

Cross-Connection Control Manual

East Larimer County
Water District



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May 13, 2022

CROSS CONNECTION CONTROL -- WHAT IS IT?

A cross connection is any potential or actual physical connection between potable water and a non-potable fluid. These connections can range in severity from severe hazards (involving sewage or hazardous substances) to aesthetic problems (juice, dirt, etc.).

WHY DO I NEED A CERTIFIED BACKFLOW PREVENTION ASSEMBLY?

Without protective assemblies and devices, (referred to as backflow prevention assemblies and devices), the potable water supply can become contaminated by any customer in the system.

Although many people are not aware of it, we see common backflow preventers every day. The average household sink, whether in the bathroom or a kitchen, utilizes an air gap to prevent the potable water supply from becoming contaminated. Other appliances that utilize water (namely, clothes washers) have built-in backflow preventers as well. Some businesses, specifically hospitals and shops that use hazardous chemicals, are isolated from the rest of the system with heavy duty backflow prevention assemblies.

This Cross-Connection Control Program was implemented to ensure compliance with the Colorado Primary Drinking Water Regulations, Article 11.39. These regulations require East Larimer County Water District (ELCO, ELCO Water District, ELCO District or District) to control cross-connections through a collaborative effort, to inventory, monitor and enforce the proper installation and operation of backflow prevention assemblies. This program calls for facility inspections to identify and eliminate cross connections that may contaminate the District water supply as well as annual testing of those backflow prevention assemblies. ELCO Water District is aware that many cross connections exist within the customer's plumbing system. All cross connections downstream of the service connection are considered isolation protection. Per the Colorado Primary Drinking Water Regulation 11.39, isolation protection is outside of the jurisdiction of ELCO District. Unless special conditions exist and arrangements are made between ELCO Water District and the customer, ELCO Water District does not have jurisdiction, responsibility or liability for lack of backflow protection or inadequate backflow protection downstream of the service connection (containment). The customer is responsible for complying with current plumbing code. If the customer is unsure if the plumbing system is properly protected, the plumbing inspector should be contacted.

This manual provides necessary information for the installation and maintenance of commercial and residential backflow prevention assemblies within the ELCO Water District. Information regarding installation and maintenance of backflow prevention assemblies serving as containment protection or service protection will be enforced by ELCO Water District. Information referring to backflow protection serving as isolation protection is for information only and may or may not meet the requirements of the Plumbing Department.

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PART 1 - GENERAL

1.1 DESCRIPTION AND DEFINITIONS

- A. The following words, terms and phrases, when used in these Rules and Regulations, shall have the following meaning ascribed to them:
1. **Approved:** The term “approved” as herein used in reference to a backflow prevention assembly or method shall mean such assembly or method approved by the Backflow coordinator as complying with all applicable specifications and requirements of these Rules and Regulations.
 2. **Approved Testing Laboratory:** The Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California (FCCC&HR) or the American Society of Sanitary Engineers (ASSE).
 3. **Approved Water Supply:** Any public potable water supply which has been approved by the Colorado Department of Health and is operating under a valid health permit issued by the Colorado Department of Health.
 4. **Auxiliary Water Supply:** Any water supply on or available to any premises other than the public potable water supply. These auxiliary water supplies may include, but not be limited to, water from another utility’s potable water system or from any source such as a well, spring, river, pond, lake, reservoir, stream or any other body of water.
 5. **Backflow:** The undesirable reversal of the direction of flow of water or mixtures of water and other liquids, gases, or other substances into a potable water system from any source or sources caused by backpressure and/or back siphonage.
 6. **Backflow Prevention Assembly:** Any mechanical apparatus designed and used to prevent backflow into a potable water system.
 7. **Backpressure:** Any increase in pressure in the downstream piping system (by pump, elevation of piping, or steam and/or air pressure) above the supply pressure at the point of consideration which would cause, or tend to cause, a reversal of the normal direction of flow.
 8. **Back siphonage:** Any form of backflow due to a reduction in system pressure that causes a negative or sub-atmospheric pressure to exist in the water system. Back siphonage will occur if atmospheric pressure is introduced into the system during a sub-atmospheric condition in the water supply. **Certified Cross-Connection Control Technician (Certified Technician):** A person who must possess a valid certification from the American Society of Sanitary Engineering (ASSE) or The American Backflow Prevention Association (ABPA). The process for certification must include successful completion of an examination administered by one of the approved

organizations.

