

CURTIN UNIVERSITY
PROJECT DELIVERY GUIDELINES

HYDRAULIC SERVICES
DESIGN GUIDELINES
000326



Curtin University

Details of revisions			
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1 INTRODUCTION

These Project Delivery Guidelines have been prepared for the guidance of consultant engineers and installation contractors appointed to provide hydraulic services to Curtin University (CU) and set out the minimum standards, preferred appliances/fixtures and installation methods required.

The Project Delivery Guidelines have been prepared in consultation with Curtin University subject matter experts and stakeholders. It is recognised that the subject matter of Guidelines will not always be suitable for all project elements and departures from the Guidelines may be required or desirable. Departures from Guidelines must be agreed upon in consultation with the relevant University Guideline subject matter expert. Departures must be recorded in a project register and recorded and reviewed in the Project Control Group meeting minutes under its own meeting agenda item "Project Delivery Guideline Departures". Where the University subject matter expert identifies that a departure adds ongoing value to the University, the subject matter expert will update the relevant Guideline.

1.1 AUSTRALIAN AND AUTHORITY STANDARDS

Design consultant engineers and licensed hydraulic contractors are required to meet the 'deemed to satisfy' provisions of the National Construction Code, relevant Australian standards and authority requirements. These guidelines do not replace the requirements of these standards.

Design engineers will document that all works are to be carried out by suitably qualified and licensed contractors. All installations are to meet the 'deemed to satisfy' provisions of the National Construction Code, Australian standards, Water Corporation by-laws, Office of Energy regulations and Health Department requirements.

1.2 REFERENCED DOCUMENTS

The relevant standards applicable to hydraulic design, construction and testing include, but are not limited to, the following:

- National Construction Code
- AS/NZS3500.1 Plumbing and drainage Water Services
- AS/NZS3500.2 Plumbing and drainage Sanitary Plumbing and Drainage
- AS/NZS3500.3 Plumbing and drainage Stormwater Drainage
- AS/NZS3500.4 Plumbing and drainage Heated Water Services
- AS2419.1 Fire Hydrant Installations System design, installation and commissioning
- AS2441 Installation of Fire Hose Reels
- AS/NZS2982 Laboratory Design and Construction
- AS/NZS5601 Gas Installations
- Water Corporation Western Australia Industrial Waste Guidelines
- AS4674 Design Construction and Fitout of Food Premises

- AS1428.1 Design for access and mobility General requirements for access – New building work
- Water Corporation of Western Australia Backflow Contamination Guidelines
- ATCO gas information for working around gas infrastructure:

<http://www.atcogas.com.au/Safety/Working-around-gas-infrastructure>.

1.3 DISABILITY ACCESS AND INCLUSION PLAN

Curtin University believes in creating equitable and inclusive access for people with a disability to its facilities, services, events and academic programs on all its Western Australian campuses.

The *Universal Design Guideline* has been developed to reflect a commitment to equity and inclusion for all by embedding Universal Design principles into project planning, design and delivery guidelines. Consultant architects, designers and engineers should make themselves familiar with the particular requirements of the *Universal Design Guideline* before responding to a project brief.

1.4 HEALTH AND SAFETY

Curtin University is committed to providing and maintaining high standards of health and safety in the workplace and will:

- ensure compliance with relevant legislation and the University's Health and Safety Management System
- promote an organisational culture that adopts health and safety as an integral component of its management philosophy
- ensure that health and safety is part of the business planning processes and that it is adequately resourced by all areas
- maintain an effective mechanism for consultation and communication of health and safety matters
- maintain an effective process for resolving health and safety issues and managing health and safety risks
- provide appropriate health and safety training
- regularly review health and safety performance to monitor the effectiveness of health and safety actions and ensure health and safety targets and objectives are met.

A copy of our Health and Safety Management Standards can be found at:

<https://healthandsafety.curtin.edu.au/local/docs/HSManagementStandards.pdf>

1.5 SUSTAINABILITY AT CURTIN

It is Curtin University policy that all new or refurbishment projects on site should support its status as Australia's first university to achieve a 5-star Green Star – Communities rating from the Green Building Council of Australia (GBCA). Designers should understand and incorporate the Green Star criteria into designs and specifications in order to maintain and enhance Curtin's Green Star status. Information on the criteria can be found in the *PDG Green Star – Communities Design Guidelines*.

1.6 UNIVERSITY-APPROVED PLUMBING CONTRACTORS

Licensed plumbing contractors are required to be registered under Curtin's Company Registration and Inductions scheme:

<https://parking.curtin.edu.au/workingforus/inductions.cfm>.

Design consultant engineers are to nominate plumbing subcontractors for intended projects from the approved list to suit the project requirements.

1.7 PROJECT DOCUMENTATION

All CU projects are required to be documented with AutoCAD drawings that meet the requirements of the Curtin University *Documentation Deliverables Guidelines*.

Installation contractors are to keep accurate records of the as-installed work during the progress of the project. The consultant engineers are to supply the installation contractors (at the commencement of the contract) with a set of the design contract drawings that are to be marked up progressively as any variation to the contract drawings occur. Services located in ground are to be measured by the installation contractor from the nearest building wall, with the dimensions clearly showing the location of all hydraulic services noted on the as-constructed drawing together with all as-constructed invert levels.

At the completion of the project and before final payment, the marked-up drawings are to be submitted to the design consultant engineer who will amend the contract design drawings and computer drawings to reflect the as-constructed installation. The design consultant engineer will then be required to provide the installation contractor with a set of as-constructed drawings for checking and sign-off as a true and complete record of the as-constructed work. The signed-off as-constructed drawings are to be included in the completed as-constructed operating manuals and submitted to CU.

