



COLORADO

Department of Public
Health & Environment

WATER QUALITY CONTROL DIVISION
SAFE DRINKING WATER PROGRAM POLICY

POLICY TITLE: Backflow Prevention and Cross-connection Control	
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Approved by:  Ron Falco, P.E. Safe Drinking Water Program Manager	

1.0 Purpose and Background

The purpose of this policy is to clarify the *Colorado Department of Public Health and Environment's* (Department) interpretation of Article 1-114 and Article 1-114.1 of Title 25 of the *Colorado Revised Statutes* and of Section 39 of 5 CCR 1002-11 *Colorado Primary Drinking Water Regulations* (Regulation 11) effective May 1, 2015.

Specifically, this policy clarifies the Department's interpretation of the following:

- Permitting an Uncontrolled Cross Connection
- Ensuring that Activities are Completed - Implementing Legal Authority
- Appropriate Assembly or Method for an Identified Contaminant
- Unacceptable Health and/or Safety Risk
- Site-specific Deviation Criteria
- Most Protective Backflow Prevention Assembly or Method
- Survey Process Documentation
- Public Water System's Water Supply System Cross Connections
- Active Date

Safe Drinking Water Program Policy Number DW-007: Backflow Prevention and Cross-connection Control

The Department reserves the right to deviate from this policy as specified in WQCD Policy 1: Implementation Policy Framework.

2.0 Applicability

This policy applies to all public water systems.

3.0 Definitions

- a. *Multi-family* means a single residential connection to the public water system's distribution system from which three or more separate living units are supplied water.
- b. *Single-family* means:
 - i. A single living unit that is supplied by its own separate service line; or
 - ii. Multiple living units where each individual living unit is supplied by a separate service line; or
 - iii. Two separate single living units supplied by a common service line.
- c. *Water supply system* means a water distribution system, piping, connection fittings, valves and appurtenances within a building, structure, or premises. Water supply systems are also referred to commonly as premise plumbing systems.

4.0 Policy Statement

4.1 Clarification on regulatory intent of the phrase “installing or permitting any uncontrolled cross connection”

In order to align with applicable state statute, Regulation 11, section 11.39 states that the supplier of water is prohibited from installing or permitting any uncontrolled cross connection. The concept of prohibition from installing or permitting an uncontrolled cross connection directly relates to the supplier's actions once the supplier becomes aware of a cross connection.

Installing means modifications or additions to waterworks or water supply systems that create a cross connection. In this case, the supplier is prohibited from intentionally performing any actions which would result in the creation of a cross connection.

Permitting an uncontrolled cross connection in the context of Regulation 11, section 11.39 means the supplier has allowed their users or customers to continue to have an uncontrolled cross connection past the regulatory-defined timelines. An assembly installed on a cross connection that has a failed test is considered an uncontrolled cross connection and must be resolved within 120 days. If the regulatory-defined timelines have elapsed and the supplier has not taken any of the actions outlined in item 'a' below, then the supplier is allowing, or permitting, the cross connection to exist and is in violation of Regulation 11.

Safe Drinking Water Program Policy Number DW-007: Backflow Prevention and Cross-connection Control

- a. The supplier is in compliance with Regulation 11 if the supplier completes one of the following actions within 120 days of identification:
 - i. Control the cross connection.
 - ii. Remove the cross connection.
 - iii. Suspend service to the connection. Before suspension of service can be considered an appropriate action the Department expects that the supplier will confirm the following:
 1. The connection downstream of the valve used to suspend the service does not remain pressurized because the customer has access to an alternative source of water or a storage tank onsite.
 2. If the cross connection is to a fire suppression system; suspension of service would not result in the building being inadequately protected from loss of life through fire.
 - A. If there are service connections at the property separate from the fire suppression system causing the cross connection, a supplier may suspend service to one or all of those other service lines (e.g. domestic or irrigation) as an appropriate action.
 - iv. Receive a Department-approved alternative compliance schedule.
 1. Department-approval of an alternative compliance schedule means written approval from the Department.
- b. After 120 days, the supplier is only in compliance with Regulation 11 if the supplier is following an approved alternative compliance schedule.

4.2 Ensuring that Activities are Completed - Implementing Legal Authority

- a. Regulation 11, section 11.39(2)(a)(vi) refers to the “process the supplier will use to ensure backflow prevention assemblies are tested by a Certified Cross-Connection Control Technician”. The Department will determine the adequacy of a supplier’s process to ensure that testing has been completed by a certified professional. Typically, the supplier of water is in compliance with section 11.39(2)(a)(vi) of Regulation 11 if the supplier does the following:
 - i. The supplier has a documented process in place where the supplier receives a test report directly from the Certified Cross-Connection Control Technician or their associated company.

