BACKFLOW PREVENTION

MANAGEMENT PLAN

(A Plan to meet the requirements of the Health Act as relates to Backflow Prevention)

South Waikato District Council

DOCUMENT CONTROL SHEET

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This document comprises a total of 83 pages (excluding cover).

REVISIONS

Number	Issue date	Description	Additions
Version 1.0	April 2010	Draft	
Version 1.1	July 2010	Final	

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1.0 Introduction

This Backflow strategy has been instigated following the South Waikato District Council (SWDC) Asset Management Plan Improvement Programme (Item IP 11) and the Public Health Risk Management Plan (PHRMP) (Item IP 2.1).

SWDC have been aware of the need for backflow prevention for some time as it was identified in the 1961 Water Protection Regulations. To this end, SWDC have already identified that Wastewater pump stations are a high hazard and have installed backflow prevention devices on all wastewater pump stations which includes six monthly testing by the Contractor to ensure the ongoing operation of the devices. Also, properties with connection between the water source and the reservoir in Arapuni, Tirau and Putaruru have been fitted with an RPZ at their boundary.

The SWDC Building Control Authority has also enforced backflow prevention as required under the Building Act to date. The Building Act addresses the protection of the people inside the property via protection at source (i.e. at the hazardous appliance such as the bedpan washer). The Building Control Authority is limited in its window of opportunity to enforce backflow prevention as this can only be required of a property owner at the time of uplifting a building consent.

If a building is considered unsafe or unsanitary a notice can be issued to the property owner but the risk would need to be very high for this to occur.

Due to this limitation the Services Department is focussed on pressing on with protection of the public water supply by ensuring backflow preventers are installed at the property boundary as there is no limitation on when this can occur under the Health Act.

Historically, water suppliers have struggled to instigate backflow prevention programmes due to duplicate and confusing legislation. This lead the inclusion of Section 69ZZZ in the Health Drinking Water Amendment Act 2007 which give water suppliers the powers to install backflow devices at the boundary and recoup the costs from the property owner when there is a need to protect the public water supply from a risk.

Boundary protection to the networked system

This change in legislation has opened the door to simple and concise backflow prevention programmes. This policy addresses the strategy of the Service Department to achieve boundary protection on all high risk properties and general reduction of risk in relation to backflow.

The overall strategy of South Waikato District Council in this document is to:

- Identify potential hazards
- Ensure potential hazards have appropriate backflow protection
- Ensure a register is kept of all backflow prevention devices
- Ensure the devices are tested annually
- Educate consumers of the potential hazards associated with backflow

This document supports the following strategic and operational documents:

- Water Supply Asset Management Plan
- Public Health Risk Management Plan
- Code of Practice for Subdivision and Development (part 5 Water Supply and Other Services)

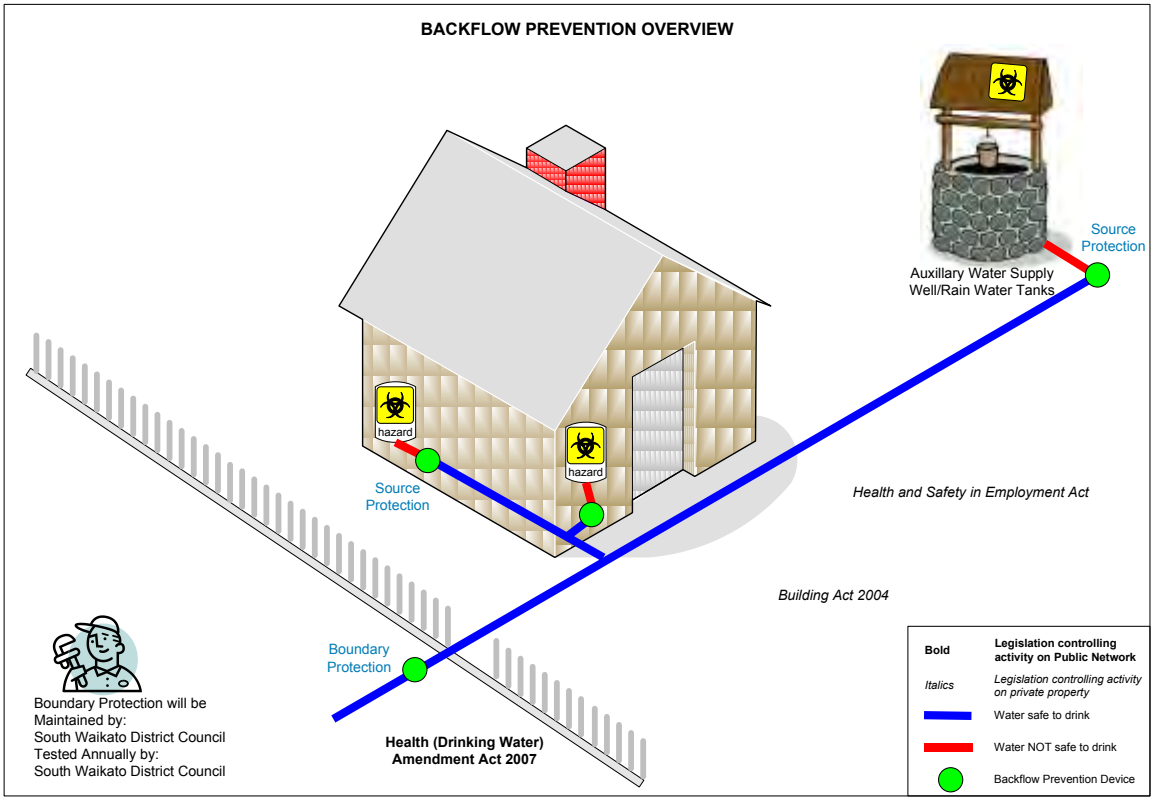
2.0 How Backflow Occurs

Backflow is the flow of a liquid, solid or gas contaminant back into the potable public water supply. This can happen either by back-siphonage or back-pressure and applies to both hot and cold water systems.

Back-siphonage backflow is caused by the supply pressure becoming less than the downstream pressure, causing a vacuum in the supply pipe line. Back-siphonage can be created when there is stoppage of the water supply due to nearby fire-fighting, repairs or breaks in the water main. This effect is similar to sipping a drink through a straw, which induces a flow in the opposite direction.

Back-pressure backflow is caused by downstream pressure that is greater than the upstream or supply pressure in a public water system or consumer's potable water system. Back-pressure can result from an increase in downstream pressure, a reduction in the potable water supply pressure, or a combination of both. Increases in downstream pressure can be created by pumps in the consumer's water supply.

Source protection is enforced under the Building Act by the SWDC Building Control Authority. The Building Control Authority is limited in its window of opportunity to enforce backflow prevention as this can only be required of a property owner at the time of uplifting a building consent. Due to this limitation the Services Department is focussed on pressing on with protection of the public water supply by ensuring backflow preventers are installed at the property boundary as there is no limitation on when this can occur under the Health Act. This relationship for legislative backflow protection at source and boundary is indicated on the diagram below.



3.0 Council's Legal Obligations and Best Practice Guidelines

The following extracts of summaries of the principal Acts, Regulations and Standards that are relevant to the area of backflow prevention to provide a background to Council's responsibilities and powers.

Refer to Section 14.0 Extracts of Legislation for full versions of the legislation where appropriate.

3.1 Legislative Position in relation to this Policy

3.1.1 Health (Drinking Water) Amendment Act 2007

The Health (Drinking Water) Amendment Act 2007 which came into effect on 1 July 2008, is now the primary piece of legislation that relates to the protection of public drinking water supplies by the local authorities.

The Health (Drinking Water) Amendment Act 2007 revokes the previous Water Supplies Protection Regulations 1961, which were established under the Health Act 1956, and which previously contained the main legislative provisions relating to backflow prevention.

Following is Section 69ZZZ which specifically addresses backflow prevention.

> ***69ZZZ Protecting water supplies from risk of back-flow***
>
> *1 This section applies if a networked supplier considers that there is a need to protect the networked system from risks of pollution caused by water and other substances on properties connected to the networked system.*
>
> *2 A networked supplier may,—*
> *(a) if the supplier considers it desirable or necessary,—*
>
> *(i) install a back-flow prevention system in the network on the side of the point of supply for which the supplier is responsible for maintaining; or*
> *(ii) allow the owner of property to which water is supplied to install a back-flow prevention system that incorporates a verifiable monitoring system (being a monitoring system approved by both the supplier and a drinking-water assessor):*
>
> *(b) require the owner of the property in respect of which the back-flow prevention system operates or the person who is required (whether under the Local Government Act 2002 or any contract) to pay for drinking water supplied to that property,—*
> *(i) if paragraph (a)(i) applies, to reimburse the supplier for the cost of that system (including the cost of installation, testing, and on-going maintenance); and*
> *(ii) if paragraph (a)(i) or (ii) applies, to repair or modify any back-flow prevention system that, in the opinion of the supplier, is not functioning adequately.*
>
> *A person who installs a back-flow protection device must take all reasonable steps to ensure it can operate in a way that does not compromise the operation of any automatic sprinkler system connected to the water supply.*
>
> *A networked supplier—*
> *(a) must test each back-flow protection device operating in its network at least once a year; and*
> *(b) must advise the territorial authority in its area of the results; and*

(c) may require the occupier of the property in respect of which the device operates to pay the reasonable costs involved in conducting the test.

3.1.2 Health Act 1956

The Health Act 1956 requires that adequate water supplies are provided to communities including any building built, sold or let must have an adequate and convenient supply of wholesome water.

69G Interpretation
wholesome, in relation to drinking water, means—
(a) being potable; and
(b) not containing or exhibiting any determinand in an amount that exceeds the value stated in the guideline values for aesthetic determinands in the drinking-water standards as being the maximum extent to which drinking water may contain or exhibit the determinand without being likely to have an adverse aesthetic effect on the drinking water

Section 23 of the Act also provides for the network supplier "to make bylaws under and for the purposes of this Act or any other Act authorising the making of bylaws for the protection of public health."

The Health Act 1956 now contains significant new provisions relating to backflow that were introduced via the Health (Drinking Water) Amendment Act 2007 that relate to the protection of drinking water including the installation of backflow prevention devices, refer to Section 3.1.1.

3.1.3 Local Government Act 2002 (LGA2002)

The LGA2002 is a wide ranging piece of legislation that sets out the purpose and obligations of local authorities. Although not specifically covered by the LGA2002, there are several areas of the Act that have relevance to the prevention of potential contamination by backflow. These include:

Part 7 details specific obligations of local authorities. Although not specifically covering backflow potential contamination, section 130 covers obligations to maintain water services. In addition, section 126 covers general obligations relating to the supply of water at a scheme level.

3.2 Associated Legislation

Backflow prevention devices must be correctly installed, maintained and tested as a requirement for compliance schedule

The following legislation will not be used by SWDC Services Department in the enforcement of the Services backflow strategy but is provided for background information on the wider role that SWDC fulfils.

3.2.1 The Building Act 2004

This requires that buildings are safe and sanitary and the occupants are safeguarded from possible illness.

The Act requires, under sections 100 and 101, that an annually renewable Building Warrant of Fitness (for non-residential buildings) to ensure

the specified systems stated in the compliance schedule are operating correctly. The compliance schedule includes any backflow preventers installed at the source of potential contamination.

The Building Act calls upon the Building Code in the Building Regulations 1992, specifically, Schedule 1, G12 Water Supplies regarding backflow prevention. This is the minimum acceptable standard to comply.

It should be noted that existing buildings, and their specified systems, are not required to be upgraded to comply with the Building Code unless an alteration or change of use takes place (refer sections 112A, 115 and 116A of the Building Act 2004). This effectively means that where a building, and its associated water systems, were built and approved under legislation prior to the introduction of the Building Code, Council may not be able to use the Building Act to enforce the installation of a backflow preventer within a building. However, with the passing of the Health (Drinking Water) Amendment Act 2007, Council now has the ability to enforce the installation, and ongoing testing and maintenance, of backflow prevention devices on the reticulation side of a property boundary.

3.2.2 New Zealand Building Code 1992

The New Zealand Building Code was established as the First Schedule to the Building Regulations 1992. It should be noted that at the time of publication, the Building Code was being reviewed to align it with the Building Act 2004. All new building work must comply with the Building Code. It is a performance based code, which means it states how a building and its components must perform as opposed to describing how the building must be designed and constructed. The relevant clause in the NZ Building Code for Water Supplies is G12.

Dental cuspidors with inlets below the flood rim allow potential contamination

The first objective of G12, as stated in G12 1.1, is to "***safeguard people from illness caused by contaminated water***". Clause G12 3.2 further specifies that a building's potable water supply systems shall be protected from potential contamination, and shall be installed in a manner which avoids the likelihood of potential contamination within the building's system, and water main.

A building owner is therefore required by law to „***avoid the likelihood of potential contamination within the system and the water main'.*** To help building owners ensure that their building's potable water system complies with this legal requirement, the Department of Building and Housing has prepared a Compliance Document in accordance with section 22 of the Building Act 2004. Compliance Documents are non-mandatory guidance documents, but do provide a recognised method with the specified performance criteria of the NZ Building Code.

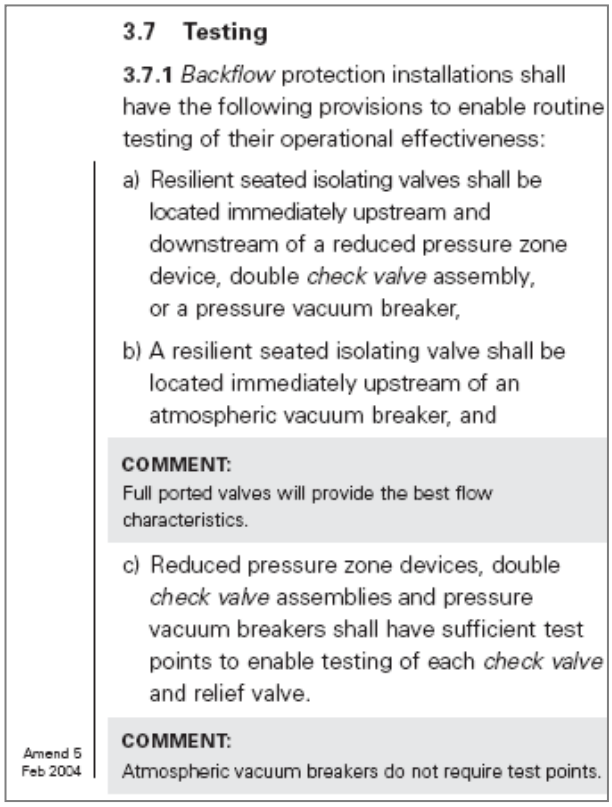
3.2.3 Compliance Document for NZ Building Code 2004 Clause G12/AS1 Second Edition (June 2007)

The Compliance Document for G12/AS1 Water Supplies (June 2007) provides guidance on the following aspects:

- Section 3.1 of the Compliance Document for Clause G12/AS1 prohibits water that has been drawn from the water main from being returned to the public system via backflow or cross connection.
- Section 3.2 prohibits cross connections between mains potable water supplies and private potable water supplies, as well as between potable water supplies and any facilities or pipes containing non-potable substances.
- Section 3.3 sets out hazard ratings for various types of facilities or appliances.
- Section 3.4 specifies the conditions under which backflow protection shall be provided. i.e. wherever it is possible for water or contaminates to backflow into

the potable water supply, as applicable the appropriate hazard rating in table 2 of the document.

The following is Clause G12/AS1 from the New Zealand Building Code



3.7 Testing

3.7.1 *Backflow* protection installations shall have the following provisions to enable routine testing of their operational effectiveness:

a) Resilient seated isolating valves shall be located immediately upstream and downstream of a reduced pressure zone device, double *check valve* assembly, or a pressure vacuum breaker,

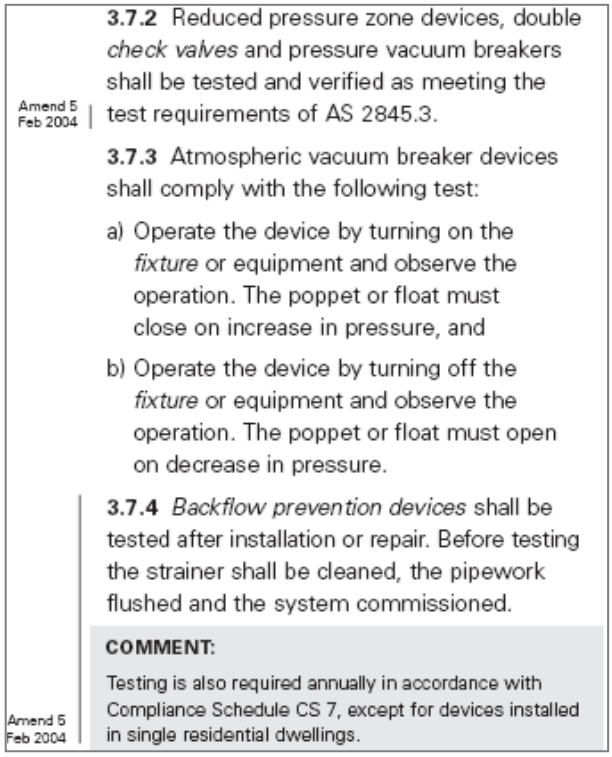
b) A resilient seated isolating valve shall be located immediately upstream of an atmospheric vacuum breaker, and

COMMENT:
Full ported valves will provide the best flow characteristics.

c) Reduced pressure zone devices, double *check valve* assemblies and pressure vacuum breakers shall have sufficient test points to enable testing of each *check valve* and relief valve.

