

## SECTION 24

### HYDRAULIC SERVICES

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1	9 April 2013	Multitech for JCU	First Edition
2	30 September 2013	Manager, Infrastructure Services	Revised with JCU comments
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V3	02/07/18	Manager, Infrastructure Services	2018 general review update

## **24.0 HYDRAULIC SERVICES**

This document is a sub-section of the James Cook University (JCU) Design Guidelines and is not to be read in isolation. Consultants and Contractors are required to comply with all sections of the JCU Design Guidelines.

### **24.1 Design Process Requirements**

The consultant shall be held responsible / liable for ensuring that all works necessary for the complete installation and successful operation are included in the design and specifications. Specific deliverables are required at the end of each project stage, namely:

#### **24.1.1 Approvals Required during Design**

Approval shall be obtained from the JCU Estate Directorate, Deputy Director, Planning and Development at SD for the:

- Plant numbering sequence,
- Use of any rain water harvesting including pre-treatment devices and rain water tank sizing calculations,
- Hot drinking and non-drinking water generation method (solar or heat pump),
- Proposed use of valves not manufactured from Brass or Stainless steel,
- Proposed use of Thermostatic Mixing Valves (TMV)
- Filters designed to cater for specific use areas, e.g. labs and remote areas,
- Proposed use of Sewer lifting stations
- Proposed use of Trade Waste lifting stations, and the
- Proposed treatment of any waste water for re-use.

Approval shall be obtained from the JCU Estate Directorate, Manager, Infrastructure Services at SD for the:

- Proposed reduced grades for waste water or trade waste reticulation, and the
- Assessment of the requirements of the local authority for trade waste pre-treatment.

#### **24.1.2 Site Infrastructure Connection Approvals**

The Manager, Infrastructure Services is responsible for approving the Hydraulic Services Application (which is to be prepared and submitted to the Local Authority by the Hydraulic Design Consultant) on behalf of JCU, PRIOR to that submission.

Furthermore, the Manager, Infrastructure Services is responsible for approval of all connections to JCU's existing infrastructure, including water mains, fire and sewer infrastructure. A single request (per hydraulic system) to connect to the JCU site infrastructure is to be sent to the Manager, Infrastructure Services, at least 3 working days before the connection is required.

This request shall contain the following information;

- Form 15 or statement from designer that design meets code requirements
- Form 16 or statement from installer that installation has been done in accordance with design
- As built drawing of surveyed in-ground pipework, pits/manholes or valves and connection points to existing trunk lines.
- Certificate of Design Compliance as per 24.1.4 completed by the CD RPEQ Design Engineer.
- Hydraulic Commissioning Plan (including connection and testing procedure)
- Certificate of Installation Compliance
- Water quality test result (pre-connection clean and or passivation)
- Water pressure test results (Form 71)
- System commissioning test results
- Water supply network analysis with the above water demand and fire flow modelled.
- Static and Dynamic Models for fire design basis.
- Site sewerage PWWF modelling with proposed development added
- System commissioning and test results in compliance with legislation and codes

#### **24.1.3 Schematic Design (SD) Report / Design Review**

Report Content in addition to requirements of Section 30:

- Results of any Flow and Pressure testing on water main/s adjacent to the site and any requirements for pumps and tanks to supplement the mains water supply
- A description of:
  - the roof & storm water drainage design for the project including interfaces with the civil infrastructure,
  - any rain water harvesting including pre-treatment devices and rain water tank sizing calculations for approval by the Deputy Director: Planning and Development
  - the cold drinking and non-drinking water service
  - the warm water design intent including the required temperatures under the relevant standards
  - Outcome of risk assessment and backflow prevention requirements,
  - the sanitary plumbing and drainage systems,

- any trade waste plumbing and drainage required for the project ,
- proposed waste and trade waste water pipe grades, especially if reduced grades are proposed and if there is any proposal for a waste water lifting station – approval is required for either concept
  - the design intent for any reticulated LP or Natural gas for the project including storage requirements, safety equipment, labelling etc.
- Assessment of best method of generating hot water for approval by JCU Deputy Director; Planning and Development; heat pump, solar, electricity or gas.
- A drawing proving that the drainage systems proposed will work i.e. showing invert levels from the furthestmost points to the connection points can be made on a standard grade and without having to have a reduced grade on any section of drain
- Design intent for drainage other than in stable ground i.e. drains in highly reactive ground and results and recommendations from the Geotechnical Engineer on the soil conditions.

