Drinking Water Protection Conference 2023

From the source to the last flowing tap

Designing a Plumbing System……………………..

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water NEW ZEALAND
The New Zealand Water & Wastes Association Waiora Aotearoa


Google
how to design plumbing systems for buildings
Google Search
I'm Feeling Lucky
Google offered in: Māori

How hard can it be?

The Civil & Infrastructure engineer has provided clean drinking water, there's a RPZD at the boundary, with good water pressure...the network is safe! Phew…

That must mean my responsibility has just reduced dramatically??

Am I right?

Typically, we all know that the design of water services within a building is to provide the necessary quantity of water to an area or fixture via the means of a piping system designed with:

- Acceptable water velocities
- Acceptable pressure drops

If we get those right then we have acceptable flow and pressure at our fixtures/appliances, client is happy, job done.

Brilliant! That’s all we need to know, waayyyy too easy!!

Presentation over, thanks for attending.

In the design office, Public health/Hydraulic Engineers are looking further than just trying to drop in a backflow valve for the sake of achieving compliance.

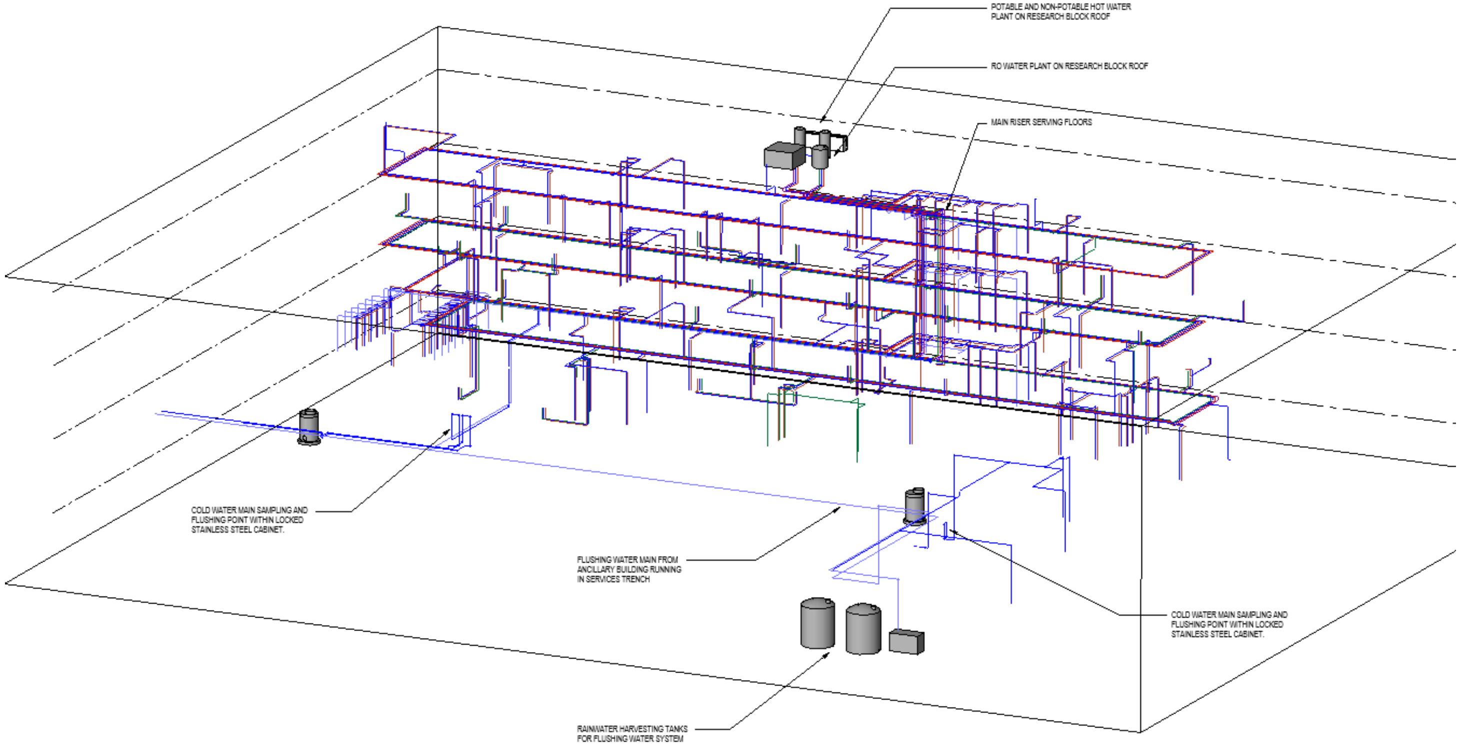
It is easy drawing a valve into a water system where a hazard has been identified during the design phase.

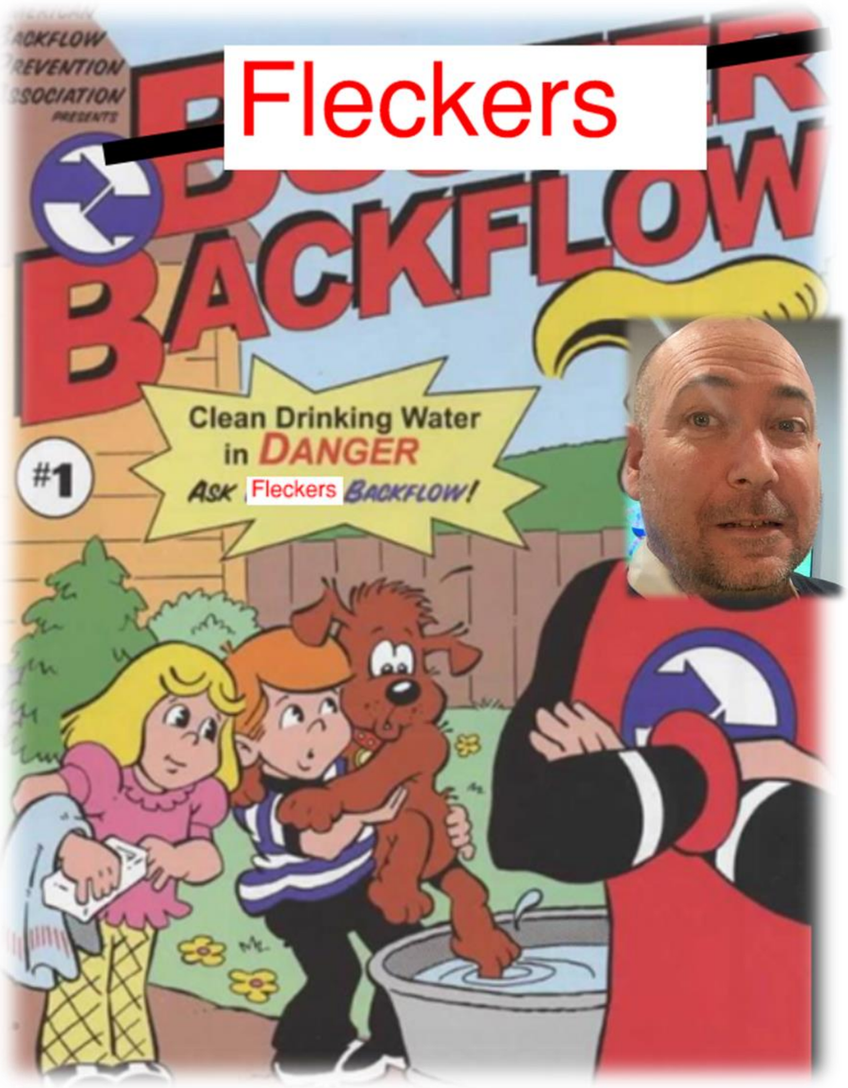
Doesn't really work like that!

Let's dive deeper and see what goes on inside my head when I'm looking at a new building and trying to layout the water services.

Remembering I'm not just looking at hazards in isolation, I have the responsibility to ensure a safe and adequate water supply within the building for all uses 24/7 - 365 days a week!

My role is also to ensure the building occupants and building users are safe from drinking contaminated water……..contaminated from the buildings water system network that is.





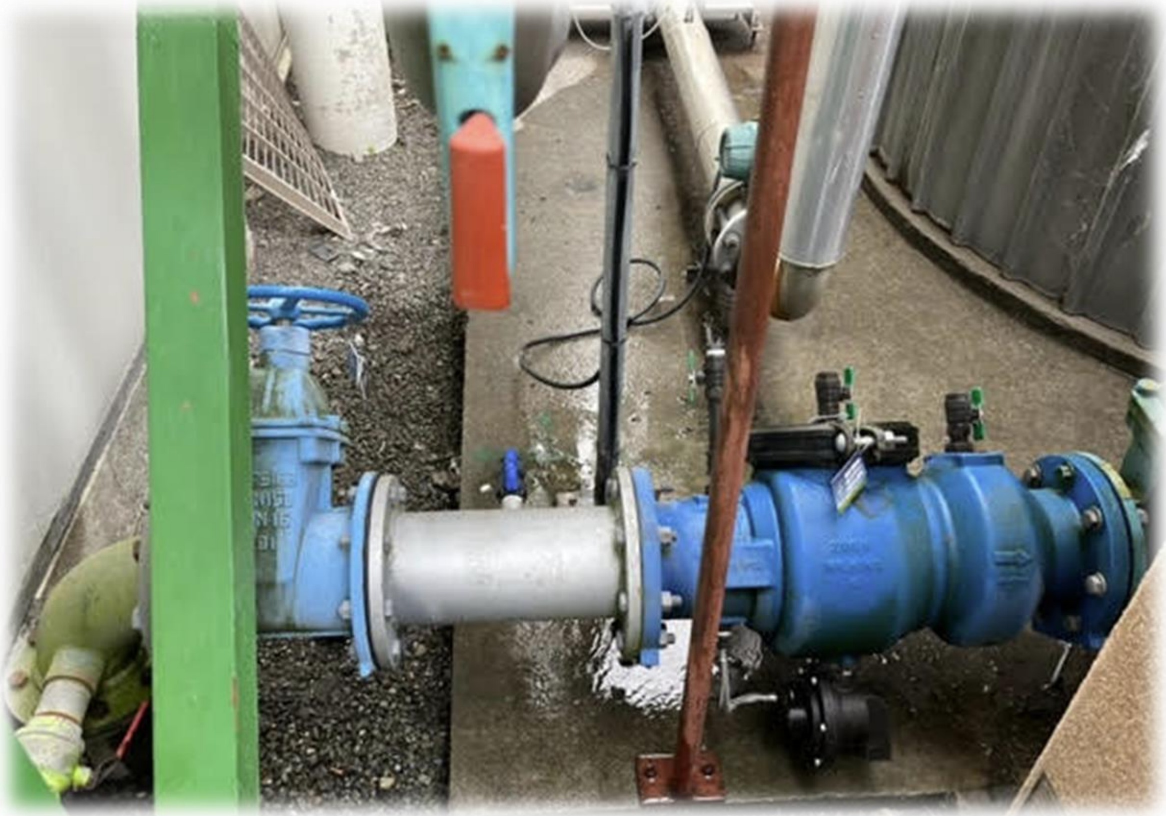
What are some of the things to consider?