Amend 5 Feb 2004

COMMENT:
Atmospheric vacuum breakers do not require test points.



Amend 5 Feb 2004

3.7.2 Reduced pressure zone devices, double *check valves* and pressure vacuum breakers shall be tested and verified as meeting the test requirements of AS 2845.3.

3.7.3 Atmospheric vacuum breaker devices shall comply with the following test:

a) Operate the device by turning on the *fixture* or equipment and observe the operation. The poppet or float must close on increase in pressure, and

b) Operate the device by turning off the *fixture* or equipment and observe the operation. The poppet or float must open on decrease in pressure.

3.7.4 *Backflow prevention devices* shall be tested after installation or repair. Before testing the strainer shall be cleaned, the pipework flushed and the system commissioned.

COMMENT:
Testing is also required annually in accordance with Compliance Schedule CS 7, except for devices installed in single residential dwellings.

Amend 5 Feb 2004

3.2.4 Building (Specified Systems, Change in use, and Earthquake Prone Buildings) Regulations 2005

Schedule 1, Specified Systems (7), states *'Automatic back-flow preventers connected to a potable water supply'.* This legislation simply re-affirms that where installed, a „specified system' is subject to a compliance schedule and Building Warrant of Fitness.

3.2.5 Health and Safety in Employment Act 1992

The Health and Safety in Employment Act states the responsibility of the employer to ensure the safety of employees as outlined in Section 6 of the Health and Safety in Employment Act.
The responsibility of the employer extends to visitors entering the building including volunteers as outlined in Section 3C, 3D and 16, refer to Section 14.7 Health and Safety in Employment Act 1992 of this plan for more details.

3.3 National Standards and Industry Best Practice Guidelines

3.3.1 Drinking Water Standards for New Zealand 2005

Following is an excerpt from the Drinking Water Standards for New Zealand.

"Drinking-water Standards for New Zealand 2005 (DWSNZ) supercedes Drinking-water Standards for New Zealand 2000 (Ministry of Health 2000). It details how to assess the quality and safety of drinking-water using the revised water quality standards and compliance criteria (collectively called the DWSNZ) that come into effect from 1 January 2006. The drinking-water standards apply to drinking-water, that is, water intended to be used for human consumption,

food preparation, utensil washing, oral hygiene or personal hygiene. The criteria are applicable to all drinking-water except bottled water, which must comply with the Food Act 1981."

"The DWSNZ alone are not sufficient to protect against the public health risks from contaminated drinking-water. They provide a check on the final quality of the water delivered to consumers. The potential contamination of a water supply is guarded against by the treatment and delivery processes being managed as specified in the Public Health Risk Management Plan for the supply."

3.3.2 Backflow Prevention for Drinking Water Suppliers Code of Practice 2006

This publication is a recommendation, as determined by Water New Zealand (formerly NZWWA), of how local authorities should carry out „good practice' in protecting their water supplies from potential contamination, in particular via backflow into mains water supplies.

The Backflow Prevention Code of Practice deals only with Boundary Protection, with internal protection at the source of potential contamination, principally controlled by the Building Act 2004 and the Building Code 1992.

In the preparation of this code it was indeeded that this code be formally adopted by all Water Suppliers as the method of compliance to Ministry of Health Public Health Risk Management Plan offering some uniformity throughout New Zealand. It's contents include Water Supplier and Customer Responsibilities, Product and Design Standards, Testers and Surveyors Qualifications.

Hazards can exist at outlets intended for food preparation

Adoption of the code requires Water Suppliers to:

- Ensure that the actions of customers do not have the potential for an adverse effect on other customers through potential contamination of water supply mains
- Be proactive in determining what customers pose significant potential hazards to the integrity of the water supply
- Have clear policies on backflow prevention
- Have a „risk management programme' to identify potential hazards and ensure that appropriate backflow devices are installed at all properties/premises. The risk management programme should include a database of containment devices, and include a system for regular testing of devices
- Ensure that all personnel are appropriately trained

SWDC has used this Code of Practice extensively in the preparation of this Document.

3.3.3 Ministry of Health Public Health Risk Management Plan Guide (Distribution System) Backflow Prevention June 2001

The Ministry of Health produces various guides to assist water suppliers in complying with existing Drinking Water Standards and legislation. The Ministry of Health Guide to Public Health Risk Management Plans (Distribution System) - Backflow Prevention provides guidance on the types of potential hazards associated with backflow events, identifying possible causes and preventive measures.

South Waikato District Council have an prepared Public Health Risk Management Plans for each scheme. They have taken into account the Ministry of Health Guide to Public Health Risk Management Plans (Distribution System) - Backflow Prevention as referenced in Section 3.4.3 of this Document.

3.3.4 AS/NZS 2845.1:1998 Water supply - Backflow prevention devices - Materials, design and performance requirements

"This Standard specifies requirements for the design, performance and testing of backflow devices, used for the protection of potable water".

3.3.5 AS/NZS 3500.1:2003 Plumbing and drainage – Water Services

Section 1.1

"This Standard specifies the requirements for the design, installation and commissioning of cold water services from a point of connection to the points of discharge, and non drinking water from a point of connection to the points of discharge. It applies to new installations as well as alterations, additions and repairs to existing installations."

Section 4.1

"Section 4 specifies the requirements and methods for the prevention of potential contamination of the drinking water within the water service and the water main and provides for the selection and installation of backflow prevention devices."

Please note that AS/NZS 3500.4:2003 has the following reference for backflow prevention under Section 3.2 Cross-Connection and Backflow Prevention: "Cross-connection controls and backflow prevention devices shall be installed in accordance with AS/NZS 3500.1."

3.3.6 AS/NZS 3500.5:2000 Plumbing and Draining Part 5: Domestic Installations

Section 1.1

"This Standard sets the requirements for the installation of hot and cold water supply, sanitary plumbing and drainage and stormwater drainage, for domestic plumbing work."

Section 1.2.2

"This Standard may be used for compliance with the New Zealand Building Code clause G12, Water Supplies."

Section 1.4.3

Of specific note is that application of "This Standard may be used as an alternative solution for compliance with the New Zealand Building Code Clause G12, Water Supplies and Clause G13, Foul Water."

Section 2.16

Section 2.16 deals with the Protection of Potable (Drinking) Water Supplies while Section 2.17 deals with Provision of Backflow Prevention Devices and Section 2.18 specifically addresses protection of hazards relating to the installations of Irrigation and Lawn Watering.

3.4 South Waikato District Council Standards and Plans

3.4.1 SWDC Code of Practice for Subdivision and Land Development

This document outlines the standard of construction that all assets are to be built to including the list of Approved Materials to be used within the SWDC water supply.

3.4.2 SWDC Water Supply Bylaw

South Waikato District Council were revising the Water Supply Bylaw in 2010.

3.4.3 SWDC Public Health Risk Management Plan

Following is an extract from the SWDC Public Health Risk Management Plan as at March 2010 relating to the risk presented by potential backflow at that time.

Event	Critical Points within System Element	Risk Level	Mitigation Existing	Mitigation Proposed
No backflow policy	Distribution System - Backflow Prevention	Significant	Suitable qualified maintenance staff Testing of known backflow devices on annual basis Ongoing training of maintenance staff	Back flow policy instigated
No backflow prevention device	Distribution System - Backflow Prevention	Significant	Only newer connections have manifolds	

4.0 Overall Strategy and Work Programme

South Waikato District Council Services Department are committed to protecting the potable water supply from potential backflow hazards.

In 2010 SWDC carried out a desktop assessment of potentially high hazard premises within the district. A work programme has been created in a Microsoft Excel spreadsheet to monitor progress of this programme. The desktop assessment was completed by:

- Reviewing SWDC internal memorandums stating potential backflow hazards (dated 18 December 1996 and 30 January 2001)
- Identifying properties in the South Waikato A-Z business directory
- Identifying properties in the yellow pages
- Interviewing SWDC Services, SWDC Building Consent Authority and Watermark staff for known premises that could be a hazard

The desktop assessment was then developed into an inspection programme staged over three years. The inspection programme consists of an on-site hazard inspection of the property. A Backflow Prevention Inspection Checklist form, refer to Section 15.1, will be completed for each property.

Properties that are identified as a high hazard will then be programmed for a backflow prevention device to be installed at the boundary within three months. This strategy has prioritised high hazard properties to be addressed first with the emphasis on Putaruru.

All high hazards in Putaruru will be addressed first as chlorine treatment in Putaruru is programmed to be turned off thereby removing any residual protection in the water supply mains this would provide.

The backflow devices will be installed by Council's Contractor and the property owner will be billed a standard fee as per the size of the device. Properties with a backflow prevention device installed will have an annual fee on the property that covers annual testing and depreciation on the device.

The maintenance costs of the devices will be funded by the general water supply rate.

This cost share between private and public has been created to recognise that the property owner has created the hazard and should pay for the initial purchase and installation of the device and its annual testing. However, the devices are installed to protect the entire community so the maintenance and renewal of the devices can justifiably be funded by the ratepayer to recognise the greater good provided by the devices.

Annual testing will be managed and issued by SWDC and completed by Council's Contractor.

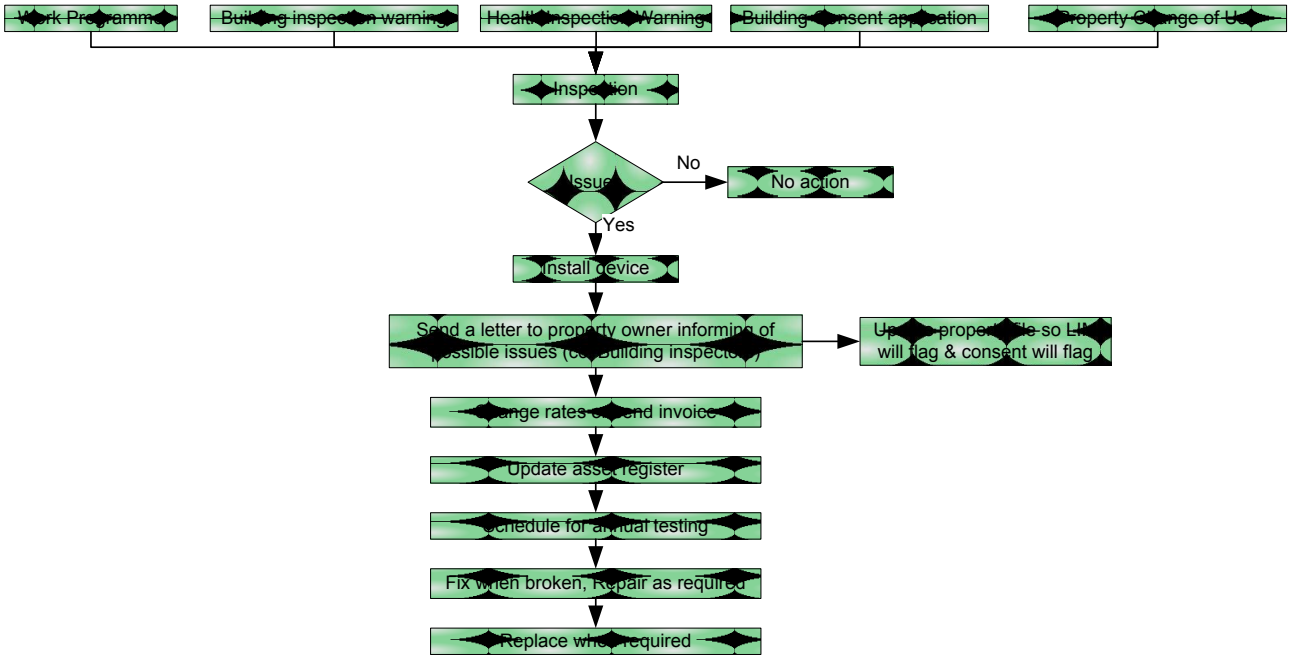
Whenever a boundary device is to be installed by SWDC the property owner will be notified of this in advance. This standard letter (Refer Appendix 15.0) shall notify the property owner of the hazard their property presents and the anticipated installation fee. However, this letter shall also inform the property owner that this does not supersede their responsibility under the Building Act and they are still responsible for providing source protection at hazards. The property owner shall also be informed that their property file has been tagged as such.

SWDC have recognised that some pipe work changes (such as water meter offset or renewal) may be required when the backflow device is installed at the boundary. SWDC will carry the cost of these extra charges, over and above the standard backflow installation cost. Also, any "unders or overs" on the standard installation cost against actual cost will be funded by SWDC via the backflow prevention budget.

SWDC recognise that the public and potentially some tradesmen may not fully understand the issues around backflow and what the potential health risks associated with a backflow event could be. For this reason SWDC will carry out the following education:

- Carry out awareness programme
- Send a letter to property owners that inspections for backflow will be carried out and what backflow is
- Update South Waikato District Council website to include information on backflow prevention
- Have information flyers available when building consents that affect water supply are applied for
- Have information available at plumbing outlets
- Send out general information via rates and the newspapers
- Establish processes for identifying new issues as they arise (i.e. Building consent applications and change of use)

SWDC have adopted the following process to manage possible backflow issues.



5.0 Roles and Responsibilities

5.1 General

This strategy identifies the following parties as having a significant responsibility and contribution towards the Services backflow prevention strategy:

- SWDC Services Department
- SWDC Building Consent Authority
- Council's Contractor
- Property Owners

5.2 SWDC Services Department

SWDC Services department shall be responsible for:

- Updating this document on a regular basis or as deemed necessary
- Inspections to assess property hazard and communication with owner
- Installing boundary protection on all High Hazard properties
- Education of the public on the hazards associated with backflow
- Invoicing property owners for backflow device installation
- Maintaining a register of all boundary backflow devices and their annual tests
- Ensuring annual testing is carried out for boundary devices
- Ensuring that properties with potential internal hazards not mitigated at the source are noted on the Property File to appear during the LIM process and lodging of Building Consent process
- Ensure all records are available for inspection by the Medical Officer of Health
- Ensure that all Contractors that work on the water supply comply with this Document
- Education of IQP/LBP, plumbers and relevant Council staff on the requirements of this Document

5.3 SWDC Building Consent Authority

South Waikato District Council Consent Authority shall be responsible for:

- Source Protection of hazards in accordance with Building Code G12
- Processing of consents for installation of devices including checking for compliance schedule requirements
- Ensure all consents for water supply are assessed by SWDC Services Department for potential backflow protection at boundary
- Advising property owner to apply for Compliance Schedule where none exists (to ensure all source protection devices are recorded on this)
- Fitting HCVB's free of charge during the consent or any inspection process including replacement of existing defective devices
- Ensuring that properties with potential internal hazards not mitigated at the source are noted on the Property File to appear during the LIM process and lodging of Building Consent process

5.4 Council's Contractor

Council's Contractor shall be responsible for:

- Installing all Council owned boundary devices to the standards set out in this Document
- Carrying out Annual testing on boundary Backflow devices

- Maintaining certified backflow test equipment as required
- Maintaining a staff member qualified as an IQP as required
- Being familiar with the requirements of this Document

5.5 Property Owner

To comply with this Policy:

The property owner has the responsibility to pay for the standard cost associated with the installation and annual testing of backflow prevention devices installed at the boundary under the Health (Drinking Water) Amendment Act. Also the property owner may separately be required by the Building Consent Authority to install source protection and shall be responsible for the installation and costs associated with the installation, maintenance and testing of backflow prevention devices within their property as per the Building Act 2004.

If a property is tenanted the Property Owner is legally responsible for ensuring the protection of the potable water supply, regardless of existing tenancy agreements.

The Property Owner and tenants shall not interfere with any device fitted at their property.

To comply with the Building Act:

The property owner shall be responsible for preventing any potential contamination of the potable water supply and must:

- Observe all legislative requirements regarding the correct use or change of use of all equipment connected to the potable water supply
- Lodge a building consent for the installation, alteration and removal of all internal backflow prevention devices
- Apply for a Compliance Schedule in conjunction with building consent
- Install suitable backflow prevention device(s) within the specified timeframe given in writing by Council
- Maintain these device/s in proper working order at all times
- Notify Council of any change in property use or alterations to plumbing that may compromise the quality of the potable water supply or introduce additional potential hazards
- Test all internal devices annually by the anniversary date of the last test
- Keep a copy of the test certificates for the previous two years minimum and returning all test certificates to Council, as per the Building Act 2004 Section 110
- Ensure that any internal backflow protection device is accessible at all times and is not bypassed unless protected by another device of equivalent hazard rating
- Allow access for Council's Contractor as required

These requirements only apply to devices within the property boundary. Should the relevant Regulations or Standards change at any time the property owner shall be responsible for fully complying with any new requirements.

The property owner is responsible for the payment of all fees and costs associated with consents, installation, maintenance, testing, or removal of internal devices to meet the requirements of the Building Act.

If the property owner installs a complying backflow device without lodging a building consent the property owner shall be responsible for any fees associated with demonstrating compliance with the Building Act retrospectively.

If a property is tenanted the Property Owner is legally responsible for ensuring the protection of the potable water supply, regardless of existing tenancy agreements.

6.0 Hazards and Acceptable Solutions

6.1 Hazard Rating

The cross connection hazard rating is defined in the Building Code G12/AS1 as:

Hazard Rating	Description
High Hazard	Has the potential to cause death
Medium Hazard	Has the potential to injure or endanger health
Low Hazard	Would constitute a nuisance, by colour, odour or taste, but not injure or endanger health

A full list of hazards and their classifications as per Clause G12/AS1 of the Building Code are included below.