#### **24.1.4 Developed Design / Design Review**

Report Content in addition to requirements of Section 30:

- A detailed description of:
  - the roof & storm water drainage design for the project including interfacing with the civil infrastructure
  - any rain water harvesting including pre-treatment devices and final tank size if approved in SD
  - drainage design for installation in other than in stable ground i.e. drains in highly reactive ground and confirmation of recommendations from Geotechnical Engineer
  - the warm water design including the required temperatures under the relevant standards
  - the sanitary plumbing and drainage design including the materials, grades and types of plumbing systems to be used
  - the trade waste plumbing and drainage design required for the project including any required pre-treatment devices (local authority requirements to be specified)
  - gas pipe sizing calculations of the design for any reticulated LP or Natural gas for the project including storage requirements, safety equipment, labelling etc.
- A report on:
  - the cold drinking and non-drinking water service design including site connections, metering, backflow prevention, insulation, signage etc.
  - the design for the hot drinking and non-drinking water services including type of hot water generation, tempering, insulation, description of flow and returns etc.
- All IFC drawings and design calculations
- Updated site mains and waste water schematics, showing positions of all new valves and SMHs
- Updated stormwater drainage drawing

The Developed Design JCU RPEQ Certification Schedule below shall be completed by the DD Design Engineer and submitted for confirmation.

<b>Project Name</b>		
<b>Project Number</b>		
<b>Date</b>		
<b>Company</b>		
<b>RPEQ Design Engineer Name</b>		
RPEQ Licence Number		
Building Area (GFA)	sqm	
Building Area (UFA)	sqm	
Calculated Building Peak Mains Water Flow (excl Fire Water Demand as per Section 29)	l/s	
Calculated Building Peak Hot Water Flow /Demand storage/recovery	l/s	
Calculated 24 hr Systems Peak Mains Water Flow Demand (excl Fire Water Demand as per Section 29)	l/s	
Calculated Building Peak Sewer/Sanitary Water Flow	l/s	
Calculated Building Peak Trade Waste Flow	l/s	
LP or Natural Gas flow		
Hydraulic Services Estimated Capital Investment (ex GST)	\$	
Pedestal Count		
Urinal Equivalent Pedestal Count (included above)		
Total number of Filters	No. Off	
Total number of Hose Taps	No. Off	
Total number of Valves	No. Off	
Total number of Gully Traps	No. Off	
Total number of Trade Waste Pre-treatment stations	No. Off	
Size of approved Rain Water Tank	klitre	
Any other plant and equipment requiring routine inspections	No. Off	
<b>Manager Infrastructure Services</b>		
All specific design elements are included in the design	YES / NO	
Does the investment decision in SD Report include Life Cycle Costing	YES / NO	

#### 24.1.5 Contract Documents Requirements

In addition to requirements of Section 30, include an updated Certification Schedule as per 24.1.4 completed by the CD RPEQ Design Engineer.

#### 24.1.6 Handover Requirements

Following commissioning, undertake a witness inspection of the operation. Ensure that the Consulting Engineer and JCU Manager, Asset Strategy and Maintenance and/or JCU Manager, Infrastructure Services (or representatives) are present.

As a minimum, prove to their satisfaction:

- Testing and commissioning of all hydraulic systems were witnessed and signed off by an

independent testing authority not associated with the hydraulic contractor.

- Legionella count test results on all circuits and systems
- Proof of isolation between potable and non-potable cold and hot water systems.
- CCTV inspection footage, .mpeg format.
- Inspection sheets showing that testing has been done to AS3500/AS2141 and AS2118 and other mandatory standards.
- Local Authority Completion Certificates.

Following commissioning, undertake a witness inspection of the operation of the hydraulic systems. Ensure the JCU appointed Consultant hydraulic engineer and Manager, Infrastructure Services, or representative are in attendance.