1.8 PERMITS

Design engineers will document for licensed contractors to make relevant applications (and pay all associated fees) and obtain applicable permits for all work to be carried out under the proposed project. Examples of applications and permits include:

- development and headworks charges levied by the Water Corporation for sewer and water
- industrial waste discharge permits
- payment of fees and charges for major plumbing fixtures
- industrial training levies etc. and enterprise bargaining agreements
- Office of Energy gas certificates
- Curtin University permits
<https://properties.curtin.edu.au/workingforus/permits.cfm>
 - Access
 - Service Isolation

- High-risk Activity (Dig/Excavate, Hot Works, Crane)
- Confined Space
- Building Works Notification
- industrial waste permits (these will need to be completed in consultation with the Curtin occupant, project manager, hydraulic consultant and facility manager and submitted by the licensed plumbing contractor to the Water Corporation).

2 HYDRAULIC SYSTEM DESIGN

Curtin University has adopted a policy of requiring the metering of all provided services such as power, water and gas. Design consultants should refer to *000346 PDG Services Metering Guidelines* for information on how to meet the requirements when responding to a hydraulic services brief.

The guideline can be accessed on the PF & D webpage at <https://properties.curtin.edu.au/workingwithus/guidelines.cfm> .

2.1 SYSTEM DESIGN BRIEF

The design consultant engineer and/or licensed plumbing contractor, when requested by CU, will provide to CU for review and approval a proposed hydraulic services design brief. This brief will cover all areas of the proposed system installation and shall include, but not be limited to, the following items:

- confirmation of existing service capacities to meet project supply demands
- a description of existing service upgrades to meet project demands
- areas of CU that will be affected by service upgrades outside the project boundary areas, if applicable
- estimated annual water consumption rates for the project
- estimated maximum MJ/h rating of total gas requirements, if applicable
- a description of the system design listing any pump or storage tank requirements
- a description of the system design listing any metering requirements
- a description and listing of any industrial waste treatment and discharge requirements that may affect existing CU industrial waste permits or require new industrial waste permits
- a schedule of fixtures and tapware proposed for the project
- a schedule of backflow prevention devices for zone and individual protection
- a schedule of proposed services installation materials.

2.2 WATER AND ENERGY CONSERVATION

Engineering design is to meet best practice for water and energy conservation. Design engineers will need to document approved fixtures, tapware and hot water supply appliances to meet the following minimum requirements:

Showers	7 litres/minute
Basins	6 litres/minute
Troughs	6 litres/minute
Sinks	6 litres/minute

Water Closets	Dual flush 4.5 litres/3 litres
Urinals	Electronic flush timed flow or waterless (where approved by CU)
Hot Water Units	<ul style="list-style-type: none"> • Gas high-flow instantaneous type and three-phase electric instantaneous type where applicable • Solar hot water units only where approved by CU • Gas-boosted storage type units where applicable to project requirements.

Flow and pressure controllers are to be documented to be fitted in positions to allow easy access for maintenance and replacement.

Tapware is to have water efficiency labelling and be standards compliant (WELS).

Hydraulic water and natural gas services are to be sub-metered to allow for monitoring of consumption rates. Refer to Section 4 Hydraulic Service Sub-metering.

2.3 GREEN STAR-COMMUNITIES

It is a CU requirement that all new or refurbishment projects on site should support Curtin University's status as Australia's first university to achieve a 5-star Green Star-Communities rating from the Green Building Council of Australia (GBCA). Designers should understand and incorporate the Green Star criteria into designs and specifications in order to maintain and enhance Curtin's Green Star status. Information on the criteria can be found in the *000325 PDG Green Star - Communities Design Guidelines*.

2.4 CONNECTIONS TO NEW BUILDINGS

Connections to new buildings will be defined in the project brief.

Design consultant engineers will be required to contact Curtin CAD Services (DrawingServices@curtin.edu.au) to obtain all relevant as-constructed services information. This information is to be reviewed by the design engineers for location, size and capacity to meet the project brief requirements.

Design engineers are to advise CU where services within the immediate area of the proposed project fail to meet the minimum supply requirements and to report on service upgrade requirements and areas that will be affected by these upgrades and are outside the area of the proposed project upgrade.

3 EXISTING HYDRAULIC SERVICES INFRASTRUCTURE

3.1 EXISTING SERVICE INFORMATION

This section outlines existing campus supply services. The design consultant engineers and licensed installation contractors are responsible for checking authority supply requirements due to ongoing infrastructure changes and for making allowances in designs for all necessary upgrades to service their specific project demands.

3.2 BENTLEY CAMPUS

DOMESTIC WATER SERVICES

The Bentley Campus is serviced via the Water Corporation of Western Australia, with the following boundary water service connections:

- 150 mm boundary domestic water meter located on Manning Road, 07466-112 Meter No. NK-0900018
- 150 mm boundary domestic water meter located on Brand Drive boundary, 09479-249 Meter No. KK-0900127
- 100 mm boundary domestic water meter located on Kent Street, Meter No. KM-0600018.

Internal property water mains have been installed in varying sizes throughout the campus.

Boundary meter pressures vary as follows:

- Manning Road 482–520 kPa
- Brand Drive 434–480 kPa
- Kent Street 550–590 kPa.

Pressures vary due to peak flow demands on the CU main and Water Corporation street mains. Pressures will be affected by the installation of boundary containment valves and design consultants and contractors will need to contact Facilities Management (Rizwan.Check@curtin.edu.au) for the latest pressure data.

SEWER DRAINAGE

The campus buildings are currently serviced by Water Corporation of Western Australia gravity sewers, which are located within the campus and consist of the following:

- 300 mm high density polyethylene (HDPE) from Kent Street boundary to the Central Plant area
- 230 vitrified clay (VC) from 300 HDPE Carpark 33 along Dumas Road to south of the Hockey Stadium
- 230 VC from the Hockey Stadium heading east to Hayman Road.

Refer to the Water Corporation's reticulated sewer plans for locations and invert levels: <https://www.watercorporation.com.au/home/builders-and-developers/services-for-existing-land/add-a-service>.

NATURAL GAS SERVICES

CU has natural gas mains supplied via gas meter sets located on Brand Drive near the North Plant, Building 300 and on Manning Road. Gas pressures range from 5.5 kPa to 7.5 kPa. Natural gas mains consist of PVC, copper and polyethylene pipes.

FIRE HYDRANT SERVICES

Fire hydrants and fire hose reels are supplied from both the campus domestic water mains and the dedicated fire service main.

