

WATER NEW ZEALAND

# Boundary Backflow Prevention for Drinking Water Supplies



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## **Disclaimer**

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# INTRODUCTION

Within a water distribution system, circumstances can occur where backflow results in drinking water becoming contaminated. Water suppliers have an obligation to ensure that the actions of any one customer do not have an adverse effect upon others through the contamination of water supplies. The water supplier must therefore have clear policies on backflow prevention at the boundary<sup>1</sup> between the water mains or aquifers and customers' plumbing systems.

Backflow can occur when the pressure in a customer's system exceeds the pressure in the supply system, either because of increased pressure in the customer's system or reduced pressure in the supply system, for example due to a mains break or pump failure.

This document provides best practice guidance on how water suppliers can minimise the risk of backflow through the development of policies and practices covering the selection, installation and monitoring of backflow devices for all connections supplied with drinking water, including residential properties.

This document is a revision of an earlier (2006) version that has been updated in response to changes in legislation, in particular sections of the Health (Drinking Water) Amendment Act 2007 that specifically refer to protecting water supplies from risk of backflow. Also, particular attention has been paid in this document to fire protection systems following consultation with representatives of the fire industry.

Following the guidelines put forward in this document will provide water suppliers with a means of compliance with the Act, and should result in a more consistent approach to backflow prevention throughout New Zealand.

This document has been compiled in two parts:

Part 1 – Guidelines for Water Suppliers

Part 2 – Code of Practice for Boundary Backflow Prevention

Part 1 concludes with a model policy statement and bylaw that could be adopted by a water supplier. Part 2 of the document could be adopted by a water supplier as a means of compliance for boundary backflow devices installed within the area under its jurisdiction.

This document does not take precedent over any legislative requirements. Relevant legislation includes but is not limited to:

- Health (Drinking Water) Amendment Act 2007
- Building Act 2004 and amendments and Building Regulations 1992
- Local Government Act 2002 and subsequent amendments
- Health and Safety in Employment Act 1992
- Health Act 1956
- Resource Management Act 1991
- Plumbing, Gasfitters and Drainlayers Act 2006
- Food Hygiene Regulations 1974
- Camping Ground Regulations 1985.

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<sup>1</sup> Point of use backflow prevention within buildings required by the New Zealand Building Code clause G12 Water Supplies (specifically G12.3.5) of the Building Regulations 1992 is outside the scope of this document.

Reference is made in this document to the following industry standards:

- NZS 4541 Automatic Fire Sprinkler Systems
- AS/NZS 2845.1:2010 Water Supply – Backflow Prevention Devices – Materials, design and performance standards
- ASSE product standards on backflow devices
- Field Testing of Backflow Prevention Devices and Verification of Air Gaps 2011
- Public Health Risk Management Guide – Distribution Systems – Backflow Prevention, version 1 Ref D2.4 June 2001.

The revision of this document was funded by the Water Services Managers' Group of Water New Zealand and produced by the Backflow Group of Water New Zealand.

*With most water supplies there is a real risk, or even a history, of backflow.*

*There have been many serious backflow incidents recorded in New Zealand although they are not often widely publicised. Many of these incidents, such as beer from a brewery back-siphoning into a public water main, fortunately did not result in any known significant public health consequences, but had circumstances been different there could have been adverse health consequences for the brewery's neighbours.*

*More serious incidents sometimes get reported as headline news, such as in May 1994 when it was reported that caustic soda from a dairy factory back-siphoned into a common water main resulting in at least six people receiving chemical burns, some of them serious. The incident was caused by a maintenance worker's mistake. Had a proper boundary device been installed the incident would have been contained within the factory.*

*Preventing incidents like these are the prime reason for producing this document. The likelihood of backflow is low but the consequences could be catastrophic.*

# DEFINITIONS

**Backflow** means a flow that is contrary to the normal intended direction of flow. In this document it refers to flow from the customer's premises back into a common or public water supply, or back into an aquifer.

**Backflow Tester** means a person approved by the water supplier for testing boundary backflow prevention devices.

**Backflow Surveyor** means a person approved by the water supplier to undertake surveying for potential backflow risks.

**Backflow prevention device** means a device to prevent backflow as defined in AS/NZS 2845.1. These include:

- dual check valves (non- testable);
- air gap devices (verifiable);
- double check valves (testable); and
- reduced pressure zone devices (testable).

(Vacuum breaker backflow prevention devices, also defined in AS/NZS 2845.1, are not suitable as boundary backflow devices).

**Back pressure** refers to a situation where the pressure in the downstream (customer's) plumbing is greater than the pressure in the water supplier's mains resulting in a reversal of normal flow direction and thereby possible contamination of the mains water.

**Back siphonage** refers to a situation where the pressure in the water supplier's main is less than the pressure in the downstream (customer's) plumbing resulting in a reversal of normal flow direction and potential contamination of the mains water by water being sucked back into the water supplier's main.

**Boundary device** (sometimes known as a containment device) means any backflow prevention device located at or near the point of supply as defined by the water supplier, usually as close as is practical to the property boundary.

**BWoF** or Building Warrant of Fitness as per the New Zealand Building Code.

**Common or public water supply** means any water supply system that serves individual customers from a common system. Often such systems will be public water supplies owned and directly or indirectly operated by public organisations such as city or district councils. Private organisations also operate similar water supply systems.

**Customer** refers to the owner or occupier of the property who is responsible for the purchasing and use of water supplied.

**Drinking Water Assessor** refers to person appointed under the Health (Drinking Water) Amendment Act and employed by the Ministry of Health or a District Health Board.

**Fire Line** means any water supply service pipe dedicated to supplying water for fire fighting within a property.

**G12** means clause G12 Water Supplies in the New Zealand Building Code which is contained in the First Schedule of the Building Regulation 1992.

**HDWA Act** means Health (Drinking Water) Amendment Act 2007.

**IQP** means an **independent qualified person** accredited to undertake specified work under the NZ Building Act.

**PHRMP** means the Public Health Risk Management Plan as required under the HDWA Act.

**Point of Supply** is that point which marks the boundary of responsibility between the customer and the water supplier irrespective of the property boundary.

**Toby** means a valve at the end of a service pipe.

**Water supplier** means any organisation defined as a drinking water supplier in the HDWA Act that supplies water to another organisation or individual customers.

# Part 1 - GUIDELINES FOR WATER SUPPLIERS

The Health (Drinking Water) Amendment Act requires a water supplier to determine when it is desirable or necessary for backflow protection to be used to protect water supplies. Amongst other things, the Act also requires the water supplier to:

- keep a register of the devices;
- ensure the devices are tested at least annually; and
- have in place a public health risk management plan (PHRMP).

A more comprehensive listing of the water supplier's responsibilities in relation to backflow is provided below, covering the three areas - policy, practice and programme. This document provides guidance on best practice in each of these areas.

Policy	Practice	Programme
Risk assessment	Installation standards	Testing and surveying
Ownership	Device register	Education
Policy statement	Enforcement	Incident response plans

## 1.1 Risk Assessment

### Public Health Risk Management Plan

The determination of the risk of backflow contamination of a water supply is required by Section 69ZZZ of the HDWA Act and use is recommended of the *Public Health Risk Management Plan (PHRMP) Guide* available from the Ministry of Health website:

[www.health.govt.nz/publication/public-health-risk-management-plan-guides-drinking-water-supplies](http://www.health.govt.nz/publication/public-health-risk-management-plan-guides-drinking-water-supplies) . The PHRMP guide provides examples of high, medium, low and very low risk situations and minimum recommended boundary backflow protection requirements for each.

It is recommended that a PHRMP is developed looking at the need to protect the water supply as a whole, taking into account the likelihood and potential consequence of backflow occurring at some time in the life of the water supply. When assessing the risk of backflow to drinking water, the water supplier should consider all aspects of their supply and distribution systems, including:

- areas of low pressure;
- parts of the network with high supply interruption rates;
- upstream rural connections;
- the location of industrial customers and sewage pumping stations;
- the size of the water connection;
- potential volume of backflow;
- the elevation of the property above the water mains; and
- the proximity to sensitive customers (eg hospitals).

It is important to note that the compliance timeframes to prepare and implement a PHRMP, which are linked to population size served by a water supply, are not related to the requirements of Section 69ZZZ of the HDWA Act for backflow prevention, which has been in force since the legislation was enacted. So for smaller water supplies (population served less than 500), even if a PHRMP is not required, the backflow risk assessment needs to be undertaken as soon as practical. An example of a PHRMP risk assessment, using the risk determination provided in the Ministry of Health guideline document, is presented in Appendix 1.



## NZ Building Code clause G12 Water Supplies

In carrying out the backflow prevention risk assessment, the water supplier must also take account of the principles in the NZ Building Code clause G12 Water Supplies, which are aimed at ensuring that the correct (internal) backflow prevention devices at point of use are installed in the premises (as opposed to backflow devices on the property boundary). Where required by the NZ Building Code, the on-going performance monitoring of internal backflow devices will be covered by the building warrant of fitness (BWoF).

G12 has the following definitions:

High Hazard - any condition, device or practice which, in connection with the potable water supply system, has the potential to cause death.