As a minimum, prove to their satisfaction:

- The hot water systems are installed and operating as designed
- Warm water temperatures are correct
- Laboratory gas shutdown controls function correctly
- Sample 10-20% of WC flushing

Rectify any defects identified. Should re-inspection be required, the cost of consultants reinspections will be deleted from the contract sum. In addition to Section 30, Operating and maintenance manuals must include as a minimum:

- Final certification from the Local Authority
- Commissioning results of TMVs and backflow devices
- Gas installation certificates

## **24.2 Hydraulic Equipment Requirements**

JCU owns, operates and maintains all infrastructure services and all academic buildings on and within the campuses. The RPEQ consulting engineer shall take a long term investment and maintenance decision strategy when designing the systems.

The mains water supply for any building shall be designed to include a dedicated water service isolated by double check valves located in an accessible approved position.

The design shall include the requirement for a full campus water mains flow and pressure test specific to the project site, prior to the design of any mains water service. Flow and pressure testing results should be verified by the installing contractor prior to the commencement of works.

All exposed pipe work is to be chrome plated. All hydraulic penetrations in building fabric to be finished with chrome wall or floor flanges and the penetration shall achieve the required fire rating for that part of the building. Water and gas services in buildings located within structural concrete slabs are to be designed to be fully retrievable.

### 24.2.1 Identification of Equipment

Confirm the plant numbering sequence with JCU Deputy Director – Planning and Development prior to Contract Documentation. Prefix equipment with building number (xxx) for Townsville, the Cairns building number is an integral part of the sequence.

All items of equipment must be suitably identified with Traffolyte labels.

Generally all plant is to be numbered as follows (xxx is building identifier):

- Valves “xxx-RPZ-01” Townsville or “RPZ-xxx-01” Cairns

### 24.2.2 Storm Water Requirements

#### 24.2.2.1 Storm Water Drainage

External down pipes are to discharge over storm water inlet pits where not connected to a rain water harvesting tank.

Down pipes are to discharge over minimum 450x450 inlet pits with a minimum depth of 4 times the diameter down pipe discharging over it. The outlet of the downpipe is to be a minimum 150mm above the grate, for ease of clearing, and be angled so that the discharge, no matter how minor, discharges over the grate of the pit.

Falls and run-off for stormwater are to be provided to field gullies and connected to the stormwater system.

Provision is to be made for overland flow from stormwater collection pits. Do not provide for run off from paved area over grass.

Gully and trench grates to be traversed by pedestrians are to be heel guard type and all grates to be hot dipped and galvanized (stainless steel for higher quality finish). Grates to be minimum of 450mm width.

All stormwater drainage shall be a minimum 150mm internal diameter.

Co-ordination with the site drainage and landscape architect will need to be demonstrated during the all stages of the design

#### 24.2.2.2 Roof Drainage

Box gutters and concealed eaves gutters are NOT permitted.

All roof drainage systems are to be fabricated from marine grade stainless steel including roof gutters and downpipes with the overflow to the outside of the building and the secondary overflow path away from the building.

The Eaves Gutters shall be sized to a 1:20 year Average Return Interval (ARI) and the sole of eaves gutters are to be a minimum 200mm wide and must allow ease of access into the gutter for cleaning. The back and stop ends of the eaves gutter is to be a minimum 30mm higher than the front of the eaves gutter.

The minimum size of a downpipe shall be 150 mm.

Leaf guard is not to be installed on gutters. The roof drainage system is to be designed to withstand cyclonic conditions and add a 10% safety margin to the final calculations for sizing.

Down pipes within building elements will have a test gate and expansion joint at the base in an accessible position and will be hydrostatically tested. Access panels are to be nominated on the

hydraulic plans and co-ordinated with the Architect.

Section 8.6 contains the requirements for Roof Access.

#### 24.2.2.3 Rain Water Tanks

Rain water harvesting and a wet system of tank fill are not preferred by James Cook University. If a business case can be proved and the requirement is approved by the JCU Estate Directorate, Deputy Director, Planning and Development, the rain water tanks will be out of the ground, constructed with non-trafficable roof tops, be insect and vermin proof and be sized relative to the catchment area and rainfall data for the area where they will be installed.

