

Hydraulics & Wet Fire



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

DESIGN STANDARDS

Document Register

Issue	Date	Description	Initials
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Disclaimer

Refer to the Disclaimer within the UQ Design Standards.

Reference Documents

Refer to the UQ Design Standards for the list of documents and associated standards to be referenced for design work.

The designer is to coordinate between disciplines and standards.

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1 Hydraulic Services

General Requirements

1.1 Scope of Works

The Hydraulic services shall be a fully operational system while complying with the requirements of the statutory authority, all relevant Australian Standards, state bylaws and building codes.

The Hydraulic services shall be designed, installed, tested and commissioned in accordance with all relevant Codes and Standards, UQ guidelines, Green Star / WELL / NABERS Water (if applicable) and industry best practices.

All new buildings and refurbishments are to be delivered to meet the latest versions of UQ's sustainability strategies.

Hydraulic services shall comprise of the works installed by a licensed person in accordance with Statutory Regulations generally known as plumbing and drainage code.

Departures from the hydraulic design guidelines require prior agreement from UQ P&F before proceeding.

Hydraulic services generally comprise of the following:

- Sanitary drainage
- Sanitary plumbing
- Trade waste plumbing & drainage
- Trade waste pre treatment
- Grey water systems
- Stormwater systems including gravity, siphonic roof drainage systems and on-site detention systems.
- Rainwater harvesting and reuse
- Fixtures and fittings

- Potable water reticulation including potable water storage panel tanks

- Potable water filtration
- Non-potable water supply
- Hot water reticulation and generation systems
- RO Water reticulation
- Backflow prevention

1.1.2 Standards and Codes

Materials and workmanship shall conform to Australian Standards and Codes where not in conflict with the provisions of this Specification, including but not limited to the Standards and Codes listed below:

- AS 3500 National Plumbing and Drainage Code
- AS 5601 Gas Installation Code
- AS 6400 Water Efficient Products – Rating and Labelling
- AS 5200.00 Technical Specification for Plumbing and Drainage Products
- AS 5601.1 Gas Installations
- National Construction Code Series
- Queensland Plumbing and Drainage Act 2002
- Queensland Water Supply Act 2000
- Queensland Standard Plumbing and Drainage Regulation 2003
- Plumbing Code of Australia
- Queensland Plumbing & Waste Water Code
- Queensland Development Code
- National Guidelines for Managing Food, Fats, Oils and Grease (FFOG) for Food Premises

Where some doubts exist as to the appropriate standard, the decision shall be made by the Contractor before commencement of any work

on or off the site. If a doubt exists as to whether a section of the design is able to comply with the relevant authorities regulations the Builder shall be notified prior to the commencement of any work.

It is the sub-contractors responsibility to provide a complete and fully functioning system complying in all respects to these Codes and Standards.

1.1.3 Reticulation Pipework & Valves

Water service risers shall be capable of being isolated at the bottom or at top in cases of downward feeds. Isolation of downward feeds shall be located in accessible positions typically between 300mm to 1500mm above floor level.

Branch lines shall be isolated at the riser on each level with additional risers required on sub-branches where servicing an outlet or group of outlets such as in a laboratory or on a fixture bench to minimise the impact of maintenance/ failures.

Isolation valves shall be readily accessible at floor level behind suitably sized duct doors or access hatches in accordance with the architects finishes specification.

Isolation valve types shall have the ability to be disassembled in situ without alteration or augmentation to the supply service which they are associated with to allow for the maintenance and or replacement. Where valves are 80mm or over, resilient seat gate valves shall be used.

Ring main distribution systems should be implemented wherever possible to minimise the potential impact for loss of supply and prevent stagnation of water supplies to low frequency of use fixtures.

1.1.4 Pipework Support

Brackets for all pipe supports shall be equal to galvanised mild steel "Unistrut" P1000 channel complete with purpose made galvanised spring nuts, framings, fittings and pipe clamps for each pipe. 'U' clamps must not be used with PVC pipes. Fixings for PVC must completely circumvent the pipe without

distorting the cross sectional profile of the pipe.

The pipework shall be separated from the hanging bracket using an approved insulated tape.

Pipework must not come into contact with any other service pipes or part of the building structure unless insulated with 25mm thick sectional lagging.

Provide seismic restraints for all equipment, pipework etc in accordance with AS1170.4 and to align with importance level of structure.

1.1.5 Identification of Pipework

All pipes shall be identified in accordance with Australian Standard AS 1345 for the Identification of Piping, Conduits and Ducts; and AS 1318 - Industrial Safety Colour Code and AS 2700 Colour Standards for General Purposes.

The ground colour shall be applied to a length of not less than 300mm and shall be used in conjunction with adhesive labels for identification.

The location of identification marking shall be at intervals of not more than 3m and adjacent to branches, junctions, valves, both sides of walls and control points. Such markings shall be placed so that they are easily seen from all approaches.

The direction of the flow shall be indicated by an arrow adjacent each colour band.

Adhesive labels shall be used for identification and indication of the direction of flow of pipework.

Where pipes are located underground and pass under sealed pavements such as roads and pathways, additional measures shall be included for identification purposes with the use of brass survey marker tags with individual engraved inscription to confirm service.

1.1.6 Service Ducts

Where possible all services shall be run in accessible service ducts, fire rated at the floor.

Duct sizes shall be such to allow for the safe and easy removal and repair of pipework and valves.

1.1.7 Floor Penetrations

Floor penetrations for groups of pipes in wet areas shall have a cast concrete upstand or bund. In all locations, metal pipes shall be sleeved and caulked. The sleeve shall be copper, standing 30mm above the finished floor.

1.1.8 Laboratory Services

The water services to each laboratory shall be a dedicated potable and non-potable supply with isolation points located within the laboratory or within reasonable distance to the laboratory.

Isolation of the water services to a laboratory and other research facility shall be possible without the interruption of services to other spaces in the building.

Water supplies to scrubbers shall be set up so that 95% of the water is recirculated with 5% is bled off to the adjacent waste connection. Ensure that all adequate high hazard backflow prevention requirements such as RPZD's or registered airgaps are maintained.

Services to any PC3 Animal or Invertebrate Facilities shall comply with the requirements of AS/NZS 2243.3 – 2010 Safety in Laboratories Part 3; Microbiological Aspects of Containment Facilities.

1.1.9 Underground Water Services & Valves

All underground pipework shall have a minimum of 600mm cover to topmost surface of pipe or pipes. Pipes shall be laid to the requirements of AS 3500. Pipes shall be laid side by side and not one above the other.

Pipes laid in the same trench as electrical or data conduits shall be separated in accordance with the requirements of AS 3000 and AS 3500.

All underground pipework shall be identified by laying continuous PVC marker tape not less

than 300mm above the pipe and shall have the ability, via trace wire or equivalent, to be detected via above ground detection scanning equipment.

Trenches shall be backfilled only with selected fill and compacted in layers not exceeding 200mm to a relative density of 95%.

All valves shall be accessible in concrete pits which shall be drained. All bolts, washers etc shall be 316 stainless steel. Thrust brackets in pits shall be hot dipped galvanised. Pipes shall be sleeved where they pass through the pit wall.

All valve pits are to be identified on the surface by a precast concrete pillar with recess for reflective 'V' marker plate.

1.1.10 Separation of Services

All below ground services shall maintain minimum separation distances in accordance with AS3500 series where installation against other hydraulic services occur.

When installation occurs against another service, such as electrical, the separation shall be what ever the greater distance requirements nominated from that specific service's Australian Standard.

1.1.11 Acoustic Treatments

Pipework shall not pass through noise sensitive areas NR30 or below.