The dedicated fire service is continually being extended to cover existing buildings, replacing hydrants supplied from the domestic water mains. Design consultant engineers and installation contractors should consult with the Hydraulic Maintenance Manager on current supply information.

The dedicated fire service main is supplied by attack flows and pressures via an electric fire booster pump and diesel backup pump located at the North Plant room. Fire pumpsets draw water via a 25,000-litre tank from the Brand Drive fire service boundary connection. Pumpset duties are as follows:

- 10 litres/sec @ 1,000 kPa
- 20 litres/sec @ 990 kPa.

Boosted fire mains consist of:

- 100–200 vinyl iron
- 100–150 copper type A
- 180–250 PE100 PN 16.

Hydrants external to buildings on the dedicated fire service are a dual-valve type with risers painted red.

Fire hydrants connected to the domestic water mains are painted yellow.

Two primary booster cabinets are connected to the dedicated fire service main and are located:

- adjacent to the North Plant fire pump room
- adjacent to the main entrance on Beazley Ave.

Individual buildings in some locations have building-specific fire booster cabinets.

Note: The Department of Fire and Emergency Services' (DFES) approval for the dedicated fire service main requires buildings with internal fire hydrants to be supplied via building-specific fire booster cabinets supplied via the dedicated fire service mains.

STORMWATER RETENTION SYSTEM

Existing campus building stormwater run-off is contained in on-site concrete soakwells located in close proximity to the building(s) being serviced. Stormwater run-off from the main service roads is retained in soakwells in certain places and also collected in stormwater drains that discharge into on-site stormwater compensation basins.

Stormwater drains and fittings are to be sewer-grade pipes and fittings up to and including 300 mm diameter pipe. Above this diameter, drains and fittings are to be Vinidex StormPRO. Design consultant engineers and installers are required to review pipe and fitting material with these requirements of installation and can advise Operations and Maintenance of suitable alternatives.

4 HYDRAULIC SERVICE SUB-METERING

4.1 SUB-METERING

Proposed buildings and refurbishment of existing buildings are to be fitted with domestic water sub-meters installed on the incoming supply main to the building. Individual tenancies within buildings are to be fitted with tenancy sub-meters installed on the supply main to the tenancy. Design consultant engineers and installation contractors are to allow for alterations to existing building supply mains, where applicable, to provide one point of supply to the proposed building or tenancy for the installation of sub-metering.

All sub-metering shall be carried out in compliance with *000346 PDG Services Metering Guidelines*.

4.2 SUB-METERS

Sub-meters shall be:

- Elster V100 for sizes 15–40 DN
- Elster H4000 for sizes 50–150 DN.

The sub-meters shall be designed for the measurement of cold potable water and be compliant with Australian standards. Meters are to be fitted with remote electronic reading connections with magnetically operated 'T probe' meters.

The Elster V100 sub-meters are to have disconnection unions fitted to inlet and outlet connections for removal and replacement of meters. Isolation valves are to be installed on inlet and outlet connections.

Elster H4000 sub-meters are to have flanged bolted connections for removal and replacement and isolation valves on inlet and outlet connections.

LOCATION OF SUB-METERS

Domestic water sub-meters are to be installed in accessible locations for reading and maintenance. Sub-meters are not to be installed in ground.

SUB-METER IDENTIFICATION

Sub-meters are to be installed with their meter identification plates stating:

- the meter identification number provided by the Hydraulic Maintenance Manager
- the Curtin building number serviced by the sub-meter
- where installed for tenancy within buildings, the room number(s) serviced by the sub-meter in addition to the building number.

5 SERVICES GENERAL

5.1 EXCAVATIONS

Operations and Maintenance is to be consulted prior to any excavation for the location of any services likely to be encountered on the pipe route. The contractor will be responsible for carrying out all necessary hand digging and ground probing radar electronic investigations to confirm locations of existing services. The Permit to Dig/Excavate information is a guide only to existing services. (Refer to Section 1.8 PERMITS.)

5.2 SERVICE IDENTIFICATIONS

SERVICE IN-GROUND IDENTIFICATION

All in-ground pipework shall have 75 mm-wide aluminium service identification tape placed directly over the service 300 mm above the top of the pipe, and turned up into a clean out/valve box so an electronic charge can be attached in the future to identify the pipe route with an electromagnetic detector. Where damaged during excavations, identification tape must be repaired by the contractor and such repairs sighted by the project manager and/or builder.

EXPOSED SERVICES COLOUR AND IDENTIFICATION LABELS

Service pipes located in service ducts, plant rooms and concealed in ceiling spaces shall be clearly labelled with permanent identification labels (375 mm-long colour bands and 375 mm-long pipeline markers) to identify contents of the pipe and direction of flow so that all sections of the service pipe are readily identifiable. Identification labels are to be spaced at 1,500 mm (maximum) centres.

Exposed service pipes in plant rooms and laboratories are to have permanent identification labelling and be painted in colour-coded identification paint to comply with AS1345.

Item	Identification
Cold water potable	Mid Blue B.15
Cold water non-potable	Green – Jade G.21
Drains	Black
Fire services	Red – Signal Red R3
Hot water	Green – Jade G.21
Natural gas	Yellow Ochre – Sand Y.44
Laboratory Tap Colours	
Deionised water	Cabana green
Natural gas	Primrose
Cold water non-potable	Cabana green
Cold water potable	Atlantic blue

Item	Identification
Laboratory Pipeline Identification Colours	
Deionised water	Green – Jade G.21
Cold water potable	Green – Jade G.21
Cold water non-potable	Green – Jade G.21

SERVICE VALVES IDENTIFICATION

Service valves and meters are to be provided with service identification tags (Seton brass or approved equivalent) complete with custom lettering and secured to valves with a brass chain to valve stem. Service valve tags are to be a minimum 50 mm diameter, with black engraved lettering.

Service meters tags are to be a minimum 250 mm x 150 mm, with black engraved lettering.