- ✓ Material Choice
- ✓ Flow Velocities
- ✓ Frictional Losses
- ✓ Pumped Supply, Mains Supply
- ✓ Flow Temperatures, Hot Cold Etc
- ✓ Chlorinated (Disinfected Water Supply)
- ✓ Water Characteristics, Ph Levels, Iron, Sodium Etc.
- ✓ Size Of The System, Entrained Air, dead legs
- ✓ Height and footprint of the building
- ✓ Water use and frequency of use
- ✓ Main plant and appliance locations
- ✓ Safety In Design Considerations
- ✓ Passive Fire
- ✓ Hazards within the building (backflow)

These are just some of the things that need to be considered well before I'm thinking about dropping in any backflow devices.

Undertaking the ground work prior helps in the long run.

<u>This list is not exhaustive either!</u>



You cannot make this stuff up!

What design standards/codes do I use?

New Zealand Building Code Requirements

Building Consent Authority (BCA) Requirements

Health and safety Legislation

Fire Service requirements

Any other Institution Design Standard requirements

Legionella – BSRIA/EN Guidelines & TM-13

CIBSE Guide G Public Health Engineering Services

CIBSE Guide Reclaimed Water

IOP Design Guide

General principles of Food Hygiene CAC/RCP

AS.NZS 3500.1 Water Services

AS/NZS 3500.4 Heated Water Services

BS8558:2015 Guide to Design of Water Services for Non-Residential

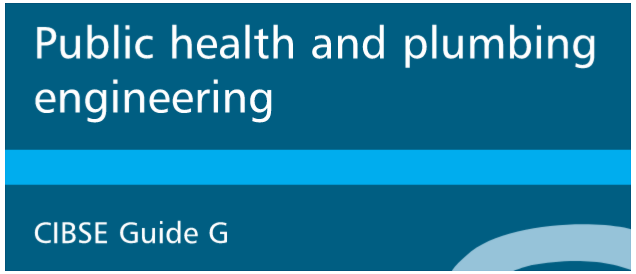
NZBC G10/Piped Services

NZBC G12/VM1 Water Services

NZS 4219:2009 Seismic Performance of Engineering Systems in Buildings

AS 4775 Emergency Showers

There are so many out there, ones to the left are the usual "go-tos" for daily work.



The Institute of Plumbing

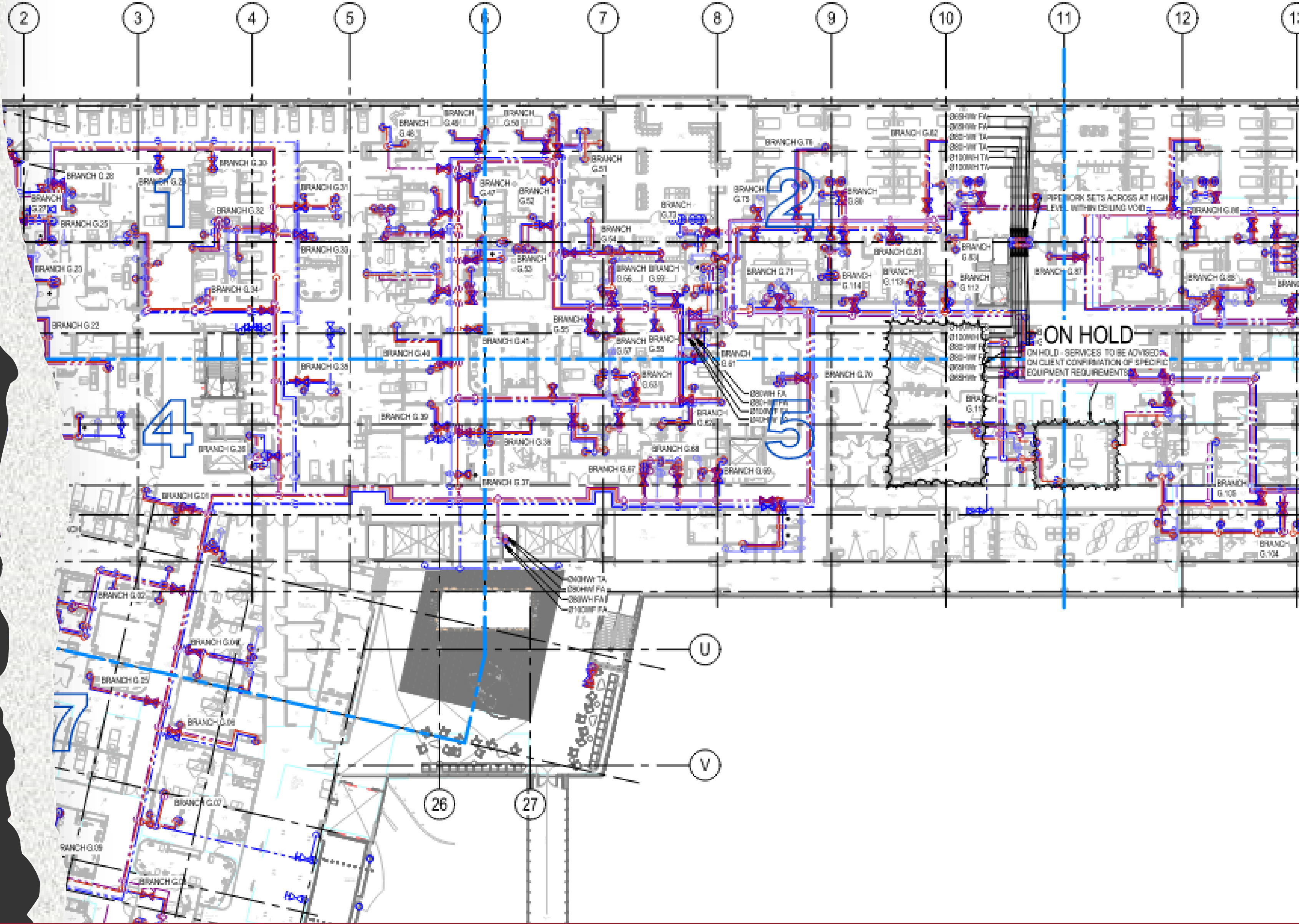
So many to work from!

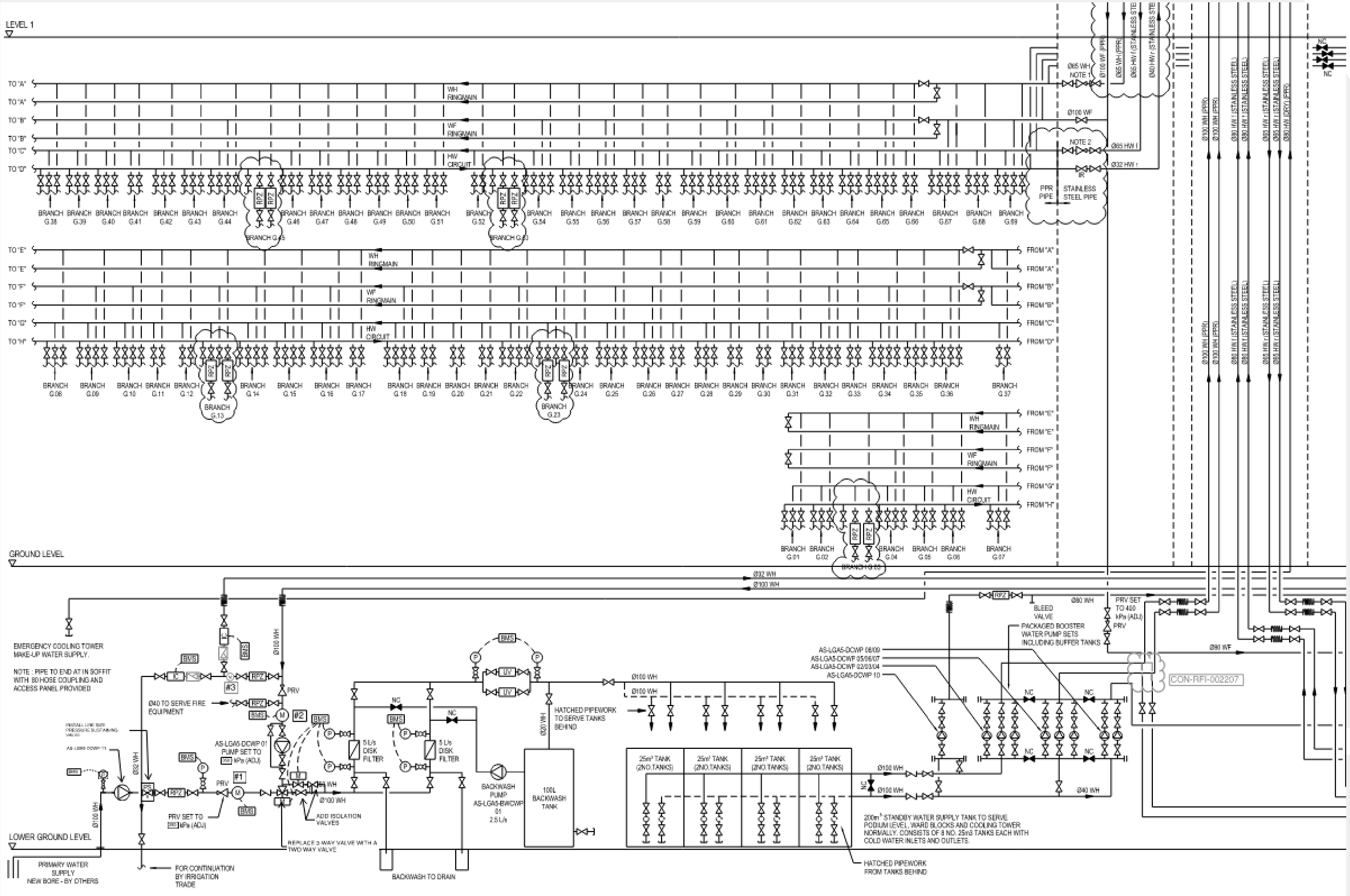
Some designs are massive!

