


Section 12 Hydraulics.



Design Standard Guidelines Index:

- 01 General
- 02 Architecture
- 03 Audio Visual
- 04 Civil
- 05 Communication Cabling
- 06 Design for access and mobility
- 07 Documentation Standards
- 08 Electrical
- 09 Environmentally Sustainable Design (ESD)
- 10 Fire and Life Safety
- 11 Interior Design
-  12 **Hydraulics**
- 13 Infrastructure
- 14 Landscaping
- 15 Lifts
- 16 Mechanical
- 17 Metering and Controls
- 18 Security
- 19 Signage and Wayfinding
- 20 Structure

Revision History







Revision Number	Description	Section Owner	Date
Issue 1	Original Draft	Rob Oudshoorn	-
Issue 2	Internal Review	Rob Oudshoorn	-
Issue 3	First public circulation	Rob Oudshoorn	October 2016
Issue 4	Updated Issue	<i>Rob Oudshoorn</i>	<i>September 2019</i>

Current Document Acceptance

Update Authored	Approved	Date
<i>S. Palmer</i>	<i>Rob Oudshoorn</i>	<i>September 2019</i>

Key Updates from Previous Issue

Revision Item	Details
<i>12.1.2 Key Design Principles</i>	<i>Additional content</i>
<i>12.1.2.2 Maintenance Considerations</i>	<i>Amended content</i>
<i>12.2.3 Hydraulic Design for Fire Service</i>	<i>Section omitted and located in Section 10 Fire and Life Safety</i>
<i>12.2.4 Potable Water Supply</i>	<i>Amended content</i>
<i>12.2.7 Tanks</i>	<i>New content</i>
<i>12.2.8 Overflows</i>	<i>New content</i>
<i>12.2.9 Alarms</i>	<i>New content</i>
<i>12.2.10 Laboratory Gases</i>	<i>New content</i>
<i>12.2.11 Hot Water Systems</i>	<i>New content</i>
<i>12.2.11.1 Domestic Hot Water Systems</i>	<i>New section</i>
<i>12.3.1 Domestic Cold Water Pipes</i>	<i>New material table</i>
<i>12.4.3 Commissioning</i>	<i>New content</i>

	<u>12.1 Overview</u>	<u>1</u>
	12.1.1 Purpose	1
	12.1.2 Key Design Principles	1
	<u>12.2 Design Concepts</u>	<u>2</u>
	12.2.1 Connection to Existing Water Supply	2
	12.2.2 Back Flow Prevention	2
	12.2.3 Hydraulic Design for Fire Service	2
	12.2.4 Potable Water Supply	2
	12.2.5 Non-Potable Domestic Cold Water	2
	12.2.6 Sanitary Plumbing	2
	12.2.7 Tanks	2
	12.2.8 Overflows	2
	12.2.9 Alarms	2
	12.2.10 Laboratory Gases	2
	12.2.11 Hot Water Systems	2
	<u>12.3 Materials & Equipment</u>	<u>4</u>
	12.3.1 Domestic Cold Water Pipework & Valves	4
	12.3.2 Floor Wastes	4
	12.3.3 Floor Penetrations	4
	12.3.4 Filtration	4
	12.3.5 Sanitary Plumbing Materials	4
	<u>12.4 Installation Requirements</u>	<u>5</u>
	12.4.1 Installation	5
	12.4.2 Pressure Testing	5
	12.4.3 Commissioning	5
	12.4.4 Practical Completion	5
	<u>12.5 Numbering & Labelling</u>	<u>6</u>
	12.5.1 Identification of Pipework	6
	<u>Compliance Checklist</u>	<u>7</u>

12.1 Overview

12.1.1 Purpose

This section covers the hydraulic design criteria for water supply and drainage.

This section of the Design Standard Guidelines is intended to be read and implemented during design in conjunction with **Section 01 – General** and any project specific brief and agreements.

12.1.2 Key Design Principles

The consultant shall investigate design options such as ring mains, reservoir storage and pumping systems and provide recommendations of the most effective and efficient solution with respect to the University's present and future supply demands.

The consultant shall obtain all necessary data such as mains water pressures/flows etc. to assist system design and for the submission of design for approvals.

The consultant shall provide full computer-designed hydraulic calculations to the satisfaction of regulatory authorities and the University.

The consultant should note, low water pressures are available from CCC mains around the campus. Likely that multi-story buildings will require water booster sets as a result.

12.1.2.1 Future Services Installation

Allowance shall be made in the documentation of all projects for duct access to accommodate future services installation from the services tunnels to all areas within the buildings.