Medium Hazard - any condition, device or practice which, in connection with the potable water supply system, has the potential to injure or endanger health.

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.

In G12 there is no very low hazard category as there is in the PHRMP. For all intents and purposes the low, medium and high hazard categories can be considered equivalent of the low, medium and high risk categories respectively of the PHRMP. Appendix 2 contains the device selection guide from G12 for internal or point of use protection, which differentiates between devices for use in back pressure or back siphonage situations.

In situations where internal backflow devices contribute to reducing the overall risk, the water supplier may decide to take this into account when deciding on the type of device required at the boundary. The decision will be based on factors such as the water supplier being satisfied with the on-going maintenance and testing of the internal devices, low likelihood of change of use of the premises and ease of surveying.

### Risk Reduction through Selection of Appropriate Boundary Backflow Devices

In developing a policy on the type of boundary device to be used in different circumstances, the water supplier must take into account both the activity within the premises that produces the greatest potential hazard and the likelihood and the consequence of backflow to the water supply network. Appendix 3 contains a guide to backflow hazards founds in various types of premises.

Below is an example of a device selection guide that could be used by a water supplier:

PHRMP Risk Level	Boundary Device type
Very Low Risk	Non-testable dual check valve
Low Risk	Double check valve or air gap
Medium Risk	Double check valve or air gap; Double check valve detector for fire protection
High Risk	Reduced pressure zone or air gap; Reduced pressure zone detector for fire protection

Residential household units are in the very low risk category. It is recommended that, over time, non-testable dual check valves are installed for boundary backflow protection for all residential connections. Such a device is relatively inexpensive and provides basic protection against backflow to both the water supply and to the customer, whose hot water cylinder, for example, could be damaged if backflow occurred. Single check valve devices are prone to failure and should not be used.

The double check valve and reduced pressure zone devices are testable and air gaps verifiable, and as such are more appropriate for higher risk situations (eg farm, commercial or industrial water use, or residential properties with pools, tanks, troughs, etc).

## 1.2 Ownership

The HDWA Act provides for boundary backflow devices to be owned and maintained by either the water supplier or by the property owner. The relevant sections of the Act are in Appendix 4.

**Option 1: Water Supplier Owned.** A decision by the water supplier to take over ownership of existing boundary devices will require the customer's agreement. It may also require policy and bylaw changes regarding the definition of the point of supply. Asset ownership will involve the water supplier with ongoing maintenance and testing of the devices (and may require the acquired assets to be valued for depreciation purposes).

**Option 2: Customer Owned.** To continue with customer ownership of the devices, which may have been set up under Water Supply Protection Regulations (now superseded by the Health Act amendment), the water supplier will need to update their policy and practices documentation to include HDWA Act requirements for a verifiable monitoring system, and PHRMP improvements.

**Option 3: Combined Ownership.** Examples of a combined approach to ownership could involve new boundary devices being owned and maintained by the water supplier and existing compliant testable devices owned by the customer, or all testable devices customer owned. Irrespective of the ownership of testable devices, it is recommended that all non-testable devices are owned by the water supplier. This may require policy and bylaw changes as well as the updating of processes to administer the different systems.

The decision regarding ownership is up to the individual water supplier and should be made after careful consideration. The issues and considerations associated with the three options are listed in Appendix 5.

The recommendation is water supplier owned as there is less risk of non-compliance due to wrong device installation and/or devices not being tested, consistent with feedback received from the Water New Zealand Water Services Managers' Group that water supplier owned works best. However, if there is doubt about the option to be followed, a series of meetings with those knowledgeable about backflow and policy implications, plus those affected by any change, could help in reaching the decision most appropriate for a particular water supplier.

Defining the point of supply is a critical issue that needs to be addressed in finalising the water supplier/customer ownership decision, as it not only marks the boundary for responsibility between customer and water supplier, but also a demarcation line beyond which (on the customer's side) a certifying plumber must be involved. (If the point of supply is not defined by a bylaw, supply agreement or local act then the point of supply is as per the HDWA Act interpretation "...the point immediately on the property owner's side of the toby".)

Where the backflow device is customer owned, then not only must the person engaged to undertake maintenance and testing of the device be approved for such work by the water supplier, but they must also be a certifying plumber with current backflow IQP accreditation under the Building Act.

If customer owned is adopted, an agreement should be sought from the customer that they will provide test reports, maintenance records and notification of any change of use in a timely manner. Reliance on the Building Warrant of Fitness (BWof) system to cover testing of boundary devices will not necessarily be sufficient as not all buildings have a BWof, eg residential properties with swimming pools, rain water tanks or home businesses.

## 1.3 Device Register

The HDWA Act requires a water supplier to maintain a register of all boundary backflow devices, including (non-testable) dual check valves. The register should include both water supplier and privately owned boundary devices. Where it is required that the devices are regularly tested, this information should be included in the register together with test records. It is recommended that test results are held for at least two years.

This register could be used for both boundary devices and point of use (internal) backflow prevention devices as required under the NZ Building Code.

The boundary devices owned by the water supplier should be included on the water supplier's asset register and have a unique identification number (eg, use of the device's serial number). These devices should also be subject to an asset management/ maintenance/ replacement/ testing programme.

## 1.4 Backflow Prevention Programme

As part of PHRMP, risk assessment and improvements the water supplier should develop a programme that amongst other matters should:

- identify potential risks and provide a timeframe for the risks to be reduced or eliminated through the installation of appropriate boundary devices;
- have a system in place to ensure that all testable boundary devices are tested at specified intervals;
- have in place an installation/replacement programme for non-testable backflow devices;
- cover situations where water is being extracted from bores or taken from water mains by water carriers;
- heighten public awareness to the risks of backflow contamination; and
- include a response plan to deal with a water supply contamination incident due to a backflow event.

### Inspection

An inspection programme should be established to cover all non-residential properties and residential properties, eg lifestyle blocks, where the water supply may be used for other than domestic purposes. Once a full inspection of such premises in the water supply area has been carried out, it is recommended that random surveys to determine the extent of change of use be carried out from time to time.

The person surveying properties for potential backflow problems must be approved by the water supplier. More detail on the accreditation process for backflow surveyors/ testers is provided in Appendix 6. It is recommended that at least one member of the water supplier's staff has backflow surveyor/ tester accreditation.

The programme should be proactive in seeking out new premises, or change of use within existing premises, where backflow prevention devices do not exist or the standard of existing backflow protection needs to be changed. The installation or upgrading of boundary backflow prevention devices should keep pace with the surveying programme.

Where an unprotected hazard is identified the surveyor must advise the customer and water supplier immediately. The water supplier must also inform the territorial authority (district or city council).

Where a property is inspected and found to require a testable device (or the existing device is non-compliant), the water supplier should arrange for installation of an appropriate device. In

circumstances where the adopted policy involves customer ownership of testable devices, the water supplier should give the customer an appropriate amount of time to install the required device depending on prevailing circumstances and the immediate risk posed. This period of time should not exceed three months.

The water supplier should endeavour to enter into arrangements with those organisations that are responsible for the approval of construction of new buildings (usually territorial authorities and building certifiers) so that they are kept abreast of changes that could place additional contamination risk on the water supply network. Changes to the activity may require changing the standard of backflow protection, while changes to the flow patterns may require a meter replacement. Such an arrangement might involve sections within a council responsible for building consents, trade waste and dangerous goods.

### **Testing (other than devices used in a very low risk situation)**

The HDWA Act requires all boundary backflow devices to be tested at least annually. Testing should be carried out more frequently under special circumstances as determined by the water supplier and after any maintenance work is carried out on the device. In the event of a suspected backflow incident, the water supplier can request that an additional test be carried out. (This testing regime does not apply to very low risk situations where non-testable dual check valve devices have been used. Such devices should be subject to a sampling programme, as discussed in the following section.) Testing of boundary devices should only be carried out by a person who is approved for such work by the water supplier.

The water supplier should formally remind customers who own boundary devices of their responsibility to have their devices tested by an approved backflow tester and their obligation to provide the water supplier with test results by the appropriate date. Where the test results are not received by the due date, the water supplier should contact the customer and arrange for the test to be carried out within ten working days where practical. To be effective the water supplier must have robust systems in place to highlight and act upon tests results not received by the due date.

The test records should be kept for a minimum of two years. It is recommended that at least 10% of reports received are checked, together with field auditing, to ensure that quality is maintained.

*Testing only covers the performance of the boundary device. It does not address whether the device is the appropriate device for the current risk. This is the responsibility of an approved backflow surveyor.*

*Water suppliers may elect to carry out testing and surveying at the same time. This could be done by using a person approved for both backflow testing and surveying.*

*Persons involved in backflow testing must be fully aware of their responsibilities and actions required of them under the Health and Safety in Employment Act should they find that there are hazards to people using water on the site. Testers should have a health and safety plan available for inspection.*

*Testing of customer owned devices must be carried out by a certifying plumber who is also on the water supplier's approved list of backflow testers.*

### **Non-testable Dual Check Valve Devices**

It is strongly recommended that, as a minimum, a non-testable dual check valve is provided for all residential connections. The water supplier's backflow prevention programme should specify the time frame for installation of these devices (if not already documented) and their regular replacement.