This building has a large footprint per floor.

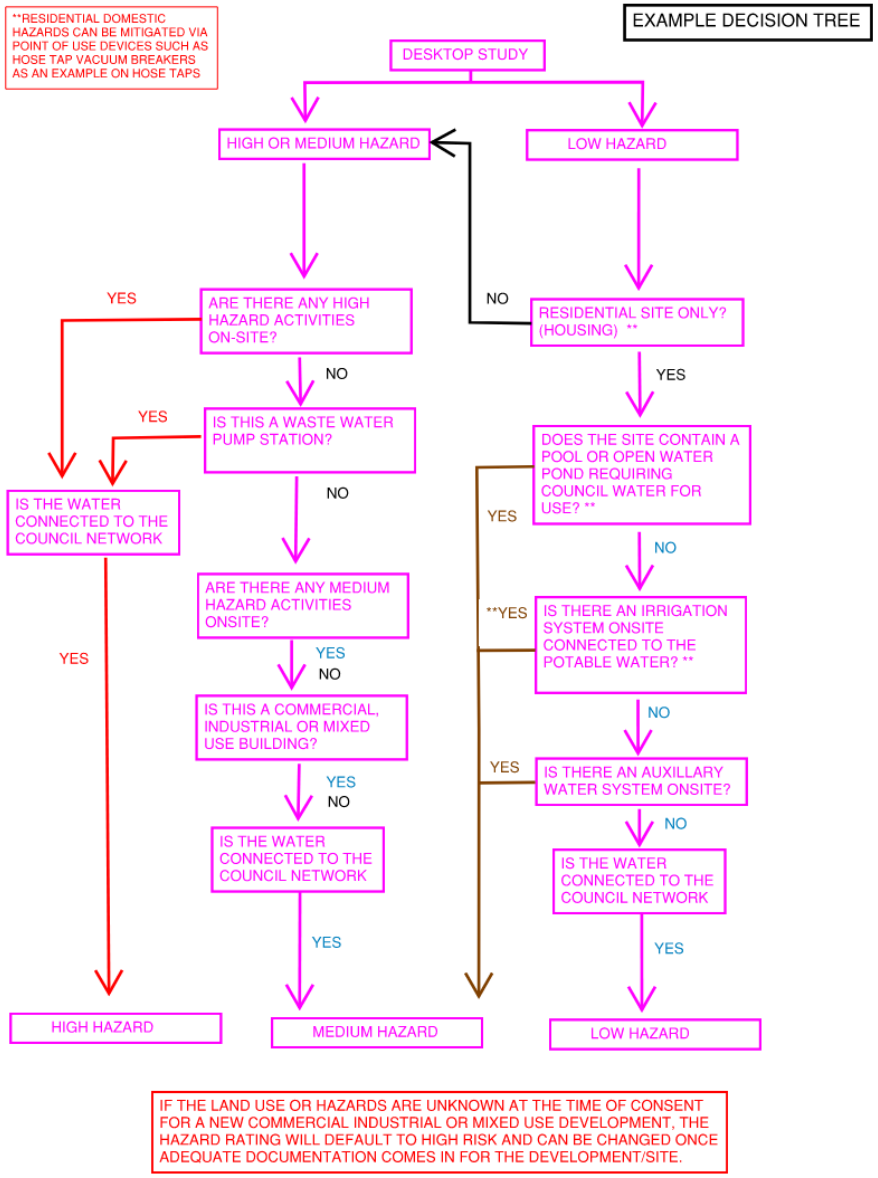
There are 10 floors to deal with, multiple pressure zones and a plethora of hazards scattered throughout the building.

Remember, when I start there are no pipes there, it’s a blank canvas to negotiate everything else going on!





LEVEL 1
GROUND LEVEL
LOWER GROUND LEVEL
WH RINGMAIN
WF RINGMAIN
HW CIRCUIT
EMERGENCY COOLING TOWER MAKE-UP WATER SUPPLY.
NOTE : PIPE TO END AT IN SOFFIT WITH 80 HOSE COUPLING AND ACCESS PANEL PROVIDED
PRIMARY WATER SUPPLY NEW BORE - BY OTHERS
FOR CONTINUATION BY IRRIGATION TRADE
BACKWASH TO DRAIN
100L BACKWASH TANK
HATCHED PIPEWORK TO SERVE TANKS BEHIND
PACKAGED BOOSTER WATER PUMP SETS INCLUDING BUFFER TANKS
HATCHED PIPEWORK FROM TANKS BEHIND
CON-RFI-002207



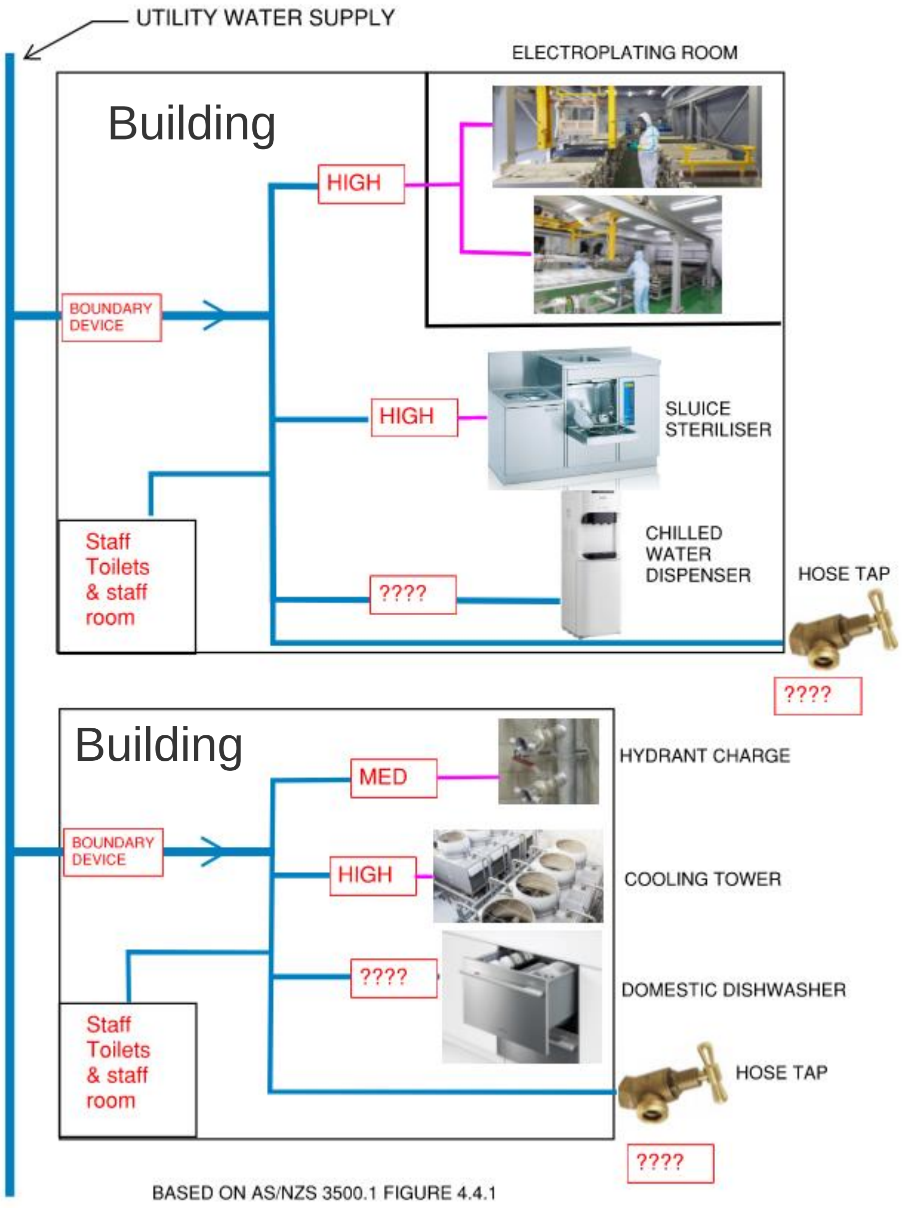
Backflow Hazard Planning:

For the new engineers that I train up, a simple thing like a decision tree when they are looking at a set of drawings helps the mind think about hazards within the building.

It is in Bluebeam so they can shift different boxes around.

Example to the left is trying to work out really early on in the design phase what sort of is containment is potentially required.

Simple yet effective exercise to get them looking at the whole site.