9. **Check Valve:** A self-closing device that is designed to permit the flow of fluids in only one direction.
10. **Consumer:** The owner or operator of a consumer water system.
11. **Consumer Water System:** Any water system located on any privately or publicly owned premises that is supplied by the public potable water system or by an auxiliary water supply. The water system may be either a potable water system, a nonpotable water system or an industrial piping system.
12. **Contamination:** An impairment of the quality of potable water by sewage, industrial fluids, waste liquids, compounds, or any other materials, solids, gases, or liquids to a degree which creates an actual hazard to the public health through poisoning or the spreading of disease.
13. **Containment:** Protection of ELCO Water District's system at the water service connection prior to any other points of use. ELCO Water District has jurisdiction of containment backflow protection.
14. **Critical Level:** The critical level or "C/L" marking on an approved backflow prevention assembly is the point conforming to approved standards established by the approved testing laboratory which determines the minimum distance above the flood-level rim of the fixture (highest point of usage) or receptacle served at which the assembly may be installed. When a backflow prevention assembly does not bear a critical-level marking, the bottom of any such approved assembly shall constitute the critical-level.
15. **Cross-Connection:** Any unprotected actual or potential physical connection or structural arrangement of piping or fixtures between a consumer's water system and the public potable water system through which it is possible to introduce into any part of the public potable water system any used water, industrial fluid, gas, liquid, solid or any other substance. Examples of such cross-connections include, without limitation, swing connections; removable sections; four-way valves; removable spools; dummy sections of pipe; swivel or change-over devices; jumper connections; sliding multiport tubes; solid connections; and any other temporary or permanent devices through which or because of which backflow could occur.
16. **Degree of Hazard:** The level of potential risk to the public health and the type of adverse effect that the hazard may have upon the public potable water system.
17. **Backflow coordinator:** The backflow coordinator of East Larimer County Water District.

18. **Flood-Level Rim:** The edge of a receptacle from which liquid overflows.
19. **Health Hazard:** Any condition, device, or practice in a consumer water system and its operation which could create, or in the judgment of the backflow coordinator or the Colorado Department of Health, may create a danger to the public health and well-being. A health hazard shall, without limitation, be deemed to exist at sewage treatment plants, sewage pumping stations, chemical manufacturing plants, hospitals, medical centers, mortuaries and plating plants.
20. **Hospital:** Any facility operated for the diagnosis, care and treatment of human disease, illness or injury, including convalescence and care during and after pregnancy and to which persons may be admitted for overnight stay or longer. The term “hospital” shall include, without limitation, sanitariums, nursing homes and maternity homes.
21. **Industrial Piping System:** Any system used by a consumer for transmission of or to confine any fluid, liquid, solid or gaseous substance other than potable water. Such a system includes, but is not limited to, all pipes, conduits, tanks, receptacles, fixtures, equipment, and appurtenances used to produce, convey, or store substances which are or may be polluted or contaminated.
22. **Isolation:** Backflow protection of the drinking water downstream of the water service connection, within the customer's plumbing system from non-potable systems. Isolation backflow protection is outside of ELCO Water District's jurisdiction.
23. **Medical Center:** Any facility operated for the diagnosis, care and treatment of human disease, illness or injury, and to which persons are not normally admitted for overnight stay. The term “medical center” shall also include dental clinics.
24. **Nonpotable Water:** Water that is not safe for human consumption or that has not been approved by the Colorado Department of Public Health and Environment as being safe for human consumption.
- 25. Non-Single Family Residential Customers (NSFR):**
26. **Nontestable Devices:** Approved backflow prevention devices designed for isolation protection of non-potable systems within the customer's plumbing system. Nontestable devices may not be used for containment protection. Exception: dual check valve backflow prevention devices may be only be used for service protection of single-family residential service connections.
27. **Pollution:** The presence of any foreign substance (organic, inorganic, radiological or biological) in the water which tends to degrade its quality so as to constitute a hazard or impair the usefulness or quality of the water to a degree that does not create an actual hazard to the public health but which does adversely or unreasonably affect such waters for domestic and/or potable use.
28. **Pollution Hazard:** An actual or potential threat to the physical properties of the public potable water system or to the potability of the water in the public potable water system that would constitute a nuisance be aesthetically objectionable, or cause minor damage

to the system or its appurtenances, but which would not be dangerous to the public health.