It is recommended that the water supplier should require all new residential connections to the water supply to include a (non-testable) dual check valve device. For existing connections, the requirement could be that the device is installed or replaced whenever the water meter is replaced or maintenance is carried out on the connection. (Normally the device would be part of the meter assembly or, if the connection is not metered, then located with the toby at point of supply.) Ownership of the boundary backflow device, as with ownership of the meter and toby, should be with the water supplier.

A sampling programme should be established to remove dual check valve devices and subject them to a reversed flow to determine the age at which failure is occurring so that appropriate replacement intervals for these devices can be incorporated into the water supplier's asset management programme.

## **Education**

As part of the backflow prevention programme, water suppliers should be proactive in informing the community, in particular property owners and occupiers, about the risks that cross-connections and backflow can pose to water supplies and how they can comply with the water supplier's policies and relevant legislation. This could take the form of leaflets available from council offices and other suitable facilities. This information should include but not be limited to advice on the following:

- explanation of the potential hazards that backflow poses to water supplies and aquifers;
- backflow policy and how customers can comply;
- information for plumbers;
- information on testing;
- what backflow prevention services customers have to pay for; and
- reference to further relevant information.

## **Bore Water and Auxiliary Supplies**

The water supplier should ensure that all ground water takes from an aquifer have adequate backflow protection. The backflow protection programme should require that bores are drilled, constructed and maintained in a manner that avoids any contamination of, or cross-connection with, groundwater aquifers. This should include ensuring that well head construction on all bores incorporates a boundary device and, where required, a flow measuring device.

Ground water takes for irrigation or stock water with direct injection of chemicals should require, as a minimum, a double check backflow device to protect the aquifer.

Auxiliary supplies such as fire storage tanks and ponds, rainwater tanks, and surface waters that have connection with water mains or aquifers should also have boundary backflow protection prescribed.

## **Tanker Filling and Hydrant Use**

The backflow protection programme should cover the use of water supplies by tanker operators. The water supplier should permit registered water carriers with an approved PHRMP only to take water from mains supply for human consumption, preferably from designated filling points fitted with backflow prevention.

For tankered water for human consumption, the water carrier must be registered under the Ministry of Health registration system. The list of registered water carriers is at <http://www.drinkingwater.esr.cri.nz/carriers/carriers.asp>. Registered water carriers have a code of practice document (Ministry of Health (2008): *Guideline for the Safe Carriage and Delivery of Drinking-Water*) which details their requirements under the HDWA Act, including backflow protection.

The water supplier may place conditions on taking water for non-potable use from its mains, such as requiring the contractor to use a hydrant standpipe with a double check valve or use of collapsible hoses. Where the water supplier requires a testable device, the test certificate should be kept with the device or in the vehicle used to carry the device at all times. If a testable backflow device is not required by the water supplier, a permanently mounted air gap of no less than 25 mm or twice the nominal diameter of the delivery pipe should be installed between the pipe outlet and the filling tank. In addition, the tanker discharge shut-off valve and any other connection to the tank should be such that they cannot be connected to a street hydrant by a standard fire hose coupling.

This above does not apply to the New Zealand Fire Service going about their normal business of fire fighting and hydrant testing, or to fire certifiers assessing the availability of fire flows. The Fire Service should advise the water supplier of routine hydrant testing in case of potential backflow and/or customer complaint.

### **Response Plan to a Contamination Incident**

The backflow programme should include a contingency plan to be followed in the event of a backflow incident. Guidance on a suitable incident response plan to contamination of a water supply resulting from backflow can be found in the PHRMP Guide – Contingency Plans. Procedures should be in place so that updated contact details are readily available in the event of an emergency. From time to time the water supplier should carry out an emergency response exercise to familiarise staff with the plan and their responsibilities.

## **1.5 Policy Statement and Bylaw**

The policy statement on boundary backflow devices must be clear and simply address the issues of ownership and responsibilities for approval, installation, on-going maintenance, testing and other matters. The statement should also cover policy on upgrading non-complying devices and the costs that will be passed on to the customer.

Getting approval for changes to existing policy documents will involve procedures specific to each water supplier. Amendments to a bylaw need to follow Section 86 of the Local Government Act 2002 and the use of special consultative procedures prior to adoption. Appendix 7 provides an example of a policy statement and bylaw clauses associated with Option 3: Combined Ownership.

The policy statement and bylaw should include detail of (or reference to) enforcement provisions in the event that a serious potential backflow hazard to the water supply is identified, and to the dispute resolution process if there is disagreement regarding the seriousness of the identified hazard.

As well as the policy statement and bylaw, the water supplier will need to prepare a specific practice document (ie, a code of practice) to cover installation and testing requirements. Part 2 of this document has been prepared as a code of practice that could be adopted by water suppliers.

# Part 2 - CODE OF PRACTICE FOR BOUNDARY BACKFLOW PREVENTION

## 2.1 Boundary Backflow Installations

The water supplier is responsible for approving the type, location, geometry and size of all boundary backflow protection device installations. The installation details approved by the water supplier after consultation with the customer will take into consideration:

- the backflow device to be installed;
- the nature of the hazard and the likelihood of future change of use;
- the metering arrangement (if applicable);
- the size of the connection to meet anticipated flow rates;
- head losses through the device;
- manufacturer's recommendations;
- protection against frost;
- the need for continuous water supply to the premises;
- access for checking the device;
- drainage requirements including size of drains;
- protection from traffic, underlying hazards, vandalism, etc.; and
- the point of supply beyond which customer responsibility begins.

Where possible, the device will be located just inside the customer's property boundary and just downstream of the water meter (where installed). The installation geometry must comply with the appropriate standards and manufacturer's recommendations.

Backflow prevention devices must be sited in a position where:

- they can be safely and easily checked and tested;
- the backflow installation is unlikely to be obstructed or be subject to vibration from heavy vehicular traffic or other loads; and
- they can be readily removed for maintenance or replacement.

All boundary devices shall comply with AS/NZS 2845.1 2012 or relevant ASSE product standard. The water supplier will only approve backflow devices where the device supplier has a policy of keeping manufacturers' data for all models supplied and compliance certification for at least seven years from the date of supply.

With the exception of fire lines (refer section 2.2), all boundary devices are to be installed with an isolating valve and a strainer upstream, and an isolating valve downstream of the device. Where continuous supply is needed, two devices with isolating valves should be installed in parallel. Acceptable fitting details are shown in the attached drawings.

Reduced pressure zone backflow prevention devices must be installed above ground (minimum 300mm above flood level) and be protected from vehicular traffic, frost and vandalism. They should be installed in a securely fenced or caged area with a concrete base and a lockable access gate, where possible with the gate located parallel to the property boundary.

Where double check valve devices are installed in an underground chamber, the design must allow for servicing by top entry and the chamber must be well drained. (For larger sized double check valve devices it is good practice to install these above ground, for ease of access and possible future upgrading to reduced pressure zone devices.)

The boundary backflow device must be sited so that it can be readily maintained and tested in-line without compromising the health or safety of the individuals involved. It should be possible to access the device without the need to climb ladders or scaffolding or enter a confined space.

Installation, maintenance and testing of boundary backflow devices, covered under the Health (Drinking Water) Amendment Act 2007 (HDWA Act), shall be carried out only by persons authorised by the water supply authority. However, where there is a need to undertake such work on devices on the customer's side of the point of supply that are covered by the Building Act, this work should be carried out only by a certifying plumber licensed under the Plumbers, Gasfitters and Drainlayers Act.

On completion of the installation the water supplier is to be provided with signed as-built drawings that clearly show detail about the boundary backflow protection device and the way it has been installed, together with the first test results. Where the water supplier is not the owner of the device, the details of the owner and, where appropriate, their agent(s) are to be provided with the as-built information. Details of the on-going maintenance and testing programme shall also be provided, as an indication that the owner is aware of their responsibilities for ensuring that there is a verifiable monitoring system in place.

## 2.2 Additional Installation Requirements for Fire Systems

For a fire sprinkler system to comply with NZ Building Code clause G12 Water Supplies, backflow protection is required appropriate to the cross-connection hazard:

Fire sprinkler systems fed solely from the water supply without auxiliary water supplies must have a double check valve assembly installed.

Systems containing hazardous additives used for fire fighting (foam or antifreeze) must have reduced pressure zone devices installed.

Backflow prevention devices associated with fire systems shall be installed in the sprinkler valve house, or other secured environment as approved by the water supplier. In general, no additional backflow protection is required (or recommended by fire industry authorities). However, where the water supplier requires an additional backflow device on a line serving a fire protection system to be located at the property boundary (because for instance there is a significant distance between the boundary and the valve house), the HDWA Act requires that this device does not compromise the fire sprinkler system. Thus, particular attention shall be paid in the design of the boundary installation to pressure losses associated with the boundary backflow device and its security. *(It is recommended that the boundary installation is located in a secured enclosure and that counter clockwise closing valves are incorporated, to minimise the possibility that the backflow isolation valve is deliberately closed, or left closed accidentally after testing of the boundary backflow device.)*

In accordance with NZS 4541 Automatic Fire Sprinkler Systems, all valves on a connection serving a sprinkler system (other than a domestic sprinkler system) shall be alarmed and/or monitored for unauthorised operation. The exception to this is the underground sluice valve at the public main connection, which does not require monitoring.