All Hydraulic Services shall be installed in accordance with Acoustic Standards section 17.4.4.5

1.2 Sanitary Drainage

1.2.1 Pipework

Sanitary drainage and elevated pipework shall be HDPE, PE 100, PN 6.3 where cast in concrete.

The use of PVC should be avoided or minimised where practicable. Where PCV is used it must meet the GBCA's best practices guidelines for PVC.

Jointing methods for PVC shall be by solvent cement and priming agent in accordance with AS2022 and AS3500.2.

HDPE joining shall be done via a combination of electrofusion couplings on horizontal pipe runs and butt welded on vertical pipe runs. Where butt welding is used, allowances for deburring of weld on the internal of pipework will be required with CCTV footage to demonstrate completeness.

1.2.2 Existing Drains

Prior to commencement of any new installation or design works, all existing sanitary drains shall be camera inspected to confirm fit for purpose and adequate design life to suit the nature of the new works. Where defects within the drainage system are identified, all remediation works shall be undertaken.

1.2.3 Excavation, Bedding & Backfilling

1.2.3.1 Excavation

The ground shall be excavated in the form of trenches to enable the various pipelines to be constructed with trench width increased where necessary to permit the construction of manholes and pits. Trenches shall be excavated at uniform grades and in straight lines. Provide tunnelling in lieu of trenches where required.

1.2.3.2 Bedding

Bed all types of pipes on approved coarse river sand. All bedding on 150mm shall be free of all corrosive substances.

Backfill with bedding sand to 150mm over collar of pipe. All sand shall be subject to approval.

1.2.3.3 Backfilling

Backfilling of the service shall be carried out in 200mm layers with suitable fill. Compaction of the backfilling material shall be to a level as indicated by the civil engineer. Typically, a minimum of 95% compaction shall be achieved.

1.2.4 Inspection Chambers

The inspection chambers shall be constructed from reinforced concrete or reinforced pre-cast concrete pipe to local Authorities requirements. All internal inspection 1050mm diameter chambers shall have lock down

covers. Allow to protect covers during construction. Provide rung and individual rung-by-rung ladders where inspection chamber exceeds 1.2m in accordance with clause 4.8.4.3 of AS 3500.2. The ladders are to be coated with approved protective material to promote anti slip surfaces.

1.2.5 Inspection Covers & Frames

Covers and frames shall be manufactured in accordance with AS3996 and include cast iron covers and frames with all edges machine fitted and have removable plastic lifting hole plugs. Each cover shall have a brass or stainless steel plate bearing the name of the service.

Covers and frames shall be of type D

The covers and frames shall be set to the level of the finished surface and filled in with the same material as used for the surrounding path or roadways, lawned areas shall be in filled with concrete. Brass edge trimmed covers and frames shall be used in areas where tile, paver or carpet finish is required. All covers and frames shall have the manufacturers recommended lubricant applied prior to installation.

All internal covers shall be lock down type.

1.2.6 Connection to Stacks

Shall be made with the use of a long radius bend or two (2) 45° bends positioned off their backs, facing up with a straight section of pipe between.

1.2.7 Overflow Relief Gullies

An overflow relief gully shall be provided. It shall be located in the position approved by the local council.

The gully shall be installed 150mm below the lowest fixture outlet in the building and 75mm above natural ground, or 20-25mm above paved surfaces to prevent the ingress of stormwater.

1.2.8 Inspection Openings to Surface

Inspection openings to surface shall be provided at each change of direction and at 30m intervals. Where the openings are located externally a gas tight screw cap housed in a cast iron box cover shall be provided. Where located internally a gas tight cap shall be

provided suitable to interface with the floor finishes.

Inspection openings to surface shall be installed on all WC branch connections so that clearing of sewer or house drain blockages can be achieved from the floor of the WC without the need to access the ceiling space below the WC or ablution area.

Inspection openings shall also be included on each level stack riser and be readily accessible.

1.2.9 Below Ground Identification

Refer to section 2.1.3

1.2.10 Vent Pipes

Terminate all vents through roof at the heights required by the local Authority. Provide approved type vent cowls, of material to match the vent pipes. Allow to stay vent pipes off parapet wall to the requirements of the local Authority and hot dipped galvanised conduct with separation strip between the clamp and pipe. Install apron flashing to vent pipe to vertically cover roof flashing (supplied by others) by 80mm (min). Vent pipes above metal deck roof(s) shall be HDPE grade, PE, PN 4.

1.2.11 Articulation

All allowances shall be taken to protect the sanitary drainage system where it passes from natural ground to either under slab or through structural slabs or to a fixed structure by means of articulation via swivel and expansion joints in accordance with AS2870 and the site soil classification prepared by others.

All articulation arrangements shall occur within the first 1000mm where the drainage line passes from under the building structural slab.

All articulation joints shall be installed in their mid-position of their range of possible movement at the time of installation and suitably wrapped in a plastic polymer to protect the mechanical component of the fitting/s.

When a ground bearing slab structural design is adopting a waffle pad or bored pier structural foundation or measures are not put in place to mitigate problematic soils via cut or controlled engineered fill, additional treatment will be required on the in ground drainage services that pass under the building slab and are within problematic soils.

Measurers shall include adequately sealing all trenches as they pass from natural ground to under the building slab to ensure water cannot track under the building, tying in all drainage to the underside of the ground bearing structural slab with allowance to mitigate any trench backfilling loads on the piped system or the use of mechanical expansion or articulation joints under slab at critical locations and on all vertical risers.

Additional measures may also be required outside the building structure in natural soils located a 6m intervals where site soil classifications indicate significant soil slip events or significant ground movement can occur.

1.3 Sanitary Plumbing

1.3.1 Pipework

Pipework shall be HDPE, PE100, PN 6.3 grade. HDPE piping systems shall be installed in accordance with AS 2033 and the manufacturer's instruction.

All pipework case in concrete or in ground shall be HDPE. The use of PVC should be avoided or minimised where practicable. Where PCV is used it must meet the GBCA's best practices guidelines for PVC.

All rising mains shall be "Best Practice PVC Pipe & Fittings", PN 12 for pump out riser.

Provide thermal insulation to the condensate pipework. The insulation shall be composed and manufactured without the use of ozone depleting substances. The insulation shall be 13mm thick minimum and installed in accordance to manufacturer's requirements.

1.3.2 Branches

Where a branch line enters a vertical pipe the branch fitting must be wholly outside the vertical pipe such that the internal bore of the pipe is maintained at all times.

All horizontal and vertical branches shall be at 45° to the main line.

1.3.3 Expansion Joint

Shall be of a type, material and manufacture approved by local authorities and shall be installed in such a manner that axial movement adjacent sections of the pipe to the

extent of at least 8mm in either direction is readily possible.

On vertical soil and waste stacks, one expansion joint shall be fitted at its base or in the vertical pipe above an offset bend, and at each alternate floor level except the top storey. Such expansion joints shall be installed immediately above the highest branch connection at the floor concerned.

Where there are no branches or connections to the vertical stack, one expansion joint shall be installed for each two storeys with a maximum spacing of 6m.

Shall be fitted on all branch soil, waste and vent pipes in excess of 6m in length. In these cases, expansion joints shall be installed at maximum intervals of 6m and immediately upstream of the entry to the vertical stack or other graded line.

Where a ring seal adaptor is fitted to the socket of a fitting, care must be taken to leave the required gap between the end of the pipe and the shoulder of the socket to the fitting.

1.3.4 Fixing & Supports

Soil, waste and vent pipes shall be regarded as being fixed at all supports where no provision has been made for axial and/or lateral movement.