COMMENT:

High hazard may include but not necessarily be limited to:

a) Autoclaves and sterilisers

b) Systems containing chemicals such as anti-freeze, anti-corrosion, biocides, or fungicides

c) Beauty salon and hairdresser's sinks

d) Boiler, chiller and cooling tower make-up water

e) Car and factory washing facilities

f) Chemical dispensers

g) Chemical injectors

h) Chlorinators

i) Dental equipment

j) Direct heat exchangers

k) Fire sprinkler systems and fire hydrant systems that use toxic or hazardous water

l) Hose taps associated with High hazard situations like mixing of pesticides

m) Irrigation systems with chemicals

n) Laboratories

o) Mortuaries

p) Pest control equipment

q) Photography and X-ray machines

r) Piers and docks

s) Sewage pumps and sump ejectors

t) Sluice sinks and bed pan washers

u) Livestock water supply with added chemicals

v) Veterinary equipment

Note: The examples given are not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

COMMENT:

Medium hazard may include but not necessarily be limited to:

a) Appliances, vehicles or equipment

b) Auxiliary water supplies such as pumped and non-pumped fire sprinkler secondary water

c) Deionised water, reverse osmosis units and equipment cooling without chemicals

d) Fire sprinkler systems and *building* hydrant systems

e) Hose taps and fire hose reels associated with Medium hazard

f) Irrigation systems with underground controllers

g) Irrigation without chemicals

h) Livestock water supply without added chemicals

i) Untreated water storage tanks

j) Water and steam cleaning

k) Water for equipment cooling

l) Drink dispensers with carbonators

m) Swimming pools, spas and fountains

Note: The examples given are not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

COMMENT:

Low hazard may include but not necessarily be limited to:

a) Drink dispensers (except carbonators).

Note: The example given is not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

South Waikato District Council staff and authorised contractors will determine the device appropriate by assessing the hazard against the above criteria, based on information made available by the property owner.

Should the required information not be made available to South Waikato District Council staff, a high hazard will be assumed.

6.2 Levels of Protection and Acceptable Solutions

Clause G12 of the Building Code provides acceptable solutions as outlined in the table below. Please note that only RPZ and Double Check devices are anticipated to be installed at the boundary but the full table is provided for reference.

Table 6.1: Selection of Backflow Protection (G12/AS1)

Table 2: Selection of Backflow Protection
Paragraph 3.4.5

Type of backflow protection	CROSS CONNECTION HAZARD					
	HIGH		MEDIUM		LOW	
	back-pressure	back-siphonage	back-pressure	back-siphonage	back-pressure	back-siphonage
Air gap (see **Note 1**)	✓	✓	✓	✓	✓	✓
Reduced pressure zone device	✓	✓	✓	✓	✓	✓
Double *check valve* assembly (see **Note 2**)			✓	✓	✓	✓
Pressure type vacuum breaker (see **Note 3**)		✓		✓		✓
Atmospheric vacuum breaker (see **Note 4**)		✓		✓		✓

Note:

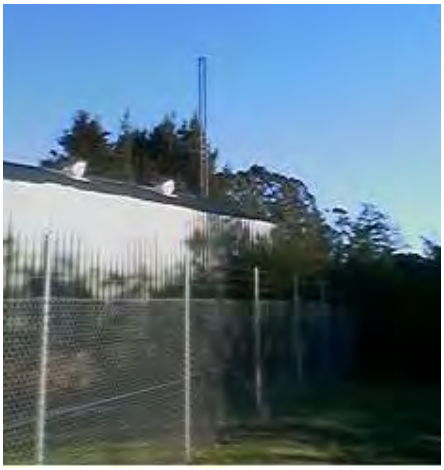
1. *Air gaps* must not be installed in a *toxic environment*.
2. Double *check valves* can be installed in a medium and low hazard *toxic environment*.
3. Pressure type vacuum breakers are designed to vent at 7 kPa or less. However, they require a significantly higher pressure to reseat and must be installed only in systems which provide pressures sufficient to ensure full closing of the valve.
4. Hose outlet vacuum breakers are a specific type of atmospheric vacuum breaker.

Where practicable and appropriate, a Registered Air Gap or Registered Break Tank is an acceptable solution for backflow prevention as ongoing maintenance costs are significantly lower than installed devices but this is not always practical at the boundary.

Although Registered Air Gaps and Registered Break Tanks are classified as “non-testable devices” in AS/NZS 3500.1:2003, the appropriate placement and effectiveness must be verified by the property owner at least every two years, or annually in conjunction with any additional device testing.

SWDC have an hydrostatic loop (or Anti-siphon loop) installed at two of their wastewater pump stations.

A hydrostatic loop, though not often used in plumbing practice, is an arrangement of pipes formed into a vertical loop to prevent backflow of water within the plumbing potable water system. A siphon has a maximum height that it can operate (about 33 feet), a hydrostatic loop is built higher than 33 feet thereby preventing backflow.



SWDC Hydrostatic Loop installed at some wastewater pump stations

7.0 Specific Hazard Strategy

Following is a summary of SWDC strategy for the type of protection at specific hazard situations.

Type of Property	SWDC Protection Strategy
Residential in town	Toby has an internal single check valve (non Testable)
Rural residential	Manifold with dual check valve (non testable)
Medium Hazard property	Double Check at boundary
High Hazard property	RPZ at boundary
Fire hydrant upstands	Contractors to have Double Check valve installed on their upstands. Council to maintain a register of the upstands and provide free annual testing of the devices
Residential Swimming Pools and Spas	HCVB supplied and installed free of charge in conjunction with Building Consent Authority
Auxiliary Water Sources (e.g. well)	RPZ at boundary
All new industrial connections (i.e. applying for water service connection)	RPZ at boundary, No annual charge unless property is high/medium hazard
High or medium Hazard property no longer in use	RPZ at boundary or disconnect water supply
Connections between water source and the reservoir	RPZ at boundary
All properties	Only one point of supply to each property, else RPZ at boundary

7.1.1 Auxiliary Water Sources

Auxiliary Water Sources include any water source other than the reticulated water supplied by the Network Supplier. These can include bores or raintanks and are frequently untreated.

While private bores within South Waikato District Council are not common the potential hazard would be mitigated in the same manner as below.

Cross connections exist where “top-up” water is drawn from the mains supply into the raintank either via the top of the raintank with a ballcock or directly into the pipework exiting the raintank (after the booster pump). Regardless of the “top up” configuration, appropriate protection is required as per G12/AS1. Typical installations include registered air gaps or double check valves.

7.1.2 Fire Lines

Buildings with chemical free “combination” systems, incorporating both fire sprinkler and domestic use (and are designed to eliminate stagnation of water) do not require backflow prevention.

Backflow prevention is required on properties (both commercial and residential) with an independent (dedicated) fire sprinkler supply connection, as per NZS4541 in Section 14.8.

7.1.3 Residential Swimming Pools and Spas

SWDC in the past has provided HCVB to property owners via the building inspectors. SWDC intend to continue supplying HCVBs and these will be proactively installed by SWDC Building Consent Authority at no charge to the property owner (limit of five per site) when this is an acceptable solution to mitigate the potential hazard from a casually used hose tap.

Protection by HCVB is common for hose taps near swimming pools, spas and washdown areas where the inlet is not pressurised for more than 12 hours continuously, and the outlet is never subjected to back pressure higher than 3m.

Hose Connection Vacuum Breaker

7.1.4 Hairdressers

Beauty salons and hairdressers were re-classified as a high hazard in the Building Code G12/AS1 in 2001. Prior to this they were classified as a medium hazard.

For the purposes of boundary protection SWDC have adopted to treat hairdressers as medium hazard and the preference is for any hazards to be protected at source.

The following diagram shows a hairdressers basin with source protection installed directly at the hazard located typically underneath the sink. These are installed within the authority of the Building Act.

Unprotected flexihose in hairdressers basin

Typical source protection arrangement

7.1.5 Fire Hose Reels

Fire hose reels will be assessed by their potential to be used or reach a high hazard activity such as chemical mixing.

Firehose reel creating a significant hazard to the water supply

7.1.6 Water Taken from Fire Hydrants

All contractor (and any Council owned) fire hydrant upstands shall be required to be fitted with a Double Check Valve. Compliance with this shall also be enforced via the Permit to take water process.

Water can be taken from fire hydrants with approval for various activities such as fire fighting, filling swimming pools, road works, cleaning or public events.

7.1.7 Water Taken from Bulk Tanker Points

South Waikato District Council have no dedicated bulk tanker filling sites for the supply of water to approved potable water carriers.

Bulk tanker operators can take water provided they comply with the Health Act 1956 and the Health (Drinking Water) Amendment Act 2007. All Water Carriers shall be registered according to Section 69J of the Health (Drinking Water) Amendment Act 2007 and shall only take water via fire hydrant upstands fitted with Double Check Valves.

8.0 Standard of Installation

All devices shall be installed in accordance with:

- The most recent versions of all Standards and best practice guidelines referred to in this document (including guidelines within this document)
- The manufacturer's recommendations

The device shall be tested immediately following installation to prove compliance with all requirements. This test shall be carried out by a registered IQP/LBP.

The selection of device for any installation shall consider the following factors to ensure the successful protection:

- The potential hazard
- Ready access for testing and servicing in line (Health and Safety considerations)
- Any requirements for uninterrupted water supply during testing
- The meter location and arrangement
- The size of any fittings in order to meet required flow rates (including fire line requirements)
- Head losses through the device
- Manufacturer's recommendations for performance and installation
- The appropriate use of inline strainers (except fire lines, dedicated fire hose reel lines or infrequently used lines unless approved by Insurance Council of New Zealand)
- Protection against frost and other environmental conditions imposed
- The nature of the potential hazard and the likelihood of future changes of use
- Drainage requirements including; potential discharge from device, site surface water, grounds drainage characteristics
- Protection from traffic, pedestrian flows, vandalism, or any potentially damaging situation

All boundary devices shall be approved via the SWDC Approved Materials list and shall be manufactured in accordance with AS/NZS 2845.1:1998.

In the following table/s is a summary of the installation standard to be met.

Note: Requirements in *italics* are sourced directly from Building Code Clause G12/AS1 and/or AS/NZS 3500.1.

Device Type	Installation Requirement
All backflow prevention devices	*Shall be manufactured in accordance with AS/NZS 2845.1:1998* and installed in accordance with AS/NZS 3500.1:2003 where appropriate and the following requirements
	Shall be fitted with a line strainer upstream to prevent particles and corrosion products from the pipe work rendering the device ineffective (with the exception on fire lines, dedicated fire hose reel lines and infrequently used lines unless approved by Insurance Council of New Zealand)
	A bypass may only be fitted where the bypass another backflow prevention device appropriate to the same [or higher] *hazard rating*
	Any devices installed below ground must have adequately functioning drainage so that no part of the device can become submerged. Note: reduced pressure zone devices shall be installed above ground in accordance with specifications below.
	Valves may be ball valves for <= 40mm and resilient seated gate valves for >40mm.
	All devices installed above ground shall be installed in a securely fenced/housed or caged area with locked access
	Shall be protected from the effects of corrosive or toxic environments. Corrosive environments may cause the malfunction of the device. Polluted air from a toxic environment may enter the piping system through the air gap or open port vent thus negating the effective air gap separation.
	Shall be protected from physical and frost damage and installed without the application of heat.
	Reduced pressure zone devices, double check valve assemblies and pressure vacuum breakers shall have sufficient test points to enable testing of each check valve and relief valve.
	Shall be attached only after the pipework has been flushed

Device Type	Installation Requirement
Double Check 	It is preferable for devices to be installed above ground and securely fenced/housed or caged. However, if device is to be in a pit it must have adequate access for maintenance by top entry, testing and functioning drainage.
	Adequate distance must be allowed from any water meter to ensure meter accuracy. Refer to water meter manufacturer recommendations.
	All devices shall be installed with isolating valves immediately prior to and following the device
	Plus requirements as specified for all backflow prevention devices as per the first section in this table

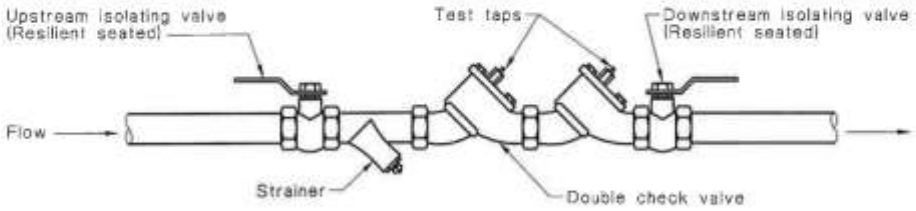


FIGURE F6 TYPICAL INSTALLATION OF A DOUBLE-CHECK VALVE

Device Type	Installation Requirement
Reduced Pressure Zone 	Adequate distance must be allowed from any water meter to ensure meter accuracy. Refer to water meter manufacturer recommendations.
	Reduced Pressure Zone devices shall have free ventilation to the atmosphere for the relief valve outlet at all times,
	Reduced Pressure Zone devices shall be located in an area that is not subject to ponding.
	Reduced Pressure Zone devices shall have the relief drain outlet located not less than 300 mm above the surrounding surface
	Reduced pressure zone devices, double check valve assemblies and pressure vacuum breakers shall have sufficient test points to enable testing of each check valve and relief valve.
	Shall be installed horizontally
	Plus requirements as specified for all backflow prevention devices as per the first device type in this table

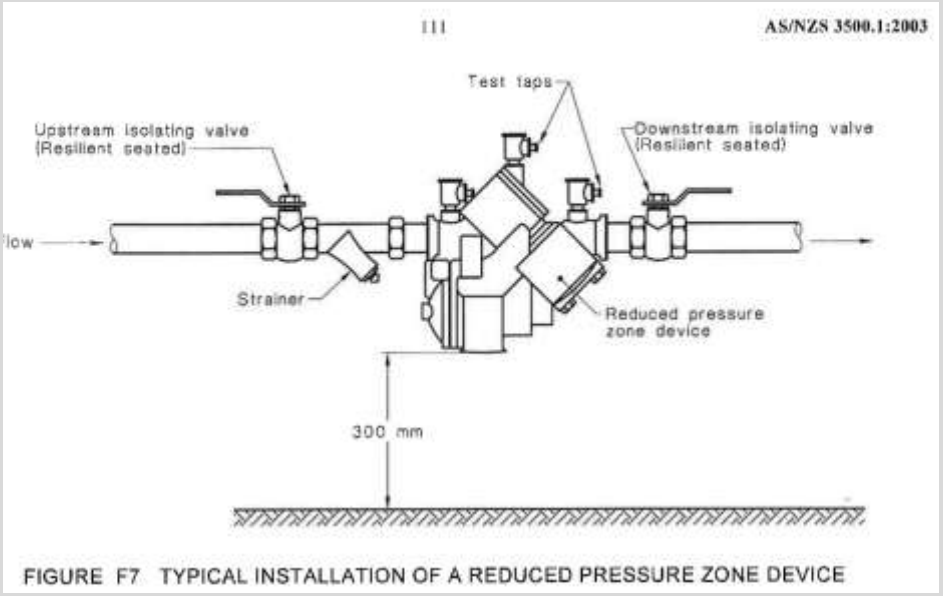


FIGURE F7 TYPICAL INSTALLATION OF A REDUCED PRESSURE ZONE DEVICE

Device Type	Installation Requirement
Air Gap 	*The air gap separation shall be the greater of 25mm or twice the supply pipe diameter*
	Air Gaps shall not be used in a toxic environment to prevent contaminated air entering the water and piping system through the air gap.
	To ensure the air gap distance is maintained the overflow pipe discharge flow rate shall be no less than the inlet pipe flow rate.
	Consideration shall be given to spill levels as per AS/NZS 3500.1:2003
	Plus requirements as specified for all backflow prevention devices as per the first device type in this table

9.0 Annual Testing and Maintenance

9.1 Testing Requirements

South Waikato District Council shall test all testable boundary protection devices operating within its network annually under the Health Act 1956.

Testing shall be carried out at the following times:

- Immediately after installation
- Annually
- On completion of any maintenance work on the backflow prevention device
- After a backflow incident or suspected backflow incident

RZP covered in grease - unsatisfactory

Where a device fails a test, an attempt to repair the device while on site and retest shall be made. Where it is not possible to repair the device on site the device shall be repaired or replaced as soon as is practically possible, with an equivalent substitute device installed (and tested) until repairs are completed.

9.2 Test Procedure

HCVB's require inspection to ensure they are not removed or damaged

The testing procedures for backflow preventers shall be in accordance with AS/NZS 2845.3:1993. In addition visual checks will also be required for registered air gaps.

The Backflow Prevention Test Certificate (as per Appendix 15.2) is to be completed for every test on every device and returned to South Waikato District Council within five (5) working days.

Special consideration shall be given when testing devices installed on fire lines with respect to insurance, life and property protection issues. Only those IQP/LBPs suitably qualified shall complete tests on devices on fire lines. Devices installed on fire lines shall be tested annually and following any fire or full flow test.

The test equipment used shall be the correct type for the device being tested. The equipment shall be a recognised make and model and not a "homemade" device. The test kit shall have a maximum working pressure of 1200kPa and shall have colour coded hoses to minimise mistakes during use.

The test equipment shall be certified/recertified every twelve months (as per the NZWWA Backflow Prevention Code of Practice) by a Telarc registered laboratory. A copy of the test certificate shall be kept with the equipment and be available for inspection by South Waikato District Council at any time.

