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| G | Water Safety Plan Guide  Distribution System  – Backflow Prevention  Version 1, Ref D2.4  **January 2014** |

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# Introduction

Backflow-prevention devices are used to stop substances that may cause sickness being drawn back into the drinking-water supply. Backflows into the main create a public health risk to the quality of water through the entire water supply. Their prevention is the responsibility of the drinking-water supplier. Backflows within a building create a risk to the health of the occupants and, under the Building Act 1991, are the responsibility of the building owner. This *Guide* is concerned with the prevention of backflow into the main.

If an event occurs that may lead to backflow, the following could happen:

* If the pressure in the distribution system drops below the pressure in the supplied premises, sickness can come from germs or chemicals drawn back into the water supply from the premises.
* If a correctly operating backflow prevention device is not installed, and the pressure in the distribution system is less than that in a premises, sickness can come from germs or chemicals carried into the water supply by backflow.

There may be risks to the health of staff who install backflow prevention devices. These are acknowledged but are not discussed further, as such risks are the subject of health and safety in employment legislation.

This *Guide* deals specifically with backflow prevention and the risks associated with it, but backflow is also noted in two other *Guides*:

* *System Pressure (Guide D2.2)*
* *Operation (Guide D2.3)*.

# Risk Summary

The event creating the greatest risk of backflow is not having properly operating backflow prevention devices installed at the boundaries of premises where contaminants could be drawn back into the mains (see D2.4.3).

The most important preventive measures are to:

* make sure correctly operating backflow prevention devices are installed at premises where contaminants could be drawn back into the mains (see D2.4.3)
* make sure all backflow prevention devices are regularly inspected and tested (see D2.4.3).

(References in parentheses are to the Risk Information Table.)

# Risk Information Table

Reliable information about water quality is essential for the proper management of a water supply. Knowledgeable and skilled staff are also essential for minimising the public health risks associated with water supplies. Please read the staff training (*Guide G1*) and the monitoring guides (*Guide G2*). While we haven’t pointed out every detail of how these documents are linked with the present document, the links are many and are important.

Abbreviations: MAV – Maximum acceptable value – see *Drinking-Water Standards for New Zealand:2000*

| **Causes** | **Preventive measures** | **Checking preventive measures** | | **Corrective action** |
| --- | --- | --- | --- | --- |
| **What to check** | **Signs that action is needed** |
| Event: **WATER PRESSURE IN THE DISTRIBUTION SYSTEM LOWER THAN PRESSURE IN SUPPLIED PREMISES** Possible hazards: *Germs; chemical determinands*. Level of risk: **High** | | | | |
| **D2.4.1.1**  A pressure drop in the reticulated system. | * Installation of one of the following backflow prevention devices depending on the level of risk to the supply:1 * reduced pressure backflow prevention device * non-testable double check valve * testable double check valve * air gap. * Annual inspection and testing of backflow prevention devices. | * Testing and inspection records. * Microbiological quality. * Chemical determinands (when there is reason to suspect contamination). | * Reports by consumers of gross contamination of tapwater. * Unexplained fluctuations in chemical and microbiological water quality. * *E. coli* or coliforms detected in 100 mL water sample. * Concentrations of targeted chemical determinands are more than 50% of their MAV. | * Determine reasons for low system pressure and rectify if possible. * Identify the premises from which backflow occurred and install appropriate device *(see D2.4.2).* |
| **D2.4.1.2**  An elevated pressure in the premise(s) supplied as compared to the reticulated system. | *See D2.4.1.1.* | *See D2.4.1.1.* | | * Identify the premises from which backflow occurred and install appropriate device. |

1 See Risk Assessment Table.

| **Causes** | **Preventive measures** | **Checking preventive measures** | | | **Corrective action** |
| --- | --- | --- | --- | --- | --- |
| **What to check** | | **Signs that action is needed** |
| Event: **NO, INADEQUATE, FAULTY, OR INCORRECTLY INSTALLED BACKFLOW PREVENTION DEVICE** Possible hazards: *Germs; chemical determinands*. Level of risk: **High** | | | | | |
| **D2.4.2.1**  The backflow prevention device not actually connected, or connected improperly. | *See D2.4.1.1.* | *See D2.4.1.1.* | | | * Identify the premises from which backflow occurred and install appropriate device. |
| Event: **NO, INADEQUATE, FAULTY, OR INCORRECTLY INSTALLED BACKFLOW PREVENTION DEVICE** (cont’d) | | | | | |
| **D2.4.2.2**  An illegal cross connection to the reticulated system. | * Annual inspection and testing of backflow prevention devices. * Ensure that only appropriately qualified persons are permitted to carry out connection work undertaken for the water supplier. | *See D2.4.1.1.* | | | * Check on qualifications of staff undertaking connections. |
| **D2.4.2.3**  The backflow prevention device may have failed safe, but may then have been removed to maintain the water flow and not been replaced. | * Annual inspection, testing and replacement, where necessary, of backflow prevention devices. * Implementation of a comprehensive spare parts policy. | *See D2.4.1.1.* | | | * Repair/replace. |
| **D2.4.2.4**  No backflow prevention device installed because of insufficient knowledge of activities on the premises. | * Develop guidelines in conjunction with local authority so that the supply engineer is informed of changes in the use of premises by the part of the authority concerned with the registration of building modifications. * Annual inspection and testing of backflow prevention devices. | *See D2.4.1.1.* | | | * Identify the premises from which backflow occurred and install appropriate device. |
| **D2.4.2.5**  Failure of backflow prevention device. | * Annual inspection and testing of backflow prevention devices. | *See D2.4.1.1.* | | | * Repair/replace. |
| **D2.4.2.6**  Vandalism or accidental damage. | * Where necessary, provide lockable enclosures for backflow prevention devices. * Annual inspection and testing of backflow prevention devices. | *See D2.4.1.1.* | * Reports by consumers of gross contamination of tap water. | | * Repair/replace. * Protect from future damage. |