Vertical soil, and waste pipes must be clear to move vertically at least 8mm in both directions through all ceilings, roofs etc. through which they pass. Vertical soil and waste pipes must be restricted against downward vertical movement at their junctions with house drains, branches at all floors.

All pipes shall be supported against all distortion and must be held true to line and grade by means of approved clips, saddles or other fixings.

Pipe supports on vertical pipes shall be placed at each floor level and intermediate between floors, so that no two supports are further apart than 2m.

Fixed supports shall be provided adjacent to the lowest branch at each floor and above the expansion joints, so as to prevent any downward movement of the pipes. All other supports shall permit not less than 8mm axial movement in either direction, except those adjacent to and above expansion joints, which

must hold the pipe firmly against downward movement.

Approved pipe supports, clips or saddles intended to permit thermal movement shall be fitted with a layer of felt or similar material between the pipe and the clip to ensure movement.

Pipe clips intended to serve as fixed points shall be rigid and securely attached to the building structure and to the pipe.

1.3.5 Inspection Openings & Gates

Inspection openings shall be provided in pipes so that each section of pipework is accessible in at least one direction.

Inspection openings shall be placed in accessible positions and to the approval of the local Authority. Bolted gates for 80mm pipes and larger shall be installed for inspection openings and rodding access. Install bolted testing gates of the same diameter as the stack at the base of each stack and at each floor level for testing purposes.

1.3.6 Exposed Piping

All exposed piping other than service areas or approved shall be chrome plated copper traps and tails throughout and adequately covered with wall and floor penetrations by means of back nut of the same material and size as the trap and tail.

1.3.7 Floor Waste Gullies

Shall be a minimum of 100mm x 65mm and shall consist of a self-cleansing palazzi type trap with 100mm riser. The maximum length of the riser shall be 600mm. The riser shall be made watertight.

Final grate selection shall be determined by the architect's floor schedules.

1.3.8 Plantroom Floor Waste Gillies

Provide 100x100 "P" trap with flat grate in plantrooms. Connection shall be to sewer or stormwater as per local authority requirements. The wastewater, due to the equipment are being washed/ serviced shall be discharged to sewer and run-offs due to rainwater shall be discharged to the stormwater.

The riser shall be made watertight. When floor waste gully are be provided within bin

collection area it shall be stainless steel incorporating a basket trap.

1.4 Trade waste Plumbing & Drainage

1.4.1 General

Design of the trade waste services shall comply with the relevant requirements of the local authority and AS3500.2.

1.4.2 Pipework

Pipework shall be HDPE, PE100, PN 6.3 grade. HDPE piping systems shall be installed in accordance with AS 2033 and the manufacturer's instruction.

1.5 Trade waste Pre-treatment

1.5.1 General

Pre-treatment devices shall be included to ensure the waste discharge from the facility is compliant to with the requirements of the local authority.

Treatment devices may include but not limited to cooling pits, silt arrestors, oil separators & grease arrestors. All treatment apparatuses shall be approved by local trade waste authorities and effectively treat within acceptable effluent ranges/levels as provided by Sewer and Water Authorities.

The national guideline for managing food, fats, oils & grease (FFOG) shall be used to determine discharge volumes of trade waste appliances to assist in confirming adequate capacity of all pre-treatment systems.

1.6 Grey Water System

1.6.1 General

Where required a grey water system shall be designed to incorporate the infrastructure to harvest, treat and reuse water for toilet flushing within the project.

Additional reference to QLD waste water code

1.6.2 Pipework

Pipework shall be HDPE PN20. Jointing shall be fusion welded joints.

1.6.3 System Treatment Parameters

Treatment plant shall be capable of producing water quality suitable for toilet flushing. The treated water shall comply with the following water quality parameters:

- a) Biochemical oxygen demand (BOD5) less or equal to 10mg/L
- b) Total suspended solids (TSS) less or equal to 10mg/L
- c) Escherichia coli (95% of samples taken over 12 month period) < 1cfu/100ml
- d) PH to be between 6.5-8.5
- e) Turbidity to less than 1 NTU (95 percentile)/ 5NTU (maximum)
- f) Disinfection Chlorine level to between 0.2 and 1mg/L residual

1.7 Stormwater systems including gravity, siphonic roof drainage systems and on-site detention systems.

1.7.1 General

Stormwater systems shall be designed to comply with the requirements outlined in the stormwater management plan prepared by the civil engineer and local authority.

All Eaves gutter roof water and overflow systems shall be sized to accommodate a Q100 or a 1% annual exceedance probability (AEP) rain event for a 5min duration in accordance with AS3500.3.

1.7.2 Pipework

Conventional drainage shall be installed using HDPE, PE100 or Polypropylene PN 6.3. Siphonic drainage shall be HDPE, PE100, PN 10 with fusion welding joints. Where downpipes are exposed refer to the architectural finishes schedule.

Sub-soil drainage shall be minimum slotted uPVC DWV complete with geofabric sock. Flexible agg drainage is not acceptable.

The use of PVC should be avoided or minimised where practicable. Where PCV is used it must meet the GBCA's best practices guidelines for PVC.

1.7.3 Inspection Openings

Test gates shall be provided at the base of all internal downpipes and of the same size as the downpipes prior to connecting to stormwater drainage lines. Inspection openings generally shall be provided at every change of direction for all inground storm water drainage inside the building.

Inspection openings on sub-soil drainage shall occur at each major change of direction, at 15m intervals and at the end of the line.

1.7.4 Rainwater Outlets

Where conventional system is installed, it shall be cast iron body type cast in concrete structure where approved by the structural engineer. The manufactured outlet flow rates shall be tested and certified in accordance with AS 3500.3 Set grates, flush and matching with adjoining surfaces. Grates shall have puddle flange and membrane clamp. Rainwater outlet shall exceed the designed flow rates.

Where a siphonic system is installed, it shall incorporate additional acoustic properties applied to the service. Set grates, flush and matching with adjoining surfaces. Grates shall have puddle flange and membrane clamp.

Where siphonic system is adopted, provide devices to dissipate the energy from the siphonic rainwater system when discharging in the rainwater tank or civil infrastructure system, ensure discharge velocities do not exceed 2m/s.

All design of the siphonic system shall be warranted by the siphonic manufacturer with the roof drainage system designed in accordance with AS3500.3. The use of specialized software must be used to validate siphonic calculations.

1.7.5 Gutters

Box Gutters shall not be incorporated and avoided at all costs.

All gutters shall be designed as Eaves Gutters and calculated to achieve a 1 in 100 year storm event or a 1% AEP in accordance AS3500.3 utilising rainfall data available from Bureau of Meteorology.

Allowances for stainless steel gutter guards shall be incorporated.

The front edge of the eave gutter shall be a minimum 50mm lower than the back edge to ensure front edge overflow can be achieved.

1.7.6 Downpipes

All downpipes shall be 150dia in size unless approved by UQ. All downpipes shall be 304 Stainless Steel unless located in corrosive or marine environments and shall be 316 Stainless Steel. The termination of the downpipe at ground level shall be via grated pit located at the building external perimeter.

Treatment of the grated pit and surrounding grounds shall ensure that no splash back or surcharging can fall back to the building structure.

1.7.7 Grated / Inspection Pits

All downpipes shall discharge over grated pits external to the building via 100mm airgap.

All major changes of direction for inground stormwater drainage systems, external to the building, shall be done via an inspection pits. Pits are to be a minimum 600mm². Light duty covers shall be used except in roadways where medium duty covers shall be used.

Where specific floor or paving finishes are used, tops of pits shall be installed to match aesthetic finishes as noted by the project Architect. Pits in dense landscaping or forest areas shall be locatable by means of a white painted hardwood post 600 high above ground with the top 100mm painted green.