The certification procedures shall be based on those contained in Appendix 1 of AS/NZS2845.

9.3 Qualifications of Tester

All personnel undertaking tests on Council owned backflow prevention devices shall, as a minimum have attended and passed an approved “Backflow Testers Cross Connection” course of not less than 40 hours and a refresher every three years or less following the initial 40 hour course.

The requirements for only a registered IQP/LBP to test backflow prevention devices within the property, as per the Building Act still remains.

10.0 Disposal / Removal

SWDC recognise that commercial and industrial properties have a change in use from time to time. Depending on the circumstances listed in the table below, SWDC require that any backflow device already installed shall remain in place. This is to avoid incurring installation costs again in the future should a hazardous situation occur. This is also the more risk averse approach thereby minimising the risk to the public.

Use	Change in Use to	SWDC
High Hazard	Medium Hazard	Keep Backflow device installed. Continue to charge for annual inspections
High or Medium Hazard	Low or No Hazard	Keep Backflow device installed. No annual inspections or fees.

Where devices have been removed from the inspection programme, SWDC will carry out audits on these properties every three years to ensure there has been no subsequent change in the risk the property presents. Properties will be tagged on the LIM and under the BWOF process the SWDC Building Consent Authority will notify the Services department of any change in use so the property can be reassessed.

11.0 Record Keeping

11.1 BizeAsset

11.1.1 Asset Information

SWDC use BizeAsset as their Asset Information System. All SWDC backflow devices will be recorded in BizeAsset with all the relevant information such as:

- Asset ID
- Serial Number
- Manufacturer
- Diameter of device
- Type of device
- Ownership of device (SWDC or Private)

Where SWDC have accepted a proxy device which is located within the property boundary, these devices will be recorded in BizeAsset with all the relevant details listed as above. Proxy devices will be recorded in BizeAsset as private ownership and annual testing certificates will be received from the property during for the BWOF certification process and these shall be held by the Building Consent Authority.

11.1.2 Annual Testing

BizeAsset will alert the Service Manager of Backflow devices that are due for inspections or devices that have been installed and haven't been tested for more than a year. Annual tests will be issued to the Contractor through the work order process. All tests will be recorded on the Backflow Prevention Test Report Forms (Appendix 15.2) and a summary of this recorded as maintenance (activity of test) against the asset in BizeAsset.

11.1.3 Maintenance

All maintenance that is carried out on backflow devices will be recorded in BizeAsset as maintenance as per normal Asset Management practices.

11.2 Work Programme Spreadsheet

SWDC have developed a Work Programme Spreadsheet and reporting tool that is intended as a project management tool only to provide demonstration of the delivery of this programme. This spreadsheet will be used to identify potential hazardous properties and to carry out the initial investigations on properties. The spreadsheet will be updated after the Backflow Prevention Inspection Checklist has been returned, when the device is scheduled for installation and following device installation.

The spreadsheet also notes peripheral tasks that must be undertaken by SWDC. This spreadsheet shall form the basis of reporting to management on the progress of the backflow programme to ensure it maintains momentum.

11.3 Property File

The property file shall be updated at the following occasions:

- A boundary device has been installed but it is suspected there are unprotected source hazards
- A boundary device has been installed so the rate for annual testing shall be added

- A property has a device but no annual testing is carried out due to a reduction in risk (this will note that there is the possibility of annual testing recommencing should the risk change)

12.0 Education

SWDC have recognised that backflow prevention is a health risk to the general public and that the general public may not be aware of backflow. SWDC will address some of the short falls in the knowledge about the risk of backflow by communicating in the following manner:

- Proactive letters to identified high hazard properties.
- Keep the website updated with backflow information
- Council page in newspaper provide general information
- Provide a pamphlet for plumbers and those working in the industry
- Provide general information with the rates bill sent to all properties

SWDC have recognised that education is not just limited to the need for boundary protection, and will incorporate the need for source protection as well.

12.1 Proactive Letter to High Hazard Properties

In order to get maximum buy-in (and minimise resistance) from property owners during the implementation of the backflow programme, SWDC will send proactive letters to all high hazard properties in advance of the inspections.

The letter will state that Council will carry out inspections in the area in the near future to assess the hazards on site. Information will be given to the property owner that explains a backflow event and what potential risks there are to the public if a backflow event was to occur. The information should clearly state that Council is bound by law to carry out backflow protection.

The letter will state SWDC intention to address boundary protection, but it is the property owners responsibility to address source protection..

12.2 Website Update

It is accepted common practice in New Zealand to communicate through the internet and SWDC have identified this to be a good communication medium to provide backflow information to the public and tradesmen.

12.3 Residential Properties

SWDC will communicate to residential property owners through the following methods:

- Council Page in local paper
- Pamphlet for Plumbers
- Information sheet with Rates

12.3.1 Council Page in Newspaper

SWDC use the newspaper to communicate to the public what they are doing in the community. Council will communicate via this form that some hazard inspections will be carried out over the next few months and a programme will be introduced to prevent this hazards. The programme will be spread over some years to keep costs minimal.

Information will also be provided to educate the general public on the risks of backflow.

12.3.2 Pamphlets for Plumber

Tradesmen and plumbers may not be aware of the potential hazards through backflow events. SWDC have decided to create an educational flyer that will be provided to hardware stores or

plumbing trade outlets. This flyer will also be provided to property owners as part of the building consent process.

12.3.3 Information Sheet with Rates

Residential homes can have potential backflow hazards that property owners may not be aware of. These hazards generally fall in the low hazard category so boundary protection will not required. However some more serious hazards could include:

- Swimming pools
- Spas
- Pop up sprinklers
- Mixing chemicals with the hose

Council would like to help the property owner to protect themselves against backflow hazards through safe practice. SWDC will provide source protection through Hose Connection Vacuum Breaker (HCVB) free of charge to property owners that have swimming pools or spas installed and educate on the risk of leaving hoses running into spray packs and the like, unattended.

13.0 Definition of Terms

Term	Definition
ABT	Approved Backflow Technician as per NZWWA Backflow Prevention for Water Supplies Code of Practice 2006. The term used in this document is IQP/LBP
Auxiliary Supply	Secondary supply from the underground aquifer, water/break tanks, dams, purifying plant etc
Backflow	The unplanned reversal of flow of water or mixtures of water and contaminants into the water supply system.
Backflow Prevention Device	A device designed to prevent backflow - including but not limited to the following devices: RPZ. Double Check, Air gap, hydrostatic loop
Backflow Register	Held in South Waikato District Council Asset Information System
Back-Pressure	A backflow condition caused by the downstream pressure becoming greater than the supply pressure
Back-siphonage	A backflow condition caused by the supply pressure becoming less than the downstream pressure
Boundary Protection	Backflow prevention provided at the property boundary to protect the water reticulation from potential contamination. The purpose of an installation at this location is to achieve 'containment protection' as per AS/NZS 3500.5 and NZWWA COP.
Cross Connection	An actual or potential connection between the potable water supply and an auxiliary supply or pipework which may be considered non-potable
COP	South Waikato District Council Code of Practice for Subdivision and Development
Domestic	All users of potable water supply described in G12/AS1 for sanitation, human consumption, food preparation, utensil washing, oral hygiene
DWSNZ	Drinking-water Standards for New Zealand 2005 details how to assess the quality and safety of drinking-water
G12/AS1	Approved document for NZ Building Code Water Supplies, Clause G12, Second edition. Also referred to as "Building Code Acceptable Solution G12/AS1 Water supplies"
HCVB	Hose Connection Vacuum Breaker – a type of backflow prevention device
Hazard	Any condition, device or practice which, in connection with the potable water supply system, has the potential to: High Hazard – cause death Medium Hazard – injure or endanger health Low Hazard – would constitute a nuisance, by colour, odour or taste, but not injure or endanger health
IQP	'Independent Qualified Person'. The current term under the Building Act 1991. Suitably qualified to test backflow devices, assess potential hazards and provide written documentation. This term is superseded by LBP. The term used in this document is IQP/LBP.

Term	Definition
LBP	Licensed Building Practitioner as referred to in Section 298-301 of Building Act 2004. The use of this term should be read in conjunction with "Transitional Provisions" in Section 438 of Subpart 4. At the time of writing this document the current industry accepted terms are IQP and ABT. The term IQP/LBP shall be used throughout this document but should be read to mean the same as IQP or ABT.
Level of Protection	South Waikato District Council term to reflect the position of the backflow prevention device and its effectiveness in protecting the community or dwelling. The options for Level of Protection are Source, Boundary or Zone.
LGA2002	Local Government Act 2002 defines the purpose of the local authorities as enabling local decision making by and on behalf of the community, and allows local authorities the power of general competence. This Act specifically requires Councils to continue to provide and maintain water and wastewater services if they do so already
MoH	Ministry of Health
NZWWA	New Zealand Water and Wastes Association
Potable Water	Water that is suitable for human consumption
Reticulation	The network of pipes, pumps and service reservoirs that delivers the drinking-water from the water treatment plant to the consumer's boundary. Also referred to as Networked System.
Risk	For South Waikato District Council internal processing prioritising only. Risk may be used incorporating likelihood of a backflow event occurring
RPZ	Reduced Pressure Zone – a type of backflow prevention device
Source Protection	Backflow prevention provided at individual fixtures where specific hazards exist
Specified System	Those systems as specified by the Building Regulations 2005 Schedule 1 and are to appear on a properties Compliance Schedule

14.0 Extracts of Legislation and Standards

14.1 The Health (Drinking Water) Amendment Act 2007 Section 69ZZZ

69ZZZ Protecting water supplies from risk of back-flow

1 This section applies if a networked supplier considers that there is a need to protect the networked system from risks of pollution caused by water and other substances on properties connected to the networked system.

2 A networked supplier may,—
(a) if the supplier considers it desirable or necessary,—

(i) install a back-flow prevention system in the network on the side of the point of supply for which the supplier is responsible for maintaining; or
(ii) allow the owner of property to which water is supplied to install a back-flow prevention system that incorporates a verifiable monitoring system (being a monitoring system approved by both the supplier and a drinking-water assessor):

(b) require the owner of the property in respect of which the back-flow prevention system operates or the person who is required (whether under the Local Government Act 2002 or any contract) to pay for drinking water supplied to that property,—
(i) if paragraph (a)(i) applies, to reimburse the supplier for the cost of that system (including the cost of installation, testing, and on-going maintenance); and
(ii) if paragraph (a)(i) or (ii) applies, to repair or modify any back-flow prevention system that, in the opinion of the supplier, is not functioning adequately.

A person who installs a back-flow protection device must take all reasonable steps to ensure it can operate in a way that does not compromise the operation of any automatic sprinkler system connected to the water supply.

A networked supplier—
(a) must test each back-flow protection device operating in its network at least once a year; and
(b) must advise the territorial authority in its area of the results; and
(c) may require the occupier of the property in respect of which the device operates to pay the reasonable costs involved in conducting the test.

14.2 Health Act 1956

Section 23 General powers and duties of local authorities in respect of public health

Subject to the provisions of this Act, it shall be the duty of every local authority to improve, promote, and protect public health within its district, and for that purpose every local authority is hereby empowered and directed—
(a) To appoint all such Environmental Health Officers and other officers and servants as in its opinion are necessary for the proper discharge of its duties under this Act:
(b) To cause inspection of its district to be regularly made for the purpose of ascertaining if any nuisances, or any conditions likely to be injurious to health or offensive, exist in the district:
(c) If satisfied that any nuisance, or any condition likely to be injurious to health or offensive, exists in the district, to cause all proper steps to be taken to secure the abatement of the nuisance or the removal of the condition::
(d) Subject to the direction of the Director-General, to enforce within its district the provisions of all regulations under this Act for the time being in force in that district:
(e) To make bylaws under and for the purposes of this Act or any other Act authorising the making of bylaws for the protection of public health:
(f) To furnish from time to time to the Medical Officer of Health such reports as to diseases and sanitary conditions within its district as the Director-General or the Medical Officer of Health may require.

14.3 Local Government Act 2002 (LGA2002)

> ***Section 10(b) Purpose of local government***
> *The purpose of local government is—*
> *(b) To promote the social, economic, environmental, and cultural well-being of communities, in the present and for the future.*

14.4 The Building Act 2004

100. Requirement for compliance schedule

(1) A building not used wholly as a single household unit—

(a) requires a compliance schedule if—
(i) it has a specified system; or
(ii) it has a cable car attached to it or servicing it; and

(b) requires the schedule for all specified systems it has and any cable car it has attached to it or servicing it.

101. Owner must comply with requirement for compliance schedule

An owner of a building for which a compliance schedule is required under section 100 must obtain the compliance schedule.

A person commits an offence if the person fails to comply with subsection (1).

A person who commits an offence under this section is liable to a fine not exceeding $20,000 and, in the case of a continuing offence, to a further fine not exceeding $2,000 for every day or part of a day during which the offence has continued

108 Annual building warrant of fitness

An owner of a building for which a compliance schedule has been issued must supply to the territorial authority a building warrant of fitness in accordance with subsection (3).

The purpose of a building warrant of fitness is to ensure that the specified systems stated in the compliance schedule are performing, and will continue to perform, to the performance standards for those systems that are set out in the relevant building consent.

The building warrant of fitness must—
(a) be supplied on each anniversary of the issue of the compliance schedule; and

(b) state that the inspection, maintenance, and reporting procedures of the compliance schedule have been fully complied with during the previous 12 months; and

(c) have attached to it all certificates, in the prescribed form, issued by a licensed building practitioner that, when those certificates are considered together, certify that the inspection, maintenance, and reporting procedures stated in the compliance schedule have been fully complied with during the previous 12 months; and

(d) have attached to it any recommendation made by a licensed building practitioner that the compliance schedule should be amended to ensure that the specified systems stated in the compliance schedule are performing, and will continue to perform, to the performance standards for those systems; and

(e) be in the prescribed form; and

(f) contain the prescribed information.

110 Owner must obtain reports on compliance schedule

An owner of a building for which a compliance schedule has been issued must—

(a) obtain annual written reports relating to the inspection, maintenance, and reporting procedures of the compliance schedule signed by each licensed building practitioner [or other person] who carried out 1 or more of those procedures; and

(b) keep those reports, together with the compliance schedule, for a period of 2 years; and

(c) produce those reports for inspection, when required, by—
(i) the territorial authority; andr
(ii) any person or organisation who or that has the right to inspect the building under any Act; and

(d) show the location of those reports and the compliance schedule on the building warrant of fitness displayed in accordance with section 108(4).

14.5 Building Regulations 2005

Specified Systems, Change in use, and Earthquake Prone Buildings

Schedule 1
Specified systems

(1) Automatic systems for fire suppression (for example, sprinkler systems).
(2) Automatic or manual emergency warning systems for fire or other dangers (other than a warning system for fire that is entirely within a household unit and serves only that unit).
(3) Electromagnetic or automatic doors or windows (for example, ones that close on fire alarm activation).
(4) Emergency lighting systems.
(5) Escape route pressurisation systems.
(6) Riser mains for use by fire services.
(7) Automatic back-flow preventers connected to a potable water supply.
(8) Lifts, escalators, travelators, or other systems for moving people or goods within buildings.
(9) Mechanical ventilation or air conditioning systems.
(10) Building maintenance units providing access to exterior and interior walls of buildings.
(11) Laboratory fume cupboards.
(12) Audio loops or other assistive listening systems.
(13) Smoke control systems.
(14) Emergency power systems for, or signs relating to, a system or feature specified in any of clauses 1 to 13.
(15) Any or all of the following systems and features, so long as they form part of a building's means of escape from fire, and so long as those means also contain any or all of the systems or features specified in clauses 1 to 6, 9, and 13:
(a) systems for communicating spoken information intended to facilitate evacuation; and
(b) final exits (as defined by clause A2 of the building code); and
(c) fire separations (as so defined); and
(d) signs for communicating information intended to facilitate evacuation; and
(e) smoke separations (as so defined).

14.6 Compliance Document for NZ Building Code 2004

Clause G12/AS1 Second Edition (June 2007)

Section 3.1 of the Compliance Document for Clause G12/AS1 prohibits water that has been drawn from the water main from being returned to the public system via backflow or cross connection.

Section 3.2 prohibits cross connections between mains potable water supplies and private potable water supplies, as well as between potable water supplies and any facilities or pipes containing non-potable substances.

Section 3.3 sets out hazard ratings for various types of facilities or appliances.

Section 3.4 specifies the conditions under which backflow protection shall be provided. i.e. wherever it is possible for water or contaminates to backflow into the potable water supply, as applicable the appropriate hazard rating in table 2 of the document.

New Zealand Building Code Clause G12/AS1

3.7 Testing

3.7.1 *Backflow* protection installations shall have the following provisions to enable routine testing of their operational effectiveness:

a) Resilient seated isolating valves shall be located immediately upstream and downstream of a reduced pressure zone device, double *check valve* assembly, or a pressure vacuum breaker,

b) A resilient seated isolating valve shall be located immediately upstream of an atmospheric vacuum breaker, and

COMMENT:
Full ported valves will provide the best flow characteristics.

c) Reduced pressure zone devices, double *check valve* assemblies and pressure vacuum breakers shall have sufficient test points to enable testing of each *check valve* and relief valve.

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COMMENT:
Atmospheric vacuum breakers do not require test points.

3.7.2 Reduced pressure zone devices, double *check valves* and pressure vacuum breakers shall be tested and verified as meeting the

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test requirements of AS 2845.3.