Safe Drinking Water Program Policy Number DW-007: Backflow Prevention and Cross-connection Control

- ii. To be considered adequate, test reports used to document compliance with Regulation 11 must include all of the following:
 - 1. Assembly or method information:
 - A. Assembly or method type;
 - B. Assembly or method location;
 - C. Assembly make, model and serial number;
 - D. Assembly size;
 - E. Test date; and
 - F. Test result (pass/fail).
 - 2. Certified Cross-Connection Control Technician information:
 - A. Certified Cross-Connection Control Technician certification agency;
 - B. Certification number; and
 - C. Certification expiration date or statement that certification is current.
 - D. As an alternative to A-C, suppliers may provide documentation of an alternative validation process such as electronic login to reporting software where only current, certified cross connection control technicians (or their companies) are given a login.
- b. Regulation 11, section 11.39(2)(a) outlines the written backflow prevention and cross-connection control program. Within the requirements of the written program, sections 11.39(2)(a)(ii, iv) refers to the suppliers of water legal authority. The Department will evaluate whether the supplier is appropriately implementing its legal authority.
- c. The phrase “the supplier must ensure” is used in Regulation 11 sections 11.39(3)(c)(i)(C), 11.39(3)(c)(i)(D), 11.39(3)(d), 11.39(3)(d)(i), 11.39(3)(d)(ii), 11.39(3)(e), 11.39(3)(e)(i), 11.39(3)(e)(ii), and 11.39(3)(f). The supplier of water is in compliance with the above referenced sections if the supplier does either of the following:
 - i. Using the supplier’s legal authority, the supplier requires the customer to take all actions necessary to complete the indicated regulatory requirement(s);
 - 1. In establishing the supplier’s legal authority, the supplier must have a legally-enforceable mechanism that implements its written backflow prevention and cross-connection control program as described in 11.39(2). The Department recommends that the legally-enforceable mechanisms include specific provisions identifying customer requirements under 11.39(2)(a)(ii, iv) and the associated remedies that the supplier may utilize for

Safe Drinking Water Program Policy Number DW-007: Backflow Prevention and Cross-connection Control

failure of customer(s) to comply. Examples of legally-enforceable mechanisms include, but are not limited to, user agreements, city/town ordinances, and other written contracts.

- ii. The supplier performs the actions necessary to complete the indicated requirement(s) in the regulation.
 - 1. If the supplier does not have a legally-enforceable mechanism in place, the Department expects the supplier to perform the actions necessary to complete the indicated requirements in the regulation.

4.3 Appropriate Assembly or Method for an Identified Contaminant

- a. The Department uses industry standards outlined in manuals such as the *Colorado Cross-Connection Control Manual*, the *EPA Cross-Connection Control Manual* and the *10th Edition Manual of Cross-Connection Control (USC Manual)* to evaluate whether the installation of a backflow prevention assembly or backflow prevention method is appropriate. Such industry standards include:

Assembly or Method Type	Abbreviation	Typical Appropriate Uses (Note: see also Section 4.5 Site-specific Deviation Criteria))
Testable Assemblies		
Reduced Pressure Zone Backflow Prevention Assembly	RPZ	Appropriate for any identified contaminant except direct connections to sewer or installations which may impair the integrity of the assembly to function as designed.
Reduced Pressure Zone Fire Protection Backflow Prevention Assembly	RPF	Appropriate for cross connections to fire suppression systems.
Reduced Pressure Zone Detector Fire Protection Backflow Prevention Assembly	RPD	
Double Check Backflow Prevention Assembly	DC	Appropriate for cross connections to fire suppression systems except when upstream of a chemical other than food grade glycerin.
Double Check Fire Protection Backflow Prevention Assembly	DCF	
Double Check Detector Fire Protection Backflow Prevention Assembly	DCD	

Safe Drinking Water Program Policy Number DW-007: Backflow Prevention and Cross-connection Control

Pressure Vacuum Breaker Backflow Prevention Assembly	PVB	Appropriate for any identified contaminant except direct connections to sewer or installations which may impair the integrity of the assembly to function as designed. Not appropriate for connections subject to backpressure.
Spill-Resistant Vacuum Breaker	SVB	
Colorado Plumbing Code	CPC	Appropriate for Backflow Prevention Assemblies or Methods installed in accordance with the most recent version of the CPC.
Methods		
Air Gap	AG	Appropriate for any identified contaminant. All cross connections can be controlled using an air gap installed in accordance with standard ASME A112.1.2.
Block and Bleed Valve or Double Block and Bleed Valve	BB	Appropriate for membrane chemical-clean-in-place and filter-to-waste at supplier’s facilities.
Check Valve	CV	The Department will determine if these methods are appropriate.
Hydraulic Conditions	HC	

4.4 Unacceptable Health and/or Safety Risk

Unacceptable health and/or safety risk can be biological, chemical, radiological or physical in nature. Risks to human health are assessed by the level of acute or toxic potential. An example safety risk from cross connections includes risks of injury from explosion when a natural gas cross connection has occurred.