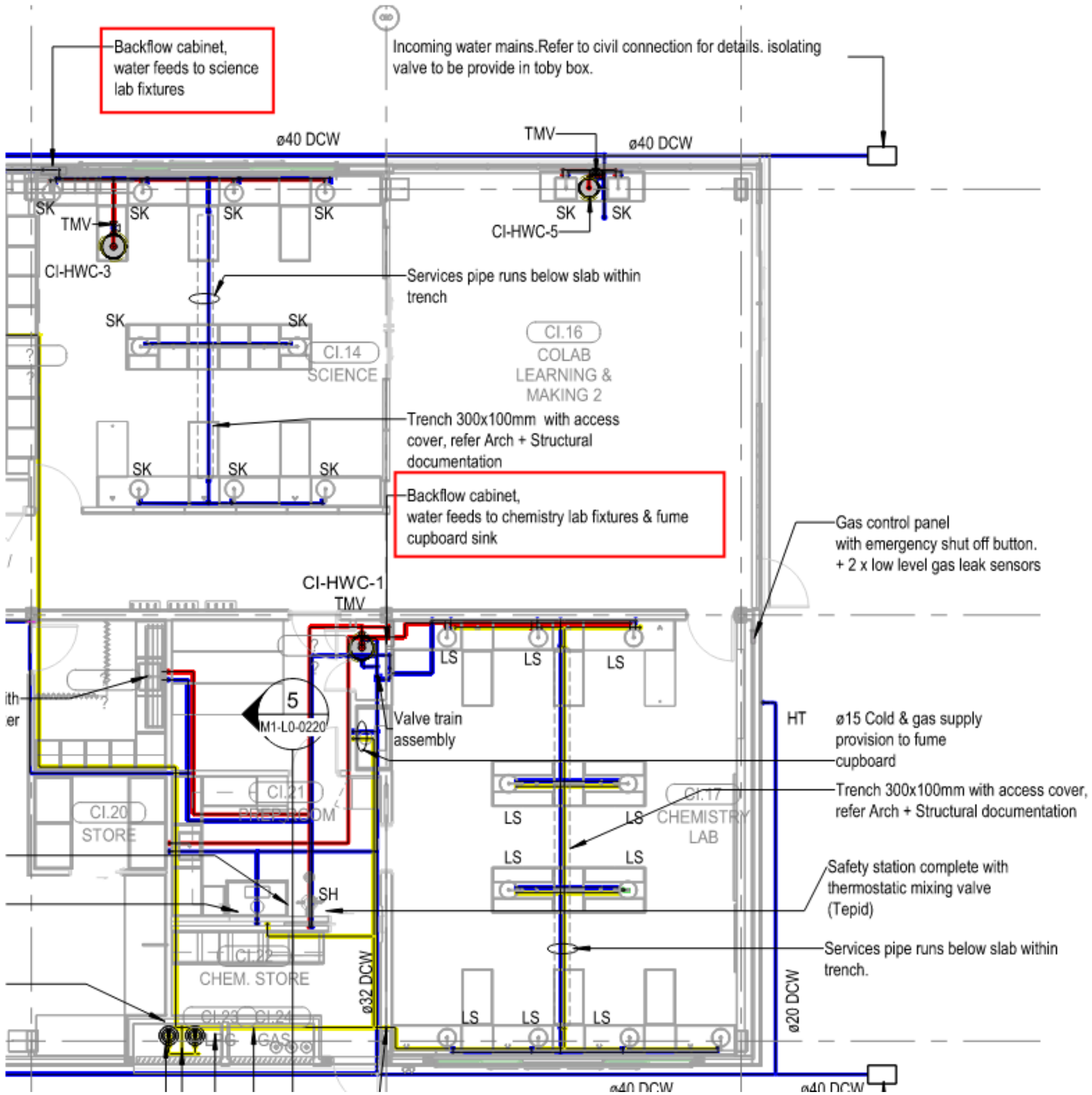
Initially locating the backflow devices.

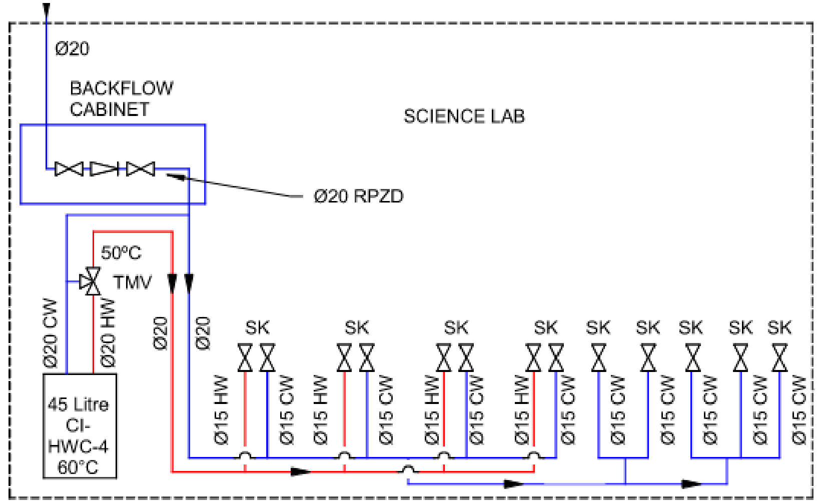
AS/NZS 3500.1 has a pretty simple to follow diagram around the placement of a backflow device.

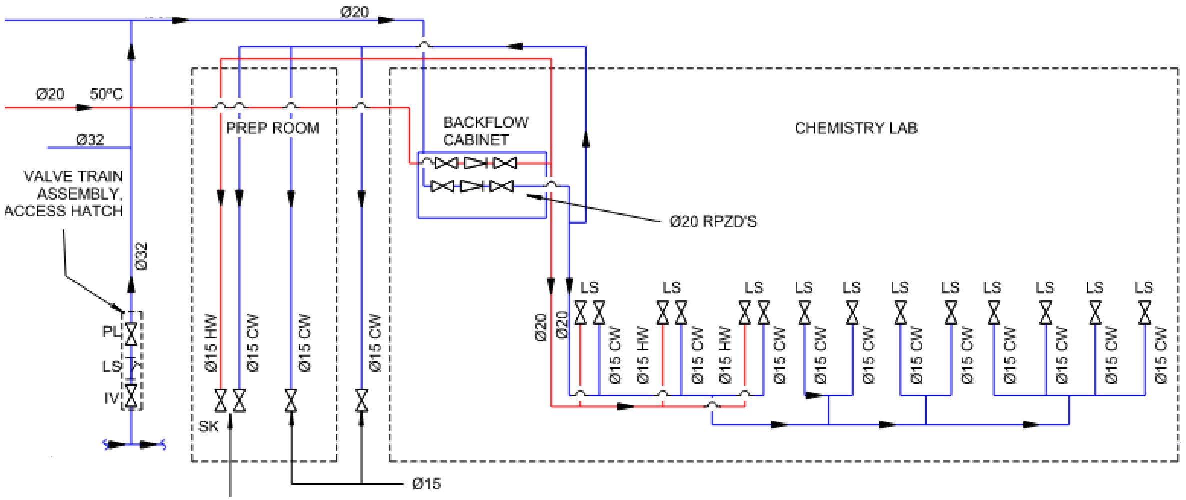
Based on:

- ➢ Containment (boundary)
- ➢ Zone (coordinated area)
- ➢ Individual (source)

The NZBC currently doesn't use this terminology so can get tricky at consent time depending on the consent officers understanding of backflow prevention protection.


Backflow cabinet, water feeds to science lab fixtures
Incoming water mains.Refer to civil connection for details. isolating valve to be provide in toby box.
ø40 DCW
TMV
ø40 DCW
SK
TMV
CI-HWC-3
CI-HWC-5
Services pipe runs below slab within trench
CI.16 COLAB LEARNING & MAKING 2
CI.14 SCIENCE
Trench 300x100mm with access cover, refer Arch + Structural documentation
Backflow cabinet, water feeds to chemistry lab fixtures & fume cupboard sink
Gas control panel with emergency shut off button. + 2 x low level gas leak sensors
CI-HWC-1
TMV
LS
Valve train assembly
HT
ø15 Cold & gas supply provision to fume cupboard
M1-L0-0220
CI.21 PREP ROOM
CI.20 STORE
CI.17 CHEMISTRY LAB
Trench 300x100mm with access cover, refer Arch + Structural documentation
SH
Safety station complete with thermostatic mixing valve (Tepid)
CHEM. STORE
ø32 DCW
ø20 DCW
Services pipe runs below slab within trench.
ø40 DCW


Ø20
BACKFLOW CABINET
SCIENCE LAB
Ø20 RPZD
50ºC
TMV
Ø20 CW
Ø20 HW
Ø20
45 Litre CI-HWC-4 60°C
SK
Ø15 HW
Ø15 CW


Ø20
Ø20
50ºC
Ø32
PREP ROOM
BACKFLOW CABINET
CHEMISTRY LAB
VALVE TRAIN ASSEMBLY, ACCESS HATCH
Ø20 RPZD'S
Ø32
PL
LS
IV
Ø15 HW
Ø15 CW
SK
LS
Ø15
Ø20


SAF-T Pump

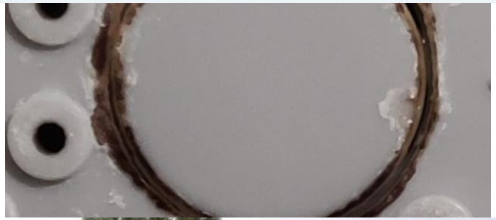
Anyway….Is the Water System itself a Hazard?

Legionnaires' disease confirmed at New Glasgow nursing home | CBC News

Five cases of Legionnaires' disease confirmed in Grand Rapids, Minn.

Legionella detected at 2 Oakwood school buildings

Water at New Hudson campground deemed 'unsafe for consumption'



Legionella found at Kettering school that hosts summer childcare

Ecological Analyses of Mycobacteria in Showerhea Biofilms and Their Relevance to Human Health |…

journals.asm.org • 2 min read

Retail Ice Storage and Dispensing

publichealth.lacounty.gov • 1 min read

To provide helpful information about reducing bacterial contamination associated with

Oakwood schools find Legionella for 4th straight year; Kettering tests continue

Sustainability and Climate Change

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

BUILDING PERFORMANCE

Transforming Operational Efficiency

Building for climate change programme

August 2020

Operational CO_2 emissions

kg CO_2-e/(m².a)

=

Fossil fuel combustion	+	Electricity use	x	Grid Emissions Factor[7]	+	Water use (potable & wastewater)	x	Water Emissions Factor[8]
Direct Emissions		Indirect Emissions		Electricity generation mix		Indirect Emissions		Water service providers energy use
kg CO_2-e/(m².a)		kWh/(m².a)		kg CO2-e/kWh		m³/(m².a)		kg CO_2-e/m³

	Initial Cap	Intermediate Cap	Final Cap
Operational Emissions Cap CO_2-e/(m².a)[12]	The cap will be a reporting mechanism for the total of the operational emissions from the three components		
Water use l/p/d[15] (to be converted to m³/m² based on occupancy of the building type)	145	110	75

Change of Required Flow Rates to Fixtures/Appliances

WELS Star Rating : WELS 4 Rated, 4.5/3 (3.5L average flush)

Example of a modern day toilet, low flushing volume with 4 star WELS rating

Recommended Star ratings

Fixture	3 Stars	4 Stars	5 Stars	6 Stars
Shower	7.5 – 9 L/min	N/A	N/A	N/A
Toilet	Average flush no more than 4.0 litres	4.5L/3L Dual Flush with an average flush of no more than 3.5 litres	Average flush no more than 3.0 litres	Average flush no more than 2.5 litres
WHB	7.5 – 9 L/min	6-7.5 L/min	4.5 – 6 L/min	3 - 4.5 L/min
Sink	7.5 – 9 L/min	6 - 7.5 L/min	4.5 – 6 L/min	No more than 4.5L/min
Dishwasher	Max 17 litres per wash	Max 13 litres per wash	Max 11.5 litres per wash	Max 9.5 litres per wash

Modern Toilets as an example, use 60% less water

Table 3: Acceptable Flow Rates to Sanitary Fixtures
Paragraph 5.3.1

Sanitary fixture	Flow rate and temperature l/s and °C	How measured
Bath	0.3 at 45°C	Mix hot and cold water to achieve 45°C
Sink	0.2 at 60°C* (hot) and 0.2 (cold)	Flow rates required at both hot and cold taps but not simultaneously
Laundry tub	0.2 at 60°C* (hot) and 0.2 (cold)	Flow rates required at both hot and cold taps but not simultaneously
Basin	0.1 at 45°C	Mix hot and cold water to achieve 45°C
Shower	0.1 at 42°C	Mix hot and cold water to achieve 42°C

* The temperatures in this table relate to the temperature of the water used by people in the daily use of the *fixture*.