3.7.3 Atmospheric vacuum breaker devices shall comply with the following test:

a) Operate the device by turning on the *fixture* or equipment and observe the operation. The poppet or float must close on increase in pressure, and

b) Operate the device by turning off the *fixture* or equipment and observe the operation. The poppet or float must open on decrease in pressure.

3.7.4 *Backflow prevention devices* shall be tested after installation or repair. Before testing the strainer shall be cleaned, the pipework flushed and the system commissioned.

COMMENT:
Testing is also required annually in accordance with Compliance Schedule CS 7, except for devices installed in single residential dwellings.

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3.0 Protection of Potable Water

3.1 Drawn water not to be returned

3.1.1 Water drawn from the *water main* shall be prevented from returning to that system by avoiding *cross connections* or *backflow*.

3.2 Cross connections prohibited

3.2.1 The *water supply system* shall be installed so that there is no likelihood of *cross connection* between:

a) A *potable water supply system* and a non-*potable water supply system*,

b) A *potable water supply system* connected to a *water main*, and any water from another source including a private water supply,

c) A *potable water supply system* and any bathing facilities including swimming, spa or paddling pools, and

d) A *potable water supply system* and pipes, *fixtures* or equipment (including boilers and pumps) containing chemicals, liquids, gases or other non-*potable* substances.

3.3 Cross Connection Hazard

3.3.1 High hazard

Any condition, device or practice which, in connection with the *potable water supply system,* has the potential to cause death.

COMMENT:
High hazard may include but not necessarily be limited to:

a) Autoclaves and sterilisers

b) Systems containing chemicals such as anti-freeze, anti-corrosion, biocides, or fungicides

c) Beauty salon and hairdresser's sinks

d) Boiler, chiller and cooling tower make-up water

e) Car and factory washing facilities

f) Chemical dispensers

g) Chemical injectors

h) Chlorinators

i) Dental equipment

j) Direct heat exchangers

k) Fire sprinkler systems and fire hydrant systems that use toxic or hazardous water

l) Hose taps associated with High hazard situations like mixing of pesticides

m) Irrigation systems with chemicals

n) Laboratories

o) Mortuaries

p) Pest control equipment

q) Photography and X-ray machines

r) Piers and docks

s) Sewage pumps and sump ejectors

t) Sluice sinks and bed pan washers

u) Livestock water supply with added chemicals

v) Veterinary equipment

Note: The examples given are not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

3.3.2 Medium hazard

Any condition, device or practice which, in connection with the *potable water supply system,* has the potential to injure or endanger health.

COMMENT:
Medium hazard may include but not necessarily be limited to:

a) Appliances, vehicles or equipment

b) Auxiliary water supplies such as pumped and non-pumped fire sprinkler secondary water

c) Deionised water, reverse osmosis units and equipment cooling without chemicals

d) Fire sprinkler systems and *building* hydrant systems

e) Hose taps and fire hose reels associated with Medium hazard

f) Irrigation systems with underground controllers

g) Irrigation without chemicals

h) Livestock water supply without added chemicals

i) Untreated water storage tanks

j) Water and steam cleaning

k) Water for equipment cooling

l) Drink dispensers with carbonators

m) Swimming pools, spas and fountains

Note: The examples given are not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

3.3.3 Low hazard

Any condition, device or practice which, in connection with the *potable water supply system,* would constitute a nuisance, by colour, odour or taste, but not injure or endanger health.

COMMENT:
Low hazard may include but not necessarily be limited to:

a) Drink dispensers (except carbonators).

Note: The example given is not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

3.4 Backflow protection

3.4.1 *Backflow* protection shall be provided where it is possible for water or *contaminants* to *backflow* into the *potable water supply system.*

COMMENT:
The protection of non-*potable water* used for personal hygiene is contained in Paragraph 4.1.

3.4.2 *Backflow* protection shall be determined by identifying the individual *cross connection* hazard(s) and *backflow* protection required. Water from each hazard shall be regarded as non-*potable* until an appropriate *backflow* protection is installed.

3.4.3 *Backflow* protection shall be achieved by:

a) An *air gap,* in accordance with Paragraph 3.5, or

b) A *backflow prevention device* selected in accordance with Paragraphs 3.4.4 and 3.4.5.

3.4.4 *Backflow* protection shall be appropriate to the *cross connection* hazard contained in Paragraph 3.3.

3.4.5 The selection of the appropriate *backflow* protection for the *cross connection* hazard is given in Table 2.

COMMENT:
Table 2 includes *air gap* separation.

Table 2: Selection of Backflow Protection
Paragraph 3.4.5

Type of backflow protection	CROSS CONNECTION HAZARD					
	HIGH		MEDIUM		LOW	
	back-pressure	back-siphonage	back-pressure	back-siphonage	back-pressure	back-siphonage
Air gap (see **Note 1**)	✓	✓	✓	✓	✓	✓
Reduced pressure zone device	✓	✓	✓	✓	✓	✓
Double *check valve* assembly (see **Note 2**)			✓	✓	✓	✓
Pressure type vacuum breaker (see **Note 3**)		✓		✓		✓
Atmospheric vacuum breaker (see **Note 4**)		✓		✓		✓

Note:

1. *Air gaps* must not be installed in a *toxic environment.*
2. Double *check valves* can be installed in a medium and low hazard *toxic environment.*
3. Pressure type vacuum breakers are designed to vent at 7 kPa or less. However, they require a significantly higher pressure to reseat and must be installed only in systems which provide pressures sufficient to ensure full closing of the valve.
4. Hose outlet vacuum breakers are a specific type of atmospheric vacuum breaker.

3.4.6 All *backflow prevention devices* must be testable in service to verify effective performance.

3.5 Air gap

3.5.1 An *air gap* shall be an unobstructed distance between the lowest opening of a water supply outlet and the highest level of the overflow water. The *air gap* separation shall be the greater of 25 mm or twice the supply pipe *diameter*, as shown in Figure 1.

3.5.2 To ensure the *air gap* distance is maintained the overflow pipe discharge flow rate shall be no less than the inlet pipe flow rate.

COMMENT:
AS/NZS 3500.1.2 Appendix F may be used to calculate the size of the overflow.

3.5.3 *Air gaps* shall not be used in a *toxic environment* to prevent contaminated air entering the water and piping system through the *air gap.*

3.5.4 Where any *fixture* or tank has more than one supply pipe, the *air gap* separation shall be the greater of 25 mm or twice the sum of the inlet pipe *diameters* and shall also comply with Paragraph 3.5.2.

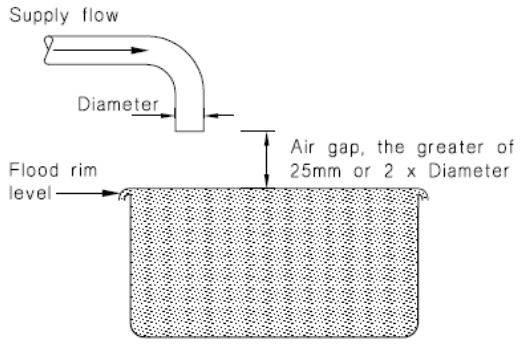
3.6 Backflow prevention devices

3.6.1 Location

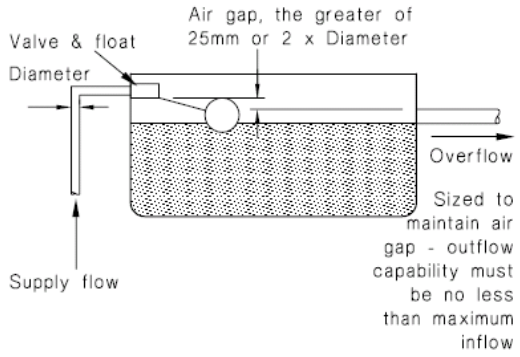
Backflow prevention devices and *air gaps* shall be located:

a) As near as practicable to the potential source of contamination, and

Figure 1: Air Gap Separation
Paragraph 3.5.1



(a) Water tank with inlet pipe above flood level rim



(b) Water tank with ball valve and overflow pipe below flood level rim

b) In an accessible position for maintenance and testing to AS/NZS 2845.3.

3.6.2 Manufacture

Backflow prevention devices shall be manufactured as follows:

a) Reduced pressure zone devices to AS/NZS 2845.1 Section 11 (see Figure 2 (a)),

b) Double *check valve* devices to AS/NZS 2845.1 Section 10 (see Figure 2 (b)),

c) Pressure type vacuum breakers to AS/NZS 2845.1 Section 9, (see Figure 2 (c)), and

d) Atmospheric vacuum breakers to AS/NZS 2845.1 Section 4 for atmospheric vacuum breakers (see Figure 2 (d)), and Section 5 for hose tap vacuum breakers.

3.6.3 General installation requirements

Backflow prevention devices shall be:

a) Fitted with a line strainer upstream to prevent particles and corrosion products from the pipework rendering the device ineffective,

b) A by-pass may only be fitted where the by-pass contains another *backflow prevention device* appropriate to the same hazard rating,

c) Protected from the effects of corrosive or *toxic environments*, and

d) Protected from damage.

COMMENT:

1. The device should be attached only after the pipework has been flushed.
2. Corrosive environments may cause the malfunction of the device. Polluted air from a *toxic environment* may enter the piping system through the *air gap* or open port vent thus negating the effective *air gap* separation.
3. The device should be protected from physical and frost damage and installed without the application of heat.

3.6.4 Specific installation requirements

Backflow prevention devices shall be installed as follows:

a) Reduced pressure zone devices. These devices shall:

i) have free ventilation to the atmosphere for the relief valve outlet at all times,

ii) be located in an area that is not subject to ponding,

iii) have the relief drain outlet located not less than 300 mm above the surrounding surface, and

iv) be installed horizontally with the relief valve discharge facing vertically down, unless different orientations are specifically recommended by the device manufacturer.

b) Double *check valve* devices. There are no additional requirements to those in Paragraph 3.6.3.

c) Pressure type vacuum breakers. These devices shall:

i) be located not less than 300 mm above the highest outlet, measured from the highest outlet to the lowest part of the valve body,

ii) be installed vertically with the air ports at the top, and

iii) have free ventilation to the air ports at all times.

d) Atmospheric vacuum breakers. These devices shall:

i) be located not less than 150 mm above the highest outlet, measured from the highest outlet to the lowest part of the valve body,

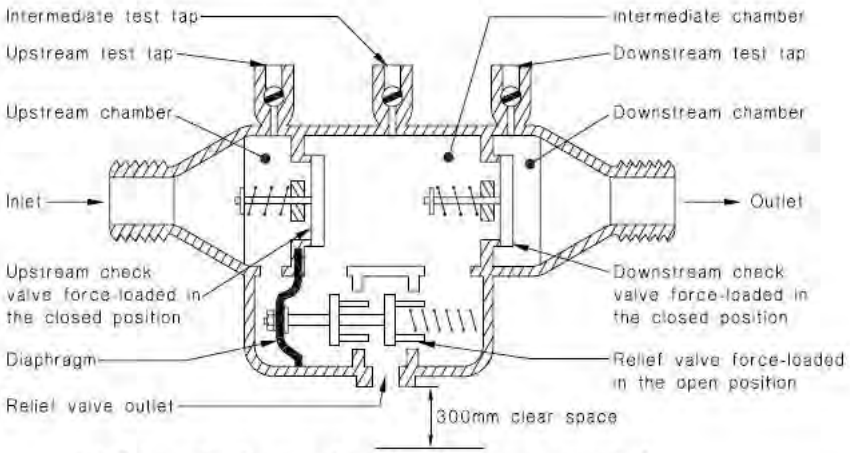
ii) have no valves located downstream of the vacuum breaker,

iii) under normal operation, not remain continuously pressurised for more than 12 hours,

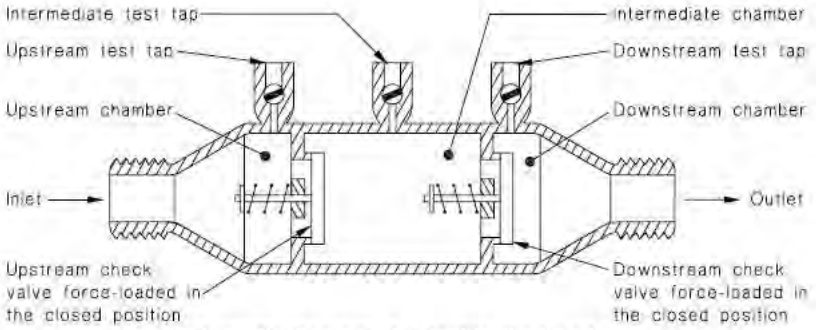
iv) be installed vertically with the air ports at the top, and

v) Have free ventilation to the air ports at all times.

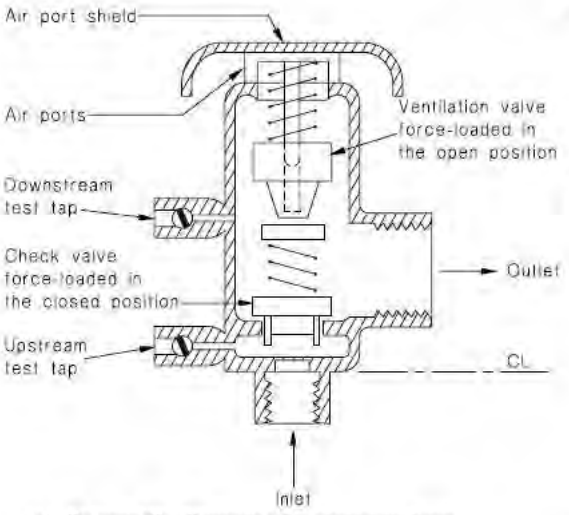
Figure 2: Backflow Prevention Devices
Paragraph 3.6.2



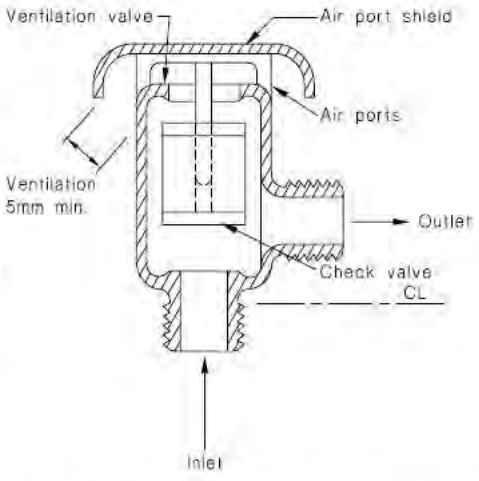
(a) Schematic diagram of a reduced pressure zone device



(b) Schematic diagram of a double check valve



(c) Schematic diagram of a pressure type vacuum breaker



(d) Schematic diagram of an atmospheric vacuum breaker

3.7 Testing

3.7.1 *Backflow* protection installations shall have the following provisions to enable routine testing of their operational effectiveness:

a) Resilient seated isolating valves shall be located immediately upstream and downstream of a reduced pressure zone device, double *check valve* assembly, or a pressure vacuum breaker,

b) A resilient seated isolating valve shall be located immediately upstream of an atmospheric vacuum breaker, and

COMMENT:
Full ported valves will provide the best flow characteristics.

c) Reduced pressure zone devices, double *check valve* assemblies and pressure vacuum breakers shall have sufficient test points to enable testing of each *check valve* and relief valve.

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COMMENT:
Atmospheric vacuum breakers do not require test points.

3.7.2 Reduced pressure zone devices, double *check valves* and pressure vacuum breakers shall be tested and verified as meeting the test requirements of AS 2845.3.

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3.7.3 Atmospheric vacuum breaker devices shall comply with the following test:

a) Operate the device by turning on the *fixture* or equipment and observe the operation. The poppet or float must close on increase in pressure, and

b) Operate the device by turning off the *fixture* or equipment and observe the operation. The poppet or float must open on decrease in pressure.

3.7.4 *Backflow prevention devices* shall be tested after installation or repair. Before testing the strainer shall be cleaned, the pipework flushed and the system commissioned.

COMMENT:
Testing is also required annually in accordance with Compliance Schedule CS 7, except for devices installed in single residential dwellings.

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14.7 Health and Safety in Employment Act 1992

Section 3C Application of certain provisions to volunteers doing regular work

(1) This section applies if—
(a) a volunteer does work for another person (being an employer or self-employed person) with the knowledge or consent of the other person; and
(b) the volunteer does the work on an ongoing and regular basis for that other person; and
(c) the work is an integral part of the business of the employer or self-employed person.

(2) When this section applies, sections 6 to 12, 19, and Part 4 apply with all necessary modifications,—
(a) as if the volunteer were an employee of the other person; and
(b) as if the other person were the volunteer's employer; and
(c) as if the volunteer were at work when doing work for the other person.

(3) This section does not apply in respect of a volunteer doing any of the following voluntary work activities:
(a) participation in a fundraising activity; or
(b) assistance with sports or recreation for—
(i) a sports club:
(ii) a recreation club:
(iii) an educational institution; or
(c) assistance with activities for an educational institution outside the premises of the educational institution; or
(d) providing care for another person in the volunteer's home.

Section 3D Protections for other volunteers

(1) This section applies in respect of all volunteers doing any voluntary work activity in respect of whom section 3C does not apply.

(2) The person for whom such a volunteer does the work activity should take all practicable steps to ensure the health and safety of the volunteer while he or she is doing the work activity, in particular by taking hazards into account when planning the work activity.