A permanent means to exclude leaf litter and debris from entering the tank will be required this could be in the form of leaf excluding rain heads or sieves on the inlet to the tanks.

Underground tanks shall be avoided but if required and approved, they shall be designed by a structural engineer, have reflux valves fitted to the outlets, have bolt down gatic access lids positioned over the inlets and outlets of the tank and be positioned so that a vacuum truck can access it to clean the bottom of the tank.

Where rainwater harvesting is implemented, a first flush roof cleaning system is to be included. First flush rain water catchment and runoff is to be based on a Q20 storm re-occurrence over the roof area per downpipe. Ensure the first flush rain water is disposed of without any detrimental effect to the building and adjacent landscape.

#### 24.2.2.4 Drainage in other than Stable Ground

All drainage in unstable ground is to be protected from excessive soil movement and will be required to be designed & certified by a suitably qualified/registered engineer. The hydraulic engineer is to document in the SD and DD reports the results and recommendations from the Geotechnical Engineer on the soil conditions.

### **24.2.3 Mains Water Requirements**

#### 24.2.3.1 Drinking Water

Further to the detail in Section 30, water metering shall be provided for all new buildings - or when carrying out alterations and/or extensions to buildings without metering.

Drinking water will be connected to site water infrastructure and sized to meet the maximum demand of the building. The water will pass through an above ground digital full flow meter assembly connected to the JCU BMS (See Section 23 for class and model requirements). All tenancies will be fitted out with the same type of meter.

The meter assembly will include an appropriate backflow device have a full flow bypass under the meter assembly and means of disconnection to service/replace the meter, strainer & backflow valve as required.

The water pressure will be limited as per the standards and also to individual equipment as per the manufacturer's instructions.

The water is to be designed so that each floor, group of fixtures and individual fixtures can be isolated with a tested gate valve which is located in an accessible position not more than 1500mm above Finished Floor Level (FFL). This will enable maintenance to be carried out and new branch lines to be installed without having to shut the water down to entire buildings.

Access panels are to be nominated on the hydraulic plans and co-ordinated with the Architect.

In-ground Cold water services shall be Class B copper tubing up to 100mm, above 100mm shall be minimum class 18 uPVC blue brute. All above ground water services to be installed in Class B copper tube. All exposed pipework shall be chrome plated.

Each fixture is to have its own isolation valve for maintenance.

#### 24.2.3.2 Non-Drinking Water

The non-drinking water will be connected to a non-drinking water supply and sized to meet the maximum demand of the building. The water will pass through an above ground digital full flow meter assembly connected to the JCU BMS (See Section 23). The meter assembly will include an appropriate backflow device have a full flow bypass under the meter assembly and means of disconnection to service/replace the meter, strainer & backflow valve as required.

The non-drinking water pressure will be limited as per the standards and also to individual equipment as per the manufacturer's instructions. Any non-drinking outlets will be signed appropriately.

The non-drinking water design is to be designed so that each floor, group of fixtures and individual fixtures can be isolated with a tested gate valve which is located in an accessible position not more than 1500mm above Finished Floor Level (FFL). This will enable maintenance to be carried out and new branch lines to be installed without having to shut the non-drinking water down to entire buildings. Provide details of the required signage at the point of discharge of non-drinking water points.

Access panels are to be nominated on the hydraulic plans and co-ordinated with the Architect.

Each fixture is to have its own isolation valve for maintenance.

In-ground non-drinking water service pipes shall be compatible with the quality of the drinking water supply.

#### 24.2.3.3 Drinking and Non-Drinking Hot Water

The preferred method of generating hot water is with solar or gas boost. Heat pumps are not permitted to be installed inside a building or enclosure. Permission must be sought from Deputy Director – Planning and Development on the type of water heater at time of SD and confirmed at each milestone.

Where multiple hot water systems are required they shall designed to the relevant standards and manufacturers requirements. The consultant's drawings shall include details of how the hot water systems are to be manifolded together and balanced.

In instances of wait times for hot water of more than 15 seconds a balanced flow and return system is to be designed for the building.