Note:

The flow rates required by Table 3 shall be capable of being delivered simultaneously to the kitchen sink and one other *fixture*.

Do they match 4-6 stars?

Oversize maybe?

Table 3.2.1 — Minimum flow rates and loading units

Fixture/appliance	Flow rate L/s	Flow rate L/min	Loading units
Water closet cistern	0.10	6	2
Bath	0.30	18	8
Basin (standard outlet)	0.10	6	1
Spray tap	0.03	1.8	0.5
Shower	0.10	6	2
Sink (standard tap)	0.12	7	3
Sink (aerated tap)	0.10	6	2
Laundry trough	0.12	7	3
Washing machine/dishwasher	0.20	12	3
Mains pressure water heater	0.20	12	8
Hose tap (20 nom. size)	0.30	18	8
Hose tap (15 nom. size)	0.20	12	4

NOTE 1 In the case of valves and appliances where test information indicates that they will function satisfactorily with a flow rate less than that shown in this Table, the tested flow rate may be substituted and the loading units adjusted accordingly.

NOTE 2 Flow rates and loading units given above are taken with cold water flowing from each individual outlet.

Visual example of different flows, same pipework with different joints

Stagnant Water – Dead Legs – Dead Ends

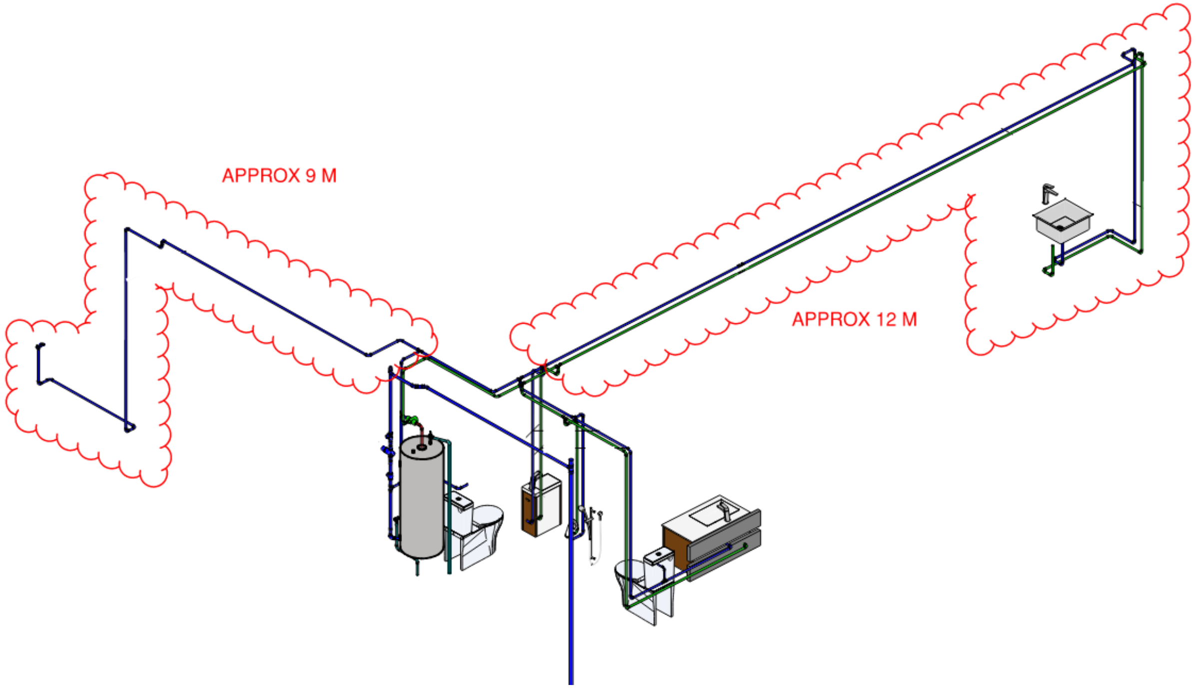
No matter how good you are, there will be one somewhere!

Loading Units	Litres/Sec.	CW in Cu 15°c - Max Velocity 1.8 m/s	HWF in Cu < 60°c - Max velocity 1.5 m/s	HWF ≥ 60°c - Max velocity 0.9 m/s
1	0.10 l/s	DN 15	DN 15	DN 20
2	0.12 l/s		DN 15	
3	0.15 l/s	DN 15	DN 20	
4	0.18 l/s	DN 20		
5	0.21 l/s			DN 20
6	0.23 l/s			DN 25
7	0.24 l/s			
8	0.25 l/s			

Design Parameter	Length	Volume
Reduce Wastewater		✓
Limit Wait Time		✓
Limit Microbiological Growth		✓

Pipe Volume Calculator - Pipe Size		
Example		
Internal Diameter	15	mm
Pipe Length	12	m
Pipe Volume	2.121	L
Fixture Flow Rate	0.1	L/sec
Wait Time	21.209	Seconds
Total		
Pipe Length	12	m
Pipe Volume	2.121	L
Wait Time	21.209	Seconds

Pipe Volume Calculator - Pipe Size		
Example		
Internal Diameter	20	mm
Pipe Length	12	m
Pipe Volume	3.770	L
Fixture Flow Rate	0.1	L/sec
Wait Time	37.704	Seconds
Total		
Pipe Length	12	m
Pipe Volume	3.770	L
Wait Time	37.704	Seconds



I am now seeing a marked increase of positive results within commercial building's, how do we combat that?

Sample Type: Aqueous						
Sample Name:		56993 - JWO1 GL Toilet 1 - Tap	56993 - JWO2 GL Toilet 6 - Tap	56993 - JWO3 Base Shower 1	56993 - JWO4 Base Bath 1 - Tap	56993 - JWO5 Base Shower 2
Lab Number:						
Total Legionellae	cfu / mL	< 10	< 10	< 10	200	20

Sample Name:		56993 - JWO6 Base Bath 2 - Tap 27	56993 - JWO9 Level 5 Toilet 1 - Tap 27	56993 - JWO10 Level 5 Toilet 6 - Tap
Lab Number:				
Total Legionellae	cfu / mL	10	< 10	< 10

Disinfection:

Upon witnessed completion of the documented disinfection methodology below, the Plumbing Contractor shall provide a water sample (undertaken by an approved water sampler) from each floor's longest index point and furnish it to an approved test laboratory for analysis. Testing shall include water borne bacteriological tests and for compliance to the NZ Drinking water Standard, include any additional tests as requested by the client.

Potable Hot and Cold-water services.

Cooling of the Domestic Hot Water System - Ensure the domestic hot water system is cooled to a maximum temperature of 22°C prior to the dosing procedure.

Flushing of the Systems - A minimum of 3 x the volume of the pipeline is required to be flushed through the systems prior to disinfection procedure to ensure all debris and pipe filings have been completely removed.

Water Filters – All installed filters/filter baskets shall be removed and cleaned after the flushing procedure but prior to the dosing procedure.

Appliances – all appliances and specialised equipment are to be isolated prior to disinfection.

Chlorination of the system:

1. The systems must be under mains pressure and full of water.
2. Dose to achieve 10 ppm chlorine throughout the systems. (for shock dosing up to 20-30 ppm maybe required, need to understand the piping system to see if it will be able to handle the higher dosage)
3. Dose via approved equipment into the system.
4. Circulate the dose throughout the hot and cold piping systems by drawing water from the longest index runs on all floor levels and to the highest point, then draw water systematically through outlets ensuring all dead leg pipe runs are included.
5. Test/sample at furthermost point to ensure uniform dispersion of chlorine throughout system, i.e. 10 ppm chlorine at the outlets.
6. Any waste chlorinated water must be disposed of properly.
7. Leave for minimum of 6 hours and retest.
8. If chlorine level is 0 ppm, repeat steps 1-3
9. Once chlorine levels are satisfactory, continue with dynamic flushing of the system until chlorine has reached 'normal levels', e.g. what is normally in the pipeline supplied by the water supplier/utility/council etc.

Note - Water temperature not to exceed 22 degrees when chlorinating.

11.Recommission the hot water plant and return all water services back to daily operating conditions.

Flushing Water Tanks, including flushing water lines.

Flushing of the Flushing Systems – A minimum of 3 x the volume of water of the flushing pipelines and flushing tank to ensure all debris and pipe filings have been completely flushed out of the flushing water systems.

Disinfection Prior to Opening of the Building is a Start, however traditionally not done in NZ unless it is a hospital

Contractor's Responsibility:

1. The contractor shall provide properly trained personnel, appropriate equipment and materials, and transportation, for the disinfection of domestic hot and/or cold-water systems, and any water supplies connected to/from them.
2. The Contractor **shall post warning signs at each floor** level/area where disinfection is being undertaken.
3. The Contractor shall dispose of waste water in a way that will cause no harmful effects.
4. It is recommended that a minimum of three (3) working days' notice must be given to the XX prior to the chlorination procedure.
5. Chlorination times/days and dates should be fully scheduled and approved by the water treatment specialist and XX prior to starting the works.
6. Contractor to confirm before dosing that product warranties will not be affected by the dosing regime.