(3) If an inspector becomes aware of a significant hazard relating to the work activity, the inspector must, as soon as practicable, contact the person for whom the volunteer is doing the work activity (or the person's representative) to discuss means of eliminating, isolating, or minimising the hazard.

(4) If this section applies, sections 39, 41, and 49 do not apply.

Section 6 Employers to ensure safety of employees

Every employer shall take all practicable steps to ensure the safety of employees while at work; and in particular shall take all practicable steps to-
(a) Provide and maintain for employees a safe working environment; and
(b) Provide and maintain for employees while they are at work facilities for their safety and health; and
(c) Ensure that plant used by any employee at work is so arranged, designed, made, and maintained that it is safe for the employee to use; and

(d) Ensure that while at work employees are not exposed to hazards arising out of the arrangement, disposal, manipulation, organisation, processing, storage, transport, working, or use of things-
(i) In their place of work; or
(ii) Near their place of work and under the employer's control; and
(e) Develop procedures for dealing with emergencies that may arise while employees are at work.

Section 16 Duties of persons who control places of work
(1) A person who controls a place of work (other than a home occupied by the person) must take all practicable steps to ensure that no hazard that is or arises in the place harms—
(a) people in the vicinity of the place (including people in the vicinity of the place solely for the purpose of recreation or leisure):
(b) people who are lawfully at work in the place—
(i) as employees of the person; or
(ii) as contractors engaged by the person; or
(iii) as subcontractors to a contractor engaged by the person; or
(iv) as employees of a contractor or subcontractor to whom subparagraph (ii) or subparagraph (iii) applies.

(2) A person who controls a place of work (other than a home occupied by the person) must take all practicable steps to ensure that no hazard that is or arises in the place harms people—
(a) who are in the place with the express or implied consent of the person; and
(b) who—
(i) have paid the person (directly or indirectly) to be there or to undertake an activity there; or
(ii) are there to undertake activities that include buying or inspecting goods from whose sale the person derives or would derive (directly or indirectly) any gain or reward.

(3) A person who—
(a) controls a place of work (other than a home occupied by the person); and
(b) knows of any significant hazard that—
(i) is in, or is likely to arise in, the place of work; and
(ii) arises from work that is being carried on, or has been carried on, for gain or reward in the place of work; and
(iii) would not, in the ordinary course of events, be reasonably expected to be in, or to be likely to arise in, a place of work of that type; and
(c) either—
(i) expressly authorises any other person to be in the place of work; or
(ii) has personally received oral advice that any other person will, under the authority of any enactment, be working in the place of work; and
(d) is not obliged, in relation to that other person, to comply with subsection (1) or subsection (2)—
must take all practicable steps to warn that other person of the significant hazard.

(4) Except in the case of the practicable steps required by this section to be taken in relation to any person described in subsection (2) or subsection (3)(c)(i), this section does not impose on any person who controls a place of work any duty in respect of any person who is in the place of work solely for the purpose of recreation or leisure.

(5) The warning required to be given to a person to whom subsection (3)(c)(i) applies—
(a) must be given to that person at the time at which the express authority to be in the place of work is given to that person; but

(b) if the express authority is given in respect of a group of persons or a body of persons, whether corporate or unincorporate, it is sufficient if the warning is given at that time to a representative or member of that group or body of persons.

(6) The oral advice required by subsection (3)(c)(ii) must be given by the person who will be working in the place of work or by that person's employer

14.8 AS/NZS 3500.1:2003 Plumbing and drainage – Water Services

SECTION 4 CROSS-CONNECTION CONTROL AND BACKFLOW PREVENTION

4.1 SCOPE OF SECTION

This Section specifies the 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.

NOTES:

1 This Section applies to Australia only.

2 In New Zealand, reference may be made to the New Zealand Building Code Document 12, Water Supplies, for alternative information on cross-connection control and backflow prevention.

3 Examples of potential cross-connections are given in 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 water supply system.

4.2.2 Quality of water supply

Only drinking water shall be supplied to plumbing fixtures or outlets for human consumption, bathing, food preparation, or utensil washing.

NOTE: The New Zealand Building Code does not require the supply of drinking water for bathing.

4.2.3 Protection against contaminants

No device or system that may cause contamination of a water supply shall be connected directly or indirectly to any part of a water service without appropriate cross-connection or backflow prevention control suitable for the degree of hazard.

4.2.4 Combined tanks

Combined tanks storing drinking water and water for other purposes shall achieve separation of the two supplies by the internal installation of double partition walls. The space between the partition walls shall be arranged to ensure that any leakage shall not be able to enter the other compartment of the tank and it shall be drained so that any discharge is external and readily noticed.

4.2.5 Alternative water supplies

Alternative water supplies shall comply with the following requirements:

(a) Where water supplied from one source is connected to another water source—

(i) an appropriate backflow prevention device shall be fitted; and

(ii) the installation shall be authorized by the responsible regulatory authority.

NOTE: In New Zealand a building consent is required.

A1 (b) Where an alternative supply is non-drinking water, piping shall be clearly and permanently labelled in accordance with Clause 9.5.2.

(c) Where the non-drinking alternative supply is installed below ground, the service shall have a continuous marker tape, installed in the trench above the service, which shall state the following:

THE PIPE BELOW IS NON-DRINKING WATER

A1 (d) Piping conveying water for non-drinking water applications downstream of a backflow prevention device installed for high or medium hazard protection, other than used for containment, shall be clearly and permanently labelled in accordance with Clause 9.5.2.

4.2.6 Authorized fixtures, appliances or apparatus

Where backflow prevention devices are provided as an integral part of an authorized fixture, appliance or apparatus, and are appropriate to the cross-connection hazard generated by that fixture, appliance or apparatus, no additional backflow prevention is required upstream of the point of connection to the water supply system.

NOTE: Where a cross-connection is found in the water service at any property or if the water service is installed in a manner that will enable backflow to occur, such cross-connection should be reported to the water utility in Australia and territorial authority in New Zealand.

4.3 CROSS-CONNECTION HAZARD RATING

Cross-connections are rated using three degrees of hazard, as follows:

(a) *High hazard* Any condition, device or practice that, in connection with the drinking water supply system, has the potential to cause death.

(b) *Medium hazard* Any condition, device or practice that, in connection with the drinking water supply system, has the potential to endanger health.

(c) *Low hazard* Any condition, device or practice that, in connection with the drinking water supply system, constitutes a nuisance but does not endanger health or cause injury.

4.4 PROVISION OF BACKFLOW PREVENTION DEVICES

4.4.1 General

The backflow protection required shall be determined by identifying the individual hazard(s) within the premises. Then working upstream from each hazard, the water shall be regarded as non-drinking until a backflow prevention device, suitable to the degree of hazard, is provided (see Figure 4.1).

The drinking water supply shall be protected from the hazard(s) by installing—

(a) individual protection at each hazard with a device listed in Table 4.1(a), or Table 4.1(b), depending on the hazard rating; and/or

(b) zone protection with a device listed in Table 4.1(a) or Table 4.1(b), depending on the hazard rating, and pipework identified in accordance with Clause 4.4.5.

Backflow prevention devices shall comply with AS/NZS 2845.1.

NOTES:

1 In assessing a potential backflow condition, consideration should be given to the complexity of piping, the probability of piping change, and negligent or incorrect use of equipment resulting in a backflow condition.

2 Typical potential cross-connection examples are given in Appendix E.

4.4.2 Type of backflow protection

Backflow prevention devices shall be provided in accordance with—

(a) the hazard rating given in Clause 4.3; and

(b) the suitability of the device shown in Table 4.1.

NOTE: See Appendix F for examples of devices relative to levels of protection.

4.4.3 Hose taps

Hose taps within 18 m of a zone-protected area within the same premises shall have a backflow protection device of the same hazard rating as the zone protection adjacent to which they are installed.

4.4.4 Additional backflow protection

Where there is potential for unprotected cross-connections in water supply installations, additional zone/s or individual backflow prevention devices shall be provided.

NOTE: Additional backflow protection may also be required by the network utility operator.

4.4.5 Water downstream of backflow prevention device

The water service downstream of a backflow prevention device shall not be reconnected to the water service upstream of the backflow prevention device without the installation of an additional backflow prevention device of the same hazard rating.

Water downstream of a containment device is considered to be drinking water unless there are unprotected hazards within the premises. Individual or zone protection against these hazards shall be provided to prevent contamination of the water supply.

Piping conveying water downstream of backflow prevention device, installed for high or medium hazard protection, other than backflow prevention devices used for containment, shall be clearly and permanently labelled 'WARNING NOT FOR DRINKING' at every outlet (see Section 9).

In New Zealand, identification of non-drinking water outlets and pipelines shall be in accordance with NZBC G12/AS1 Clauses 4.2 and 4.3.

4.4.6 Commissioning and maintenance

Testable backflow prevention devices shall be commissioned and tested after installation and prior to service. They shall be maintained in working order and tested for operational function at intervals not exceeding 12 months. Reduced pressure zone devices, double-check valve assemblies, pressure type vacuum breakers, registered break tanks and registered air gaps shall only be used with a maintenance program for device registration and test certification.

Where there is no such program, these devices shall not be fitted and the standard air gap requirements shall apply.

NOTE: In New Zealand the testing of automatic backflow protection devices is mandatory to comply with S44 of the Building Act 1991.

4.4.7 Hot water systems

The requirements in this Section for backflow prevention devices apply equally to hot water supply systems and cold water supply services. The backflow prevention device used in heated water systems shall be suitable for the specific hot water installation.

4.5 SUITABILITY OF DEVICES FOR HAZARDS

Table 4.1 lists devices suitable for each hazard rating and indicates whether protection is provided against back-pressure.

The actual device selected for each hazard rating shall comply with Table 4.1 and be subject to the approval of the regulatory authority.

4.6 INSTALLATION OF BACKFLOW PREVENTION DEVICES

4.6.1 General installation requirements

The installation of each backflow prevention device shall comply with the following requirements:

(a) No heat shall be applied to any device during installation.

(b) Installations for pressure type vacuum breakers (PVB), anti-spill pressure type vacuum breakers (APVB), double check valves (DCV) and (DDCV) and reduced pressure zone devices (RZPD) and (DRZPD) shall be fitted with line strainers in accordance with Clause 4.6.1(b)(ii), except where used in fire service installations.

(c) Line strainer elements shall comply with the requirements of Table 4.2.

(d) For all testable devices, resilient-seated (drop tight when closed) isolating valves shall be installed—

(i) immediately upstream of the line strainer or immediately upstream of the device in cases where no integral line strainer is fitted (see Clause 4.6.1(b)); and

(ii) immediately downstream of the device.

(e) Piping shall be flushed before devices are connected.

(f) Unprotected bypasses shall not be installed around backflow prevention devices.

(g) The devices shall be installed in accordance with Clause 4.6.3 and the manufacturer's written instructions.

(h) The devices shall be protected from damage including freezing.

(i) Where continuous water supply is essential, devices shall be installed in parallel to permit shut-down of a device.

(j) In-line devices shall be capable of being removed and replaced. .

NOTE: For examples of typical installations, see Appendix F.

TABLE 4.2

MAXIMUM ORIFICE DIAMETERS AND MAXIMUM CENTRE DISTANCE OF LINE STRAINER ELEMENT PERFORATIONS

Size DN	Max. orifice diameter mm	Max. centre distance mm
20	1.6	2.4
25	1.6	2.4
32-40-50	3.25	5.6
80-100-150	4.6	5.6
200-250-300	4.6	5.6

4.6.2 Location of devices

4.6.2.1 *General*

The location of each backflow prevention device shall conform to the following requirements:

(a) Backflow prevention devices shall not be located in a corrosive or polluted atmosphere, where the contaminated air can enter the piping system through the air gap or open vent port, or cause the device to malfunction.

(b) Insulation or any other protection of a backflow prevention device shall not interfere with its operation, testing or maintenance.

(c) Vented testable backflow prevention devices shall not be located in cabinets without drainage or in pits.

(d) Backflow prevention devices shall not be buried in the ground.

(e) Where water hammer occurs it should be rectified by the installation of a surge protector or water hammer arrestor.

(f) All in-line devices shall be installed with connections, to permit the removal and replacement of the device.

(g) Containment devices shall be located as close to the water meter outlet or property boundary as practicable. There shall be no branch connection between the meter and device.

4.6.2.2 *Accessibility*

All devices shall be readily accessible for ease of maintenance or testing without the need to work from ladders or scaffolding.

Where the device is fitted with test taps, their location shall ensure the clearance necessary for the performance of the applicable test procedure and maintenance as defined in AS/NZS 2845.3.

4.6.2.3 *Drainage and leakage*

Backflow prevention devices shall be positioned so that any leakage from the air ports of vacuum breakers, or drainage from reduced pressure zone devices and vented double-check valves shall be readily visible, but not constitute a hazard or nuisance.

4.6.3 Specific installation requirements for testable and non-testable devices

4.6.3.1 *General*

Backflow prevention devices shall be installed in accordance with Clause 4.6.1 and the requirement of Clauses 4.6.3.2 and 4.6.3.3.

NOTE: For examples of backflow prevention devices, see Appendix F.

4.6.3.2 *Testable devices*

Testable devices shall be installed as follows:

(a) *Registered break tanks (RBT) and registered air gaps (RAG)* Registered break tanks shall comply with Section 8 of this Standard and incorporate the following air gap requirements:

(i) The unobstructed vertical distance through the free atmosphere between the lowest opening of a water service pipe or fixed outlet supplying water to a RBT, and the highest possible water level of such RBT, shall be as given in Table 4.3.

(ii) Where any break tank receives water from two or more water services of different diameter, the air gap shall be not less than the air gap required for the largest effective opening of the water service outlets as given in Table 4.3.

(b) *Pressure type vacuum breakers (PVB)* PVBs shall—

(i) be located not less than 300 mm above the highest outlet;

(ii) be ventilated to the atmosphere at all times; and

(iii) not be located in an area that may be subject to ponding or freezing.

(c) *Double-check valve (DCV) assemblies* DCV assemblies shall be located so as not to be subject to freezing.

(d) *Reduced pressure zone devices (RPZD)* RPZDs shall—

(i) have free ventilation to the atmosphere for the relief valve outlet, at all times;

(ii) not be located in an area that may be subject to ponding;

(iii) have the relief drain outlet located not less than 300 mm above the surrounding surface;

NOTE: For an example, see Figure F7, Appendix F.

(iv) be located so that they are not subject to freezing.

(e) *Double-check detector assemblies (DCDA)* DCDAs shall be located so as they are not subject to freezing.

(f) *Reduced pressure detector assemblies (RPDA)* RPDAs shall—

(i) have free ventilation to the atmosphere for the relief valve, at all times;

(ii) not be located in an area subject to ponding;

(iii) have the relief drain outlet located not less than 300 mm above the surrounding surface;

NOTE: For an example, see Figure F7, Appendix F.

(iv) be located so that they are not subject to freezing.

(g) *Anti-spill pressure vacuum breaker (APVB)* APVBs shall—

(i) be located not less than 300 mm above the highest outlet;

(ii) be ventilated to atmosphere at all times; and

(iii) not be located in area that may be subject to ponding.

TABLE 4.3

MINIMUM AIR GAP

Diameter of the effective opening of water service outlet	Minimum air gap mm	
	When not affected by near wall	When affected by near wall
≤ 9	20	25
> 9 ≤ 12	25	40
>12 ≤ 20	40	55
>20 ≤ 25	50	75
>25	2 × effective opening	3 × effective opening

4.6.3.3 *Non-testable devices*

A1 Non-testable devices shall be installed as follows:

(a) *Atmospheric vacuum breakers (AVB)* AVBs shall—

(i) be located not less than 150 mm above the highest outlet;

(ii) have no isolating valves located downstream of the vacuum breaker;

(iii) not, under normal operation, remain continuously pressurized for more than 12 h (see AS/NZS 2845.1);

(iv) be ventilated to the atmosphere, at all times;

(v) not be located in an area that may be subject to ponding; and

(vi) be located in line and be at least the same size as the supply and discharge piping.

(b) *Hose connection vacuum breakers (HCVB)* HCVBs shall—

(i) be located downstream of the isolating valve;

(ii) not, under normal operation, remain continuously pressurized with water for more than 12 h; and

(iii) be ventilated to the atmosphere at all times.

(c) *Dual-check valves with atmospheric port (DCAP)* DCAP shall—

(i) not be located in an area that is subject to ponding or freezing; and

(ii) have the vent port located not less than 300 mm above the surrounding surface so that the device is freely drained or over a tundish (see Note 1).

NOTES:

1 For an example of port location, see Figure F5, Appendix F.

2 See Clause 4.6.2.3 regarding leakage from devices.

(d) *Dual-check valves (DUAL CVs)* DUAL CVs shall be located in an area not subject to freezing.

(e) *Dual-check valves with intermediate vent (DU CV)* DU CVs shall—

(i) not be located in an area that is subject to ponding; and

(ii) have the vent port located not less than 300 mm above the surrounding surface so that the device is freely drained or over a tundish (see Note 1).

NOTES:

1 For an example of the port location, see Figure F5, Appendix F.

2 See Clause 4.6.2.3 regarding leakage from devices.

3 For an example of the vent port location see Figure F5 (Appendix F).

(f) *Beverage dispenser dual-check valve (BDDC)* BDDCs shall—

(i) not be located in an area subject to freezing; and

(ii) have the vent port located not less than 300 mm above the surrounding surface so as the device can drain freely.

NOTE: See Clause 4.6.2.3 regarding leakage from devices.