Instantaneous hot water units can be utilised in instances of a fixture requiring hot water that is remote from the buildings hot water systems and to eliminate the need for excessive runs.

All hot water storage tanks inside a building are to be provided with a drained copper safe tray. All hot water pipes, valves and equipment is to be insulated as per the Australian Standards. Allow for sufficient space around the unit for removal of elements and above the unit for the withdrawal of anodes.

The hot water design is to be designed so that each floor, group of fixtures and individual fixtures can be isolated with a tested gate valve which is located in an accessible position not more than 1500mm

above Finished Floor Level (FFL). This will enable maintenance to be carried out and new branch lines to be installed without having to shut the non-drinking water down to entire buildings. Each fixture is to have its own isolation valve for maintenance, quarter turn valves are not permitted. Access panels are to be nominated on the hydraulic plans and co-ordinated with the Architect.

Install a backflow device with the required level of protection to the hot water service to fixtures requiring non-drinking hot water. Provide details of the required signage at the point of discharge.

Gas fired hot water units shall be mains pressure storage units in single or multiple installations.

Quick Recovery or Boiling Water Units to single isolated applications such as tea preparation stations, may be provided by the use of a under sink mounted quick recovery unit.

#### 24.2.3.4 Hot Water Pumps

Hot water circulating pumps shall be provided in hot water flow and return loops to minimise dead legs. The hot water circulating pump shall be installed on the return hot water loop. Pumps shall be "in line" model with isolation valves either side of the pump to facilitate replacement or maintenance. Pump casings shall be bronze with bronze impellers and mechanical seals. Hot water circulating pumps shall be controlled by a thermostat in the return line. A time clock shall be provided to the power source of the pump and set to the operating hours of the building it serves.

Visually accessible temperature devices are to be provided on the upstream and downstream sides of the circulation pump to enable monitoring of the systems operational temperature, also to allow the correct adjustment to the circulation pump.

Where the system is required to provide larger volumes of circulated hot water an intelligent logic controller is to be specified with timers allowing pumps to run during working hours controlled by a thermostat on the return line.

#### 24.2.3.5 Valves

All valves are to be DR Brass, Stainless steel or an equal if approved by the Estate Directorate, Deputy Director, Planning and Development. All valves are to display either their water mark or Australian standard approval. Control valves shall be provided on all hot and cold supply to all individual fixtures.

All valves 50 mm and greater to be installed with barrel unions with class D flanges.

Thermostatic Mixing Valves (TMV) shall be approved by the Deputy Director – Planning and Development. Set to requirements of AS 3500 and only used as per legislative requirements, e.g. disabled toilets.

Control valves are to be tested gate valves, Brass or Stainless steel and installed a minimum of 1500mm above finished floor level. Control valve shall be provided so as to isolate fixtures, groups of fixtures and individual floors of buildings.

Pressure limiting valves shall be provided to ensure individual fixtures have a maximum pressure of 500Kpa or a lesser pressure if required to comply with manufacturer's instructions.

Valve markers to be installed as per the FNQROC standard detail.

#### 24.2.3.6 Water Filters

Filters shall be designed to cater for specific use areas, e.g. labs and remote areas, and approved by Estate Directorate, Deputy Director, Planning and Development.

#### 24.2.3.7 Insulation

In all cases pipe insulation is to comply with the requirements of the NCC latest edition Section J for thermal properties for the relevant climate zone.

#### 24.2.3.8 Hose Taps

Hose taps are required on the external four corners of all buildings and are to be DR Brass vandal proof, with jumper valve and key type displaying water mark or Australian standards marking.

Provide water backflow protection to suit hazards identified in the SD risk assessment.

#### 24.2.3.9 Backflow Prevention

Back-flow prevention devices to AS 3500 shall be fitted to all buildings and to supply lines connected to fixtures and fittings requiring back flow prevention e.g. non-drinking water to a Laboratory, supply to a hose tap adjacent a grease trap, etc. or other waste water treatment facility.

The back flow device shall be rated according to the relevant hazard level it is protecting the water supply from. Barrel unions are to be fitted either side of the back flow device to facilitate the ease of maintenance or replacement. The minimum size of a drain or tundish for a back flow valve shall be 100mm.