Boundary backflow devices shall be installed on fire lines connected to in-ground hydrants. These devices shall be protected against vandalism.

Line strainers are not required to be installed upstream of backflow prevention devices installed on fire lines with an expected demand of less than 2,300 litres per minute. When demand exceeds 2,300 litres per minute turbulence in the line could result in debris being transported and/or should the water supplier deems it necessary due to high levels of debris in the water reticulation system, then only Sprinkler System Certifier listed strainers shall be fitted.

A backflow device incorporating a bypass meter (sometimes known as a detector check assembly) to provide backflow protection and to detect any inappropriate use or possible leakage of the fire line may be incorporated on dedicated lines for fire sprinkler systems. Such assemblies



shall have a 'producer statement' from the supplier confirming that the device has been built and tested in compliance with relevant standards.

Other than for a domestic sprinkler system, mechanical flow meters shall not be installed on fire lines, as they could compromise flow under fire conditions. Where metering is required for a common fire and metered supply, *magflo* type meters should be specified.

*(Domestic sprinkler systems may include a mechanical flow meter and non-testable backflow device. These systems will normally be of a larger size than ordinary domestic connections and should be designed without dead ends. That is, the water feed for household use flows through the sprinkler system, to ensure that debris build-up does not compromise sprinkler performance under fire conditions.)*

## 2.3 Testing Requirements

Irrespective of ownership (by the water supplier or the customer), all boundary backflow devices shall be tested at least annually (as required by the HDWA Act). Testing shall be carried out more frequently under special circumstances where required by the water supplier and after any maintenance work is carried out on the device. All registered air gaps shall be inspected and verified annually. In the event of a suspected backflow incident, the water supplier may request that an additional test be carried out. (This testing regime does not apply to very low risk situations where non-testable dual check valve devices have been used.)

The testing shall be undertaken only by a backflow tester approved by the water supplier and carried out as per the New Zealand Industry Standard: *Field testing of backflow prevention devices and verification of air gaps*<sup>2</sup>.

*(Backflow testers involved with fire lines must understand the protocols of isolating fire protection systems. These protocols address the need to notify the Fire Service, building owners, and insurers before a system is isolated.)*

The backflow test kit shall have a maximum working pressure of 1200 kPa and have separately coloured hoses to minimise mistakes being made during use. The test kit used must be certified/recertified every 12 months by an ISO registered laboratory and a copy of the test certification kept with the kit.

*(It is recommended that securely fastened test tags be attached to the device after testing showing as a minimum:*

- *the serial number of the device;*
- *the due date of the next test; and*
- *the name of tester and contact phone number.*

*The test tag should state ownership by water supplier, if water supplier owned, to avoid duplicate testing by IQPs involved in BWoF testing.)*

Where a device fails to test, the backflow tester should attempt to repair the device while on site and retest. Where it is not possible to repair the device on site, an equivalent substitute device shall be installed (and tested). The failed test report shall be provided along with the subsequent pass test report.

The backflow tester is to provide the water supplier, and the customer in the case of a customer owned device, with a test certificate as per the test certificates in the industry standard reference above. The results of all tests shall be sent to the water supplier within five working days of the test.

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<sup>2</sup> Published by Master Plumbers and Water New Zealand, 2011. Gazetted by the Department of Building and Housing.

In addition to annual testing, backflow prevention devices installed in dedicated fire systems must be tested immediately after a fire, and after each full flow test.

## **2.4 Responsibility for Payment**

Where deemed by the water supplier that a testable boundary backflow device is required, or that an existing boundary backflow device is non-compliant and requires replacement, the installation will be arranged by the water supplier but the customer will be responsible for the cost of installation, together with any consents and permit fees.

Where the boundary device is owned by the water supplier, the customer will be invoiced for the on-going cost of maintenance and testing, at rates published by the water supplier.

## **2.5 Specific Customer Responsibilities**

Where a customer owns the boundary device, the customer must take responsibility for ensuring that it remains fully operational at all times and is tested annually or more frequently in accordance with the requirements of the water supplier.

The customer must ensure that any boundary backflow protection device is accessible at all times for inspection and maintenance purposes. The water supplier reserves the right to charge customers for any additional time spent making a device accessible.

The customer must not interfere with the device in any way. This includes raising the ground levels around the device that could compromise minimum clearances or access to test the device, or using the test ports as a bypass or temporary water supply.

There must be no bypassing of any boundary device other than (with the water supplier's approval) with another similar device in parallel to ensure continuity of supply during testing.

The customer must report leaks or any other problems observed upstream of the point of supply, or in the boundary protection device itself, as soon as is practical.

The customer must report to the water supplier any significant change or proposed change to which the water is to be used in relation to hazardous materials and toxic environments. The customer must also report any significant change or proposed change that will substantially change the volume or flow pattern of water used.

## **2.6 Building Act Responsibilities**

In addition to the requirements for a boundary device, the property owner must ensure that the requirements of the Building Act are complied with for their property. This includes:

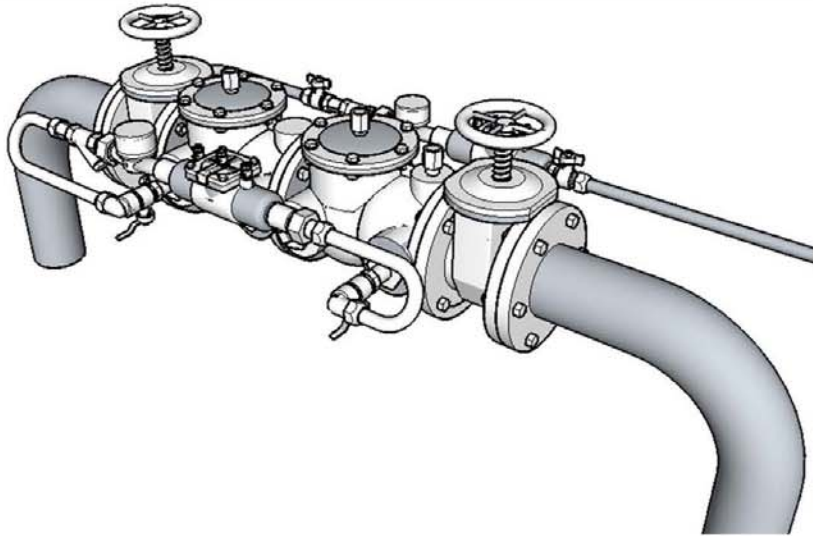
- notifying the territorial authority in writing of any change in use of the water supplied;
- obtaining a building consent for plumbing work, including the installation or removal of any (point of use) backflow prevention devices located within the premises; and
- maintaining and testing point of use backflow prevention devices in accordance with the compliance schedule.

## **2.7 Removal of a Boundary Device**

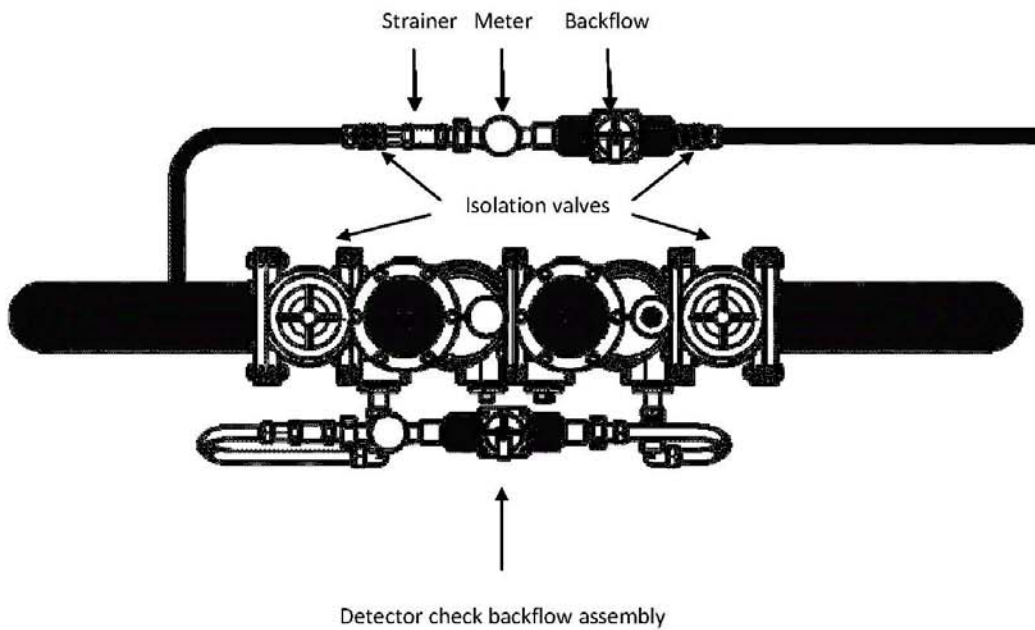
Where a customer considers that the type of boundary device in use is no longer necessary, they may put a request to the water supplier that the device be removed and another device type (eg, a non-testable device) installed in its place.