All inspection pits over 1200mm and to 3000mm in depth are to have a hot dipped galvanized HD ladder or step irons installed. No ladder is to be installed over 3000mm in depth.

1.7.8 Grated Drains

All grated drains for the collection of surface run-off shall installed to promote the main bars running in the direction of flow. "Forge-weld" brand grates complete with matching metal frames should be used in these situations in lieu of cast iron. Square stainless steel grated sumps shall be provided in tiled areas.

All grates shall be heel proof and coated with anti-slip properties.

1.7.9 Sub-Soil Drainage

All sub-soil drainage shall occur behind any retaining wall or below ground level of any basement structure. The pipe shall be installed in a minimum 10mm blue metal aggregate.

1.8 Rainwater harvesting and reuse

1.8.1 General

Where practical all new developments shall incorporate rainwater harvesting to align with the current UQ Sustainability guidelines to promote potable water offset and promote sustainable design practices. This incorporates tanks, pumps and treatment packages for irrigation, ablution and miscellaneous use.

Note: This service shall include a potable water back up supply via suitable backflow prevention device.

1.8.2 Pipework

Pipework shall be HDPE, PE100, PN 20 grade. HDPE piping systems shall be installed in accordance with AS 2033 and the manufacturer's instruction.

All pipework case in concrete or in ground shall be HDPE. The use of PVC should be avoided or minimised where practicable. Where PCV is used it must meet the GBCA's best practices guidelines for PVC.

2.8.3 System Treatment Parameters

Treatment plant shall be capable of producing water quality suitable for reuse as above or below ground irrigation and hose taps.

The treated water shall comply with the following water quality parameter:

- a) Total suspended solids (TSS) less or equal to 10mg/L
- b) Escherichia coli (95% of samples taken over 12 month period) < Nil/100ml
- c) PH to be between 6.5-8.5
- d) Turbidity to less than 1 NTU

1.8.3 Storage Tanks

Storage tank/s shall be sized to reflect the available impervious catchment areas and the proposed reuse volumes based on average and mean historic rainfall data. Tanks may be

either above ground with adjacent pump sets or below-ground with submersible pump sets, depending on what is appropriate to the building design.

All openings to the tank will be protected from mosquitoes with gauze mesh with 1mm gaps or less. A high level overflow from the rainwater tank shall be provided that will discharge to an adjacent grated stormwater pit. The overflow shall be capable to discharge at an equal or greater flow than the inlet.

1.8.4 First Flush Devices

All capture rain\water intended for harvesting shall incorporate means of a first flush device to eliminate the potential for pollutants entering the tank and to divert contaminated water to an adjacent stormwater surcharge pit before continuing to civil infrastructure.

1.9 Fixtures & Fittings

1.9.1 General

All sanitary fixtures and fittings shall be secured to all walls by the following methods:

- All fixtures shall be supported securely and shall in no way be dependent on service pipes serving such fixtures.
- Heavy duty brackets where available

All exposed connections and piping shall be bright chrome plated.

1.9.2 Schedule of Fixtures and Tapware

Refer to the architectural schedule of sanitary fixtures and fittings ensuring fixture flow rates align with the minimum WELS and or Greenstar water ratings for the project. Fixture shall meet the following minimum flow criteria

- Taps - 6 Star, less than 3 L/min
- Toilets - 4 stars, investigate vacuum
- Urinals - 6 stars - 0.8L/flush or less, consider waterless
- Showers - 3 star (6 to 7.5 L/min), preference for 6L/min
- Clothes washing machines - 5 star

- Dishwashers - 6 star

1.9.3 Laboratory Safety Showers

Safety showers and eyewash stations shall be provided in accordance with AS4775. Consideration shall be given when identifying a suitable location to ensure there is minimal impact to other persons in the space when the devices are activated. Safety showers and eyewash stations shall not be installed in main exits/ entries to laboratories.

Floor wastes shall be located adjacent to the shower. The purpose of the floor waste is to remove bulk water when the safety shower and eyewash are activated. Consideration shall be given to any floor wastes adjacent safety showers that do not readily receive discharge from another fixtures. Additional trap priming devices shall be considered.

Eyewash stations are to be connected to the drainage system. Discharging on the floor shall not be accepted.

Where a safety shower is provided separately without an eye wash or the weekly activation of the station has been mitigated through a risk assessment an alternative method to charge the floor waste will be required.

1.10 Potable water reticulation including potable water storage panel tanks

1.10.1 General

The potable water system shall be designed in accordance with AS3500.1 and the local authorities' requirements.

The cold water design velocities shall be 1.6m/s for internal pipework and 2m/s for external buried pipework.

The design pressures at any outlet shall be between minimum 300kPa and maximum 500kPa.

1.10.2 Pipework

All cold-water pipework below ground shall be cement lined ductile iron and suitable wrapped with approved material.

Cold water rising main shall be in Stainless Steel or Copper type "A" subject to operating pressure of the system.

All other domestic cold-water pipework above ground shall be Copper type "A" or type "B" as per system requirement and installed in accordance with the manufacturers requirements. Alternative materials shall not be used unless approved by UQ.

All cold-water lines to the individual fixtures are to be a minimum of 20mm diameter up to within 2.0 metres of a fixture, and then 15mm diameter may be installed.

All fittings shall be compatible with the pipework material selected and bear the stamp of approval of the local Authority.

In addition to general provisions for installation of pipe, pipes shall be fixed in continuous lengths wherever practicable and bent at changes of direction in preference to using fittings.

Wherever possible, pipes shall be run parallel with walls, slabs, etc., and with each other branches taken off at right angles.

Where pipes are let up along walls and then through to fixtures, the pipes shall not be bent but are to be fitted to elbows for correct fitting of cover plates.

Short pipe extension pieces from wall connection fixtures shall be fitted with union connections to allow for removal of fixtures. Pipes shall be separated from the building structure with specified brackets.

All exposed pipework shall be insulated. All pipework external and insulated, in plant rooms or exposed shall be sheathed with aluminium cladding.

1.10.3 Jointing Materials

All joints shall be cleaned free of any foreign material, dirt, and grease etc., before any attempt is made to do

the joints.

Joints shall be cut true and square, remove all burrs and swarfs, etc. and grind or file a chamfer lightly around the pipe.

Silver Brazing Alloy shall contain not less than 15% silver, verification of the silver content shall be given in writing to the Hydraulic Consultant.

Care shall be taken not to overheat the joint. Apply the correct flux as recommended by the manufacturer slightly carbonising flame shall be used. Failure to use 15% silver brazing alloy will result in rectification of all joints.

Press-fit joints for copper pipework shall be made of made of copper or gunmetal. Inspection of un-pressed fittings utilises a positive leak path for the whole range 2.2kPa to 300kPa when a dry pressure test is performed and 100kPa to 650kPa with a wet pressure test. After pressing, the connection shall be permanent and inseparable.

The seal material shall be suitable for application. Fittings shall carry Watermark Approval.

1.10.4 Cold Water Meters

Coldwater meters shall be installed typically above ground in a dedicated hydraulics cupboard at a height and location that are easily accessible and approved, if applicable, by the water service provider. The meters shall be installed in a valve train incorporating isolation valve, strainer, PLV and suitable level backflow valve is required. All water meters shall also include full flow by-pass nominally closed for maintenance purposes. Ensure all connections are made via union connections and have isolating valves to facilitate maintenance.

1.10.5 Pressure Reduction Station (PRV)

Pressure valve stations shall be provided in duplicate on the cold-water lines and be adjustable between 300kPa – 500kPa.

Where installed on the main riser, assembly shall be complete with valves and check valves in duplicate and parallel. Pressure gauges are to be provided on the inlet side and outlet side of the pressure reducing valves.