FIRE SERVICE IDENTIFICATION AND NUMBERS

Fire hydrants, isolation main valves and fire hose reels are to be provided with service identification tags (Seton brass or approved equivalent) complete with red custom lettering as follows:

		Wording
Hydrants	Brass plate 250 x 150 mm	HYDRANT BOOSTED # 000
Fire hose reel	Brass plate 50 mm dia.	FHR # 000
Valves	Brass plate 250 x 150 mm secured to valve box	FIRE VALVE # 000

Consultant engineers and installation contractors are to obtain numbers from the Hydraulic Maintenance Manager.

BACKFLOW PROTECTION DEVICES

Backflow protection devices requiring annual testing are to be provided with service identification tags (Seton brass or approved equivalent) complete with custom lettering and secured to valve stems with brass chains. Service tags are to have black custom lettering stating the valve number on a minimum 50 mm diameter brass plate.

Consultant engineers and installation contractors are to obtain valve numbers from the Hydraulic Maintenance Manager.

5.3 PROTECTION OF IN-GROUND SERVICES

Denso 500 primer paste, mastic and tape shall be used to protect all underground nuts and bolts on all fittings, valves hydrants, mechanical joints and tapping bands.

Copper pipes installed in ground are to be spirally wrapped in two layers of Petro 40 tape (or approved equivalent).

Steel work shall be hot-dipped galvanised after fabrication.

Nuts and bolts, washers, clips, etc. used in connection with any of the services shall be of non-corrosive material compatible with the material in contact.

Surface rust, scale, build-up, etc. on any component in the installation shall be removed during the progress of the works and the affected area de-scaled, brushed and treated with a compound recommended by the manufacturer of the component.

5.4 DOMESTIC WATER SERVICES

GENERAL

Domestic water services are to be installed to comply with the latest Australian standards. In addition to these standards, CU requires consultant engineers and installation contractors to comply with the following requirements:

- sub-metering (Section 4.1)
- service pipe identification (Section 5.2)
- protection of services (Section 5.3)
- service pipe materials (Section 6)
- service isolation valves (Section 7)
- installation (in duplicate) of Zone RPZD (reduced pressure zone device) valves to allow for servicing and maintenance.

WATER PRESSURES

Internal building water supply pipes to fixtures and appliances are to have water pressures not exceeding 300 kPa. Design consultant engineers and installation contractors are to allow for adjustable pressure-limiting valves complete with isolation valves to supply pipes exceeding the maximum pressure.

Laboratory and other facilities requiring the installation of safety-deluge showers, for compliance with Australian standards, are required to have compliant pressures and flows. Design consultant engineers and installation contractors are to ensure supply pipe sizing is adequate to meet the required flows and pressures and submit certification testing on completion of the installation.

PRESSURE PUMPS AND STORAGE TANKS

Where it is deemed necessary by the consultant engineer or installation contractor to install domestic water pressure pumps and storage tanks, the following must be adhered to:

- Pumps are to be a variable-speed type complete with isolation valves on suction and discharge connections.
- Pressures gauges are to be fitted to a discharge pipe.
- Pump controllers are to have building management system (BMS) monitoring connections.
- Storage tanks are to be in duplicate to allow for annual wash-down maintenance or, alternatively, sectional tanks with diversion walls are acceptable.
- Storage tanks are to be fitted with full-size maintenance access hatches located in accessible locations and, where required, fitted with permanent access ladders and platforms.
- Storage tanks are to be fitted with high-level sensors or float switches wired to a controller. The controller is to have an audible and visual alarm in addition to BMS connections.

5.5 DEDICATED FIRE SERVICE

GENERAL

The dedicated fire service is to comply with the latest Australian standards and *000321 PDG Fire Safety Project Guideline*. In addition to these standards, CU requires consultant engineers and installation contractors to comply with the following:

- The refurbishment of existing building internal fire hydrants is to include an extension (if required) and connection to the dedicated fire service. A fire booster cabinet is to be installed to service the internal hydrants. As agreed by DFES, where the CU campus fire system for existing buildings may not be able to meet DFES appliance access requirements, then the installation of booster cabinet requirements may need to be discussed and agreed upon by DFES.
- Any alterations to the existing fire service will require consultant engineers and installation contractors to allow for an upgrade of the existing campus primary booster cabinets block plans.
- Any new fire service will require consultant engineers and installation contractors to allow for an upgrade of the existing campus primary booster cabinets block plans.
- New and upgraded fire hydrants and hose reels are to be fitted with a CU-specific identification number. Consultant engineers and installation contractors are to obtain identification numbers from the Facilities Management officers.

- New fire service isolation valves are to be fitted with a CU-specific identification number. Consultant engineers and installation contractors are to obtain identification numbers from Facilities Management officers.
- protection of services (Section 5.3)
- service pipe materials (Section 6)
- service isolation valves (Section 7).

FIRE SPRINKLERS

The CU-dedicated fire service is not designed for combined hydrant and sprinkler systems. Should it be necessary for a proposed project to have fire sprinkler systems, then it will be necessary for consultant engineers to obtain Facilities Management approval for the supply of such systems from the dedicated fire service prior to design documentation. Approval requests will need to include the combined flow rate and pressure requirements.

5.6 SANITARY PLUMBING AND DRAINAGE

GENERAL

Sanitary plumbing and drainage installations are to be installed to comply with the latest Australian standards. In addition to these standards, CU requires consultant engineers and installation contractors to comply with the following requirements:

- service pipe identification (Section 5.2)
- service pipe materials (Section 6)
- completion and submission of the fixture/appliance installation notice (Section 9.2)
- provision of sewer access chamber with cast iron covers to all building external main drains.

VENTING

Sanitary plumbing and drainage vents are to comply with the latest Australian standards. In addition to these standards, CU requires consultant engineers and installation contractors to comply with the following:

- Air admittance valves are not to be installed without prior approval of Facilities Management officers.
- Vents (where possible) are to be combined with Australian standards-compliant header vents in roof spaces to minimise roof penetrations.
- Vents (where practicable) are to be offset in roof spaces to terminate as close as possible to the high point (ridge) of roof.