12.1.2.2 Maintenance Considerations

All equipment requiring servicing and maintenance shall be located in accessible locations and capable of replacement without having to modify existing pipework. Access panels of a size to permit removal and/or maintenance of the *equipment* shall be provided.



12.2 Design Concepts

12.2 Design Concepts

12.2.1 Connection to Existing Water Supply

Each system shall be independent with appropriate isolation, filtration and back flow prevention devices.

In all cases isolation shall be provided between dissimilar *materials*.

The University standard for connection of water supply to exposed fixtures and fittings shall be by way of chrome-plated soft-drawn copper pipe. Braided hose connections may be approved on a case by case basis only.

12.2.2 Back Flow Prevention

The following services shall have approved back flow prevention devices fitted to the supply:

- PC1, PC2, PC3 and PC4 laboratories
- Non-potable domestic cold water

The back flow prevention system shall be an approved system from the Standard Equipment List. The devices shall be of a manufacture approved by the University complete with *gate or ball valves*.

~~Where balancing is critical, a three pipe system shall be preferred.~~

12.2.3 Hydraulic Design for Fire Service

Refer to Section 10 Fire and Life Safety for related requirements.

~~To be developed further.~~

~~For all fittings, piping, branches, valves, hydrants, hose reels, sprinklers, etc., hydraulic fire services shall include provision of booster pump equipment as necessary to complete the installation.~~

~~Fire service pipework installed below ground shall be poly ethylene sized to allow for any losses.~~

~~Fire services installed above ground or in services ducts shall be approved medium grade galvanised steel pipe to AS1074 with roll groove joints and fittings. Lightweight steel pipe is not permitted.~~

~~Hydrant systems shall be designed in accordance with NZS 4510. The design consultant shall obtain approval from the Fire Service for any hydrant system installed.~~

~~At ground level, external accessed inlets shall be provided.~~

~~Exposed fire service pipe work, cabinets, valve box covers, etc. shall be painted Dulux – Wildfire Red.~~

~~Pressure gauges shall be installed at the supply point and at the highest point on the fire hydrant riser.~~

~~Provision shall be made for the isolation of all services at each floor level, so that no inter-connection between levels occurs.~~

12.2.4 Potable Water Supply

The potable domestic cold water system shall include for all piping, fittings, branches, etc. that supply hand basins, drinking fountains and kitchen sinks etc. where cold water could be consumed.

Water pressure available shall be between 400-650 KPa *at the fitting/outlet* and pipe velocities shall be between 1.0 to 2.2 metres per second. Adequate fixings shall be provided to prevent water hammer, *must be compliant with manufacturer's requirements for the pressure and velocity*.

Systems must be tested to NZS2020 for plumb solvency and tested by an independent provider.

12.2.5 Non-Potable Domestic Cold Water

The Non-potable domestic cold water system shall include for all piping, fittings, branches, etc. supplying toilets, flushometers, laboratory wash sinks, landscape irrigation etc. where cold water *will not* be for human consumption.

Mains pressure garden irrigation supply from the main isolation valve and backflow prevention devices to solenoid valves may be installed in polypipe and fittings subject to approval by the University.

12.2.6 Sanitary Plumbing

Inspection openings under concrete paving shall be extended to the finished level to provide access to the entire drainage installation.

Inspection chambers shall be provided at main junctions, changes in gradient and direction, and at intervals not exceeding 60 metres.

At least one overflow relief gully shall be provided for each building.

Test sumps to neutraliser pits and mixing tanks shall be easily accessible.

Placement of neutraliser tanks shall take into account the requirement for vehicular access where pumping out procedures are necessary. Associated dosing tanks shall be located where access can be gained independently of any laboratory or office areas. An adjacent cold water point shall also be provided for washing down purposes.

Step irons shall be provided in chambers exceeding 1.2 metres in depth.

12.2.7 Tanks

Tanks shall be installed in accordance with the manufacturer's requirements and shall be selected from a range suitable for the particular application. No copper tanks shall be used.

12.2.8 Overflows

Shall be sized appropriately for the particular service. Shall be located in a visible position but so as not to cause a nuisance or hazard.

12.2.9 Alarms

Critical systems shall have alarms linked to the BMS, alarm strategy to be developed and agreed with the UC FM team during the design process.

12.2.10 Laboratory Gases

Specific requirements for laboratory gases will need to be developed on a project by project basis to meet the operational requirements of the facility. All installations shall be designed to meet international best practice standards for similar installations and all relevant codes and legislation.

12.2.11 Hot Water Systems



12.2 Design Concepts

Central calorifier systems are used throughout the University.