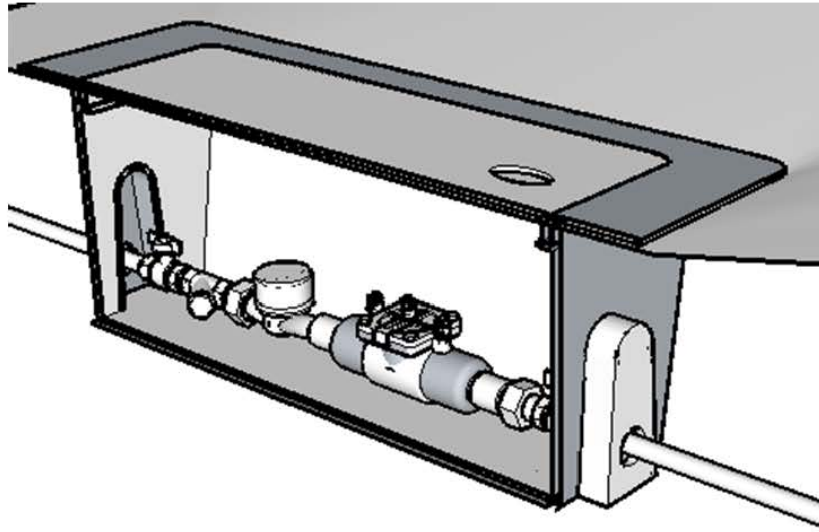
Where the request is granted, the removal and replacement procedures must be approved by the water supplier and any costs involved borne by the customer. Full and appropriate records of the change must be provided to the water supplier.

Alternatively, the water supplier may require the device to remain in place to mitigate future risks and may agree to suspend testing with a specified periodic review after discussion with the local Drinking Water Assessor.

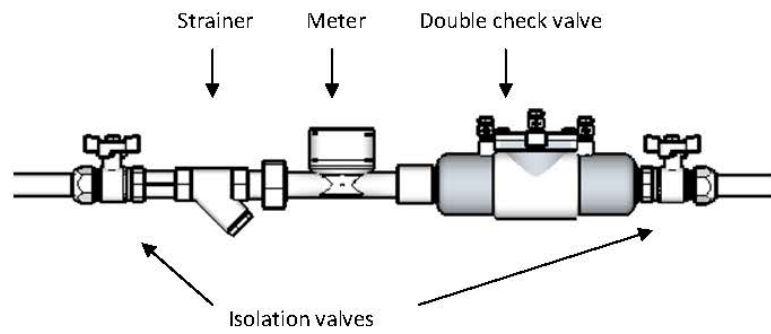


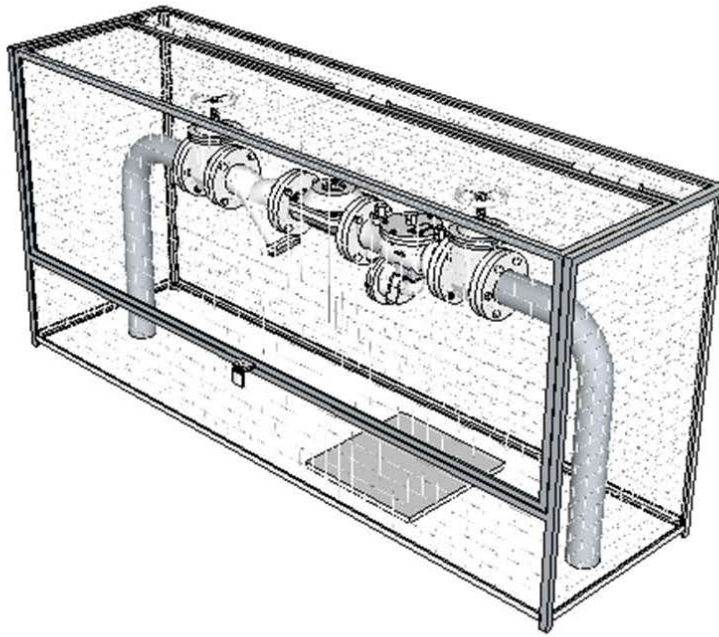
Fire line with detector assembly and separate metered service line