The PRV shall be able to operate in both static and dynamic conditions.

1.10.6 Potable Water Tanks

Stainless steel potable water tanks shall be provided where it is deemed a standby potable water supply is required. The tanks effective capacity shall be equal to 4hrs building unless specifically noted otherwise. All tanks shall include the necessary accessories (overflows,

sludge valve, drain valve, accessible access panels) to comply with AS/NZS 3500.1

1.11 Potable Water Filtration

1.11.1 General

Potable water filtration is to be provided downstream of a break/ holding tanks or where there is a requirement for the development to comply to the WELL standards. Refer to the projects ESD pathway for clarification.

1.11.2 Pipework

Pipework for the treatment plant skid shall be PEX PN20. Jointing shall be mechanical brass joints.

1.11.3 Treatment Train

The treatment train shall consist as a minimum of the following:

- Granular activated carbon filter vessel
- 1.5 micron screen filter with automated backwash
- UV disinfection prior to supply to building

1.12 Non-potable Water Service

1.12.1 General

Non-potable water services may incorporate harvested condensate, fire test water and rainwater. To ensure suitability for application, additional inline treatment may be undertaken.

The reclaimed water can be utilised for irrigation, toilet flushing and miscellaneous supply. Refer to the projects ESD pathway to confirm the extent of non-potable water service required.

1.12.2 Pipework

All pipework below ground shall be HDPE, PE100, and PN 20.

All other pipework above ground shall be Copper type "A" or type "B" as per system requirement and installed in accordance with the manufacturers requirements.

All above and below ground pipework shall be clearly and readily identifiable in colour code in accordance with AS3500.1 to indicate recycled or non-potable water.

1.12.3 Laboratories Water Service

All laboratories shall be supplied from a dedicated non-potable system. All installations are to comply with AS 3500 and other relevant Australian Standards. Where a building has a dedicated non-potable water supply, any new works shall test and validate adequacy of non-potable supply is fit for purpose for new project requirements.

1.13 Hot Water Reticulation & Generation Systems.

1.13.1 General

The hot water system shall be designed in accordance with AS3500.4 and the local authorities' requirements.

No gas fired hot water systems are to be used. All hot water generation shall be via heat pump with minimum COP of 3.5.

The hot water design velocities for circulatory systems shall be as follows:

Flow – 1m/s maximum

Return – 0.8m/s

The hot water design velocities for all non-circulatory systems (dead legs) shall be 1.6m/s.

The design pressures at any outlet shall be between minimum 300kPa and maximum 500kPa.

1.13.2 Pipework

All hot water pipework shall be Copper type "A" or type "B" as per system requirement and installed in accordance with the manufacturers requirements.

1.13.3 Insulation

All thermal insulation used in the hydraulics installation shall be composed and manufactured without the use of ozone depleting substances. All hot and warm water shall be insulated 25mm thick minimum with R value as per AS/NZS 3500.4 and installed in accordance to manufacturer's requirements.

All insulated pipework external, in plant rooms or exposed shall be sheathed with aluminium cladding.

1.13.4 Thermostatic Mixing Valves

Provide thermostatic mixing valve to provide hot water 43.5°C to all PWD ablutionary fixtures and 50°C to all other fixtures. All valves shall be tested upon completion of tests. Tests shall include fail safe tests and all results shall be recorded.

1.13.5 Balancing Valves

Where required, balancing valves shall be installed in hydraulic risers and easily accessible locations for maintenance and future adjustment. The valves shall be of the thermostatically controlled type.

1.13.6 Pressure Reduction Valve Stations

Where required pressure reduction valve stations shall be provided on the main riser, assembly shall be complete with valves in duplicate and parallel. Pressure valve stations on the hot-water lines and be adjustable between 300kPa – 500kPa.

Pressure gauges are to be provided on the inlet side and outlet side of the PRV.

The PRV shall be able to operate in both static and dynamic conditions and shall be a certified product to be used on the hot water system.

1.13.7 Hot Water Circulation Pumps

Secondary hot water circulating pump sets shall be located on the return pipework to the hot water plant. The pump set shall be in a duty/ standby arrangement. The pump set shall be sized based on the calculated temperature loss through the circulatory system and to ensure the maximum velocity is not exceeded. The pump set shall be capable of monitoring the return temperature of the hot water return system and activate when return temperatures drop below the calculated or allowable system temperature drop.

1.13.8 Hot Water Generation

The hot water generation system shall be determined by the overall demand of the proposed project. Projects with a significant hot water demand shall have a centralised plant. In all other instances point of use hot water units shall be used.

1.13.8.1 Centralised Hot Water Plants

Centralised plants shall have the sufficient capacity to cater for the projects peak hour

water consumption plus 50% recovery in the next peak hour in standby hot water storage.

The designer shall present the final calculations back to the university prior to approval.

The type of hot water generation plant shall be determined by the projects ESD pathway with COP's of a minimum of 3.5. Typically, the centralised plant shall harness renewable forms of energy such as solar, heat pumps or co-generation.

1.13.8.2 Point of Use Hot Water Units

Point of use hot water units shall be used where the use of centralised plants are not practical due to spatial limitations or the calculated peak hour volumes are less than 500Lt/hr for a centralised plant to be installed and suitable electrical infrastructure is available to support the demand of the units.

1.13.9 Hot Water for Laboratories

Hot water for laboratories shall be provided from a dedicated centralised plant that is non-potable only. The supply, if from a potable water supply shall come via an approved hazard backflow prevention device. Typically the hot water plant shall comprise of mains pressure storage units in parallel with insulated flow and return lines incorporating both circulating and stand-by pumps.

Non-potable hot water point of use electric instantaneous hot water units are also acceptable.

Additional testable backflow valves may be required where individual backflow zones are identified to ensure the wider non-potable hot water supply is not compromised.

1.13.10 Hot Water Dead Legs & Wait Times

All single branch or dead legs shall be kept to an absolute minimum. The hot water wait time for any fixture shall not exceed 10 seconds. Consideration shall be given based on flow rate of fixture to achieve this requirement.

1.14 RO Water Reticulation

1.14.1 General

Reverse Osmosis (RO) system shall be suitable for the appropriate quality of water as stipulated in AS/NZS 4187:2014 for the final rinse and sterilisation processes. This shall be confirmed by UQ P&F.

Additional water filtration and or softening shall be reviewed if required. Treatment system shall align with intended water quality required for the project based on the source of water supply chemical characteristics and TDS's.

1.14.2 Pipework

All RO pipework shall be installed in Stainless Steel pipework system to the RO Manufacturer's approval. This shall be equivalent to ASTM A312 for Seamless Stainless Steel. Jointing method shall be orbital welding or alternative materials shall be approved by UQ P&F.

1.15 Backflow Prevention

1.15.1 General

Backflow prevention devices shall be installed in accordance with AS/NZS 3500. All valves shall comply with AS 2845.1. The backflow prevention valves shall be appropriately rated to withstand the working pressure and temperature of the system.

Where RPZD are proposed, additional tundishes shall be provided, it should discharge to stormwater system where practical. Discharge from testable devices to ground is not permitted.

Valves 80mm and over shall be stainless steel. The device shall be applicable to the relevant hazard. Barrel unions are to be fitted between the upstream and downstream isolation valves to allow for the unrestricted removal of the backflow device for maintenance.

Where testable backflow prevention valves are required for containment protection, these should be installed in a N+1 arrangement to facilitate maintenance and replacement without system disruption.

1.15.2 Location

Backflow prevention devices are to be installed in locations that permit access for servicing and testing from floor level without causing potential risk or damage.