# Risk Assessment Table

The following table sets out in detail situations in which the absence of adequate backflow prevention may create risk to public health, and the comparative levels of risk. The risk rankings in the table are modified from information contained within Table E3 of *AS/NZS 3500.1.2* (1999).

| **Reference** | **Event** | **Comment** |
| --- | --- | --- |
| **D2.4.2** | **High-risk situations:**   * Premises with an alternative non-potable water supply. * Premises where inspection is restricted. * Sanitary fixtures and systems. * Medical, dental, hospital, mortuary or veterinary equipment. * Piers, marinas, wharves and waterfront equipment and including ships’ water supplies. * Meatworks and abattoirs. * Sewage treatment plants. * Drainage systems. * Boilers. * Cooling towers and air conditioners. * Equipment, tanks, fixed hoses, hose attachment outlets, appliances and other forms of cross connection within: * car and plant washing facilities * dry-cleaning premises * photographic processing laboratories * funeral parlours * metal finishing plants * weed or pest spraying facilities * mixing of chemicals, pesticides * nurseries * chemical plants, any premises using, processing or manufacturing toxic chemicals * dental surgeries * chemical laboratories * pathology laboratories * universities and research facilities * timber treatment facilities * water treatment facilities * vehicular sewage disposal facilities. | Minimum recommended level of protection:   * Reduced pressure backflow-prevention device.‡ |

‡ Air gaps provide a high level of protection, and are also an acceptable form of protection in these instances, so long as they are properly maintained.

| **Reference** | **Event** | **Comment** |
| --- | --- | --- |
|  | **Medium-risk situations:**   * Premises with alternative potable water supply. * Premises with grey water reuse systems, or where water is recycled for cooling or other purposes. * Premises with reticulated and disinfected water systems. * Public and private swimming pools, and spa pools. * Food and beverage processing plants. * Irrigation systems. * Commercial laundry facilities. * Premises with rainwater tanks. * Hairdressing premises. * Automatic fire sprinkler systems. * Equipment tanks, fixed hoses, hose attachment outlets, appliances and other forms of cross connection within industrial or commercial facilities where toxic or hazardous chemicals are not used. | Minimum recommended level of protection:   * Reduced pressure backflow prevention device.‡ * Testable double check valve.‡ |
|  | **Low-risk situations:**   * Premises used for the storage or preparation of food or beverages. * Drink dispensers. * Hose taps for fixed domestic irrigation systems. | Minimum recommended level of protection:   * Testable double check valve. * Air gap. * Hose connector vacuum breaker (for hose taps). |
|  | **Very low-risk situations:**   * All household units (ie, residences). | Minimum recommended level of protection.   * Non-testable dual check valve (part of meter assembly maintained by water supplier). * Air gap. |

# Contingency Plans

You may need to consult with the Medical Officer of Health to assess how serious a problem is, if an event happens despite preventive and corrective actions you have taken.

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| ***Event –* Backflow into the distribution system occurs** | |
| *Indicators:* | * Complaints of discoloured, tasting or smelling water coming from taps. * Backflow incident reported by industry. * Reports of illness in parts of the community. * Inability to maintain disinfectant residual in parts of the distribution system. * *E. coli* or coliforms found in the distribution system |
| *Required actions:* | * Notify the MOH, and in consultation warn consumers in the affected area not to draw water until further notice. If necessary, provide another source of potable water until water of acceptable quality can again be supplied. * Identify the source of the backflow incident, and isolate until a backflow prevention device can be fitted, or the one already installed can be made operational. * Drain and flush the affected part of the distribution system, considering the need to flush with elevated chlorine concentrations if the incident may have involved microbiological contaminants. (Consultation with the regional council will probably be required with regard to disposal of the flushed water.) * Monitor an appropriate determinand in the affected area to determine the successive of the contingency measures, and notify consumers, when the supply is safe to use, that they will need to flush their taps until good quality water an again be drawn. * Record cause of system failure and steps taken to correct. * Modify water safety plan if necessary. |
| *Responsibility:* | Manager designated responsible for the water supply. |

# Water Safety Plan Performance Assessment

To make sure that your supply’s water safety plan (formerly known as a Public Health Risk Management Plan, PHRMP) is working properly, periodic checks are needed. The overview document outlines what needs to be done. The following table provides the detailed information for checking this particular supply element.

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| *What to measure or observe:* | * Inspection records. * Quality assurance.   Inspections should be carried out by persons who have passed a recognised course of at least 40 hours (with refresher courses every three years). Inspections should include all backflow prevention devices fitted by the water supplier.  Any subcontractor will need to provide appropriate assurances of training and quality for the persons they intend to use. The testing shall be to a standard in accordance with Chapter 5 of the *United States Environmental Protection Agency Cross Connection Manual*, or AS 2845:Part 3. |
| *How often:* | * Inspectors must have 10 percent of their work independently checked on an annual basis, to ensure that standards are maintained. |
| *What to do with the results:* | * The collected data need to be periodically reviewed to see whether problems with this supply element are developing. This should be done as frequently as the manager responsible considers necessary to minimise risk to public health arising from this supply element. * Should this review show any unusual incidents, indicate that proper procedures are not being carried out, or indicate that poor water quality is reaching customers, then review the procedures for managing backflow prevention. * Evaluate the monitoring results, and any actions taken as the result of having to implement a contingency plan, to see if the water safety plan needs modification – eg, preventive measures are up-to-date; the contingency plan steps are still adequate; and changes to protocols relating to the installation of backflow protection devices are recognised in the plan. |
| *Responsibility:* | Manager designated responsible for water quality. |