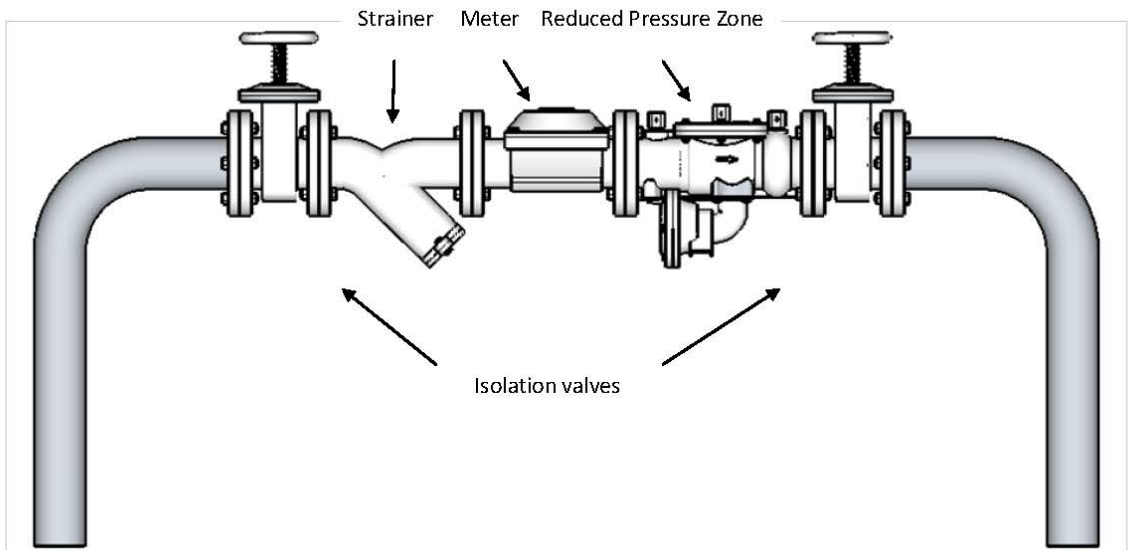


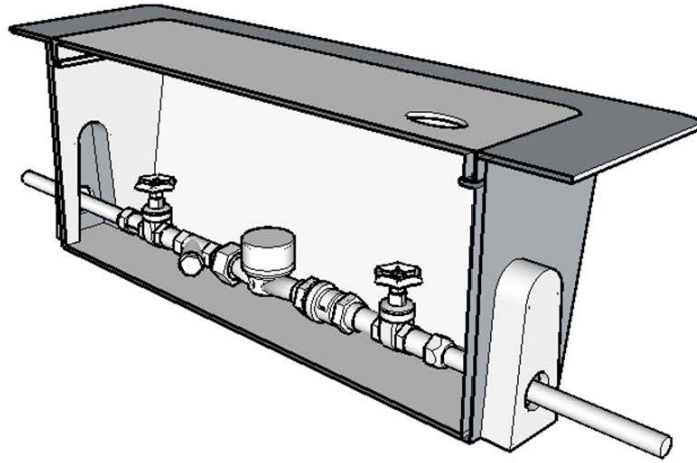
Double check valve on metered supply



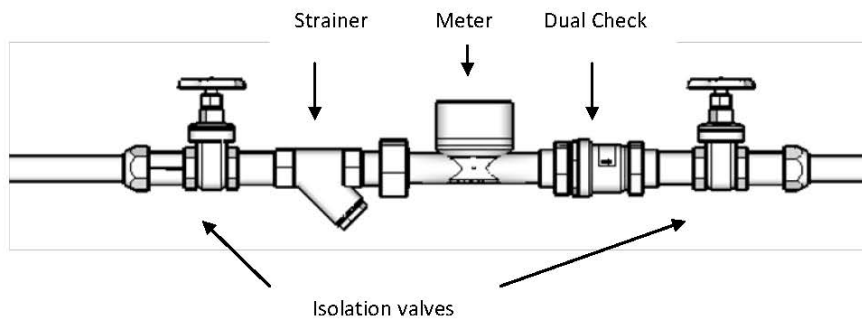


Reduced Pressure zone device in locked cage





Household supply metered with Dual Check device



# APPENDICIES



# Appendix 1 Example of PHRMP Risk Assessment

Risk Event	Risk No.	Potential Cause	Likelihood	Consequence	Overall Risk	Indicators of Performance	Current Preventive Measures,	Immediate Corrective Actions	Improvement Items
Backflow prevention: Network pressure less than premises; Introduction of contaminants into the mains.	Council is reviewing its policy on backflow protection to its water supplies to take account of the new legislation re control and ownership of boundary backflow prevention devices - refer section 69ZZZ of the Health (Drinking Water) Amendment Act 2007. This may lead to a review of the Water Supply Bylaw.								
	1.1	Pressure drop	Likely	Moderate	High	Customer complaints of contaminated water. E coli levels in network. Levels of targeted chemical determinands.	Installation of backflow prevention device that matches the risk to the supply from the premise. Annual testing of backflow prevention devices.	For all backflow events isolate and flush affected part of the network	Policy to install backflow prevention devices on all premises with potential for backflow at owner's cost. Annual inspection and testing of backflow prevention devices. Only qualified persons permitted to install, inspect, test and maintain backflow prevention devices.
	1.2	High consumer pressure	Possible		Moderate			Determine reason for low pressure and rectify	
	2.1	No or incorrectly connected backflow device	Likely		High				
	2.2	Illegal cross-connection	Almost certain		Extreme		Annual testing of backflow prevention devices	Survey premise suspected of causing contamination	Policy to install backflow protection devices on all premises with potential for back flow at owner's cost.
	2.3	Backflow device removed after installation	Unlikely		Moderate		Annual testing of backflow prevention devices	Repair/ replace	Device as part of meter assembly and owned by water supplier. Annual inspection, testing and where necessary replacement of backflow prevention devices. Implementation of spare parts policy
	2.4	Backflow device not installed. Need not identified due to change in use.	Likely		High		Annual testing of backflow prevention devices. Ensure that water supply engineer is advised by Building Consent of any change of use that has occurred.		Install appropriate device. Policy to install backflow prevention devices at all premises with potential for backflow at owners cost.
	2.5	Device failure	Likely		High		Annual testing of backflow prevention devices	Repair/ replace	Ability to control the test and repair of devices
2.6	Vandalism or accidental damage	Unlikely		Moderate	Annual testing of backflow prevention devices		Repair/ replace	Provide lockable enclosures as standard for above ground installations. Protect from further damage.	

## Appendix 2 Selection of Backflow Protection from G12

Type of backflow prevention	Cross-Connection Hazard					
	HIGH		MEDIUM		LOW	
	back - pressure	back-siphonage	back-pressure	back-siphonage	back-pressure	back-siphonage
Air Gap (Note 1)	X	X	X	X	X	X
Reduced pressure zone device (Note 1)	X	X	X	X	X	X
Double check valve assembly (Note 2)			X	X	X	X
Pressure type vacuum breaker (Note 3)		X		X		X
Atmospheric vacuum breaker (Note 4)		X		X		X
<b>Note:</b> <ol style="list-style-type: none"> <li>1. Air gaps and reduced pressure zone device must not be installed in a toxic environment.</li> <li>2. Double check valves can be installed in a medium and low hazard toxic environment.</li> <li>3. Pressure type vacuum breakers are designed to vent at 7 kPa or less. However, they require a significantly higher pressure to reseal and must be installed only in systems which provide pressures sufficient to ensure full closing of the valve.</li> <li>4. Hose outlet vacuum breakers are a specific type of atmospheric vacuum breaker.</li> </ol>						

## Appendix 3 Example of Backflow Hazard Criteria

HAZARD	COMMENTS	DEVICE REQUIRED
<b>High</b> <i>Any condition, device or practice which, in connection with the potable water supply system, has the potential to cause death.</i>	Equipment used for handling, mixing, measuring and processing hazardous chemical or harmful microbiological substances	Reduced pressure zone device, Registered air gap Reduced pressure zone detector for fire systems
ACTIVITY	EQUIPMENT	
Medical facilities (includes laboratories, hospitals, pharmacies)	Autoclaves, sterilisers, aspirators, haemodialysis machines, pan washers, bidets, sluice sinks, spittoons/cuspidors	
Fire or cooling systems with chemicals	Systems containing chemicals such as anti-freeze, anti-corrosion, biocides, or fungicides	
Industrial and trade waste customers	Boiler, chiller, steam calorifier and cooling tower make-up and recycled water; electroplating, degreasing, descaling, pickling, stripping and dipping tanks and vessels	
Car and factory washing facilities	Chemical dispensers and chemical injectors (high toxicity)	
Water treatment facilities	Chlorinators, demineralising equipment using ion-exchange resins with acid/alkali regeneration. Plants with auxiliary supplies. Drinking water in reclaimed water plants.	
Dental clinics	Dental equipment	
Commercial buildings	Direct heat exchangers (unsealed and toxic environment) Fire sprinkler systems and fire hydrant systems that use toxic or hazardous water.	
Commercial laundries	Recirculated or recycled water, venturi detergent and bleach dosing	
Mortuaries	Embalming systems	
Pest control businesses	Hose taps associated with High hazard situations like mixing of pesticides, aspirators, sprayers	
Food preparation facilities	Clean in place tanks, vats and food storage vessels	
Photography labs X-ray machines	Developer mixing facilities	
Airports, piers and docks	Seawater cross-connections (ie, hoses on wharves, fire systems using seawater, primed by town supply)	
Sewage pump stations and sump ejectors	Wash-down hoses and decontamination systems	
Horticultural and commercial gardens	Irrigation systems with chemicals	
Agriculture	Livestock water supply added chemicals/chemigation (ie, antibiotic injectors and bloat control), farm irrigation with fertigation systems and cow shed washdowns	

Veterinary clinic	Veterinary equipment
Water filling stations	Water tankers and associated hoses
Schools, universities and polytechnics	Boilers and water based heating systems, laboratories, irrigation systems, swimming pools
Inappropriate use of hydrants	Purging of flammable or explosive gases in gas systems

<b>HAZARD</b>	<b>COMMENTS</b>	<b>DEVICE REQUIRED</b>
<b>Medium</b> <i>Any condition, device or practice which, in connection with the potable water supply system, has the potential to injure or endanger health.</i>	In general Commercial and residential water uses other than domestic sanitary fixtures.	Reduced pressure zone device, Registered air gap, Double check valve Double check detector for fire systems
<b>ACTIVITY</b>	<b>EQUIPMENT</b>	
Beauty salon and hairdresser's sinks	Hairdresser's sinks	
Commercial car washes or vehicle wash down	Appliances, vehicles or equipment wash-down facilities without chemical additives	
Water treatment systems	Deionised water, reverse osmosis units and equipment cooling without chemicals	
Auxiliary water supplies such as pumped and non-pumped fire sprinkler secondary water	Fire sprinkler systems and building hydrant systems Hose taps and fire hose reels associated with Medium hazard	
Horticultural and commercial gardens	Irrigation systems with underground controllers but without chemicals (includes residential irrigation)	
Rural water supply	Livestock water supply without added chemicals; milking sheds	
Rain water collection	Untreated water storage tanks	
Recirculated water systems	Water for equipment cooling and steam cleaning	
Residential and commercial premises	Swimming pools, spas and fountains	

<b>HAZARD</b>	<b>COMMENTS</b>	<b>DEVICE REQUIRED</b>
<b>Low</b> <i>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</i>		Double check valve, Registered air gap Hose connection vacuum breaker
<b>ACTIVITY</b>	<b>EQUIPMENT</b>	
Commercial premises with potential for change of use.	Domestic sanitary fixtures only	
Cafes, restaurants and other facilities used for the storage or preparation of food and beverages	Drink dispensers with carbonators, coffee machines, dishwashers, garbage can washer, retractable hoses, urinal, auto vegetable peeler, ice maker	
Residential premises	Hose tap used for fixed domestic irrigation systems	
Schools and Parks, etc	Drinking water fountains	

<b>HAZARD</b>	<b>COMMENTS</b>	<b>DEVICE REQUIRED</b>
<b>Very Low</b> All household units (ie, residences).	MoH PHRMP Guideline recommends a non-testable dual check valve to be part of meter assembly maintained by water supplier.	Non-testable dual check valve Air gap
<b>ACTIVITY</b>	<b>EQUIPMENT</b>	
Residential water connections	Domestic sanitary fixtures only	

## Appendix 4 Extract from Health (Drinking Water) Amendment Act 2007

### 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.
- “(3) 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.
- “(4) 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.

### 69ZZZA Keeping, inspection, and copying of registers

- “(1) Any register that is required to be kept under this Part may be kept in any manner that the Director-General considers appropriate, including, either wholly or partly, by means of a device or facility that—
- “(a) records or stores information electronically or by other means; and
  - “(b) permits the information so recorded to be readily inspected or reproduced in usable form; and
  - “(c) permits the information in the register to be accessed by electronic means, including (without limitation) by means of remote logon access.
- “(2) The Director-General must keep any register that is required to be kept under this Part open for public inspection—
- “(a) on the Ministry's website in an electronic form that is publicly accessible; and
  - “(b) during ordinary office hours, at—
    - “(i) the head office of the Ministry; or

“(ii) an office of the Ministry for the time being specified for the purposes of this subsection by notice published in the *Gazette*.

“(3) The Director-General must supply to any person a copy of all or part of any register that is required to be kept under this Part, on request, and on payment of a reasonable charge for the production of the copy.

### **69Z Duty to prepare and implement public health risk management plan**

“(1) Every drinking-water supplier must, on or before the date on which this section begins to apply to that drinking-water supplier, prepare in writing either or both of the following, whichever is applicable:

“(a) a public health risk management plan in relation to that drinking-water supplier's drinking-water supply:

“(b) in the case of a drinking-water supplier who is a water carrier, a public health risk management plan in relation to that water carrier's method of transporting raw water or drinking water.