Each testable backflow prevention device shall be placed on a register nominating size, make, model, location and last test date which is to be kept and maintained by facility management.

1.15.3 Laboratories

Backflow prevention devices shall be installed in all PC3 Animal or Invertebrate facilities to align with zone or individual protection.

Where a dedicated building non-potable water supply is available, the supply shall be tested to confirm the supply is "potable" in nature. If testing indicates contaminated non-potable supply, then all new proposed non-potable connections for the project shall come from the potable supply with additional high hazard backflow prevention devices.

1.16 Water Meters

1.16.1 General

All authority water meters to be installed to local water authorities requirements.

Sub-metering shall be provided to areas that consumes more than 10% of the building's water usage. All meters shall incorporate attached non-battery reed switches. Sub meters shall be provided for potable, non-potable cold water supplies on the following areas:

- Master meter - supply into building
 - Sub-meter on all laboratory levels
 - Sub-meter on commercial tenancies
 - Sub-meter for centralised hot water
 - To align with any ESD or Greenstar Pathway plant
-
- Sub-meter on potable water backup supply on irrigation supplies
 - Sub-meter on any major mechanical plant usage areas
 - Additional meters to align with any ESD pathways for the project

2 Wet Fire and Sprinklers

General Requirements

2.1 Scope of Works

The Hydraulic services shall be a fully operational system while complying with the requirements of the statutory authority, all relevant Australian Standards, state bylaws and building codes.

The Hydraulic services shall be designed, installed, tested and commissioned in accordance with all relevant Codes and Standards, UQ guidelines, Green Star / WELL / NABERS Water (if applicable) and industry best practices.

All new buildings and refurbishments are to be delivered to meet the latest versions of UQ's sustainability strategies.

Hydraulic services shall comprise of the works installed by a licensed person in accordance with Statutory Regulations generally known as plumbing and drainage code.

Departures from the hydraulic design guidelines require prior agreement from UQ P&F before proceeding.

Hydraulic services generally comprise of the following:

- Fire hose reel
- Fire hydrants including pumps and tanks
- Fire Sprinklers
- Fire Booster

2.2 Standards and Codes

Materials and workmanship shall conform to Australian Standards and Codes including but not limited to the following codes and standards:

- AS 2118.6 Combined Sprinkler & Hydrant Systems

- AS 2941 Fixed Fire Protection Installation – Pumpset Systems
- AS 2419.1 Fire Hydrant installations
- AS 2441 Installation of Fire Hose Reels
- AS 2118.1 Automatic Fire Sprinkler Systems.
- AS 1603 Automatic Fire Protection and Alarm Systems.
- AS 1670 Fire Detection, Warning, Control and Intercommunication Systems - Systems Design, Installation and Commissioning.
- AS 4118 Fire Sprinkler Systems
- AS3500.1 – Water Services
- National Construction Code Series
- Local Fire Brigade
- Urban Utilities

2.3 Fire Hose Reels

Fire Hose Reels shall be installed in accordance with AS2441.

All Fire Reels are to be 36 Metres in length.

All Hose reels are to be installed with a Gate Valve fitted to allow the

removal of the fire hose reel for servicing and or replacement.

Where fire hose reels are supplied from potable water system, all pipework shall incorporate backflow prevention device.

2.4 Fire Hydrants

Fire Hydrants shall be installed in accordance with AS2419

Where located in an above ground situation, the service shall be constructed of galvanised mild steel piping jointed by approved patented rolled grooved pipe and fittings.

Where located in below ground situations the service shall be constructed of cement lined

ductile iron pipes and fittings or UPVC pressure pipe.

To all changes of direction where DICL fillings are used supply and construct concrete thrust blocks of relevant size, design and location to prevent movement of the pipeline by means of the internal pressure.

Where fire hydrants are proposed to be connected via the potable water supply, the landing valve shall be watermarked approved and suitable level of hazard backflow valve shall be incorporated. Landing valves shall be of standard 65mm Diameter, all brass valve, fitted with a wheel type handle, and shall be of an approved pattern conveniently situated for connection and operation with an outlet thread suitable for connection to a standard brass cap

2.5 Fire Sprinklers

All fire sprinkler services shall be designed in accordance with the National Construction Code Part

E1.5, Specification E1.5 & all applicable parts of AS2118.

Unless otherwise specified by the Deputy Director – Planning and Development, fire sprinkler systems shall be ‘wet pipe’ systems.

The configuration of the various services shall be in accordance with the following;

Fire Sprinkler services:

- Residential Buildings AS2118.4
- All other areas AS2118.1
Combined Hydrant and Sprinkler Services AS2118.6

Fire sprinkler system design shall include a requirement for full Hyena hydraulic calculations to be submitted and reviewed by the relevant project stakeholders prior to installation.

All fire sprinkler services design shall include provisions to allow for routine testing in accordance with the requirements of AS1851.

The designing consultant shall ensure that before commencing any installations, Fire Services Contractors shall provide evidence to the UQ P&F

are duly registered with the Fire Protection Contractors Registration Board of Queensland,

and have such licences as required by State legislation.

Designs should ensure that all wet fire services, hydrant, hose reel & sprinkler be certified and tagged by a certified fire services equipment installer.

Wet fire services shall be designed such that preventative maintenance can be carried out in accordance with AS1851. Consideration shall be given to the availability of system consumables, replacement pipe, fittings, valves and any other item required.

The fire sprinkler system design should ensure that upon system completion the installing contractor shall provide 3 hardcover maintenance manuals with all technical information, maintenance and testing programs, all warranties and hard copies of drawings.

Fire sprinkler services design shall be such that nothing about the way plant is designed when erected or installed makes it unsafe for the end user and furthermore ensuring that nothing about the way plant is commissioned makes it unsafe for the end user.

The consultant shall specify that the Fire Service Key required for all door locks and key switches shall be keyed to the 003 fire service key only.

Fire sprinkler control valve assemblies design shall ensure that they are located within a secure enclosure and fitted with anti-tamper devices to prevent unwanted system activation. Fire sprinkler control valve assemblies shall be located in an AS2118.1 compliant location readily accessible to the attending authority and additionally approved by UQ P&F, Building Surveyor and the QFES prior to design finalisation.

All block plans must be provided as engraved traffolyte type and at least A2 (594 x 420mm) in size as a minimum.

All fire sprinkler designs shall nominate the required system duties as a basis for the system performance testing in accordance with the requirements of AS1851.1. All commissioning testings shall be performed in the presence of the UQ representative and all testing results shall be provided to UQ P&F – Planning and Development prior to inspection and approval by the QFES.

Following the completion of the performance testing the QFES Community Safety Inspection Officers will conduct their proving tests as a process in the final certification of the systems.

Fire sprinkler systems shall be designed and installed such that system activation is relayed to the QFES or designated third party monitoring service.

The fire sprinkler service design shall include only SSL pressure switches, installation of other equipment of equal or superior standard shall only be used after the approval.

2.6 Fire Booster

The fire booster shall be located in areas that are readily visible and accessible in accordance with local fire brigade requirements. Ensure all fire rate and protection is in accordance with AS2419 and local fire brigade requirements.

Boosters shall be placed on 150mm thick concrete plinths, within appropriately sized All allowances are be made where appropriate to capture and reuse 80% of the fire test water, via extension of the fire test drain, for irrigation purposes. Ensure that appropriate filtration

cabinet and incorporate nominated booster inlets and outlets complete with couplings suitable for specific local fire brigade connections. All inlets and outlets shall incorporate brass caps, chained to the valve body.

All booster cabinets must include up-to-date fire block plan and notice of working pressure appropriate to the system design.

2.7 Isolation Valves

All gate valves installed on the fire hydrant piping system must be “remotely monitored” gate valves with electronic anti-tamper devices.