5.7 STORMWATER DRAINAGE AND ROOF PLUMBING

STORMWATER DRAINAGE

Stormwater drainage is to comply with the latest Australian standards and local council conditions. In addition to these standards and conditions, CU requires consultant engineers and installation contractors to comply with the following:

- Soakwells are to be concrete precast louvre slotted type with geotextile cloth wrap and concrete trafficable covers. The covers are to be raised, as required, and to terminate a maximum of 300 mm below the finished paving on ground level.
- Proposed internal downpipes are to be fitted with external relief grates. Relief grates in paved areas are to be cast iron, nickel bronze or stainless steel Vari-level paving grates that are finished flush with the finished paving levels.
- External downpipes are to discharge over relief sump grates with a minimum distance between sump grate and downpipe of 50 mm to allow for removal of debris and the grate. Where downpipes are located near entrances to buildings or in other similar situations where the discharge would cause local flooding, the downpipe is to be directly connected to the drain and the relief grate positioned away from such areas.
- Grated sumps are to be fitted with hinged cast iron grates installed on concrete sumps no deeper than 1,200 mm to allow for maintenance cleaning of the sumps.

ROOF PLUMBING

Eave gutters, box gutters, valley gutters and downpipes are to be installed to comply with the latest Australian standards. In addition to these standards, CU requires consultant engineers and installation contractors to comply with the following:

- Box gutters are required to be designed to suit the average recurrence interval greater than 1-in-100-year rainfall intensity.
- No box gutter depth shall be less than 150 mm.
- Box gutters are required to be fitted with overflow drainage pipes equal to or greater than the minimum required downpipe size.
- Eave gutters are to be designed to suit the average recurrence interval of 1-in-100-year rainfall intensity.
- Materials are to be durable with service life expectancy in excess of 25 years.

ROOF FLASHING

Hydraulic consultants, architects and installation contractors are required to provide roof flashing to penetrations (complete with trays etc.) in accordance with the Lysaght manufacturer installation manual for metal deck roofs. (Refer to www.lysaght.com.)

5.8 NATURAL GAS SERVICES

Natural gas services are to be installed to comply with the latest Australian standards. In addition to these standards, CU requires consultant engineers and installation contractors to comply with the following requirements:

- sub-metering (section 4)
- service pipe identification (Section 5.2)
- protection of services (Section 5.3)
- service pipe materials (Section 6)
- service isolation valves (Section 7).

6 SERVICE PIPE MATERIALS

6.1 GENERAL

Hydraulic design engineers will be required to specify the appropriate service pipe materials suitable to meet the installation criteria and CU design guidelines for service materials. Alternatives to the materials listed here will need to be referred to Facilities Management plumbing division for consideration and approval.

6.2 DOMESTIC WATER SERVICE PIPES

SUPPLY PIPES IN GROUND EXTERNAL TO BUILDINGS

Water service supply pipes in ground external to buildings are to be copper, minimum class type-B pipe within one metre from the external perimeter walls of the building and wrapped in protective tape.

Water service supply pipes in ground beyond one metre from the external perimeter walls of the building can be either copper, class type-B pipe or polyethylene pipe (systems PE 100 PN 12.5 with electrofusion fittings; butt welding is prohibited).

SUPPLY PIPES IN GROUND UNDER BUILDINGS

Hydraulic design engineers will provide designs that avoid the installation of domestic water supply pipes under proposed buildings. Where this is not possible, design engineers will document that services in ground under buildings are to be installed in copper pipe with PVC sleeves from external walls to suitably sized cast-iron access pits with raised stainless steel or brass trim. Main supply pipes are not to be installed under buildings without approval of the Facilities Management plumbing division.

SUPPLY PIPES INTERNAL TO BUILDINGS

Water service supply pipes located in masonry walls are to be copper pipes and fittings, minimum class type-B clipped and wrapped to comply with Australian standards.

Water service supply pipes located in ceiling spaces and accessible ducts are to be copper pipe and fittings, minimum class type-B or Aquatherm polyethylene pipe (or approved equivalent) and fittings clipped to Australian standards and manufacturer's requirements.

DOMESTIC HOT WATER PIPES

Domestic hot water pipes are to be copper, minimum class type-A pipe and fittings. All pipes are to be insulated to meet minimum Australian standard requirements and a minimum Green Star – Communities 5-Star standard (refer to Section 2.3).

SOFTENED AND FILTERED WATER SUPPLY PIPES

Hydraulic design engineers will specify appropriate supply pipe materials and fittings to suit softened water and filtered water to meet laboratory user group requirements

and Australian standards. Designers are to allow for plastic and polyethylene type pipes to be accessible, for maintenance and replacement.

6.3 SEWER, SANITARY AND SOIL PIPES

SEWER PIPES

In-ground sewer pipes and fittings are to be drain, waste and vent (DWV) pipes with solvent cement joints, strictly conforming to the manufacturer's recommended method for installation and Australian standards. High-density polyethylene pipe (HDPE) pipes and fittings with electrofusion jointing are an acceptable alternative where considered appropriate by the design consultant engineer.

LABORATORY WASTES AND DRAINS

Laboratory wastes and drains are to be HDPE pipes and fittings with manufacturer-approved electrofusion fittings. Butt-welded site joints are prohibited. Alternative pipe materials where considered appropriate by the design consultant engineer to suit waste discharges are to be reviewed and approved by Facilities Management plumbing officers.

HIGH TEMPERATURE AND GREASE WASTES AND DRAINS

Wastes and drains receiving high temperature and/or grease discharges are to be installed in copper, minimum class type-A and HDPE pipe and fittings.

SOIL PIPES

Soil pipes above ground are to be copper, minimum class type-B or HDPE pipe and fittings, or DWV pipe and fittings with line size maintenance inspection openings to all junctions and changes in direction.

PLANT ROOM DRAINAGE AND WASTES

Drains and waste pipes to plant rooms are to be copper, minimum class type-B, HDPE or DWV pipe and fittings. Above-floor wastes subject to damage are to be installed in copper pipes.