29. **Potable Water:** Water from any source that has been approved by the Colorado Department of Public Health and Environment as safe for human consumption.
30. **Potable Water System:** Any system used for the transmission, storage and use of potable water. This system includes all pipes, conduits, tanks, receptacles, fixtures, equipment, and all other appurtenances used to transmit, store or use potable water.
31. **Public Potable Water System:** East Larimer County Water District, which shall include all sources, facilities, and appurtenances from the source to the point of delivery of potable water to the consumer, such as valves, pumps, conduits, pipes, tanks, receptacles, fixtures, equipment, and all other appurtenances used to produce, convey, treat and store potable water for public consumption or use.
32. **System Hazard:** An actual or potential threat of severe damage to the physical properties of the public potable water system or of pollution or contamination which would have a protracted effect on the quality of the potable water in the system.
33. **Used Water:** Any water which has been supplied by the Utility from the public potable water system and has passed through a water service connection into a consumer water system and is no longer under the control of the Utility.
34. **Utility:** East Larimer County (ELCO) Water District
35. **Vacuum:** Any pressure less than atmospheric pressure.
36. **Water Service Connection:** The terminal end of a service connection to the public potable water system, being the downstream end of the curb-stop valve where the Utility loses control over the water at its point of delivery to the consumer water system. "Water service connection" shall also include service connections from a fire hydrant and all other temporary or emergency service connections from the public potable water system.

1.2 QUALITY ASSURANCE

- A. Only those backflow prevention assemblies described in FCCC&HR's most current "List of Approved Backflow Prevention Assemblies" and, in the case of single-family residences, those assemblies bearing the approval of the ASSE, are approved by the Backflow coordinator for use as hereinafter set forth in these Rules and Regulations. Backflow prevention assemblies must be installed in an orientation that is approved by FCCC&HR. Only such approved backflow prevention assemblies shall be used, and no substitutions will be allowed.
- B. The entire backflow prevention assembly including the isolation valves furnished as part of the assembly shall meet the design and performance specifications of and be approved by the FCCC&HR.
- C. To be approved, all backflow prevention assemblies, except ASSE approved nontestable single-family residential assemblies, must be readily accessible for in-line maintenance and testing.

1.3 RESPONSIBILITIES

- A. The consumer shall be responsible for preventing pollutants and contaminants from the consumer's water system from entering the public potable water system at the water service connection by installing, operating, having tested and inspected, and by maintaining approved backflow prevention assemblies as required by these Rules and Regulations.

1.4 TYPE OF PROTECTION REQUIRED

- A. The type of backflow prevention assemblies required by these Rules and Regulations shall depend on the degree of hazard to the public potable water system that exists from the consumer water system.
 - 1. On water service connections designated as commercial, industrial, retail or multi-family, an approved air-gap separation or reduced pressure principle assembly shall be used at the water service connection where there is an existing or potential health or system hazard.
 - 2. An approved air-gap separation or reduced pressure principle assembly shall be used at the water service connection to fire sprinkler systems.
 - 3. An approved double check valve assembly may be used at the water service connection to fire sprinkler systems that do not contain chemical or supplemented by an auxiliary water source.
 - 4.
 - 5. Within the customer's plumbing system, downstream of the water service connection an approved air-gap separation, reduced pressure principle assembly, pressure vacuum breaker assembly or an atmospheric vacuum breaker assembly should be used where there is an existing or potential health or system hazard in compliance with local plumbing codes.
 - 6. Within the customer's plumbing system, downstream of the water service connection an approved air-gap separation, reduced pressure principle assembly, double-check valve assembly, pressure vacuum breaker assembly or atmospheric vacuum breaker assembly shall be used where there is an existing or potential pollution hazard in compliance with local plumbing codes.
 - 7. A single check valve or two single check valves linked in tandem is not considered an approved backflow prevention assembly.