(g) *Vacuum breaker check valve (VBCV)* VBCVs shall—

(i) be located in an area not subject to freezing; and

(ii) have the vent port located not less than 300 mm above the surrounding surface so that the device can drain freely.

(h) *Single-check valves—Spring loaded (Australia only)* Spring-loaded single check valves shall—

(i) have an isolating valve installed upstream and adjacent to the device;

(ii) be fitted in an accessible position; and

(iii) only be used in fire services.

SECTION 8 WATER STORAGE TANKS

8.1 SCOPE OF SECTION

This Section specifies requirements for the storage of water.

NOTE: For connections of rainwater tanks, see Section 14.

8.2 PURPOSE OF TANKS

8.2.1 General

This Section applies to tanks provided for the storage of water for the following purposes:

(a) Sanitary flushing.

(b) Drinking water supply.

(c) Firefighting.

(d) Airconditioning.

(e) Refrigeration.

(f) Ablutions.

(g) Prevention of cross-connections.

(h) Make-up water.

(i) Contingency reserve.

8.2.2 Limitations on use

A tank that is intended for the storage of drinking water shall not be used to supply directly any water closet pan, bidet, flush valve, slop hopper pan or other similar fixture or fitting used, or intended to be used, for sanitary flushing except as provided for in Clause 10.9.

8.3 DESIGN AND INSTALLATION REQUIREMENTS

8.3.1 General

The installation of tanks shall be as follows:

(a) All materials used to construct tanks shall comply with Section 2.

(b) All tanks shall be installed on bases, plinths or supports designed to adequately support the weight of any such tank and its contents when filled to maximum capacity.

(c) All metallic tanks, or such other tanks as may be directed, shall be installed with a membrane of non-corrosive insulating material between the support and the underside of the tank.

(d) Every tank shall be supported in such a manner that no load is transmitted to any of the attached pipes.

(e) All tanks shall be accessible for inspection, repairs, maintenance and replacement.

(f) Every tank shall be provided with a cover, designed to prevent the entry of dust, roof water, surface water, ground water, bird or animal life.

(g) For New Zealand, tanks shall be supported against seismic forces (see New Zealand Building Code (NZBC) Clause G 12/AS 1).

8.3.2 Capacity of storage tanks—Measurement

The storage capacity of any tank shall be taken to be the volume of water above the invert of the outlet pipe when the water surface is 20 mm below overflow level.

8.3.3 Access

Access to tanks shall be provided in accordance with the following:

(a) Adequate headroom and side access shall be provided for every tank, to enable inspection, cleaning and maintenance procedures to be carried out to the interior and exterior of the tank.

(b) The requirements of AS/NZS 2865 on the design and manufacture confined spaces shall be taken into account in the design of a water tank.

Where the interior depth of any storage tank exceeds 2 m, access ladders of standard design and dimensions complying with AS 1657 shall be installed.

8.3.4 Placement of tank

8.3.4.1 *Safe-tray*

Where required, tanks shall be placed in safe-trays in accordance with Clause 8.8

8.3.4.2 *Limitations on location of drinking water tanks*

Tanks storing dinking water shall not be located directly beneath any sanitary plumbing or any other pipes conveying non-drinking water.

8.4 TANK DESIGN

8.4.1 General

Water storage tanks shall be designed and connected in accordance with Figure 8.1. Tanks with dual water supply shall maintain the air gap in accordance with Clause 4.6.3.2(a). Where the capacity exceeds 500 L provision shall be made at the base for easy removal of sludge.

8.4.2 Internal corrosion protection

Where required for corrosion protection, the internal surfaces of tanks shall be coated with a protective coating applied in accordance with the manufacturer's instructions and Clause 2.5.

8.4.3 Tank cover

Any tank that supplies drinking water shall be provided with a cover that shall be—

(a) close fitting;

(b) secured in position if the tank is located externally; and

(c) provided with a covered access opening not smaller than 0.5 m^2, where the whole cover is not removable.

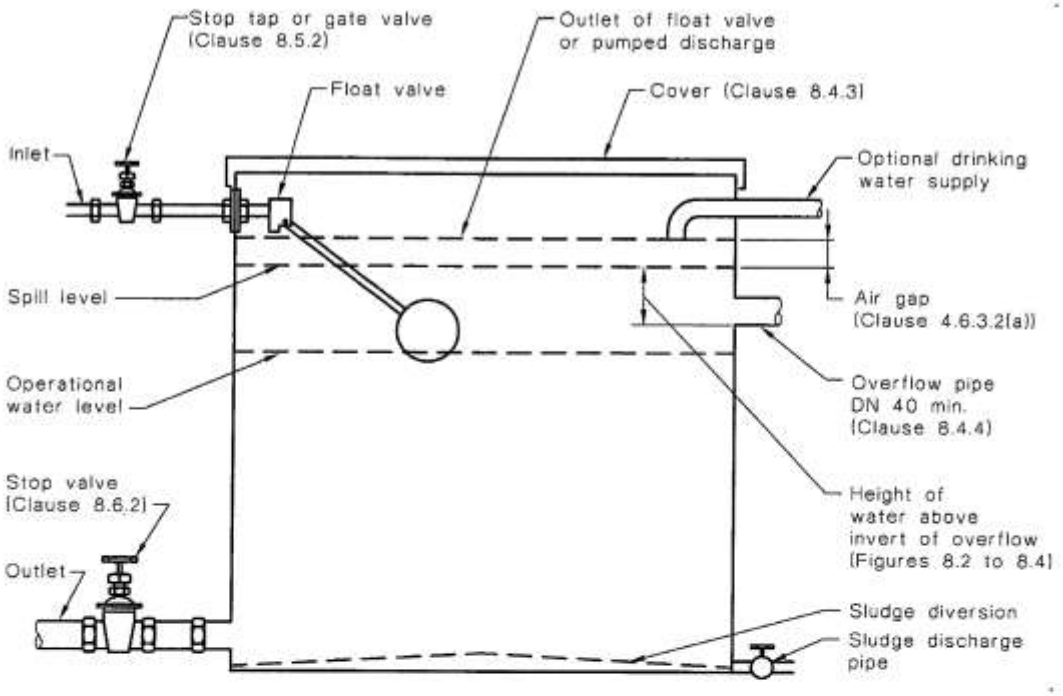


FIGURE 8.1 TYPICAL COLD WATER STORAGE TANK

8.4.4 Tank overflow

8.4.4.1 *General*

Overflow pipes from tanks shall be—

(a) not smaller than DN 40; and

(b) capable of discharging the inflow rates shown in Table 8.1 and the outflow rates shown in Figures 8.2, 8.3, 8.4, or hydraulically calculated taking into account the maximum head available in the main (but not less than 500 kPa), friction losses, elevation of the tank, size of the orifice and type of overflow outlet.

8.4.4.2 *Discharge of overflow*

In order not to cause damage or nuisance, the tank overflow shall discharge where it is readily visible—

(a) into the safe-tray, directly over the safe-tray overflow outlet;

(b) directly into the safe-tray overflow;

(c) onto an impervious graded floor, in such manner that the entire discharge drains freely and harmlessly to a floor waste outlet; or

(d) outside the building, clear of doors, windows or other opening, and within the property boundaries.

TABLE 8.1

RATE OF INFLOW TO STORAGE TANKS

Diameter of float valve inlet orifice mm	Inflow at 500 kPa L/s
6	0.54
8	0.95
10	1.49
15	3.4
20	6.0
25	9.3
32	15.3
40	23.8
50	37.2*
65	63.0
80	95.4
100	149.0
125	232.8
150	335.2

* Figures 8.2, 8.3 and 8.4 only cover up to this inflow.

The supply rate shall be determined from the following equation:

$$Q = m \times A \times \sqrt{2gH \times 10^3} \quad \ldots 1$$

where

Q = supply rate, in litres per second

m = orifice coefficient for thin sharp-edged plate = 0.6

A = cross-sectional area of orifice, in square metres

g = acceleration due to gravity (9.8 m/s^2)

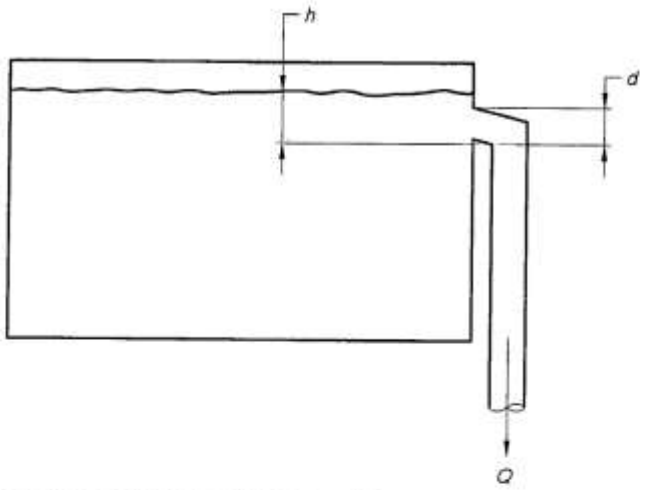
H = head of water on inlet of orifice, in metres

NOTES:

1 The diameter of the float valve inlet orifice is not necessarily related to the nominal size of the fitting.

2 As a guide, the orifice size is normally half the nominal size, except in the case of full way valves.

3 Refer to Appendix G and Figure G1 for additional information.



Flow rates shall be determined from the following equations:

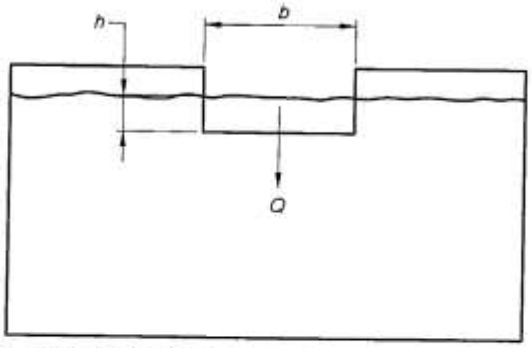
Weir flow, $h \leq d$ $\quad Q = 4.66 \times 10^{-5} \times d^{0.7} \times h^{1.8}$

Orifice flow, $h > d$ $\quad Q = 4.66 \times 10^{-5} \times d^{2} \times \sqrt{(h - d/2)}$

Internal diameter of overflow pipe (d)	Discharge through overflow (Q), L/s									
	Height of water above invert of overflow (h), mm									
mm	20	30	40	50	75	100	125	150	175	200
40	0.14	0.28	0.47	0.58	0.78	0.94	1.08	1.20	1.31	1.42
50	0.16	0.33	0.55	0.83	1.17	1.43	1.65	1.84	2.02	2.18
75	0.21	0.44	0.73	1.09	2.27	2.93	3.47	3.94	4.35	4.73
100	0.26	0.53	0.90	1.34	2.78	4.67	5.72	6.60	7.38	8.08
125	0.30	0.62	1.05	1.56	3.25	5.45	8.15	9.65	10.94	12.09
150	0.34	0.71	1.19	1.78	3.69	6.19	9.25	12.86	14.85	16.60
175	0.38	0.79	1.33	1.98	4.11	6.89	10.30	14.30	18.91	21.44
200	0.42	0.87	1.45	2.17	4.51	7.57	11.31	15.71	20.73	26.40

NOTE: The orifice coefficient $m = 0.6$ applies to the orifice flow conditions. Water heights are measured from the pipe invert or crest. This allows for overflows that are not flowing full. The capacity of those overflows is determined from the minimum specific energy of flow over a weir. No allowance is given in the Table for belling of the overflow, nor for an increase in effective head due to siphonage through the overflow pipe. These factors may substantially increase the discharge capacity of the overflow pipe.

FIGURE 8.2 RATE OF OUTFLOW FROM TYPE 1 OVERFLOW (PIPED) HORIZONTAL OUTLET STORAGE TANKS



Flow rates shall be determined from the following equations:

Weir flow $Q = 5.39 \times 10^{-5} \times b \times h^{1.5}$

Width of weir (b)	Discharge overflow (Q), L/s									
	Height of water above crest of weir (h), mm									
mm	20	30	40	50	75	100	125	150	175	200
25	0.12	0.22	0.34	0.48	0.88	1.35	1.88	2.48	3.12	3.81
30	0.14	0.27	0.41	0.57	1.05	1.62	2.26	2.97	3.74	4.57
75	0.36	0.66	1.02	1.43	2.63	4.04	5.65	7.43	9.36	11.43
100	0.48	0.89	1.36	1.91	3.50	5.39	7.53	9.90	12.48	15.25
125	0.60	1.11	1.70	2.38	4.38	6.74	9.42	12.38	15.60	19.06
150	0.72	1.33	2.05	2.86	5.25	8.08	11.30	14.85	18.72	22.87
175	0.84	1.55	2.39	3.33	6.13	9.43	13.18	17.33	21.84	26.68
200	0.96	1.77	2.73	3.81	7.00	10.78	15.07	19.80	24.96	30.49

NOTE: The orifice coefficient $m = 0.6$ applies to the orifice flow conditions. Water heights are measured from the pipe invert or crest. This allows for overflows that are not flowing full. The capacity of those overflows is determined from the minimum specific energy of flow over a weir. No allowance is given in the Table for belling of the overflow, nor for an increase in effective head due to siphonage through the overflow pipe. These factors may substantially increase the discharge capacity of the overflow pipe.

FIGURE 8.4 RATE OF OUTFLOW FROM TYPE 3 OVERFLOW (WEIR) RECTANGULAR STORAGE TANKS

8.4.4.3 *Discharge not readily visible*

Where the tank overflow pipe does not discharge to a readily visible position, a telltale pipe not smaller than DN 20 shall be connected to the invert of the overflow pipe and discharge as required by Clause 8.4.4.2.

8.4.4.4 *Size of air gap*

An air gap complying with Clause 4.6.3.2(a) shall be maintained between the spill level of the tank and the outlet of the water service.

8.5 INLET PIPING

8.5.1 Connections

Union couplings or flanges shall be used to connect the water service to the inlet of the storage tank.

8.5.2 Stop valve

Where a float valve is fitted, an isolating valve shall be installed in an accessible position to allow maintenance of the float valve.

8.6 OUTLET PIPING

8.6.1 Connections

The outlet piping shall be connected to the storage tank by means of union couplings or flanges and shall be a minimum of one pipe diameter from the bottom of the tank.

8.6.2 Service outlets

For tanks of more than 50 L capacity, each service outlet shall be fitted with an isolating valve installed in an accessible location.

8.7 SLUDGE VALVES

A sludge valve shall be fitted when the capacity of the tank exceeds 500 L. The sludge shall be discharged to the satisfaction of the relevant environmental protection legislation and shall be readily visible and not cause damage or nuisance. The minimum size of the valve shall not be less than half the outlet pipe size nor less than DN 40.

8.8 SAFE-TRAY

8.8.1 General

A safe-tray shall be provided under every storage tank, except where the tank is external to the building or located on an impervious floor graded to an outlet, the safe-tray shall—

(a) have no portion of the tank closer than 75 mm to a vertical line from the edge of the safe-tray and no portion of an attached auxiliary part closer than 25 mm to such vertical line; and

(b) have placed between the tank and the safe-tray, durable supports, not less than 12 mm thick and of an area not less than 0.5A nor more than 0.6A, where A is the area of the base of the tank, and the support shall project beyond the sides and walls of the tank but not closer than 20 mm to the sides of the safe-tray.

8.8.2 Safe-tray construction

Safe-trays shall be fabricated from materials that comply with Clause 2.6. The sides of trays shall be not less than 50 mm in height and all joints shall be made watertight.

8.8.3 Overflow

The safe-tray shall be fitted with an overflow that effectively drains the safe-tray. The overflow drain shall have—

(a) an internal diameter greater than the diameter of the tank overflow, but not less than DN 50 in Australia and DN 40 in New Zealand;

(b) a continuous fall to its discharge point in accordance with Clause 8.4.4.2;

(c) all seams in sheet metal pipe uppermost;

(d) all joints in sheet metal pipe lapped in the direction of the flow;

(e) all circumferential joints made watertight; and

(f) support in the vicinity of the tray and at intervals not greater than 1 m horizontally and 2.4 m vertically.

8.9 MARKING OF TANKS

Except if installed in domestic or residential buildings, all tanks shall have their intended use identified with not less than two permanent notices attached to each tank in readily visible positions, one on the front of the tank and one on the cover. Notices shall—

(a) be not less than 450 mm × 250 mm in size;

(b) have a red background;

(c) have the text in white, capital letters of not less than 25 mm in height; and

(d) have an identification in accordance with AS/NZS 2865 where applicable.

Tanks holding drinking water shall carry the following warning:

WARNING: DRINKING WATER

APPENDIX E

EXAMPLES OF POTENTIAL CROSS-CONNECTIONS

(Informative)

E1 SCOPE

This Appendix provides some examples of installations in which cross-connections are likely to be encountered.

The methods of cross-connection control are given in Section 4.

E2 POTENTIAL CROSS-CONNECTIONS

Some examples of installations in which cross-connections are likely to occur are as follows:

(a) *Agricultural and horticultural properties* Market gardens, poultry farms, and dairy farms, the interconnection between water service and dam water, drinking nipples, fogging sprays, irrigation pipes, antibiotic injectors, cleansing injectors, vertical sprays for vehicle washing, or any submerged outlet or hose at tanks or feed troughs.

(b) *Catering and allied trade installations* Commercial kitchens, hotels, and clubs, the interconnection between the water service and water-cooled refrigerant units containing methylchloride gas, or any submerged outlets or hoses that connect to glass washers dishwashers, bain-maries, food waste disposal units, garbage can washers, ice-making machines, refrigerators, hoses when supplying water to sinks or other receptacles.