Gullies to plant room traps are to be charged via a charge pipe connected to a timer solenoid. Trap seals depths are to suit mechanical consultant requirements. In addition to these requirements, all floors are to be evenly graded to floor wastes in accordance with Australian standards and gullies are to be a minimum diameter of 100 mm.

SANITARY AND SOIL DRAINAGE

Sanitary and soil drainage is to be designed for DWV pipe and fittings with inspection openings to comply with Australian standards. Main drains are to be installed with full chamber access (with solid cast iron covers) located outside of paved areas, where possible. Where this is not possible, covers are to be solid cast iron and finished flush with the surrounding paving. Covers are to be greased and correctly seated on completion of final inspections.

6.4 FIRE HYDRANT AND FIRE HOSE REEL PIPES

FIRE HYDRANT SUPPLY MAINS EXTERNAL TO BUILDING IN GROUND

The dedicated fire hydrant supply mains are to be Acu-Tech Polyethylene PE 100 PN 16, minimum class pipes with electrofusion fittings. Butt welds are strictly prohibited. Fire service branch pipes to building hydrants are to be copper, minimum class type-A and fittings with protective wrapping.

FIRE HYDRANT SUPPLY MAINS IN GROUND UNDER BUILDINGS AND IN CLOSE PROXIMITY TO BUILDINGS

A consultant engineer is required to undertake pressure/flow rate testing (F1, P1) on the existing boosted main to ensure the demand meets the existing supply. (Refer to Section 2.4.)

The installation of the dedicated fire hydrant supply mains under buildings is strictly prohibited.

The dedicated hydrant supply main is considered (based on the results of flow rate/pressure testing of the centralised boosted system) to be in close proximity to the proposed building which may result in structural loading on the main or damage to the structure resulting from a damaged main. Advice from a structural engineer might be required. The service is to be copper, minimum class type-A pipe with protective wrapping.

FIRE HYDRANT SUPPLY MAINS INTERNAL TO BUILDINGS

Fire hydrant supply mains located within the building or above ground are to be copper, minimum class type-A pipe. Buildings that have fire sprinklers installed or that have copper pipes installed in fire-rated ducts or stairs must comply with Australian standards.

Fire hydrant supply mains located within buildings without fire sprinkler protection or outside fire-rated ducts or stairs are to be hot-dipped galvanised pipes and fittings to comply with AS2419.1.

FIRE HOSE REEL SUPPLY PIPES

Fire hose reel supply pipes within buildings are to be copper, minimum class type-A pipe and fittings or hot-dipped galvanised pipe and fittings to comply with relevant Australian standards.

6.5 GAS SERVICES SUPPLY PIPES

GAS SERVICES SUPPLY PIPES IN GROUND EXTERNAL TO BUILDINGS

Gas service supply mains external to buildings are to be copper, minimum class type-B pipe and fittings with protective wrapping, polyvinyl chloride (PVC) gas pipes and fittings and Acu-Tech polyethylene pipes with electrofusion fittings. All are to comply with Australian standards and Office of Energy requirements.

GAS SERVICE SUPPLY PIPES INTERNAL TO BUILDINGS

Gas service supply pipes that are internal to a building and in areas considered to have restricted access are to be copper, minimum class type-B pipe. Alternative pipe materials are to be submitted to the Facilities Management officers for review and approval.

6.6 STORMWATER DRAINS

STORMWATER DRAINS IN GROUND EXTERNAL TO BUILDINGS

Stormwater drains in ground up to and including 225 mm diameter pipe are to be installed in sewer-grade PVC, class SH drains and fittings. Testing of stormwater drains is to be subject to the same testing procedures as for sewer pipes and covered under AS3500.

STORMWATER DRAINS INTERNAL TO BUILDINGS

Stormwater drains that are internal to a building are to be sewer-grade DWV drains and fittings pipe.

7 SERVICE ISOLATION VALVES

7.1 DOMESTIC WATER SERVICES

DOMESTIC WATER SERVICE EXTERNAL ISOLATION

Isolation valves are to be installed to all service branch pipes from the main domestic water service supply pipe.

Isolating valves up to and including 80 mm diameter shall be installed in full-flow stainless steel ball valves with stainless steel handles and fitted to the service pipe by a threaded tube bush brazed to the pipe on the inlet side and a flare-type boiler union on the outlet side. Isolation valves must not be brazed to the supply pipe. Valves are to be a compliant water-marked type.

Isolation valves above 80 mm diameter are to be knife-gate type valves with flanged bolted connections to service supply pipes.

External in-ground isolation valves are to be installed in pits with an approved 300 x 300 mm cast iron box and cover. Valves are to be fitted with identification labels identifying areas serviced and installed no deeper than 600 mm from the isolation handle to the finished paving or ground level. Valve boxes are to be installed on DWV sleeves or concrete/masonry pits with a minimum clearance of 40 mm between the wall of the pit or sleeve. Valve box covers are required to finish flush with the finished ground level or paving, and be painted blue.

DOMESTIC WATER SERVICE INTERNAL ISOLATION

Internal water service supply pipes servicing room fixtures or equipment shall be isolated with isolation valves located in ducts or cupboards in accessible locations. Internal fixtures are to have a separate isolation from the main supply pipe to allow for individual shutdown and maintenance or replacement.

7.2 DEDICATED FIRE HYDRANT ISOLATION

DEDICATED FIRE HYDRANT RING MAIN

Isolation valves are to be installed on the dedicated fire ring main to isolate sections of the main; complying with AS2419.1. Valves in ground are to be connected to the main service supply pipe with flanged bolted connections. Threaded nuts and bolts are to be stainless steel.

FIRE HYDRANT BRANCH PIPES

Fire hydrant branch pipes to buildings are to be fitted with isolation valves in accordance with Australian standards. Valves are to be installed in pits with 300 x 300 mm cast iron boxes and a hinged cover set in a concrete surround and with a brass, engraved identification plate as the nominated under service identification. In addition, where located outside of paved areas, the valve box cover surround is to be fitted with a red reflective road marker (available from [Reflective Road Safety Products](#)).