Back flow devices shall not be fitted anywhere on a building where it may cause damage to the building, a slip hazard or become a nuisance. The discharge from drain hole is to be easily visible from buildings, pathways or roads adjacent the installation.

All ported backflow prevention devices shall be provided with a Tundish sized to AS3500 but in no case smaller than 100mm.

All backflow prevention valves located externally shall be in a vandal proof enclosure and included in the SD Risk Assessment.

### 24.2.4 Specific Fire Water Requirements

Please see Section 29 of these Design Guidelines

### 24.2.5 Waste Water Requirements

#### 24.2.5.1 Sanitary Drainage

The design shall allow for all waste/sanitary drainage to be fed to the campus infrastructure via gravity at normal grades and in accordance with the local authority's requirements. Reduced grade drains are to be avoided at all times. If reduced grades are required, approval must be obtained from JCU's Manager, Infrastructure Services at time of SD and confirmed at each milestone.

Sewer lifting stations are to be avoided at all times. If a lifting station is required then permission must be sort from JCU Estate Directorate, Deputy Director, Planning and Development at time of SD and confirmed at each milestone.

Pipe Materials shall suit the conditions of the wastewater (temperature, trade waste etc.)

Inspection chambers shall be installed in accordance with Local Authority requirements with cast iron gas tight chamber covers stamped 'SAN'.

Sanitary risers will have a test gate and expansion joint at the base on each floor in an accessible position. Access panels are to be nominated on the hydraulic plans and co-ordinated with the Architect.

#### 24.2.5.2 Tundishes

Tundishes to be stainless steel sized to comply with AS 3500 with a minimum size of 100mm and shall be trapped where required.

#### 24.2.5.3 Gully Traps

All gully traps are to have a non-mechanical permanent method of charging/priming.

Gullies unable to be charged by a fixture shall have their water seal protected by a priming device e.g. The priming device shall connect to the nearest WC flush pipe and run under slab in 6mm copper tube to connect to the FWG above the water seal. The copper tube is to be encased in dense wrapping.

Floor waste gullies shall have a non-slip finish, with chrome plated brass or stainless steel screwed grates set flush with the floor finish surface. All floor wastes in concrete floor slabs shall have puddle flanges. All floor wastes shall be regularly charged via a basin, condensate drain or a non-mechanical priming system – a hose tap will not suffice.

#### 24.2.5.4 Clear Outs

Clear outs will be provided as per the standards and provided every 30m and at changes of direction of all drainage systems. Clear outs will be chrome plated brass and will have concrete surrounds in soft landscaped areas and will be 100mm above the surrounding surface.

Clear outs will be provided adjacent to every Water Closet (WC) on ground floor in an accessible position to enable clear access to drainage system.

#### 24.2.5.5 Trade Waste Pre-Treatment

The requirements of the local authority shall be assessed and communicated to the Manager, Infrastructure Services at time of SD and confirmed at each milestone.

Grease traps will be required for all greasy waste lines and also be installed prior to oily water pre-treatment by an oil water separator. Grease traps are to comply with Local Authority requirements.

All above-ground trade waste pre-treatment devices shall be fit for purpose and made of marine grade stainless steel and preferably under cover or inside plant rooms.

20mm Anti-vandal Hose taps with the required backflow will be positioned within 6m of trade waste devices for cleaning purposes.

GITs installed above-ground shall be installed on a minimum of 100mm concrete plinth designed by a structural engineer. Bollards are to be provided if required to protect from vehicular traffic or mechanical damage.

Oil/Water separators are to above ground type manufactured from stainless steel and installed under cover within a bunded area.

A sampling point is to be provided.

Other than treatment to comply with trade waste requirements, waste water shall not be treated or re-used, including grey water.

#### 24.2.5.6 Trade Waste Drainage

The design shall allow for all trade waste drainage to be fed via gravity to the site infrastructure after being treated to the local authority's requirements through proprietary pre-treatment device.

Reduced grade drains are to be avoided at all times. If reduced grades are required, approval must be obtained from the Manager, Infrastructure Services at time of SD and confirmed at each milestone.