All fire isolation valves shall be readily accessible and located above ground at heights not exceeding 1.5m and typically within fire isolated passages or plantrooms unless approved by UQ, project fire engineer or the local fire brigade.

2.8 Fire Test Water

and treatment is used to for the captured fire test water to achieve the suitable water quality for the irrigation type and or local authority requirements.

3. Associated Works

3. Associated Works

3.1.1 Hydraulic - Electrical Termination Points

Item	Work By	Extent of work
Emergency Drencher Shower/Eye Wash	Hydraulic	<ul style="list-style-type: none"> Provide final location of safety shower/eye wash stations Provide and install flow valve, low pressure valve and local audio/visual alarms, ensure valves are located outside of any hazardous areas Provide terminals at the control box for the connection of an alarm power supply. Provide flow switch (c/w relay terminals for alarm signal) on each safety shower/eye wash stations
	Electrical	<ul style="list-style-type: none"> Provide power isolator to safety shower alarm control box locations nominated and make final connection.
Boiling /Chilled filtered Water Units	Hydraulic	<ul style="list-style-type: none"> Coordinate location of boiling/chilled filtered water units with electrical services Connect to outlet provided by electrical
	Electrical	<ul style="list-style-type: none"> Provide power outlet (BMS timed control) adjacent to boiling/chilled filtered water units as required by the hydraulics subcontractor.
Chilled Drinking Fountains	Hydraulic	<ul style="list-style-type: none"> Coordinate location of drinking fountains with electrical services Connect to outlet provided by electrical
	Electrical	<ul style="list-style-type: none"> Provide power outlet adjacent to drinking fountain.
Urinal Flushers	Hydraulic	<ul style="list-style-type: none"> Provide confirmation of urinal locations to the electrical subcontractor Connect to outlet provided by electrical
	Electrical	<ul style="list-style-type: none"> Terminate at an above-ceiling 230V switched socket outlet adjacent to each urinal flusher controller.
Hot water Units	Hydraulic	<ul style="list-style-type: none"> Coordinate location of hot water units with electrical services Connect to outlet/isolator provided by electrical
	Electrical	<ul style="list-style-type: none"> Provide power outlet/isolator(BMS time controlled) adjacent to hot water units
Boosting / Circulating pumps, hot water	Hydraulic	<ul style="list-style-type: none"> Provide locations of all pumps to electrical subcontractor including power loads and connection type eg. Control panel, hard wired, isolator, 3 pin plug.

Item	Work By	Extent of work
heaters, Reverse Osmosis System & trap priming devices	Electrical	<ul style="list-style-type: none"> Provision of isolators and GPO's from switchboard to hot water control panel, re-circulating pump control panel, reverse osmosis systems, boiling and chiller water units and hot water units. Provision of isolators from switchboard to domestic booster pump, water softening unit, and filtration system control panel.
Trade waste system	Hydraulics	<ul style="list-style-type: none"> Co-ordinate location of diversion pipework underground (provided under Civil works) located on the Civil stormwater drainage Co-ordinate location of control panel for external underground Trade waste tank
	Electrical	<ul style="list-style-type: none"> Provide underground conduit from pit to Control panel. Provide direct connection to control panel for external underground Trade waste tank Provide conduits from control panel to external underground Trade waste tank
Sub meters	Hydraulic	<ul style="list-style-type: none"> Provide sub meters
	Electrical	<ul style="list-style-type: none"> Liaise with hydraulic subcontractor prior to first fit and connect power supply to sub meters

3.1.2 Fire – Hydraulic Termination Points

Item	Work By	Extent of work
Fire Test Drains	Fire	<ul style="list-style-type: none"> Provide required locations of floor sumps and or drainpipe including flow rates
	Hydraulic	<ul style="list-style-type: none"> Provide floor sumps and or drainpipe size in locations at co-ordinated locations accommodated the peak fire test water flows nominated by the fire contractor. Pipe test water back to onsite storage if required for the projects ESD pathway.
Water supply	Fire	<ul style="list-style-type: none"> Provide location and connect downstream of dedicated fire connection provided by hydraulic contractor Provide total fire simultaneous demand in L/s
	Hydraulics	<ul style="list-style-type: none"> Provide a dedicated fire connection off the civil water infrastructure including all required metering and backflow prevention device.
Onsite Water Storage	Fire	<ul style="list-style-type: none"> Provide inflow rates in L/s to hydraulic contractor
	Hydraulics	<ul style="list-style-type: none"> Provide drainage provisions for overflows based on inflow rates.

3.1.3 Mechanical - Hydraulic Termination Points

Item	Work By	Extent of work
Floor wastes and tundishes in mechanical plant areas and in walls	Mechanical	<ul style="list-style-type: none"> Provide required locations of floor wastes and tundishes on drawings. Pipe condensate to tundishes and ensure that an air gap remains between the tundish and condensate pipe discharge or connection to dry stack if provided. Provide insulation as necessary to prevent condensate and cold tracking.

Item	Work By	Extent of work
	Hydraulics	<ul style="list-style-type: none"> • Provide floor wastes and tundishes in locations shown on mechanical drawings. • Provide fire rated in-wall tundishes in locations shown on mechanical workshop drawings. • Oversee final connection to TD to confirm compliant airgap is maintained and inform mechanical contractor of defect.
BMS Interface & monitoring of status, alarms, control, etc.	Mechanical	<ul style="list-style-type: none"> • Provide cabling between the BMS/specific university monitoring system and terminal strips located within the hydraulic panels to receive status signals including: <ul style="list-style-type: none"> - <i>Hot water plant;</i> - <i>circulating pumps;</i> - <i>Sub flow meters;</i> - <i>Eye Wash/Safety Showers and</i> - <i>Pump well level alarms</i> - <i>Water leakage detector</i> - <i>Reverse Osmosis System</i> • Coordinate with the Hydraulic subcontractor regarding signal types and scaling factors for meters. All scaling factors and calibration information is to be supplied by the provider of the hydraulic meter.
	Hydraulics	<ul style="list-style-type: none"> • Provide labelled terminal strips at the Hydraulic panel located within each building and make available at the terminal strip the output signal from the scheduled hydraulic points. • Provide all devices such as water meters and ensure devices provide a pulsed output type suitable for data capture by the BMS/specific university monitoring system. • Monitor pumps and other hydraulic equipment and transfer fault signals to the terminal strip at the hydraulic control panel. • Wire from all meters to the terminal strips to export metering data. • Coordinate signal type with the Mechanical/BMS subcontractor. • Provide scaling factors and calibration information for the hydraulic sub meters and water leakage detectors.
Cold water supplies	Mechanical	<ul style="list-style-type: none"> • Provide required locations of cold water supplies on workshop drawings. • Provide all flow rates in L/s. • Provide pipework from the isolation valve provided by hydraulic contractor to the mechanical plant.
	Hydraulics	<ul style="list-style-type: none"> • Provide cold water supplies of the size, quantity and at the locations shown on the mechanical workshop drawings. Terminate the cold water supply at an isolation valve. • Provide RPZ backflow prevention valves where applicable. • Provide floor waste/Tundish where an RPZ is required.

Item	Work By	Extent of work
Trade Waste System	Mechanical	<ul style="list-style-type: none"> Provide ventilation where required to dedicated trade waste room
	Hydraulics	<ul style="list-style-type: none"> Provide air intake and exhaust requirements to mechanical contractor. Co-ordinate final location of tradewaste apparatus.