7.3 GAS SERVICE ISOLATION

GAS SERVICE EXTERNAL ISOLATION VALVES

Gas service branch pipes to buildings are to be fitted with full-flow isolation ball valves stainless steel manufactured, with stainless steel handles in pits with a 300 x 300 mm cast iron box and cover.

Note: The cover is to be painted yellow and where located outside of paved areas is to be fitted with a yellow reflective road marker (available from [Reflective Road Safety Products](#)).

GAS SERVICE INTERNAL ISOLATION VALVES

Gas service pipes to internal appliances are to be fitted with isolation valves at close proximity to allow for the shutdown and maintenance of individual appliances. Service isolation valves are to be provided to each branch pipe from the main supply pipe.

LABORATORY GAS ISOLATION

Laboratory gas services supply pipes are to be fitted with All Controls or an approved equivalent safety gas check system with a safety shut-off button located to comply with Australian standard laboratory requirements.

7.4 BACKFLOW PREVENTION VALVES

Designers are to document backflow protection devices to comply with Water Corporation and Australian standard requirements. Backflow valves are to be installed for zone protection at the main building branch, room fixture protection and individual fixture protection.

Reduced pressure zone devices (RPZDs) are to be located externally, where possible, and installed in duplicate to allow for maintaining supply during servicing. Inlet and outlet service pipe connections are to be fitted with disconnection unions located between the isolation valves.

8 PRIOR TO OCCUPATION

8.1 DOCUMENTATION

CONSTRUCTION DRAWINGS AND SPECIFICATION

Documentation is to meet the requirements of Curtin CAD Services with the Curtin University *Documentation Deliverables Guidelines* providing guidance.

Preliminary, tender and construction documentation is to be issued to CU in AutoCAD, pdf and printed format. The number of copies is to be confirmed with CU. Consultant engineers and installation contractors are required to brief CU's Service Manager Hydraulic Maintenance and obtain their approval prior to any installation.

AS-CONSTRUCTED MANUALS

An electronic copy of the operating manual shall be provided. This is to be labelled on the outside face of the disk with the name of the project and titled "Hydraulic Services Operating Manual" and submitted to CU on practical completion of the project.

The manual index shall nominate the dates of practical completion and defects liability termination and shall include the name and addresses of the:

- project hydraulic services consultant
- installation subcontractor.

The manual shall contain, as a minimum:

- schedule of maintenance procedures (e.g. weekly/monthly/annually/seasonally)
- appliance information details (exact type and model numbers)
- fixture and tapware information details (exact type and model numbers)
- as-constructed drawings, prints and disk
- warranty for each item of equipment installed where applicable
- contact details for persons in the event of warranty attendance during the defects liability period
- operating and maintenance instructions for each item of equipment installed
- schedule of names and addresses for all suppliers of equipment
- certificates of satisfactory completion from authorities, where applicable
- certificate of compliance signed and dated from the installation contractor
- commissioning statements starting date of commissioning and persons present at commissioning.

The schedule of maintenance shall include (but not be limited to) such items as:

- pressure pumps
- storage tanks
- valves and ball valves

- emergency shutdown procedures
- compliance testing of equipment.

The design consultant engineer is to review the as-constructed maintenance operating manual supplied from the installation contractor to ensure all relevant information is contained within the manual and meets CU requirements.

8.2 INSTRUCTING THE UNIVERSITY

The design consultant engineer will specify for installation contractors prior to, or at the time of, issue of the notice of practical completion and before handing over to CU, to instruct CU (or its representative) for four hours in the presence of the project superintendent and by practical demonstration all aspects of operation and maintenance, general preventative maintenance and emergency shutdown procedures of the installed hydraulic services installation.

9 FIXTURES AND FITTINGS

9.1 GENERAL

To keep consistency with the look and feel of existing fixtures and fittings and with known, proven products, Table 1: Preferred Fixture and Fittings details Curtin’s preferences. Designers are requested to document from this table. Any special fittings and fixtures or variations from the listed items are to be submitted to CU Facilities Management Plumbing division for review and approval.

9.2 FIXTURE/APPLIANCE INSTALLATION NOTICE

The design consultant engineers and/or licensed plumbing contractors are to complete a Facilities Management fixture/appliance installation notice (a copy can be found in APPENDIX A: FIXTURE/APPLIANCE INSTALLATION NOTICE). The completed and signed notice, applicable design drawings briefs and service specifications are to be submitted at the project review stage.

Table 1: Preferred Fixture and Fittings

Item and Description	Finish	Comments
Gas sub-meters		
Email gas meters: with pulse meter reading capabilities or, where applicable, turbine gas meters complete with filters		Meters are to be located above ground in purpose-made lockable metal cabinets. Size is to suit metal and lock to suit the Curtin Grand Master Keying System
Hot water units		
Rinnai Infinity gas high-flow instantaneous hot water units: <ul style="list-style-type: none"> Rinnai commercial models HD 200 external, HD 200 internal and HD 250 external, models to suit application 		Consultant to check gas supply to building
Rheem electric storage units: single or three-phase type to suit application		Consultant to check power supply to building
Stiebel Eltron electric instantaneous hot water units: models DHE 18, DHE 21 or DHE 27 to suit application		Consultant to check power supply to building
Stiebel Eltron electric instantaneous single point hot water units: models DHC 6 and DHC 8 to suit application		Consultant to check power supply to building
Fire hydrants		
Galvins: model 381301-GE BS fire hydrant valve 65 BIC with top butterfly cap painted	painted red	
BSP inlet Model 381301 RG-GE BS fire hydrant valve 65 BIC with top butterfly cap painted – roll groove inlet	painted red	

