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Plumbing information sheet No. 13

Backflow Prevention and Cross-connection Control

Aim

The aim of this document is to provide information about why backflow protection and cross-connection control is required and what is required to keep water supply systems safe.

What is backflow and why is backflow protection required?

Backflow is the unwanted reversal of flow into the drinking water supply, which can occur under conditions of backpressure or back siphonage.

Many fixtures and appliances connected to drinking water supplies have the potential to contaminate the water supply; backflow protection is required to protect from such contamination.

Some common examples of points where contamination could occur are:

- Retrofit bidet's where the spray exits from below the flood level of the toilet pan
- Drinking troughs for cattle
- Radiator systems that contain anti-rust agents.

What causes a backflow event?

Two types of events, which can cause a backflow event, are:

Back-siphon – this is where a water supply falls below atmospheric pressure which allows the water to be drawn back through the pipe work.

An example of where back-siphon could occur is if there is a break in a water pipe while the water is turned off. The flow of the water leaving through the break could siphon contaminated water into the pipe work.

Backpressure – this is where the difference between the pressure within any water service and a higher pressure within any vessel or pipework to which it is connected.

An example of where backpressure could occur is where a pump may be installed which forces water back through the pipework system.

What is a cross-connection?

A **cross-connection** is any connection between a drinking water supply system and any non-drinking supply or other substance, which could result in contamination of the drinking water supply system.

An example of a cross-connection is where a radiator system has a water top up connection and there is no backflow prevention device installed. This is because the radiator may have an anti- rust agent in the water inside of it, and there is potential for the contaminated water to enter the water supply system.

What are the types of protection?

There are two type of protection, 'individual protection' and 'zone protection'.

Individual protection is where the protection is provided at the source.

Zone protection is where the protection is provided for a select area of a property.

NB: *where zone protection is provided all of the pipework within the zone should be treated as non-drinkable.*

NZBC G12

The 'Objective' provision of NZBC G12 requires that:

G12.1 The objective of this provision is to–

(a) safeguard people from illness caused by contaminated water:

In addition, the 'Performance' provision requires that:

G12.3.1 Water intended for human consumption, food preparation, utensil washing or oral hygiene must be potable.

In order to achieve these requirements G12/AS1 outlines acceptable solutions to protect from a backflow event or cross-connections.

Risk categories

G12/AS1 3.3 provides definitions of the different backflow hazard categories as follows:

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.

Selecting a backflow prevention device

The following factors must be considered when choosing a backflow prevention device:

Level of risk – Different devices can be used depending on the level of risk

Type of backflow event that could occur – not all backflow prevention devices are suitable for both backpressure and back-siphon events

Toxicity of the environment – Air gaps must not be installed in a toxic environment.

G12/AS1 3.4.5 outlines that "*The selection of the appropriate backflow protection for the cross connection hazard is given in Table 2*."

Installing a backflow prevention device

When installing a backflow prevention device the plumber should consider the following

1. *The valve position* **–** When installing a backflow prevention device, care should be taken to ensure that:
    a) there is adequate space around the device for maintenance and testing
    b) the device is installed in an area where it is safe from potential damage from vandalism
    c) the device is installed where it is protected from potential damage due to environmental conditions (e.g. frost, flooding and corrosion)
    d) the device is positioned correctly to provide protection to the water supply.
2. *The valve is supported* – Are the pipework supports sufficient to hold the weight of the backflow prevention device?
3. *The correct valve is used* **–** Care must be taken to ensure the correct type of device is used for the risk category, type of backflow event that could occur and environment.
4. *The valve is correctly installed* – When installing a backflow prevention device the following must also be installed:

    a) isolating valves on the inlet and outlet of the valve (with the exception of the atmospheric vacuum breaker which must have no valve on the outlet or anywhere downstream)
    b) unions to allow for the removal of the valve
    c) a filter on the inlet of the prevention device (to prevent particles I the water supply compromising the effectiveness of the valve).

5. *Equivalent hazard rating on a by-pass* – Where a by-pass is required to maintain a water supply the by-pass shall contain a backflow prevention device equivalent to the same hazard rating as the main feed.
6. *Correct orientation of the valve* – Many backflow preventers cannot be installed with a downward flow as the head of water could potentially prevent the valves within the backflow preventer from closing effectively.

Type of backflow protection	Cross Connection Hazard					
	High		Medium		Low	
	Backpressure	Back-siphon	Backpressure	Back-siphon	Backpressure	Back-siphon
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)		✓		✓		✓

Notes:

1. *Air gaps must not be installed in a toxic environment*
2. *Double check valves can be installed in a medium and low 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.*

Table modified from G12/AS1 Table 2.

Building warrant of fitness

Section 108 of the Building Act 2004 requires buildings which a compliance schedule has been issued to have annual checks completed as part of a building warrant of fitness (BWOF).

Part of the BWOF is for backflow prevention devices to be tested annually by an independently qualified person (IQP).

The Building Act 2004 defines an **independently qualified person** as a person:

"(a) who is accepted by a territorial authority as being qualified to—

(i) carry out or supervise all or some of the inspection, maintenance, and reporting procedures required for a specified system stated in a compliance schedule; and

(ii) certify that those procedures have been fully complied with; and

(b) whose acceptance under paragraph (a) has not been withdrawn by the territorial authority"

For information on how to become an IQP practitioners should contact the territorial authority in the area that they wish to practice as an IQP.

Testing

Testing of backflow prevention devices is required annually as part of a BWOF. However, testing of backflow prevention device must also be completed in the following times:

- immediately after installation of the backflow prevention device
- on completion of any maintenance work on the backflow prevention device
- after a backflow or suspected backflow incident
- at the request of the Area Health Officer, Building Control Officer, Dangerous Goods Inspector or Water Services Manager.

References:

G12 Water supplies

AS/NZS 2845.1:2010 – Water supply - Backflow prevention devices - Part 1: Materials, design and performance requirements

AS/NZS 2845.3:2020 – Water supply - Backflow prevention devices, Part 3: Field testing and maintenance of testable devices