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTION ASSEMBLIES

- A. **Air-Gap Separation:** A physical separation between the free-flowing discharge end of a public potable water system pipeline and an open or nonpressure receiving vessel. An approved air-gap separation shall be at least double the diameter of the supply pipe measured vertically above the flood-level rim of the vessel, but in no case less than one inch. See Colorado Plumbing Code for additional limitations.
- B. **Reduced Pressure Principle Assembly:** An assembly containing two independently acting, approved check valves together with a hydraulically operating, mechanically independent pressure differential relief valve located between the check valves and at a point below the first check valve. The unit shall include four properly located testcocks and two tightly closing resilient seat isolation valves.
- C. **Double Check Valve Assembly:** An assembly of two single, independently acting, approved check valves. The unit shall include four properly located testcocks and two tightly closing resilient seat isolation valves.
- D. **Pressure Vacuum Breaker:** An assembly containing one internally loaded check valve and an independently operating loaded air-inlet valve located on the discharge side of the check valve and fitted with two properly located testcocks and two resilient seat isolation valves.
- E. **Atmospheric Vacuum Breaker:** A device containing a valve body containing a float-check, a check seat and an air-inlet port.
- F. **Nontestable Devices:** Nontestable devices that are approved by the ASSE shall only be used for single-family residential applications and are limited to the following:
 - 1. **Standard Residential Dual Check:** Same as the dual check with atmospheric vent assembly, but it does not have an intermediate atmospheric vent.
 - 2. **Hose Connection Vacuum Breaker:** A specialized version of the atmospheric vacuum breaker which attaches between sill cock and hose. Cannot be used as protection from backpressure.

PART 3 - EXECUTION

3.1 PROTECTION REQUIRED REGARDLESS OF DEGREE OF HAZARD

- A. In the case of a consumer's premises having an auxiliary water supply, the public potable water system shall be protected by an approved air-gap separation or an approved reduced pressure principle assembly installed on each service line to the premises.
- B. In the case of a consumer's premises having internal cross-connections or there are intricate plumbing arrangements which make it impractical to ascertain whether or not cross-connections exist, the public potable water system shall be protected by an approved air-gap separation or an approved reduced pressure principle assembly installed on each service line to the premises.
- C. In the case of a consumer's premises where entry is restricted or where complete inspections for cross-connections cannot be made with sufficient frequency or on sufficiently short notice to

assure that cross-connections do not exist, the public potable water system shall be protected by an approved air-gap separation or an approved reduced pressure principle assembly installed on each service line to the premises. There must be reasonable access to the backflow prevention assembly for ELCO personnel and the backflow assembly tester.

3.2 EXAMPLES OF PROTECTION REQUIRED FOR SPECIFIC FACILITIES

- A. **Booster Pumps:** When it becomes necessary due to low pressure or special operating conditions to install a booster pump on the water service line to any consumer's premises, such service line shall be protected by the installation of an approved air-gap separation or an approved reduced pressure principle assembly.

- B. **Fire Systems:** For fire protection systems consisting of only direct connections from the public potable water system and where there are no pumps, tanks or reservoirs, no physical connection from other water supplies, no antifreeze or other additives of any kind, and where all sprinkler drains discharge to the atmosphere, dry wells, or other safe outlets, a double-check valve assembly is required.
 - 1. For fire protection systems not meeting all of the aforementioned requirements, An approved air-gap separation or reduced pressure principle assembly shall be used at the water service connection to fire sprinkler systems.

- C. **Heating and Cooling Systems:** All heating and cooling systems, including boiler systems other than those used in single-family residences, that are connected to the public potable water system should have an approved reduced pressure principle assembly installed at the water service connection to the facility or as approved by the plumbing inspector.
 - 1. Boiler systems in single family residences shall have, as a minimum, an ASSE approved dual check with atmospheric vent assembly installed on the water service connection. The consumer is advised that due to thermal expansion, some means of relieving internal pressure should be provided.