3.1.4 Building Trades - Hydraulic Termination Points

Item	Work By	Extent of work
Pipework penetrations	Hydraulic	<ul style="list-style-type: none"> Confirm dimensions/sizes of large hydraulic penetrations on workshop drawings to verify penetrations indicated on Architectural and Structural drawings are adequate; Confirm dimensions/sizes of access panels for access to isolation valves and inspection openings for the maintenance of hydraulic services and for compliance with AS3500; Confirm dimensions/sizes of holes required in finished surfaces for hydraulic services; Confirm dimensions, sizes and location of all in-wall tundish locations including where they are fire rated.
	Building Trades	<ul style="list-style-type: none"> Provide all ducts and large hydraulic penetrations (blockouts) as shown on Architectural and Structural drawings; Provide all large hydraulic penetrations (blockouts) as shown on Architectural and Structural drawings; Provide access panels to all pipework, inspection panels in walls and false ceilings; Provide access panels and inspection panels in walls and false ceilings; Provide and cut all holes in finished surfaces, timber, cupboards, false ceilings, vanity units, shelves; Provide all framing included fire rated framing to in-wall tundishes and TMVs.
Gutters and Downpipes	Hydraulic	<ul style="list-style-type: none"> Confirm dimensions/sizes and location of gutters and downpipes on workshop drawings
	Building Trades	<ul style="list-style-type: none"> Provide downpipes, eaves gutters, roof valley gutters, rainwater heads and sumps
Concrete plinths	Hydraulic	<ul style="list-style-type: none"> Confirm dimensions/sizes and location of concrete plinths required for hydraulic services plant equipment on workshop drawings.
	Building Trades	<ul style="list-style-type: none"> Concrete plinths for the following equipment: <ul style="list-style-type: none"> All hot water units Circulating pumps Concrete foundations for the following equipment: <ul style="list-style-type: none"> Tradewaste tank

18.2.5 Hydraulic - Civil Termination Points

Item	Work By	Extent of work
Sewer Reticulation	Civil	<ul style="list-style-type: none"> Provide a stub connection from the sewer infrastructure at the co-ordinated location with the hydraulic contractor including size and invert. Terminate within one meter of the site boundary. Where required – provide a maintenance shaft/manhole at the co-ordinated location with the hydraulic contractor including size and invert. Terminate manhole within one meter of the site boundary
	Hydraulic	<ul style="list-style-type: none"> Provide location, depth and size including proposed flow rates based on AS3500.2 of fixture loading converted into L/s. Hydraulics contractor to make final connection from the building to the stub/manhole and co-ordinate/confirm final location with Civil contractor including invert, depth of cover and size.
Potable and Fire Mains	Civil	<ul style="list-style-type: none"> Provide the new connection at the co-ordinated location with the hydraulic contractor including size and invert. Terminate within one meter of the site boundary. Where connections to water authority are proposed, provide the design and application of the new connection and authority water meter.
	Hydraulic	<ul style="list-style-type: none"> Hydraulics contractor to extend the incoming potable and fire water main downstream from Civil connection. Provide all containment backflow prevention devices either within the meter arrangement or immediately downstream of meter. Obtain all necessary pressure and flow information to validate the design.
Stormwater Reticulation	Civil	<ul style="list-style-type: none"> Provide a legal/lawful point of discharge Provide all onsite detention systems including outlets to legal/lawful point of discharge Provide stormwater pits and underground stormwater network for receipt of rainwater tank overflows, roof drainage system via downpipes and storm water generated from internal spaces within the building open to atmosphere e.g open courtyards
	Hydraulics	<ul style="list-style-type: none"> Provide all flow rates at each termination location Connection of roof drainage system to terminate above grated pits except where onsite rainwater harvesting is required. Provide all below ground stormwater from roofs and internal building open to atmosphere areas and terminate at detention system
External Services (General)	Civil	<ul style="list-style-type: none"> Assist in site wide co-ordination with existing survey/services with the design team to confirm alignment, grades and depth of cover of hydraulic services

Item	Work By	Extent of work
		<ul style="list-style-type: none"> Assist in site wide levels and grading of levels to promote compliant ORG levels
	Hydraulics	<ul style="list-style-type: none"> Assist in site wide co-ordination with existing survey/services with the design team to confirm alignment, grades and depth of cover of hydraulic services Provide ORG locations and proposed levels to assist in co-ordination of external levels.

3.1.5 Irrigation – Hydraulic Termination

Item	Work By	Extent of work
Water Supplies	Irrigation	<ul style="list-style-type: none"> Provide required locations or connection points including flow rates in L/s and required minimum and maximum pressures at each connection Provide monthly and annual system volume requirements for establishment and ongoing maintenance of all greenspaces to allow sizing of any onsite storage to occur Extend from provisional point provided by hydraulic contractor and distribute to all irrigation network.
	Hydraulic	<ul style="list-style-type: none"> Provide a capped connection point complete with suitable backflow prevention device at the co-ordinated termination point. Provide onsite dedicated storage, filtration and onsite pump set for irrigation purposes
Drainage	Irrigation	<ul style="list-style-type: none"> Provide locations of each planter box and indicative drainage outlet location Connect and install all sub-soil and sub-cell planter drainage to the provisional point provided by hydraulic contractor
	Hydraulics	<ul style="list-style-type: none"> Provide a dedicated drainage outlet including puddle flange and upstand overflows at each planter box location.

3.1.6 Reverse Osmosis Plant – Hydraulic Termination

Item	Work By	Extent of work
Water Supplies	RO Specialists	<ul style="list-style-type: none"> Provide required sized plant to cater for the quality type and peak flow rates of the system Connect to capped inlet and outlet supply Commission the plant and system including all alarms and interface with BMS
	Hydraulic	<ul style="list-style-type: none"> Provide a capped connection point complete with suitable backflow prevention device, sub-meter and pressure reduction valve at the co-ordinated termination point. Provide capped outlet and reticulation pipework of the RO system Provide final flow rates
Drainage	RO Specialists	<ul style="list-style-type: none"> Provide locations of each drainage outlet location

Item	Work By	Extent of work
		<ul style="list-style-type: none"> Connect final drainage outlet from plant to the provisional point provided by hydraulic contractor
	Hydraulics	<ul style="list-style-type: none"> Provide a dedicated and suitably sized and material selected drainage outlet based on flow rates and effluent chemical characteristics Oversee final connection to ensure registered airgap is compliant with Plumbing Standards.

3.2 General All trades

Item	Extent of work
Interfaces	<ul style="list-style-type: none"> Confirmation of interface details shown on design drawings 1 month after letting of contract
Deliveries	<ul style="list-style-type: none"> All fragmented and vertical movement of equipment within and around buildings after initial delivery
Detailing of interfaces	<ul style="list-style-type: none"> Clear identification and details of all work by other trades on working drawings and submission 2 months prior to the need for the interface to be provided.
Penetrations	<ul style="list-style-type: none"> All fire/acoustic/security sealing and associated works required to maintain the integrity of penetrations.
Sequencing	<ul style="list-style-type: none"> Full coordination with other trades on sequence of works and spatial locations of the works including attendance at coordination/sequencing workshops and meetings.
Protection of works	<ul style="list-style-type: none"> Protection of the works of other trades from damage in the work zone and access routes utilised by the trade subcontractors.

4. Schedules

4.1 Materials/Equipment/Product Schedule

Building element	Material/Product/Code	Comment	Manufacturer	Contact
Lab Tapware	Broen cold water BN-X225-J		Broen	SGF Laboratories Gary Fitzpatrick 0438279996
	Enware			
	Galvin			
Hot water pipe	Copper (minimum 12mm)		n/a	n/a

4.2 Contacts Schedule

Reason for Contact	Organisation/Group	Name	Contact Number
Security Keys	UQ Property and Facilities – security (keying)	Trevor Rowntree	3365 3055