All industrial and many commercial and multi-family connections present an unacceptable health and/or safety risk to the distribution system because of the nature of the activities that take place at the site and the magnitude or volume of potential contamination.

Waterworks and domestic wastewater treatment works are considered industrial facilities for the purposes of identifying cross connections. The public water system’s distribution system must be protected from the in-plant water supply of the waterworks.

Single-family-residential connections pose a relatively low risk to the distribution system based on the volume of water contained in the plumbing system. Local plumbing codes, which are enforced by the local jurisdiction having authority over plumbing within residential structures, are in place to protect private residences from typical residential cross connections. If the local jurisdiction having authority requires that a backflow prevention assembly

Safe Drinking Water Program Policy Number DW-007: Backflow Prevention and Cross-connection Control

or backflow prevention method be installed, it is generally the responsibility of the homeowner to maintain the assembly or method.

Backflow from connections to the following are typically considered an unacceptable health and/or safety risk:

a. For commercial, industrial and multi-family service connections

Plumbing arrangements or systems:

- i. Fire suppression systems;
- ii. Irrigation systems including dedicated irrigation connected directly to the water main;
- iii. Chemical process systems, including chemicals connected for temporary maintenance;
- iv. Hydronic heating and cooling systems, industrial boilers, chillers, cooling towers, double wall heat exchangers and solar panels; and
- v. Auxiliary water sources, display fountains, hot tubs, pools, reclaimed water systems, graywater systems and onsite storage tanks.

Commercial and industrial service connections:

- i. Dry cleaning and laundries;
- ii. Mortuaries;
- iii. Hair salons;
- iv. Laboratories;
- v. Auto repair shops;
- vi. Car washes;
- vii. Bulk fill water stations;
- viii. Restaurants;
- ix. Hospitals, dental facilities, medical facilities and clinics, and blood banks;
- x. Veterinary, pet stores, and livestock facilities;
- xi. Manufacturing facilities;
- xii. Green houses and agricultural commerce; and
- xiii. Other commercial and industrial service connections.

b. For connections within the supplier's waterworks

Any identified cross connections within such facilities must be controlled in accordance with the *State of Colorado Design Criteria for*

Safe Drinking Water Program Policy Number DW-007: Backflow Prevention and Cross-connection Control

Potable Water Systems and with the use of an appropriate backflow prevention assembly or method such as:

Cross Connection	Appropriate Backflow Prevention Assembly or Method
Filter to waste line to waste collection system	AG, BB, DC, RPZ
Clean in Place Connection	BB
Surface Wash	AG, PVB, SVB, RPZ
Subsurface Wash	AG, PVB, SVB, RPZ
Chemical Feed System	DC, RPZ
Irrigation Sprinkler	CPC, PVB, SVB, RPZ
Non Potable Water	AG, PVB, SVB, RPZ
Water Loading Stations	AG, PVB, SVB, RPZ
Connections to waste collection systems (sediment removal)	AG, RPZ,
Bypasses to treatment	Case by Case (Disinfection, coagulation and filtration must never be bypassed)
Fire Suppression Systems	DC, DCD, DCF, RP, RPD, RPF,
In-Plant Water Supply	AG, RPZ
Filtered or Finished Water	AG, RPZ

Alternatively, a site-specific deviation may be approved by the Department

c. For single-family residential connections

There are types of cross connections at single-family-residential connections that may pose a greater risk than those addressed by local plumbing codes enforced by the local jurisdiction authority. These include but are not limited to:

- i. Dedicated irrigation lines (from the water main);
- ii. Dedicated fire suppression system lines and chemically enhanced fire suppression systems;
- iii. Multi-purpose fire suppression systems are not required to be controlled where each branch of the suppression system terminates at a regularly used fixture;
- iv. Auxiliary water sources (e.g. wells, ponds, lagoons, irrigation ditches), hot tubs or swimming pools piped with permanent plumbing, reclaimed water systems, graywater systems, or onsite water storage tanks with permanent plumbing (cisterns); and

Safe Drinking Water Program Policy Number DW-007: Backflow Prevention and Cross-connection Control

- v. Connections to a home's potable water supply system from home business and hobbies including but not limited to agricultural commerce and hydroponic systems, doctor's offices, photo laboratories, hide tanning operations, and metal plating operations.