“(2) A public health risk management plan prepared under subsection (1) must,—

“(a) if prepared by a drinking-water supplier in relation to that drinking-water supplier's drinking-water supply,—

“(i) identify the public health risks (if any) associated with that drinking-water supply; and

“(ii) identify critical points in that drinking-water supply; and

“(iii) identify mechanisms for—

“(A) preventing public health risks arising in that drinking-water supply; and

“(B) reducing and eliminating those risks if they do arise; and

“(iv) include information about the estimated costs and benefits of the mechanisms referred to in subparagraph (iii); and

“(v) set out a timetable for managing the public health risks that have been identified as being associated with that drinking-water supply; and

“(vi) comply with any additional requirements imposed by the Director-General by notice in writing given to the supplier, as to the content and format of public health risk management plans:

“(b) if prepared by a water carrier in relation to that water carrier's method of transporting raw water or drinking water,—

“(i) identify the public health risks (if any) associated with that method of transporting raw water or drinking water; and

“(ii) identify critical points in that method of transporting raw water or drinking water; and

“(iii) identify mechanisms for—

“(A) preventing public health risks arising from that method of transportation; and

“(B) reducing and eliminating those risks if they do arise; and

“(iv) set out a timetable for managing the public health risks that have been identified as being associated with that method of transportation; and

“(v) comply with any additional requirements imposed by the Director-General by notice in writing given to the water carrier as to the content and format of public health risk management plans (including, without limitation, any requirement contained in a model plan issued by the Director-General).

“(3) A public health risk management plan may incorporate other material by reference if that incorporation helps the plan to comply with the requirements of subsection (2).

“(4) Every drinking-water supplier's public health risk management plan must be submitted by the drinking-water supplier to a drinking-water assessor for approval.

“(5) A drinking-water assessor—

“(a) must, within 20 working days after receiving a public health risk management plan submitted under subsection (4),—

“(i) decide to approve it or disapprove it; or

“(ii) require its alteration within a specified period; or

“(iii) require the provision of more information within a specified period; and

“(b) if the assessor issues a requirement under paragraph (a)(ii) or (iii), may, after any alteration to the public health risk management plan that is considered necessary by the assessor and made by agreement with the supplier or the water carrier, as the case may be, approve that plan.

“(6) The period of 20 working days referred to in subsection (5)(a) ceases to run during any specified period referred to in subsection (5)(a)(ii) or (iii).

“(7) If a drinking-water assessor does not approve a public health risk management plan, the assessor must notify the drinking-water supplier and give reasons for the non-approval.

“(8) Every drinking-water supplier must—

“(a) take all practicable steps to ensure that the supplier's public health risk management plan is approved under subsection (5) within a 12-month period after the date on which this section begins to apply to the supplier (excluding any specified period referred to in subsection (5)(a)(ii) or (iii));

“(b) start to implement a public health risk management plan within 1 month after the date on which that risk management plan is approved under subsection (5).

“(9) This section does not apply to a drinking-water supplier who supplies drinking water from a small drinking-water supply or a neighbourhood drinking-water supply.



## Appendix 5 Issues and Considerations re Ownership of Boundary Devices

<b>Option 1:</b>		
<b>Water Supplier Owned</b>	<b>Issues</b>	<b>Comments</b>
<p>Point of supply after last fitting of meter and backflow assembly.</p> <p>Water supplier responsible for testing, maintenance and replacement.</p> <p>Customer responsible for paying for installation, testing and maintenance.</p>	<p>Accepting and vesting of devices. Customers wishing to retain ownership.</p> <p>Possible access issues if existing or new devices inside the boundary. Also may have private supply pipe in between.</p> <p>Customer resistance to paying for devices they don't own or where one was not previously installed.</p>	<p>Water supplier arranges annual testing and also repair and retest of failed devices.</p> <p>Lower risk of devices not being tested annually or non-compliant.</p> <p>Less administration time chasing and auditing test reports.</p>
<b>Option 2:</b>		
<b>Customer owned</b>	<b>Issues</b>	<b>Comments</b>
<p>Point of supply upstream of the backflow device.</p> <p>Owner to test and maintain device.</p> <p>Verifiable monitoring system being one approved by both water supplier and drinking water assessor.</p> <p>Verifiable monitoring system requires proof that an approved person has been engaged to do testing and maintenance.</p>	<p>The collation and maintaining of accurate records for devices and their testing.</p> <p>Reliant on customer to provide test reports.</p> <p>Need for water supplier to remind customer to test devices.</p> <p>Non-tested, failed devices or non-compliant devices a risk to the water supply and enforcement will be required.</p>	<p>Allows customer choice as per Commerce Act.</p> <p>Water supplier and building control authority need to work together.</p>
<b>Option 3:</b>		
<b>Combined ownership</b>	<b>Issues</b>	<b>Comments</b>
<p>Point of supply options in policy/bylaw. Options and responsibility for ownership detailed to customer at time of connection and agreements required.</p>	<p>Issues as for options 1 and 2 above.</p> <p>Disputes may arise if device not tested or test is duplicated because of BWoF compliance schedule timeframe differs from water supplier owned programme for testing.</p>	<p>Allows customer and water supplier choice.</p> <p>Water supplier may not wish to own large devices or those with access/shutdown issues.</p>

## Appendix 6 Approved Backflow Technician

To become approved by a water supplier for work associated with boundary backflow devices a person must have a thorough knowledge of backflow prevention and cross-connection control. This includes knowledge of all relevant acts and regulations. They shall also be capable of recognising potential hazards while testing backflow devices.

In addition, they must have attended and passed an approved backflow course based on the course requirements outlined below.

All persons operating as an approved backflow tester or backflow surveyor shall be covered by public liability insurance to a value of not less than \$1m. In addition, approved backflow surveyors shall be covered by professional liability insurance to a value of not less than \$1m.

### Approved Technicians

People authorised by the water supplier to test backflow devices shall have attended and passed an approved backflow testing course.

People authorised by the water supplier to undertake backflow survey work shall have attended and passed an approved backflow surveying course.

*It is recommended that:*

- *a water supplier has at least one member of staff who holds both Testing and Surveying accreditation;*
- *the test kit used is certified/recertified every 12 months by an ISO registered laboratory and a copy of the certification kept with the kit;*
- *the backflow test kit has a maximum working pressure of 1200 kPa and has separately coloured hoses to minimise mistakes being made during use;*
- *following testing, a test tag is attached to the device showing -*
  - *the serial number of the device,*
  - *the due date for the next test, and*
  - *the name of tester and contact phone number.*

# Rules Governing Accreditation for a Backflow Tester

**Suitably qualified** - To become suitably qualified, an applicant must undertake and pass the following NZQA Unit Standards:

- Unit Standard 23847 - *Prepare to test, and inspect and test, water supply backflow prevention devices*; and
- Unit Standard 23848 – *Describe suitability, installation, and testing of water supply backflow prevention devices, and fault identification.*

**Duration** – Programme shall consist of a nominal 40 hours of face-to-face tuition.

**Programme content** – Any course of study leading to accreditation in the field of backflow prevention testing, shall consist of 2 parts:

1. a course of theoretical study which culminates in assessment; and
2. blind field testing of a range of devices.

Note: As assessment is being made against Unit Standards, the assessor must themselves hold Unit Standard 4098 - *Use standards to assess candidate performance.*

The theoretical programme shall cover the following:

- local case histories of backflow incidents;
- definitions used within the industry;
- Acts, Codes and Regulations;
- hydraulic principles;
- backflow hazards;
- operation of backflow prevention devices;
- installation of backflow prevention devices;
- testing of backflow prevention devices; and
- repair and maintenance of backflow prevention devices.

The practical field tests shall cover the following devices:

- pressure type vacuum breaker;
- double check valve assembly;
- spill resistant vacuum breaker assembly;
- reduced pressure principle backflow prevention assembly;
- verification of air gaps; and
- verification of atmospheric vacuum breakers.

**Accreditation:** Upon successful completion of the practical and theoretical examinations and payment of all fees, a certificate shall be issued by the course provider outlining topics covered and indicating the Unit Standards achieved. The provider shall also supply a photo identification card that shall state the type of accreditation with the full name of the tester and a renewal date. The applicant then must apply to their relevant water authority supplying additional information and evidence in order to be accepted as an approved backflow tester.

**Re–Accreditation:** Currency of accreditation shall be for a three year period. Re-accreditation shall require attendance at a course of not less than six hours in duration. Proof of application for re–accreditation shall be accepted as an extension to an expired accreditation.

# Rules Governing Accreditation for a Backflow Surveyor

**Suitably qualified:** To become suitably qualified, an applicant must undertake and pass an assessed programme of study.

**Pre-qualification** – The applicant shall be an accredited Backflow Tester.

**Duration** – Programme shall consist of a nominal 24 hours of face-to-face tuition.

**Programme content** - Any course of study leading to accreditation in the field of cross-connection control survey shall consist of two parts:

1. a course of theoretical study which culminates in assessment; and
2. completion of a field survey.

Note: Unit standards for backflow surveying are currently (March 2013) under development.