The calorifier temperature shall be 65° centigrade to prevent Legionella build up. The supply hot water temperature at the outlet is not to exceed 50° centigrade.

Pipework shall have a 50 year design life and be installed to ensure that the temperature drop does not exceed 50 degree centigrade.

12.2.11.1 Domestic Hot Water Systems (DHW)

Domestic hot water systems shall be separate to the heating hot water system, and should use flow restrictors and pressure reducing valves in a water management system.

Storage units shall be appropriately insulated to reduce standing losses with circulating pumps controlled to operate only when required.

Low flow fixtures should be incorporated in the design and dead legs on piping distribution systems shall be minimised.

Domestic Hot Water (DHW) should utilise Medium Temperature Hot Water (MTHW) or Low Temperature Hot Water (LTHW) via connection to existing central boiler plant if available. If a connection is unavailable, instantaneous hot water units or low volume electric storage cylinders are to be used.

Pipework material shall have a 50 year design life.



12.3 Materials & Equipment

12.3 Materials & Equipment

12.3.1 Domestic Cold Water Pipework & Valves

Potable domestic cold water services below ground are to be **HP PVC (remove HP PVC)** or polyethylene or Fusiotherm pipe.

Non-potable domestic cold water services below ground shall be **PVC (Remove PVC)** pipe. Non-potable domestic cold water services above ground shall be pre-lagged Fusiotherm pipe.

Valves selected shall meet all pressure, temperature and throttling, etc. requirements in service and be of consistent manufacture and configuration across the project.

Approved exposed pipework, subject to view in other than plant and service areas, shall be chrome plated or painted. Penetrations through walls shall be concealed with chrome plated dome flange and backnut.

Refer to below table of materials to be used for pipework. Valve manufacturers to be approved prior to purchase by the UC FM team.

Pipe Material Selection Table

Pipe Size	Hot water	Cold water	Raw Water	High Temp Heating, Low Temp Heating	MTHW
Less Than 25mm ID	PPR, Poly Butline, S/S(Ke kelit)	PPR, Poly Butline, S/S(Ke kelit)	PPR, S/S (Ke Kelit), Black Steel	Steel	Steel
Greater Than 25mm ID, less Than 100mm ID	PPR. S/S (Ke Kelit)	PPR. PE, S/S (Ke Kelit)	PPR, PE	Steel	Steel
Greater Than 100mm ID	PPR. PE	PPR, PE	PPR, PE	Steel	Steel

12.3.2 Floor Wastes

These are required within all wet areas i.e. laboratories, toilets, plant rooms, tunnels, laundries, etc. and care should be taken to ensure that adequate falls to these points are specified and achieved.

Floor wastes shall have a removable chrome plated brass grate. Floor waste shall be not less than 80mm diameter. All wastes shall be fitted with an approved flange and shall be cast into the concrete floor slab. Floor wastes shall have charging provision (i.e., trap primers). Provide deep seal (75mm) traps to plant/air handling and laboratories. Floors shall be graded to the floor wastes and any sub-flooring membranes shall also be graded to the puddle flange.

12.3.3 Floor Penetrations

All penetrations through floors shall be sealed after the installation of services which produces a neat and appropriately sized penetration. Where services are required to pass through fire rated barriers or zones, they shall be sealed with approved fire rated material.

Where floors have been penetrated by the contractor's services, these penetrations must be sealed as well as make good adjoining surfaces that preserve the integrity, fire rating and designed sound attenuation following approved methods and techniques.

Where water leakage is a possibility, the floor shall be sloped towards suitably located drains in flooring and puddling flanges used.

12.3.4 Filtration

Filtration of the potable domestic water supply is required only to specific items of equipment and plant as required by the Proprietor (eg., all mains pressure flushometer supplies).

Where required duplex inline filtration systems to 50 microns or better shall be installed.

Isolation valves and pressure gauges shall be provided either side of the filters.

12.3.5 Sanitary Plumbing Materials

Generally, heavy duty sewer class uPVC pipe and fittings are acceptable for all in-ground and suspended sewer drainage installation.

Sewer drainage receiving hot discharge and/or solvents shall be brass pipe and fittings or other approved material.

Covers and frames to be Gatic cast iron type. Internally placed chambers shall be fitted with edge strips to accommodate floor finishes.

Internal chamber drops shall be in cast iron pipe and fittings.



12.4 Installation Requirements

12.4 Installation Requirements

12.4.1 Installation

Isolation of existing services required for installation of new systems shall be coordinated strictly through University of Canterbury Project Manager (UCPM) by University Maintenance Department.

