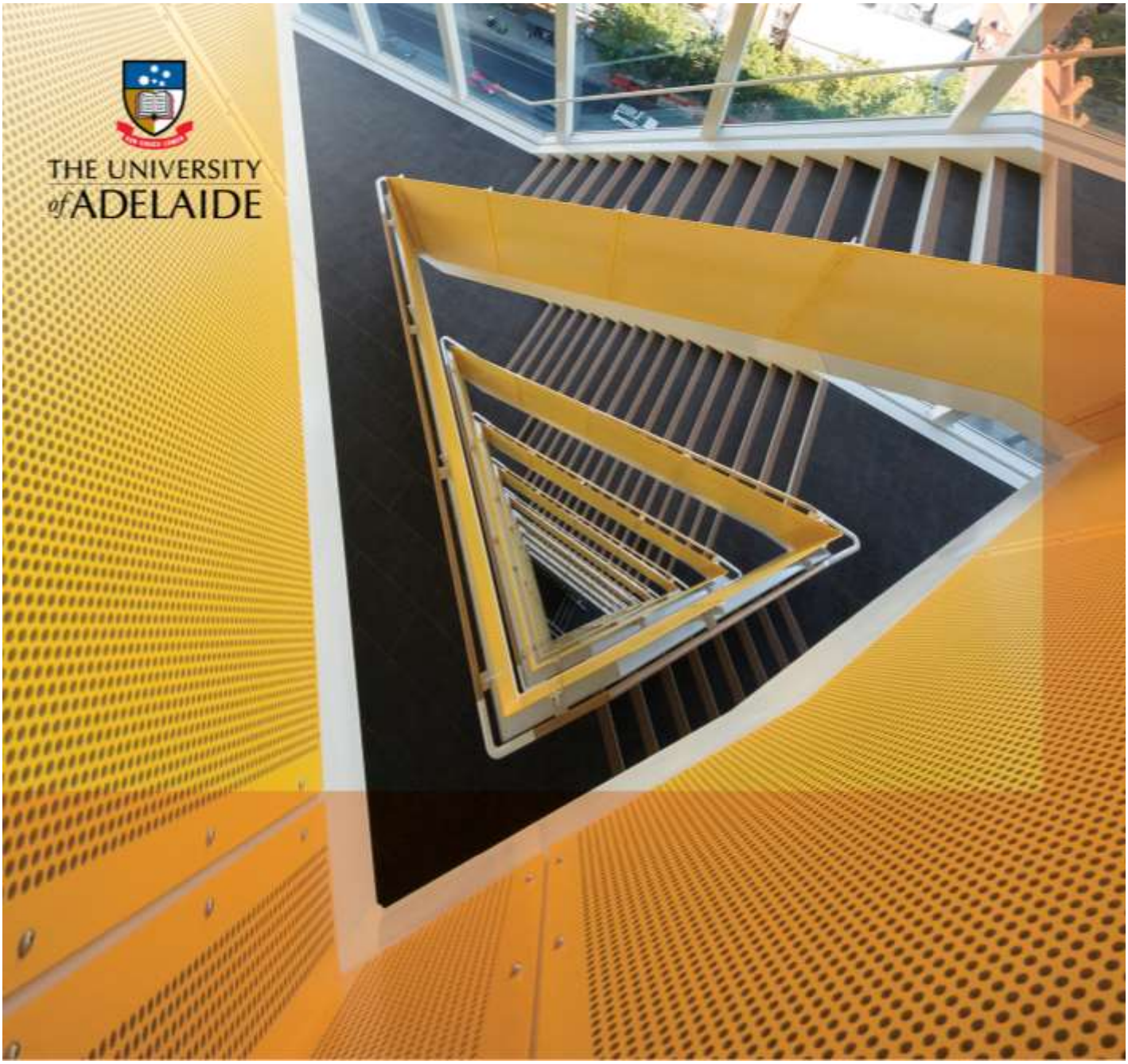
## 3.13 Samples

Refer to B. Building and Architecture.

## 3.14 Testing and certification

Prior to practical completion, compliance certificates of satisfactory completion shall be provided in accordance with the standard and AHJ.

For as-constructed documentation requirements, refer to UoA Campus Management Specification for As Constructed Documentation.




# SCHEDULES

F. Hydraulic Services

# 4. Specifications

### 4.1.1 Identification colours

| Service | Pipe Colour | Lettering | Lettering Colour |
|---|---|---|---|
| Non-Potable Cold | Green/Jade | 'Cold Non Potable' | White |
| Non-Potable Hot | Green/Jade | 'Hot Non Potable' | White |
| Potable Cold | Blue/Atlantic | 'Cold Potable Water' | White |
| Potable Hot | Green/Jade | 'Hot Potable Water' | White |
| Deionised / Reverse Osmosis | Green/Jade | 'Deionised' | White |
| Drains | Black | 'Drain' | White |
| Vent | Black | 'Vent' | White |
| Natural Gas | Yellow Ochre | 'Natural Gas' | Black |
| Fire | Red / Signal Red | As applicable | White |

## 4.2 Sanitary plumbing fixtures / tapware

Refer to B. Building and Architecture.