The theoretical programme shall cover the following:

- common definitions;
- relevant legislation;
- approved documents;
- backflow prevention devices;
- common installations;
- site facilities;
- protection; and
- surveying.

The practical field survey shall involve:

- A moderately complex establishment that contains a range of potential backflow hazards.

**Accreditation:** Upon successful completion of the practical and theoretical examinations and payment of all fees, a certificate shall be issued by the course provider. The provider shall also supply a photo identification card that shall state the type of accreditation with the full name of the tester and a renewal date. The applicant then must apply to their relevant water authority supplying additional information and evidence in order to be accepted as an approved backflow surveyor.

**Re-Accreditation:** Currency of accreditation shall be for a three year period. Re-accreditation shall require attendance at a course of not less than six hours in duration. Proof of application for re-accreditation shall be accepted as an extension to an expired accreditation.

## Appendix 7 Policy and Bylaw

### Policy Statement Example - Option 3 Combined Ownership

- |   |
|---|
| ▪ non-testable boundary backflow devices owned and maintained by Council  |
| ▪ new testable boundary backflow devices owned and maintained by Council  |
| ▪ customer given option to continue with ownership of compliant existing testable boundary backflow device or vest ownership in the Council |

This backflow prevention policy outlines Council's commitment to the protection of the potable water supplies.

The Health (Drinking Water) Amendment Act 2007 guides water suppliers in respect to the development of a backflow prevention policy to protect the water supply. Council will achieve this aim through effective implementation of the Backflow Prevention Code of Practice, efficient enforcement of the Water Supply Bylaw, and public education.

To minimise the risk of contamination to the water supply, Council's policy is that an appropriate level of backflow prevention is provided on all connections to water supplies, including water takes from aquifers.

Accordingly:

- all new connections require backflow prevention at the point of supply (defined as the point on the supply connection deemed by Council to mark the boundary of responsibility between Council and customer);
- the type of backflow prevention device to be used for new connections will be decided upon by Council dependent on the risk to the water supply posed by the customer;
- domestic/ordinary use connections as defined by the bylaw will generally require a (non-testable) dual check backflow prevention device and commercial/extraordinary use connections as defined by the bylaw will require a testable backflow prevention device at the point of supply;
- the installation details for new or replacement backflow devices shall be in accordance with Council's Code of Practice/Engineering Standards and be as approved by Council;
- installation, maintenance, testing and replacement of boundary backflow prevention devices shall be undertaken only by people approved by Council for such work;
- the ownership of boundary backflow devices on all new connections shall be vested in Council;
- existing domestic/ordinary use connections without backflow prevention will have a non testable backflow device installed by Council (at no additional cost to the customer) when the meter is replaced;
- existing extraordinary use connections (generally agricultural, commercial and industrial) without adequate backflow prevention are to be upgraded at the customer's expense (upgrading will be prioritised according to potential risk and Council will arrange for installation and testing of the new device and pass on the cost);
- customers with existing extraordinary use connections which meet Council's requirements for backflow prevention may retained ownership (and responsibility for on-going maintenance and testing) or vest ownership of the device in Council;
- where ownership of a boundary backflow prevention device has been vested in Council, it will be maintained and replaced as required by Council;
- testable backflow prevention devices, whether owned by Council or the customer, must be tested at least annually and after any maintenance;

- a schedule of targeted rates for testable backflow prevention devices of different types and sizes will be prescribed in the Annual and Long Term Plans. The appropriate charge (which covers maintenance, testing and replacement as required for existing use of Council owned boundary backflow devices) will be added to the customer's water account;
- periodic surveying of existing connections will be undertaken by Council to determine any change of use requiring upgrading of backflow prevention;
- a programme will be undertaken to advise and educate members of the community, in particular property owners and occupiers, about the risks that backflow can pose to water supplies; and
- enforcement where necessary will be as set out in the bylaw.

## **Council Bylaw Example - Option 3 Combined Ownership**

- |   |
|---|
| ▪ non-testable boundary backflow devices owned and maintained by Council  |
| ▪ new testable boundary backflow devices owned and maintained by Council  |
| ▪ customer given option to continue with ownership of compliant existing testable boundary backflow device or vest ownership in the Council |

This bylaw is made under the Local Government Act 2002 and the Health (Drinking Water) Amendment Act 2007. The purpose of this bylaw is to protect water supplies from contamination resulting from backflow (the reverse flow of water through a service connection) to a water main or to an aquifer.

### **Point of Supply**

1. The point of supply to an individual customer is the point on the service connection as deemed by Council that marks the boundary of responsibility between the customer and Council.
2. Where there is no water meter and/or backflow prevention device installed, the point of supply is the point where the service line crosses from Council's property (being generally road reserve) into private property so as to service an individual customer.
3. Where there is a boundary backflow prevention device, the point of supply is that point which is directly upstream of the backflow prevention device, in instances where the backflow device is customer owned, and downstream of the device where it is Council owned.
4. Installation of a backflow prevention device at point of supply must comply with Council's Backflow Prevention Policy and Code of Practice and the device itself with AS/NZS 2845.1 or the relevant ASSE product standard.

### **Backflow Prevention for Ordinary Supply of Water**

1. Ordinary Supply is defined as the supply of water to a customer which is used solely for domestic purposes, with end uses that includes use of a hose for:
  - washing down a car, boat, etc;
  - garden watering by hand; and
  - garden watering by a portable sprinkler.
2. New ordinary (domestic) water supply connections shall be provided with a non- testable boundary backflow device of a type approved by Council.
3. The Council will over time provide backflow protection on existing ordinary (domestic) supply connections through implementation of a programme of installing/replacing non-testable backflow devices at such time as repairs are carried out or a meter replaced at a supply connection.

### **Backflow Prevention for Extraordinary Supply of Water**

1. Extraordinary Supply is defined as all other purposes for which water is supplied other than "ordinary supply". End uses include supply to:
  - domestic - swimming pool or spa, fixed garden irrigation systems;
  - commercial or business
  - industrial
  - agricultural or horticultural
  - fire protection systems
  - storage tanks or ponds

2. All extraordinary supply connections shall be fitted with a testable backflow device at the point of supply. The type of backflow device and the design of each installation shall be as approved by Council.
3. All testable backflow devices shall be maintained in good working order and tested at least annually. Test records will be held by Council on each device.
4. Testing or maintenance work on a boundary backflow device shall be undertaken only by a person approved for such work by Council.
5. On satisfactory completion of a prescribed test, undertaken at the customer's expense, ownership of all new boundary backflow devices will be vested in Council. Thereafter Council will assume responsibility for their maintenance, including replacement if necessary, and testing.
6. Where an existing backflow device is deemed to be non-compliant, Council will arrange for the backflow device to be replaced at the customer's expense. Ownership of the replacement device will be vested in Council.
7. Customers with existing compliant backflow devices may, subject to written agreement from Council, retain ownership of the device along with the responsibility for maintenance and testing of the device in compliance with Council requirements. Alternatively, customers may vest ownership of the existing device in Council.
8. Where Council owns the boundary backflow device, customers will be charged a fee in accordance with targeted rates for water supply, as prescribed in the Long Term Plan or Annual Plan, for the on-going maintenance and annual testing of the boundary backflow device. The fee will be added to the customer's water bill.

### **Backflow Prevention for Bore Water Supply**

1. All ground water takes from aquifers shall be provided with adequate backflow protection.
2. Approval for ground water takes shall be subject to approved backflow protection being incorporated in the well head construction.

### **Customer's Responsibilities**

1. As required, customer shall provide access to the point of supply to Council authorised representatives.
2. The customer shall ensure that the area around the point of supply is maintained free of obstructions that may prevent convenient access by Council's authorised representatives.
3. The customer shall advise Council of any significant changes or proposed changes to which the water is to be used in relation to hazardous materials and toxic environments.
4. The customer shall report any significant change of proposed use that will substantially change the volume or flow pattern of water used.
5. It is the customer's responsibility under the Health (Drinking Water) Amendment Act 2007 and Building Act 2004 to take all necessary measures on the customer's side of the point of supply to prevent water that has been drawn from Council's water supply or an aquifer from returning to that supply or source.
6. For premises covered by the Building Act 2004, customers must ensure that adequate additional protection against backflow is provided within the premises:
  - (a) by either providing an adequate air gap separation or by the use of a backflow prevention device that complies with the New Zealand Building Code; and/or
  - (b) prohibiting any direct cross-connection between Council water supply and:
    - (i) any other water supply, potable or non-potable;
    - (ii) any other water source;
    - (iii) any storage tank; and



- (iv) any other pipe, fixture or equipment containing chemicals, liquids or gases.
- 7. Compliance under the Building Act 2004 does not absolve the property owner from the requirements of the Health (Drinking Water) Amendment Act 2007 for point of supply backflow prevention.
- 8. Customers with water supply serving agricultural or horticultural needs shall comply with the relevant sections of the Health (Drinking Water) Amendment Act 2007 regarding protection of potable water.

**Offences and Penalties**

Covered under water supply bylaws

**Disputes Resolution**

Covered under general bylaws.

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**A consistent approach across the 3 waters sector**