Disinfection (Chlorinating) Agent:

- Sodium hypochlorite solution to be used.
- Tablets or granular disinfectants will not be allowed.

Bacteriological and Legionella testing:

After final flushing, representative water samples will be taken by the water sampling agent for lab tests of water borne bacteriological tests including legionella and for compliance to the NZ Drinking water Standard

Sampling and analysing for other substances to evaluate potability may be required if considered necessary by the client.

What else can be done to ensure safe water in the building?

A Good "Building Water Safety Management Programme" is Paramount to a continual safe water system within a building

19 Building Water Management Safety Plan

19.1 General

The objective of this section is to ensure measures are put in place within the building's standard operational procedures, inclusive of their health and safety provisions.

It is essential that measures are permanently put in place for water quality and water heath.

19.2 Key Elements

Key elements required for the water management plan are:

- Establish a water management program team
- Describe the building water systems using easy to understand text and drawings
- Identify areas where Legionella and pathogens could grow and spread
- Decide where control measures should be applied and how to monitor them
- Establish ways to intervene when control limits are not met
- Make sure the program is running as designed (verification) and is effective (validation)
- Document and communicate all the activities

System Assessment → Monitoring → Management and Communications

19.3 Key principles of the Water Management plan include:

- Maintaining water temperatures outside the ideal range for Legionella growth
- Preventing water stagnation
- Ensuring adequate disinfection
- Maintaining devices to prevent sediment, scale, corrosion, and biofilm, all of which provide a habitat and nutrients for Legionella and pathogens

Once established, water management programs require regular monitoring of key areas for potentially hazardous conditions and the use of predetermined responses to respond when control measures are not met.

19.4 Cold Water

Not all specifications cover water safety management, specific to the system and building.

18 Pathogen Control Safety Plan

18.1 General

The objective of this section is to ensure measures are put in place within the O&M with regards to pathogen control within each building and will form part of the schools standard operating procedures (SOP) health and safety manual.

It is essential that measures are permanently put in place for water quality and water heath.

18.2 Wastewater

During normal term time most traps, FWG's etc are likely to maintain their trap seals due to daily usage and should remain charged over the weekend.

During periods of low or no use, i.e., school holidays, it is important the trap seals are checked and maintained to ensure there is no pathogen release into the rooms.

Ensure on the last day of term all tapware etc is used to replenish all traps with fresh clean water.

If there is a school caretaker looking after the property during school holidays suggest at least every second week all traps are replenished.

At least 2 days prior to staff and students starting back after an extended break, ensure all traps are replenished and any smells are cleared via ventilation, opening windows etc.

External Gully traps should be checked weekly to ensure no food stuffs, rubbish etc has been dropped into the drain.

18.3 Water Services

Similar to wastewater during term time the water lines and HWC's will be used ensuring replenishment of water within the water lines.

During extended periods of low or no use it is important that fresh water is pushed through the pipelines to flush any potential impurities that may have formed during that time.

Flush at full flow all water pipes – the exact time the water needs to run to flush a pipe will vary depending on the volume of water in the pipeline, pipe size and length needs to be considered – This will flush the stagnant water out of the pipes and replenish the trap seals.

As a rule of thumb for many domestic installations running the water from each outlet for a minimum of 5 minutes, after the water is delivered at the normal hot or cold temperatures will suffice.

Please note: When flushing the water, a mask should be worn to prevent possible inhalation of pathogens and organisms such as legionella bacteria.

Aerators, point-of-use filters, and other fittings may need to be removed to prevent scale getting caught when flushing, these are also a potential breeding ground for pathogens.

18.4 Emergency Safety Shower/Eye Wash Station.

All emergency showers, eye and face wash units shall be operationally tested on a weekly basis to flush the line and to verify proper operation.

This serves many purposes, some of which are listed below:

1. To refresh and replenish the water in the system.
2. Clear out any debris from within the pipe system, the system maybe old, galvanised pipe which will be passing particulates depending on the internal corrosion.
3. Cleaning out and refreshing the water minimises the probability of opportunistic plumbing pathogens (OPP) to start accumulating.
4. Temperature check of the water.
5. At the same time, allows the tester to check for;
   - Variations in supply conditions.
   - Environmental corrosion of equipment
   - Surrounding area (i.e are there any obstructions placed around the equipment or safe paths to the equipment)

These weekly tests should be recorded in a site logbook to facilitate continual supervision and to ensure that testing is, in fact, performed.

Annual testing:

On an annual basis, a more thorough testing procedure is required. That is, pressures, flows and temperatures are measured and any variation from the previous testing is noted and investigated.

Below is an example testing, audit and cleaning regime calendar, it is suggested that the School implements a similar regime to the below, this shall be included in the Hydraulic services O&M.

Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Logbook	Logbook	Logbook	Logbook	Logbook	Logbook	Logbook	Logbook	Logbook	Logbook	Logbook	Logbook
Weekly Test	Weekly Test	Weekly Test	Weekly Test	Weekly Test	Weekly Test	Weekly Test	Weekly Test	Weekly Test	Weekly Test	Weekly Test	Weekly Test
Annual Audit											
Cleaning			Cleaning			Cleaning			Cleaning		

Good Documentation is Paramount, especially at consent time.

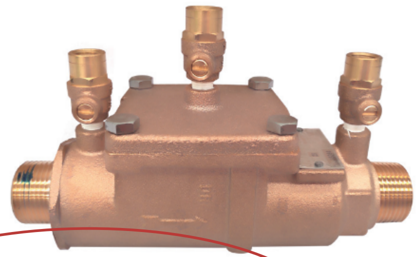
Series LF007

LF007-EN-202304

Lead Free Double Check Backflow Preventer

Size: DN15-DN50

Series LF007 Double Check Valve Backflow Preventer are designed to protect drinking water supplies from dangerous cross-connections in accordance with national plumbing codes and water authority requirements for non-potable service applications such as irrigation, fireline, or industrial processing. Only those cross-connections identified by local inspection authorities as non-health hazard shall be allowed the use of an approved double check valve assembly. Check with local authority having jurisdiction regarding vertical orientation, frequency of testing or other installation requirements.



Features

- Compact, space saving design
- Lead free large body, passages provides low pressure drop
- Top entry single access cover and modular check construction for ease of maintenance
- No special tools required for servicing
- Captured springs for safe maintenance
- Replaceable seats for economical repair
- Ball valve test cocks-screwdriver slotted

Specification

- Design Standard: AS/NZS 2845.1
- Connection Standard: DN15-DN50: MxM BSP
- Working Medium: Non corrosive liquids

Approval

WMKA1335

Consent officers are always on the look out to make sure the device specified meets AS/NZS 2845.1

The following table demonstrates compliance with the NZBC for the XXXX Consent Officer.

Code	Fixture Type	Hazard Rating	Backflow Protection	Comment
Sink	Sink - Kitchen	Low	Airgap	Meets NZBC G12, Table 2
CS	Cleaners sink	Medium	Airgap	Meets NZBC G12, Table 2
WHB	Wash Hand Basin	Low	Airgap	Meets NZBC G12, Table 2
WC	Water Closet (toilet)	High	Airgap	Meets NZBC G12, Table 2
LS	Lab Sink	High	RPZD or AVB	Meets NZBC G12, Table 2
HT	Hose Tap	Low - Medium	HTVB	Meets NZBC G12, Table 2
PRS	Prep-Room sink	High	RPZD	Meets NZBC G12, Table 2
PHR	Photo room sink (no machines connected)	Low - Medium	VB at tap outlet + airgap	Meets NZBC G12, Table 2
DW (D)	Dishwasher domestic	Low	Air Gap in appliance	Meets NZBC G12, Table 2
DW (C)	Dishwasher commercial	High (if chemical injected)	AVB integral to the appliance	Meets NZBC G12, Table 2
MUW	Cooling Tower Make Up Water	High	RPZD	Meets NZBC G12, Table 2
IRR	Irrigation Connection	Medium	DCV (no chemical injection)	Meets NZBC G12, Table 2

NOTE: All sanitary fixtures/fittings and appliances selected by the architect, check against the architects' selections during construction stage for adequate backflow prevention measures.
RPZD = Reduced Pressure Zone Device
AVB = Atmospheric Vacuum Breaker
VB = Vacuum Breaker

Provide the Consent officer the information to demonstrate the design has been through an assessment regime to identify the hazards, and what recommendations have been put in place.

Unfortunately always lacking in the majority of documentation that passes my desk when undertaking peer reviews.

Do BCA's have policies in place to satisfy themselves that the designer is competent in Backflow prevention?

Backflow Philosophy springs to mind.

D. SS7 Backflow Locations.

Backflow Prevention Protection to be listed on the Compliance Schedule for annual testing and verification are provided below:

Location	ID	Type	Size	Model	Comments
C&I Building – Chemistry Lab Wall	BF-01	RPZD	20 mm	Watts 009- (or approved equal)	Within stainless wall insert cabinet
C&I Building – Science Lab Wall	BF-02	RPZD	20 mm	Watts 009- (or approved equal)	Within stainless wall insert cabinet
C&I Building- Photography Room	BF-03	Airgap combined with Lab faucet Vacuum Breaker (Standard tapware, i.e. no lab nozzle)	10 mm	Watts NLF9-10 or equal approved	No appliances are attached to the water supply. Sink used for rinsing only. Non-commercial use. standard tap (complete with airgap and Lab Faucet Vacuum breaker for additional protection.