4.5 Site-specific Deviation Criteria

- a. The supplier of water may develop site-specific deviation criteria if the supplier determines that the installation of an alternative backflow prevention assembly or backflow prevention method is appropriate for the identified contaminant, or that a lower protective backflow prevention assembly or backflow prevention method can be installed due to more frequent testing and/or inspections.
 - i. Site-specific deviation criteria and modifications are subject to review by the Department.
 - ii. Site-specific deviation criteria may address situations where the assembly or method is installed in accordance with the local jurisdictional plumbing code or instances when the installation of an air gap or where the supplier considers that the RPZ retrofit would create an unreasonable burden. Examples of such situations include but are not limited to when the location of the assembly installation is in an area where there is not adequate drainage for an RPZ or the assembly is subject to flooding.
- b. A supplier of water may determine, during the survey process, that a multi-family residential connection poses a similar risk to the distribution system as a typical single-family residence. The supplier may develop site-specific deviation criteria to designate specific multi-family residential connections as equivalent to a single family residence connection for the purposes of backflow prevention
 - i. Site-specific deviation criteria and modifications are subject to review by the Department.
 - ii. The site-specific deviation criteria should consider tap size, volume of water in the plumbing system and compliance with local plumbing codes for irrigation systems.
 - iii. The supplier must document where site-specific deviation criteria is applied.

4.6 Most Protective Backflow Prevention Assembly or Method

Regulation 11, section 11.39 requires the supplier of water to perform a survey of any non-single-family-residential connections in the distribution system if the most protective backflow assembly or method is not used at that connection. The following are acceptable "most protective backflow prevention assemblies or methods":

Safe Drinking Water Program Policy Number DW-007: Backflow Prevention and Cross-connection Control

- a. Method - air gap installed in accordance with standard ASME A112.1.2.
- b. Assembly - reduced pressure zone backflow prevention assembly.

4.7 Compliance Ratio Rounding

- a. For compliance ratios listed in Regulation 11, Table 11.39-I, Table 11.39-II, and section 11.39(3)(e), appropriate rounding for the compliance ratios are described below:
 - (i) For compliance ratios with a listed requirement of “Greater than 0.XX”, the compliance ratio must be greater than the listed ratio for that year and rounding to the nearest hundredth is appropriate. For example, if the compliance ratio required for a given year is 0.90 and you calculate a survey compliance ratio of 0.893 for that year, then the survey compliance ratio would be 0.89 and thus out of compliance for that year. On the other hand, if you calculate a survey compliance ratio of 0.896, the compliance ratio would be 0.90 and would be in compliance for that year.
 - (ii) When the survey compliance ratio is required to be 1.0 (in compliance year 2021 and for the 2022 annual report), then rounding to the nearest tenth is appropriate. For example, a survey compliance ratio of 0.951 would round to 1.0 whereas a survey compliance ratio of 0.947 would round to 0.9 and would not meet the listed survey compliance ratio. Suppliers of water are still required to work toward 100% survey compliance regardless of the rounding.

4.8 Survey Process Documentation

Regulation 11 requires the supplier of water to document the supplier’s process for conducting surveys. Acceptable survey process documentation includes the following:

- a. How the supplier will select service connections that need a survey; for example:
 - i. Usage type - commercial, industrial, or multi-family;
 - ii. New or newly acquired connections; and/or
 - iii. Questionnaire results.
- b. How the supplier will select individuals to perform the survey including experience and/or training or certification qualifications to perform a survey; and
- c. Written and/or verbal questionnaire standards (if used).

Safe Drinking Water Program Policy Number DW-007: Backflow Prevention and Cross-connection Control

- i. The Department expects that the questionnaires provide examples of common cross connections to the customer who completes the survey.
- ii. Questionnaires may be written, verbal, or web-based and should have the property-owner indicate that the information is accurate to the best of their knowledge.
 1. If the supplier does not receive a response to a questionnaire or the results are inconclusive, the supplier is required to perform an onsite survey for cross connections or control the connection with the most protective backflow prevention assembly or method.

4.9 Public Water System's Water Supply System Cross Connections

Non-community public water systems and community water systems located on one entire property that contain water supply systems are subject to the following survey and cross connection control requirements:

- a. Generally, if the water supply system is owned by the supplier of water, then all cross connections within the water supply system must be protected from backflow. In this case, the water supply system is part of the distribution system for the purposes of identifying cross connections.
- b. The survey requirement in Regulation 11, section 11.39(3)(c) applies to the water supply system. At a minimum, identified cross connections must be controlled in accordance with the Colorado Plumbing Code. All backflow prevention assemblies and methods used to control cross connections must be tested or inspected and maintained as specified in Regulation 11.

4.10 Active Date

- a. "ACTIVE DATE" is defined in Regulation 11, section 11.39. The following provides further explanation of the term 'active date':
 - i. For most backflow prevention assemblies or methods that are in service year-round, the active date will be January 1.
 - ii. For service connections that are seasonal in nature, the active date will be the first day that the connection is pressurized or water service is provided. For example, the active date for a municipal golf course irrigation system is the date when water service is restored to the golf course following the winter season.