Item and Description	Finish	Comments
Hydrant stands Galvins: model 381384-GE galvanised dual head fire hydrant valve support frame		
Hydrant covers Model 381331-GE tamper-resistant dual fire hydrant valve cover complete with chain and padlock	painted red	DFES-approved locks
Fire hose reels <ul style="list-style-type: none"> • Galvins: fixed fire hose reel with swing guide arm model 383026 to suit application • Galvins: model 382523-GE GI swing fire hose reel with flexible water way to suit installation • Galvins: model 383224-GE LI free standing fire hose reel with stand and sun shield to suit installation 		
Fire hose reel support <ul style="list-style-type: none"> • Galvins: model 383263-GE galvanised bolt down mounting post to suit installation • Galvins: model 383307-GE galvanised fire hose reel channel bracket to suit installation 		
Fire hose reel cabinets Galvins: type to suit installation		
Laboratory		
Laboratory basins and sinks PVC or stainless inset type, acid-resistant inset type only to suit installation		
Laboratory tapware Galvins: chrome or epoxy finish to suit installation	chrome or epoxy	
Laboratory wash basins Caroma: Concorde 500 631010 or Stoddart: stainless steel single tap hole		Wash basin to have hot and cold potable water supplies, and hands-free operation
Laboratory wash basin mixer Enware: ENM1001 electronic hands-free chrome mixer or Stoddart: mixer to knee-operated basin	chrome	Requires strainer and tempering valve
Gas turrets Galvins: chrome or epoxy coated colour GE gas turrets models TG37C, TG37RAC, TG39C, TG39RAC, TG40C or TG40RAC – to suit installation		
Water sub-meters		Meters to be located above ground in purpose-made metal meter box with

Item and Description	Finish	Comments
Elster water meters: complete with pulse meter reading capabilities		lockable door and reading window; to be approved by CU
Laboratory safety deluge showers and eye face wash units Enware: University type NSP 2938 stainless-steel foot and hand operated	stainless steel	Must be supplied with potable water New: Must have 100 mm floor waste
Amenity areas		
Tea preparatory sinks Clark or Vogue: stainless-steel sinks, type to suit installation with soundproof backing to drainers Sink mixers to have flexible braided stainless steel hoses to allow for replacement	stainless steel	
Boiling water units Must be fitted with timer and internal filter		Units are to be submitted to CU for approval. Units are maintained and serviced by the Properties F&D
Chilled water drink fountains Simcraft: stainless steel with Frigmac chillers on stainless steel frame and stainless steel panels; in public areas, are to be fitted with Galvins bubblers Freestanding chilled water drink units are to be Frigmac type with bubbler and jug filler – no filters		Alternatives to be submitted to CU for approval
Wash rooms		
Vanity wash basins (Student areas) Not permitted		Must obtain CU approval
Vanity wash basins (Staff areas) Caroma: selected type to suit installation Vanity basin mixer to be chrome with flexible braided stainless-steel hose connections to allow for replacement	white vitreous china	
Urinals <ul style="list-style-type: none"> • wall hung – Caroma: wall-hung cube type with electronic flush 		Alternatives to be submitted to CU for approval
<ul style="list-style-type: none"> • floor style 		Requires CU approval before installation

Item and Description	Finish	Comments
Hand wash basins – students		
<ul style="list-style-type: none"> Caroma: model Concorde 500, wall type with chrome plug and washers 	white vitreous china	
<ul style="list-style-type: none"> Hand wash basin Galvins or Enware: Hand wash basin 	chrome	
<ul style="list-style-type: none"> timed flow pillar taps 		
Water closets and cisterns		
<ul style="list-style-type: none"> Trident smart flush toilet pan with concealed water wafer in duct cisterns, fitted with MK II flush buttons to student areas 	white vitreous china	
<ul style="list-style-type: none"> Trident smart flush toilet suite with exposed cistern to staff areas to suit installations 		
Hands-free basins		
<ul style="list-style-type: none"> Caroma: white vitreous china, model Concorde 500 with centre tap hole option 	vitreous	
<ul style="list-style-type: none"> Enware: electronic mains powered mixers 	chrome	Requires strainer and tempering valve
<ul style="list-style-type: none"> Stoddart: stainless-steel knee operated wall basin 	satın	Requires strainer and tempering valve

REFERENCES

Title
Curtin University <i>Documentation Deliverables Guidelines</i>
000321 PDG <i>Fire Safety Project Guidelines</i>
000325 PDG <i>Green Star – Communities Design Guidelines</i>
Universal Design Guideline – Built Form
000346 PDG <i>Services Metering Guidelines</i>

APPENDIX A: FIXTURE/APPLIANCE INSTALLATION NOTICE

UNIVERSITY BUILDING NUMBER _____

PROJECT NAME _____

Fixtures/Appliance	Number	Manufacturer	Size where applicable
Water closets			
Urinal wall hung			
Urinal floor style			
Wall basin			
Vanity basin			
Tea prep sink			
Cleaners sink			
Boiling water unit			
Chilled water drink unit			
Hot water unit gas instant			
Hot water unit gas storage			
Hot water unit electric instant			
Hot water unit electric storage			
Hot water unit solar			
Heat trace cabling			
Gas room heater			
Laboratory	Number	Manufacturer	Size where applicable
Laboratory sink single bowl			
Laboratory sink double bowl			
Safety deluge shower			
Safety deluge shower/eye face wash			
Hand wash basin			
Gas turret single			
Gas turret double			
Gas safety shut down system			
Reverse osmosis supply			
Commercial Kitchen	Number	Manufacturer	Size where applicable
Sink single bowl			
Sink double bowl			
Hand wash basin wall			
Hand wash basin inset			
Dishwasher			
Gas cooker			
Gas wok burner			
Gas hot plate			
Gas combi oven			

Gas fryer			
Ice machine			
Water filter			
Gas safety shut off unit			
Reverse osmosis unit			
Industrial Waste Treatment	Number	Manufacturer	Size where applicable
Grease arrestor			
Dilution/neutralizer			
Silt arrestor			
Plaster trap			
Petrol/oil separator			
Chemical treatment plant			
Backflow Protection Device	Number	Manufacturer	Size where applicable
Reduced pressure zone device			
Double testable check valve			
Dual check valve			
Vacuum breaker			
Pump Station	Number	Manufacturer	Size where applicable
Sewer pump station			
Domestic water pumpset			
Fire Services	Number	Manufacturer	Size where applicable
Hydrant single internal			
Hydrant dual external			
Fire hose reel			
Hydrant booster cabinet			
Service Meters	Number	Manufacturer	Size where applicable
Domestic water sub-meter			
Gas service sub-meter			