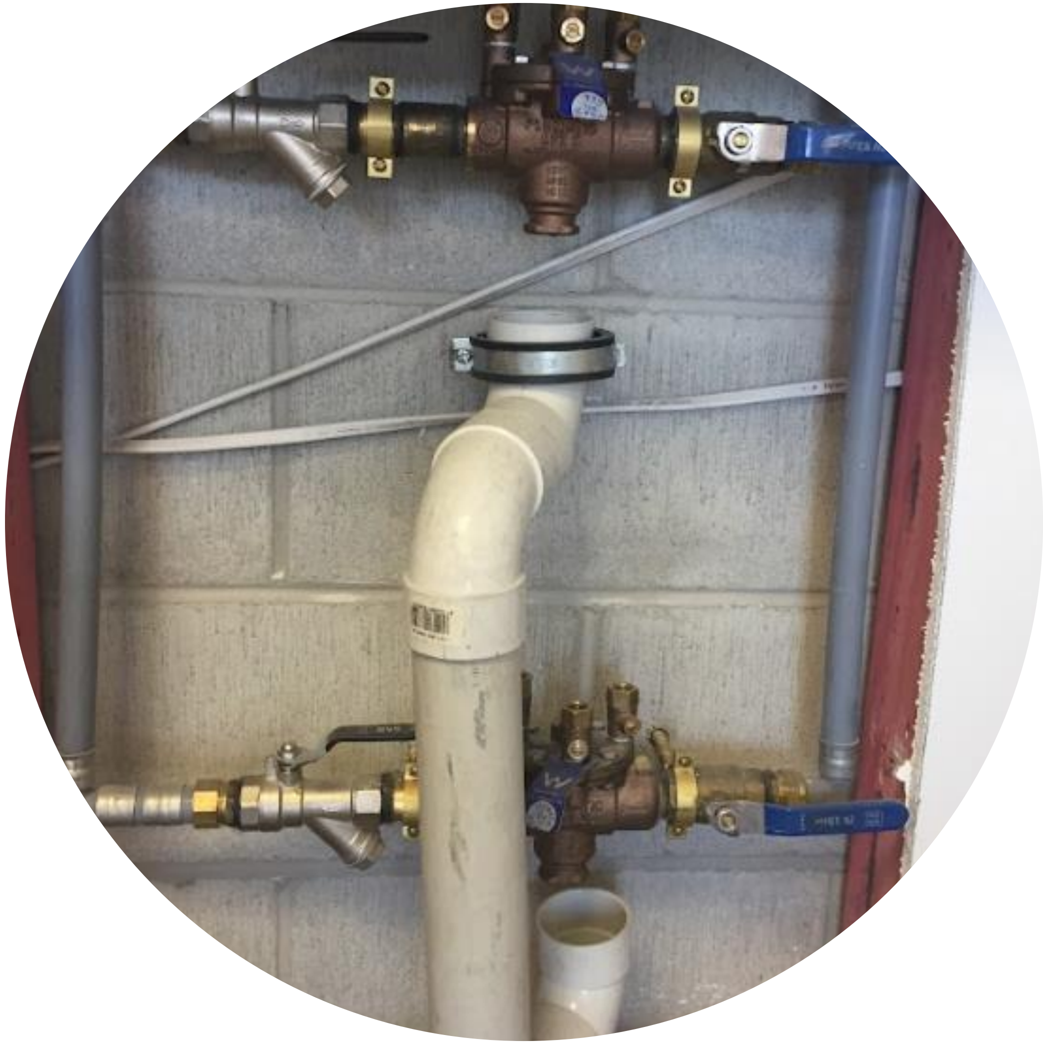
Figure 18.1: Backflow Locations (C&I Building)

A simple Table and Identifying/labelling all the devices within the building also helps in respect to understanding where the devices are located and ensuring they are added into the Compliance Schedule.

Easily Identifiable

Appliances and Integral backflow

Hairdressers sink = High Hazard in NZ………Lets just RPZD it all and hide it!



Simple yet under utilised solution

Drains!!

There is nothing specific within NZ/AS 1 G12 with sizing of the relief discharge pipe.

It just states refer to the manufactures instructions.

The manufactures instructions normally include 1 - 2 charts which give the flow rate from the relief valve.

Expensive kit…..why not!

So in a quick summary

- Protecting the building users from contaminated water is a huge responsibility.
- Don’t take for granted the water supply is safe/secure
- It is not always just about the backflow valve
- Look at the entire plumbing system as a whole
- Size the water pipes to suit the requirements
- Sensible and constructable design is paramount
- Think smarter with the water layouts
- Water safety management plans, try and implement them (it’s a hard road this one in NZ!!)
- Regular maintenance and regular water flushing


Straight off the potable water main.

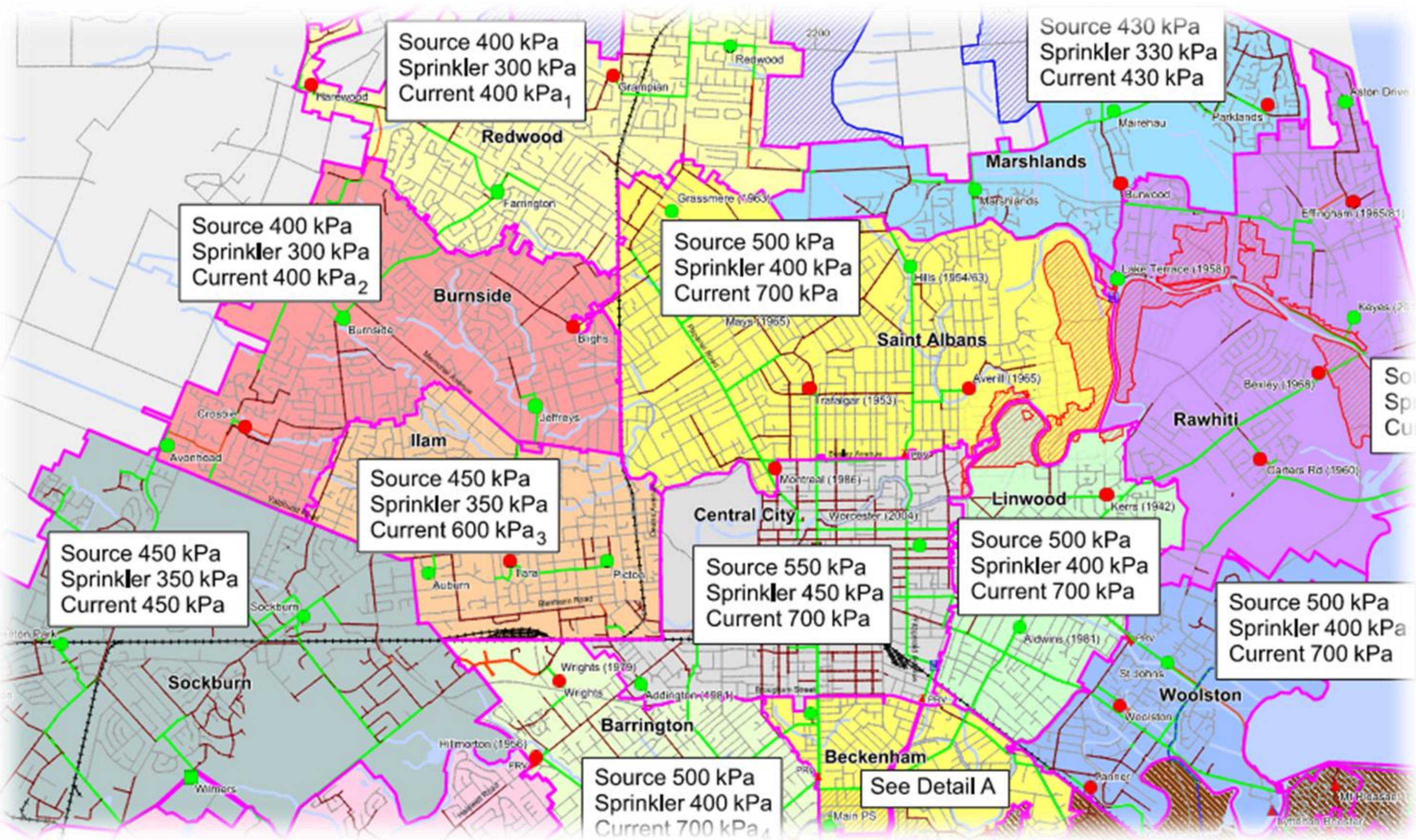
Questions?

Patai?

Slides not used

Pressure and Available pressure

The water utility supply me with x amount of pressure. All cities have different pressure zones so need to understand what the incoming pressure which determines a few factors such as introducing a booster pump into the design.



<u>Mains Flow and Pressure Report</u>

Hydrant locations:

Date: 29th July 2022

Time: 7.45am

Flow: Hydrant 1

Residual pressure: Residual kPa X & Y

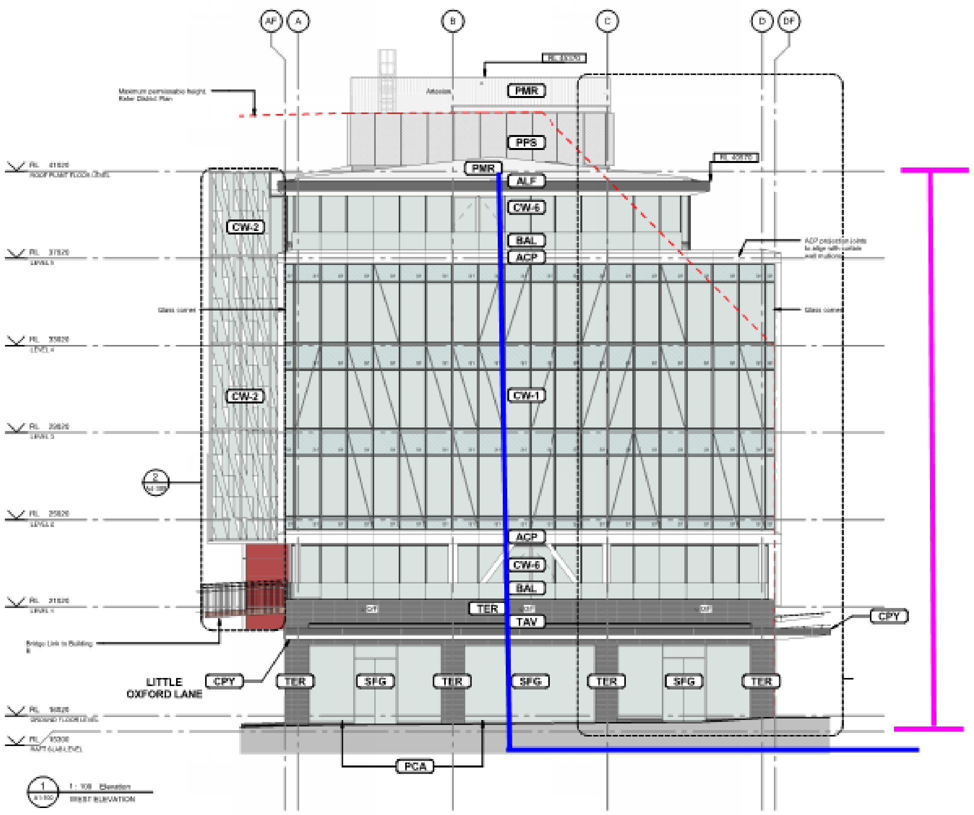
Maximum flow result: 2190Lpm at 375kPa & 505kPa