(c) *Domestic installation* Interconnection of the water service to a haemodialysis machine, bidet, water-operated venturi type ejectors attached to garden hoses where used to empty or clean out sullage pits, septic tanks, gullies, stormwater sumps, domestic grease traps, or any submerged outlets, or discharge point of the water service in sanitary flushing cisterns, garden hoses supplying water to swimming pools, ornamental ponds, fish ponds, hose taps below the flood level rim of any fixture, or located below ground surface level.

(d) *Health and sanitary services installations* These installations include the following:

  (i) *Council sanitary depots* Interconnection between the water service and sanitary pan washers, truck washers, and pan-dumping machines.

  (ii) *Dental surgeries* Any submerged outlets of water service connected to chair bowls and venturi type water aspirators.

  (iii) *Funeral parlours* In embalming areas the interconnection between the water service and water-operated aspirator pumps.

  (iv) *Hospitals and nursing homes* Submerged outlets of the water service at bed pan washers, bed bottle washers, sterilizers, steam autoclaves, instrument washers, and any interconnection between the water service and steam pipes, steam boilers, or steam calorifiers.

  (v) *Mortuaries* Post-mortem areas, submerged water service outlets at autopsy tables, flushing rim floor gullies, specimen tables, and instrument washing sinks.

(e) *Industrial and commercial installations* These installations include the following:

(i) *Tanks* Any submerged discharge point of hoses or pipes that supply water to rinse tanks, process tanks and other tanks.

(ii) *Abattoirs* Interconnection between the water service and steam pipes, steam boilers, or steam calorifiers, and the washing sprays in contact with animal carcases.

(iii) *Bleaching works* Interconnection between the water service and steam pipes, steam boilers, steam calorifiers, or any submerged outlets at revolving drum washers, or any pipes conveying non-drinking water.

(iv) *Breweries, cordial and soft drink plants* Interconnection between water service and the contents of gas cylinders, steam pipes, steam boilers, or steam calorifiers, or any submerged water service outlets at drum or bottle washers, process tanks.

(v) *Butchers' shops* Interconnection between the water service and any water-cooled refrigerant units containing methyl-chloride gas, or water-powered food processing machines.

(vi) *Chemical plants* Interconnection between the water service and chemical pipelines, or the submerged water service pipe outlets at drum washer and process tanks.

(vii) *Dry cleaners* Interconnection between the water service and solvent stills.

(viii) *Dyeing works* Interconnection between the water service pipes and steam pipes, foul water inlet sprays in process tanks, and any submerged water service pipe outlets at vats, tanks, and colanders.

(ix) *Engineering works* Interconnection between the water service and any steam boilers, diesel oil recirculating systems, recirculated cooling water for machines, testing pressure vessels, oil cooling coils, pump priming, compressed air pipelines, and venturi type ejectors in vehicle maintenance pits.

(x) *Laboratories* Interconnection between the water service and any aspirator pumps, fume cupboards, stills, centrifuges, blood testing machines, air scrubbers, test-tube washing machines, animal feeding troughs, and high-pressure gas cylinders.

(xi) *Laundries* Interconnection between the water service and any clothes washing machines, starch tanks, soap mixing vats, and recirculated hot water tanks.

(xii) *Milk processing plants* Interconnection between the water service and any steam pipes, steam boilers, steam calorifiers, or any submerged outlets at bottle washing machines, milk can washing machines, and process chilling tanks.

(xiii) *Oil storage depots* Interconnection between the water service and foam firefighting equipment.

(xiv) *Poultry processing plants* Interconnection between the water service and any steam pipes, steam boilers, steam calorifiers, or any submerged outlets at feather-plucking machines, carcass-washing machines, offal boilers, and process tanks.

(xv) *Photographic developers* Interconnection between the water service and X-ray equipment, or any submerged outlets at tanks and rinse machines.

(xvi) *Plating workings* Interconnection between the water service and solvent, acid or alkaline tanks, cooling coils, steam pipes, or any submerged outlets at tanks and rinse machines.

(xvii) *Tanneries* Interconnection between the water service and vats, drum process tanks, or steam pipes.

(xviii) *Wool processors* Interconnection between the water service and lanolin centrifuges and head recycling coils, or any submerged outlets or hoses at vats, drums, and tanks.

APPENDIX F

TYPES OF BACKFLOW PROTECTION

(Informative)

This Appendix provides examples in Tables F1 to F3 for individual, zone and containment protection together with hazard ratings and device selection. It is recommended these procedures be adopted to contain the risk levels required for backflow protection.

Figures F1 to F7 give typical installation examples for testable and non-testable backflow prevention devices.

TABLE F1

INDIVIDUAL PROTECTION—HAZARD RATINGS AND A SELECTION OF BACKFLOW PREVENTION—DEVICES FOR BACKFLOW PREVENTION PROTECTION AT INDIVIDUAL FIXTURES, APPLIANCES OR APPARATUS

Form of cross-connection	Hazard rating	Backflow prevention device
AGRICULTURAL AND HORTICULTURAL		
Antibiotic injectors	High	RBT or RPZD
Fertilizers, herbicides, nematicides, insecticides and weedicides injected into an irrigator (see Section 7, Type D)	High	RBT or RPZD
Fogging and cleaning sprays with chemical injection	High	RBT or RPZD
INDUSTRIAL AND COMMERCIAL		
Fogging and cleaning spray equipment with chemical injection or additives	High	RBT or RPZD
Pan washing apparatus	High	RBT or RPZD
Chemical dispensers (high toxicity)	High	RAG, RBT or RPZD
Weed and pest spraying and water cartage tanks	High	RAG or RPZD (see Figure F1)
Mixing of chemicals	High	RAG or RPZD
Portable and mobile tankers	High	RAG or RPZD (see Figure F1)
Chemical dispensers (low toxicity)	Medium	Testable device
Coils and jackets in heat exchangers—unsealed and toxic environment	Medium	DCV only
Coils and jackets in heat exchangers—sealed and non-toxic environments	Low	Non-testable device
Photographic processing machines (no developer mixing)	Low	Non-testable device
HOSPITALS—MEDICAL		
Equipment used for handling, mixing, measuring and processing chemical and microbiological substances	High	RAG or RPZD
Photographic developers		
(a) Developer mixing facilities	High	RAG or RPZD
(b) Water supplying rinse tanks	Low	Non-testable device
Dental console		
(a) Australia	Low	VDCV
(b) New Zealand	High	RAG or RPZD

(continued)

TABLE F1 *(continued)*

Form of cross-connection	Hazard rating	Backflow prevention device
Haemodialysis machines NOTE: Veterinary equipment is rated as for Hospital/Medical		
(a) Australia	Low	Non-testable device
(b) New Zealand	High	RAG or RPZD
FIXTURES AND APPLIANCES		
Bidets	High	RBT or RPZD
Food preparation or food storage tanks, vats and vessels with clean-in-place systems	High	RAG or RPZD
Fixtures used for food preparation, e.g., sinks	Low	AG
Fixtures used for ablutions, e.g., baths, bidettes, basins, showers	Low	AG
Laundry troughs	Low	AG
Hair salons basins or troughs	Low	Non-testable device
Carbonated drink dispensing machines	Low	Stainless steel dual CV (intermediate) vent
Drink-dispensing equipment, vending machines, coffee machines	Low	Non-testable device
Food preparation or food storage tanks, vats and vessels	Low	AG/non-testable device
HOSE ATTACHMENT OUTLETS		
(a) External hose taps	Low	Non-testable device
(b) Flexible connections over domestic fixtures	Low	Non-testable device
(c) Hose taps located within an area provided with zone protection		
(i) flexible connections over commercial, industrial or hospital fixtures	Low	Non-testable device
(ii) laboratory outlets	Low	Non-testable device
(d) Hose taps located within 18 m of a Type C irrigation system	Low	Non-testable device
WATER SUPPLY SYSTEMS PERMANENTLY ATTACHED		
Steam boilers	Low	BT
Cooling towers*	High	RAG or RPZD
Steam calorifier	Medium	Testable device
WATER TREATMENT SYSTEMS		
Demineralizing equipment using ion-exchange resins with acid and alkali regeneration	High	RBT or RPZD
Plants with auxiliary non-drinking water supplies	High	RBT or RPZD
Drinking water in reclaimed water plants	Low	Non-testable device
Chlorinators	Medium	Testable device
In-line water softeners and filters	Low	Non-testable device

* Cooling tower air gap should be measured from the rim of the cooling tower basin.

LEGEND
AG = air gap
BT = break tank
DCV = double-check valve
RAG = registered air gap
RBT = registered break tank
RPZD = reduced pressure zone device

TABLE F2

ZONE PROTECTION—HAZARD RATINGS AND A SELECTION OF BACKFLOW PREVENTION—DEVICES FOR BACKFLOW PREVENTION PROTECTION AT THE CONNECTION TO SPECIFIED SECTIONS OF A WATER SUPPLY SYSTEM WITHIN A BUILDING OR FACILITY

Form of cross-connection	Hazard rating	Backflow prevention device
AGRICULTURAL, HORTICULTURAL AND IRRIGATION SYSTEMS		
Irrigation systems injected with fertilizers, herbicides, nematicides and insecticides (see Section 7, Type D)	High	RBT or RPZD
Drinking nipples and troughs	High	RAG or RBT or RPZD
Irrigation systems (see Section 7, Type C)	Medium	Testable device
Irrigation systems (see Section 7, Type B)	Low	Non-testable device
INDUSTRIAL AND COMMERCIAL		
Electro-plating, degreasing, descaling, stripping, pickling, dipping, etc., tanks, vats and vessels	High	RBT or RPZD
Commercial laundries	High	RAG or RPZD
Cooling or heating systems with recirculating water	High	RAG or RPZD
Clean-in-place systems (i.e., internal chemical cleaning takes place without dismantling equipment)	High	RAG or RPZD
Dockside facilities	High	RAG or RPZD
Industrial process water that has been recirculated	High	RAG or RPZD
Industrial and teaching laboratories	High	RAG or RPZD
Aircraft facilities	Medium	Testable device
Secondary school laboratories (including fume cupboards)	Medium	Testable device
Water filtration equipment	Low	Non-testable device
Photographic laboratories	Low	Non-testable device
FIRE SERVICES		
Direct connection to public water supply (Aust only) No tank, reservoir, connection to other water supply, antifreeze or other additives or auxiliary supply, e.g., pond or lake within 180 m of fire brigade booster connection		Single-check valve resilient seated (see Clause 4.6.3.3 Item (h)(iii))
Fire hose reels located in areas of hazard have to have a backflow prevention device in line with the hazard ratings of the areas within reach of the fire hose.	Medium	DCV
All other fire services	Medium	DCV
Fire storage tank	Low	AG

(continued)

TABLE F2 *(continued)*

Form of cross-connection	Hazard rating	Backflow prevention device
HOSPITALS/MEDICAL LABORATORIES, NURSING HOMES		
Dissecting rooms in hospitals and medical buildings	High	RBT or RPZD
Mortuary equipment used in funeral parlours, mortuaries, autopsy areas	High	RBT or RPZD
Utility rooms, where other than handbasins are installed	High	RBT or RPZD
Operating theatres in hospitals and medical buildings	High	RBT or RPZD
Dental and medical surgeries		
(a) Australia	Low	Non-testable device
(b) New Zealand	High	RAG or RPZD
FIXTURES AND APPLIANCES		
Sanitary dump points	High	RAG or RPZD
Food storage tanks, vats and vessels with clean-in-place systems	High	RAG or RPZD
Food storage tanks, vats and vessels	Low	Non-testable device
Hair salons, basins or troughs	Low	Non-testable device

TABLE F3

CONTAINMENT PROTECTION—HAZARD RATINGS—AND A SELECTION OF BACKFLOW PREVENTION DEVICES—BACKFLOW PREVENTION PROTECTION PROVIDED AT THE PROPERTY BOUNDARY TO PROTECT THE NETWORK UTILITY'S OR MAINS WATER SUPPLY FROM CONTAMINATION

	Form of cross-connection	Hazard rating	Backflow prevention device
	TYPE OF PREMISES		
A1	Premises with an alternative water supply excluding rainwater tanks	High	RBT or RPZD
	Premises where inspection is restricted	High	RBT or RPZD
	Hospitals, mortuaries, clinics and the like	High	RBT or RPZD
	Piers, docks and other waterfront facilities	High	RBT or RPZD
	Sewage treatment plants and sewage lift stations	High	RBT or RPZD
	Chemical plants	High	RBT or RPZD
	Metal finishing plants	High	RBT or RPZD
	Petroleum processing or storage plants	High	RBT or RPZD
	Radioactive material processing plants or nuclear reactors	High	RBT or RPZD
	Car and plant washing facilities	High	RBT or RPZD
	Abattoirs	High	RBT or RPZD
	Factories using processing or manufacturing toxic chemicals	High	RBT or RPZD
	Chemical laboratories	High	RBT or RPZD
	Pathology laboratories	High	RBT or RPZD
	Sanitary depots	High	RBT or RPZD
	Universities	High	RBT or RPZD
	Food and beverage processing plants	Medium	Testable device
	Caravan parks	Medium	Testable device
	Marinas	Medium	Testable device
	Premises with grey water re-use systems	Medium	Testable device
	Public swimming pools	Medium	Testable device
	Premises with reticulated and disinfected reclaimed water systems	Medium	Testable device
A1	Premises with rainwater tanks (see Table 14.1)	Low	Non-testable device
	Premises with reticulated recycled water system	Low	Non-testable device

NOTES:

1 Properties with alternative water supply (see Clause 4.2.5).

2 Air gaps should not be used in toxic environments.

LEGEND:
AG = air gap
AVB = atmospheric vacuum breaker
DCV = double-check valve
RAG = registered air gap
RBT = registered break tank
RPZD = reduced pressure zone device

15.0 Appendices

15.1 Backflow Prevention Inspection Checklist

Backflow Prevention Inspection Checklist

Property Details

Owner/Occupant _____ Address _____

Business Name _____ Town _____

Hazard Assessment

	Yes	No
Do hazardous activities occur on the property (confirm on site) ***(if No stop)***	☐	☐
Does property present a water supply risk *(mark specific hazards over page)*	☐	☐
Is there a boundary device already installed at property? ***(if No refer (a.) if Yes refer (b.) & (c.))***	☐	☐
Property no longer in use? (option of disconnection)	☐	☐

a. Found No Device. Needs Device

	Medium	High
What hazard category	☐	☐

Service line Diameter _____

Date scheduled for installation (to be completed in SWDC office) ____/____/____

b. Found Device that we may accept as protection (Proxy)

(i.e. Just inside boundary and on compliance schedule of Building Warrant of Fitness (BWOF))

	Yes	No
Device recorded on compliance schedule with Building Consent Authority? (confirm in SWDC office)	☐	☐
Recorded in Asset Information System as a proxy device?	☐	☐

c. Found a SWDC Device

	Yes	No
Does device have an Asset ID tag?	☐	☐

Asset ID _____ Manufacturer _____

Serial No _____ Diameter _____

Device recorded on Asset Register?	☐	☐
Existing Device added to inspection programme?	☐	☐

Type of Device ☐ RPZ ☐ Double Check ☐ Air Gap ☐ Hydrostatic Loop

Comments

_____

_____

_____

_____

Inspector Details

Inspector Name _____

Date of Inspection _____ Signature _____

NOTE: Update Work Programme spreadsheet with inspection date and schedule installation date as appropriate

15.2 Backflow Prevention Test Report

Backflow Prevention Test Report

PROPERTY DETAILS

Building Name _____ Address _____

Town _____

DEVICE DETAILS

Asset ID No. _____ Manufacturer _____

Type of Device ☐ RPZ ☐ Double Check Model _____

☐ Air Gap ☐ Hydrostatic Loop Serial No. _____

Installed at ☐ Proxy (boundary private owned) ☐ Boundary Diameter _____

Exact Location of Device (if not obvious) _____

☐ Frost Protection exists? ☐ Strainer Installed? ☐ Installed Correctly?

AIR GAP DETAILS Inlet Dia _____ Type ☐ Inlet suspended over Tank ☐ Ball Valve

Overflow Outlet Dia _____ Size of Gap (from top of overflow outlet to bottom of inlet) _____

COMPLIANCE DETAILS

Type of Test ☐ Initial Test ☐ Annual Test ☐ Retest / Following Repair

The backflow prevention device detailed hereon has been tested and maintained as required under the Health (Drinking Water) Amendment Act 2007.

	Reduced Pressure Devices		
	Double Check Devices		Relief Valve
	1st Check	2nd Check	
Initial Test	☐ DC – closed tight RP_____kPa ☐ Leaked	☐ DC – closed tight RP_____kPa ☐ Leaked	_____ kPa Opened at
Repairs and Materials Used (if failed)			
Test after Repairs (if necessary)	☐ DC – closed tight RP_____kPa ☐ Leaked	☐ DC – closed tight RP_____kPa ☐ Leaked	_____ kPa Opened at
Overall Device Test Result	☐ **PASS**	☐ **FAIL**	
Visual Inspection Air Gap	☐ **PASS**	☐ **FAIL**	

Test Kit Serial No. _____ Calibration Date _____ Test Method _____

Comments _____

IQP DETAILS

IQP Name _____ Certificate No. _____

IQP No. _____ Certificate Expiry Date _____

Mailing Address _____

Company Details _____

Date of Test _____ Signature _____