Trade Waste lifting stations are to be avoided at all times. If a lifting station is required then permission must be sort from the Estate Directorate, Deputy Director, Planning and Development at time of SD and confirmed at each milestone.

Trade Waste risers will have a test gate and expansion joint at the base on each floor in an accessible position. Access panels are to be nominated on the hydraulic plans and co-ordinated with the Architect.

#### 24.2.5.7 Waste Water Treatment and Re-use

The treatment of any waste water for re-use is to be submitted to the Estate Directorate, Deputy Director, Planning and Development for approval.

#### 24.2.6 LPG / Natural Gas Services

Gas services shall be Natural Gas or Liquefied Petroleum Gas. The gas services engineer shall provide the pipe sizing calculations in the DD report and allow for future expansion of the reticulated gas system by a minimum of 20%. All joints in the reticulated gas system shall be silver soldered with a minimum 15% silver solder and pipe work is to be concealed from view. Where the pipe-work is visible it shall be protected from mechanical damage and be chromed plated.

Provide in the design a keypad operated Room Gas Control Keypad Panel adjacent to the normal entry/exit door so that the gas cut-out emergency button may be activated when exiting in an emergency situation. The control panel is to be connected to gas sniffers suited and located to the particular gas being used within the room, which will shut down the gas in the event of a leak.

The gas design is to be designed so that each floor, group of fixtures and individual fixtures can be isolated with a tested gas ball valve which is located in an accessible position not more than 1500mm above Finished Floor Level (FFL). This will enable maintenance to be carried out and new branch lines to be installed without having to shut the gas down to entire buildings.

Access panels are to be nominated on the hydraulic plans and co-ordinated with the Architect.

Where LP gas cylinders are to be installed, locate as per AS601 and allow for the following as a minimum:

- Double cylinder installation connected in parallel;
- Provide a secure mesh or vented enclosure to cylinders with lockable gates;
- Locate as close as possible to high usage rooms and in close proximity to service road for ease of access for bottle replacement or in situ filling;
- Locate on a concrete plinth at level above adjacent garden beds;
- Provide hard paving access to the LP gas cylinders; and
- Provide hazardous material signage.

#### 24.2.7 Laboratory Hydraulic Services

Laboratories should contain appropriate laboratory sinks, emergency deluge showers, emergency eye washes and separate hand washing basins. The hand wash basins will require drinking cold and warm water and be located near the entry/exit points of the Laboratory. The emergency deluge showers, emergency eye washes will require drinking water connections and be within 10 seconds reach for any individual. The emergency deluge showers shall be connected to a minimum 25mm drinking water service.

Height adjustable Laboratory sinks may be required to provide access. Height adjustable Laboratory sinks will require watermarked approved flexible connections long enough to suit the joinery movement. In some instances where corrosive chemical exposure is likely, the use of porcelain bowl sinks may be necessary.

Special water systems (such as deionised, demineralised, reverse osmosis or purified) where required should be accurately defined in terms of demand and water quality. Laboratories may provide their own water treatment/purification systems which may require pre-treated water, UV sterilisation, carbon filtration, storage tanks/vessels, recirculation pumps, special piping and avoidance of dead legs, and special metal-free fittings and tapware. Systems may be either stand-alone or recirculating depending on quality and quantity.

Enquire of the nature of liquid wastes to be produced in the Laboratory and determine in consultation with the local authority whether dilution, neutralisation or holding may be required for the application.

#### **24.2.8 Interfaces with BMS and EMS**

The wet services design is to include all required interfaces from the hydraulic equipment & control panels to JCU's BMS, as specified in JCU Design Guideline Section 23 and to JCU's EMS, as specified in JCU Design Guideline Section 25.

This includes:

- All Water Meters
- Pumps – signals for pump run/stop, pump fail & high/low level alarms
- Gas – signals from gas control panels on/off and emergency shut down
- Any injection system, i.e. chlorine injection

#### **24.2.9 Metering**

Water metering will be provided to all new buildings or to buildings undergoing refurbishment or extensions. The meters shall be an electric digital full flow meter and be capable to be connected to Special Applications – Laboratories. For tenancies, JCU will supply the Class 1 meter specification.