Test Supervisor:

Data:

Flow (Lpm)	Pressure (kPa) X	Pressure (kPa) Y
0	390	530
600	390	520
900	385	520
1500	380	510
2000	380	510
2260	375	505

Pressure and Available pressure



RL TO PLANT = 41020
RL TO GROUND = 16020

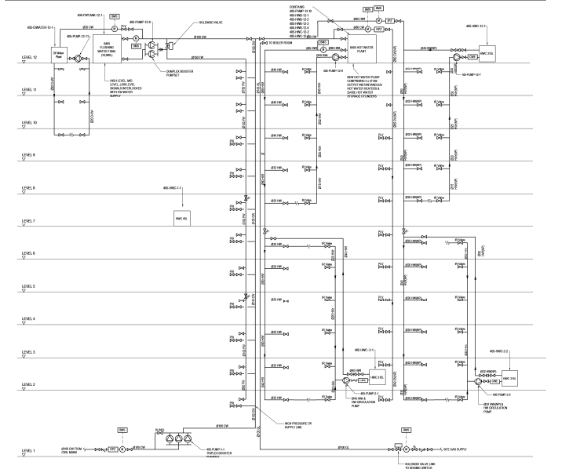
= 25 METRES
ALLOW SAY ANOTHER 5 METRES = 35 METRES

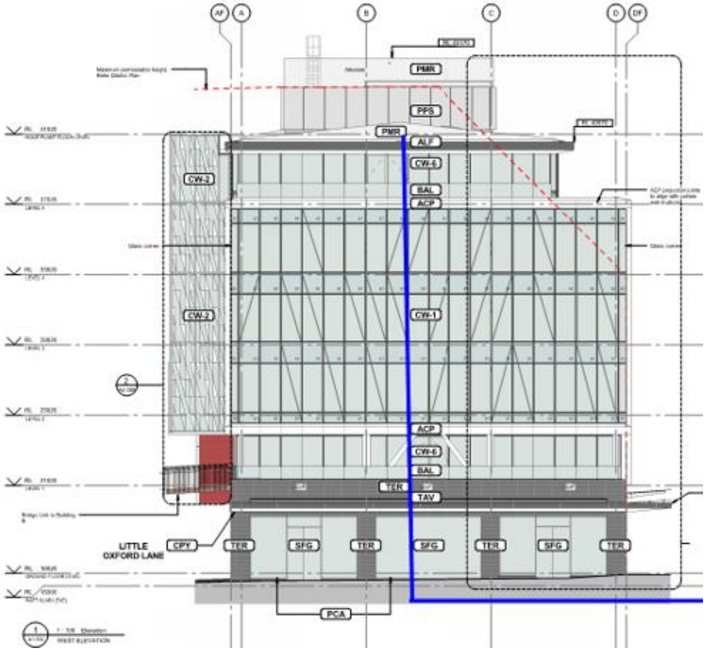
WATER PRESSURE IN THE STREET IS APPROX 300 KPA, REQUIRED PRESSURE TO THE TOP = 350 KPA.

THUS 300+350 = 650 KPA REQUIRED TO GET 350 KPA AT THE TOP.

ADD SAY A RPZD INTO THE MIX AND ....

Pressure and Available pressure





Include 1 x containment device, allow pressure drop of say 80 kpa

Allow for additional frictional losses in the system, say 50 kpa all up.

So top of the building we now have approx…

Starting pressure 650 kpa

- minus the RPZD, 80 kpa
- minus head, 300 kpa
- minus frictional losses, 50 kpa

Approx 220 kpa at the top where the important high hazard plant kit is located, they all require a RPZD.

Will the device function properly during peak demand?


TURN OFF
VALVE
AFTER
USING

BCA

You'd be surprised in Engineering Consulting, from my experience, it is a bit off a wash your hands approach.

- The specifications are written is such a way that responsibility is blurred.

Remember,

- There are no Hydraulic Qualifications in NZ
- University Degrees do not cover Public Health Engineering (Hydraulics as we know it)
- Public Health/Hydraulics is learnt "on the job" typically by mechanical engineers.

Then

- Any mistakes will be picked up at consent time…
- If missed at consent time, the specifications are written in a way that it's the plumber's responsibility anyway, so all good.

So…. if it isn't seen as important at an Academic/Consulting level then why should it be such a big deal in a design??

- Plumbing is a Restricted Licensed Trade, engineering in NZ has voluntary registration, and there are no Hydraulic Quals…

Rinse and repeat

- It worked last time……lets just do that again!

Always had me thinking this one

Verification Method G12/VM1 WATER SUPPLIES

Verification Method G12/VM1

1.0 Water Supply System

1.0.1 A design method for *water supply systems* may be verified as satisfying the Performances of NZBC G12 if it complies with:

Amend 6 Jun 2007 | Amend 12 Jun 2019

a) AS/NZS 3500.1 Section 2, Section 3 and Appendix C: Sizing method for supply piping for dwellings (note that Appendix C is part of this Verification Method even though it is included in the standard as an "Informative" Appendix), and

Amend 6 Jun 2007

b) AS/NZS 3500.4.

Section 4 not Cited

23 AS/NZS 3500.1:2018

SECTION 4 CROSS-CONNECTION CONTROL AND BACKFLOW PREVENTION

4.1 SCOPE OF SECTION

This Section specifies requirements and methods for the prevention of contamination of the drinking water within the water service and the water main and provides for the selection and installation of backflow prevention devices.

NOTE: For typical examples of potential cross-connections, see Appendix E.

4.2 PROTECTION OF WATER SUPPLIES

4.2.1 Design

All water supply systems shall be designed, installed, and maintained so as to prevent contaminants from being introduced into the drinking water supply system.

AS/NZS 3500.4:2018 20

SECTION 3 CROSS-CONNECTION AND BACKFLOW PREVENTION AND THERMOSTATIC MIXING VALVES

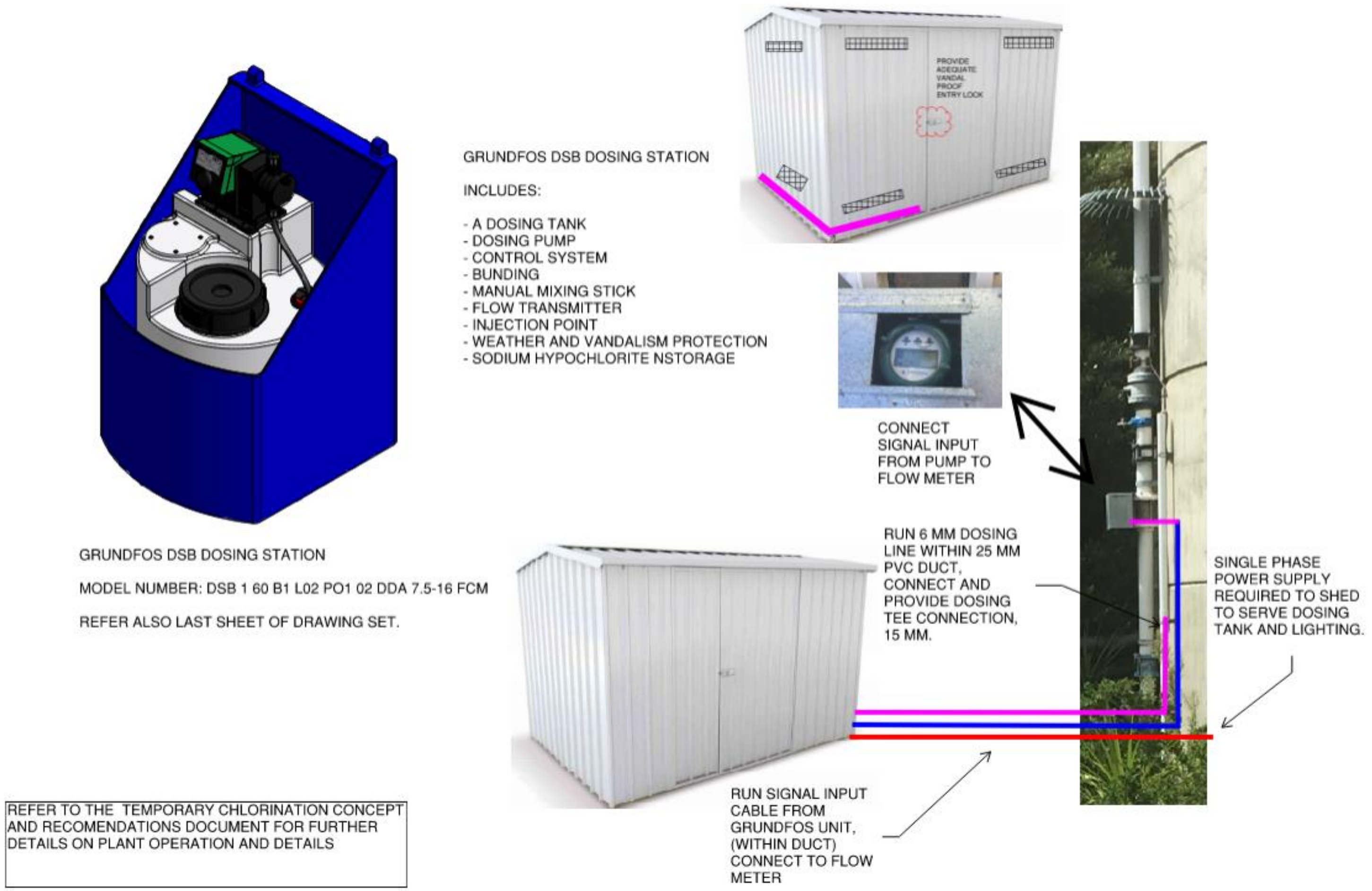
3.1 SCOPE OF SECTION

This Section sets out the requirements for the installation of backflow prevention devices and thermostatic mixing valves.

3.2 CROSS-CONNECTION CONTROL AND BACKFLOW PREVENTION

Cross-connection controls and backflow prevention devices shall be installed in accordance with AS/NZS 3500.1.

Lets look at some stuff



Additional water disinfection/treatment?