All potable water storage vessels and pipe systems shall be flushed and disinfected before being placed in service, and provision shall be made for easy access for periodic disinfection.

12.4.2 Pressure Testing

- Pumps
- General
- Cold Water Booster Pumps
- Hot water Pumps
- Sanitary Plumbing

The consultant shall arrange for preliminary testing of all water supply systems prior to final certified testing for regulatory authority approval.

12.4.3 Commissioning

Commissioning of all services to be in accordance with the CIBSE Commissioning Codes, manufacturer's requirements and particular system design requirements.

12.4.4 Practical Completion

The consultant shall specify for all necessary plumbing certificates pertaining to the works and ensure these certificates are obtained prior to practical completion.

Prior to Practical Completion the consultant shall ensure that final documentation contains "As-built" drawings provided by the services contractor and a certificate of compliance supplied by Fire Protection Inspection Services (FPIS) or other approved certifier.



12.5 Numbering & Labelling

12.5 Numbering & Labelling

12.5.1 Identification of Pipework

All pipelines shall be identified by colour banding in accordance with NZS 5807:1980 – Code of Practice for Industrial Identification by colour, wording or other coding.

Identification bands should be located at no greater than 4.5 metre centres and provide arrows to indicate direction of flow. Indicate "F" and "R" as applicable on systems featuring flow and return.

Large labels that can be read at floor level are to be used.

Where identification labels on piping, control valves, etc. are provided for the benefit of users, the labels shall spell out the full name of the service.

Labels on piping shall be of the plastic adhesive type.



Compliance Checklist

Project Name:

Date:

Submitting Consultant:

Design Stage:

Section 12 – Hydraulics Compliance Checklist

Complies
Does Not Comply
Not Applicable
Comments:

1.0 Section 01 – General

#	All Clauses	Complies	Does Not Comply	Not Applicable
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12.1 Overview

12.1.1	Purpose	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	---------	--------------------------	--------------------------	--------------------------

12.1.2	Key Design Principles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	-----------------------	--------------------------	--------------------------	--------------------------

12.2 Design Concepts

12.2.1	Connection to Existing Water Supply	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	-------------------------------------	--------------------------	--------------------------	--------------------------

12.2.2	Back Flow Prevention	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	----------------------	--------------------------	--------------------------	--------------------------

12.2.3	Hydraulic Design for Fire Service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	-----------------------------------	--------------------------	--------------------------	--------------------------

12.2.4	Potable Water Supply	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	----------------------	--------------------------	--------------------------	--------------------------

12.2.5	Non-Potable Domestic Cold Water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	---------------------------------	--------------------------	--------------------------	--------------------------

12.2.6	Sanitary Plumbing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	-------------------	--------------------------	--------------------------	--------------------------

12.2.7	Tanks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	-------	--------------------------	--------------------------	--------------------------

12.2.8	Overflows	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	-----------	--------------------------	--------------------------	--------------------------

12.2.9	Alarms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	--------	--------------------------	--------------------------	--------------------------

12.2.10	Laboratory Gases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
---------	------------------	--------------------------	--------------------------	--------------------------

12.3 Materials & Equipment

12.3.1	Domestic Cold Water Pipework & Valves	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	---------------------------------------	--------------------------	--------------------------	--------------------------

12.3.2	Floor Wastes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	--------------	--------------------------	--------------------------	--------------------------

12.3.3	Floor Penetrations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	--------------------	--------------------------	--------------------------	--------------------------

12.3.4	Filtration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	------------	--------------------------	--------------------------	--------------------------

12.3.5	Sanitary Plumbing Materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	-----------------------------	--------------------------	--------------------------	--------------------------

12.4 Installation Requirements

12.4.1	Installation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	--------------	--------------------------	--------------------------	--------------------------

12.4.2	Pressure Testing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	------------------	--------------------------	--------------------------	--------------------------

12.4.3	Commissioning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------	---------------	--------------------------	--------------------------	--------------------------

		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--	--	--------------------------	--------------------------	--------------------------



Compliance Checklist

Project Name:

Date:

Submitting Consultant:

Design Stage:

Section 12 – Hydraulics Compliance Checklist

Complies	Does Not Comply	Not Applicable	Comments:
----------	-----------------	----------------	-----------

12.5 Numbering & Labelling

12.5.1	Identification of Pipework	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
--------	----------------------------	--------------------------	--------------------------	--------------------------	--

Date:

University Reviewer:

Signed:

- Acceptable
- Acceptable subject to comments
- Resubmission required