- D. **Hospitals, Medical Centers and Mortuaries:** Any hospital, medical center, mortuary, or any facility that may contain contaminated or sewer-connected equipment, including autopsy and mortuary areas, shall have an approved reduced pressure principle assembly installed at the water service connection to the facility.

- E. **Hydraulic Processes:** Any facility that conducts hydraulic tests or utilizes hydraulic processes where the public potable water system pressure is used directly and may be subjected to backpressure, or where pumps, pressure cylinders, or other hydraulic principles are used to provide pressure for testing or process activities, shall have an approved reduced pressure principle assembly specifically designed to prevent backflow at high pressures installed at the water service connection to the facility.

- F. **Industrial Facilities:** All industrial facilities that utilize toxic or hazardous substances shall have an approved air-gap separation or an approved reduced pressure principle assembly installed at the water service connection to the facility.

G. Industrial Piping Systems: All industrial piping systems and lines supplied with potable water and containing cutting and hydraulic fluids, coolants, hydrocarbon products, caustic solutions, or other hazardous or toxic substances, shall have an approved reduced pressure principle assembly installed at the water service connection to the facility.

H. Irrigation and Lawn Sprinkling Systems:

1. Dedicated lawn sprinkler system shall be separated from the public potable water system at the water service connection by an approved air-gap separation or an approved reduced pressure principle assembly.
2. Irrigation and lawn sprinkling systems downstream of a properly protected water service connection that permit the mixing, pumping, dissolution, injection, or siphoning of any foreign substance into the water, or any such system which incorporates the use of any booster pump(s), or which is subject to backpressure, should be separated from the public potable water system by an approved air-gap separation or an approved reduced pressure principle assembly.
3. In irrigation and lawn sprinkling systems downstream of a properly protected water service connection that do not incorporate the use of an injection system or booster pump(s), a properly installed, approved pressure vacuum breaker assembly may be used. Irrigation and lawn sprinkling systems having quick-coupling valves or other similar type heads that will permit pressure to be retained in the system shall have an approved reduced pressure principle assembly installed on the system. Irrigation and lawn sprinkling systems using the subsurface drip method should also have a pressure vacuum breaker assembly installed on the system.
4. An atmospheric vacuum breaker assembly may be used when the irrigation or lawn sprinkling system does not incorporate an injection system or booster pump(s), and is not subjected to backpressure, continuous pressure or continuous flow. Atmospheric vacuum breakers shall only be installed on irrigation circuits with sprinkler heads that will not return any pressure to, or retain any pressure in the circuit when the circuit control valve is closed.
5. In any irrigation or lawn sprinkling system where the terrain makes the installation height of a pressure or atmospheric vacuum breaker assembly impractical, the public potable water system shall be protected by an approved reduced pressure principle assembly. A reduced pressure principle assembly may also be installed to serve multiple irrigation circuits in lieu of pressure vacuum breakers.

I. Multiple Service Lines: All premises being served with two or more water service lines shall have installed on each such service line that backflow prevention assembly which is required for the service line having the highest degree of hazard. By way of example, if any one of the multiple service lines has as its degree of hazard the classification of “health hazard,” but the other service lines are classified only as a “pollution hazard,” the backflow prevention assemblies required by these Rules and Regulations to be installed for a “health hazard” shall be installed on all the service lines.

- J. **Multi-Storied Buildings:** All multi-storied buildings greater than 40 feet in height shall have an approved reduced pressure principle assembly installed at a point on the water service line to the facility that is approved by the backflow coordinator. Where possible, the assembly shall be located within the building.
- K. **Photo-Processing Equipment:** All facilities that process photographic films shall have an approved reduced pressure principle assembly installed at the water service connection to the facility.
- L. **Plating Facilities, Vats, Vessels:** All plating facilities which utilize cyanides, heavy metals, acidic and/or caustic solutions for treating metals as well as solution filtering equipment with pumps, circulating lines, vats, or other vessels used in plating, etching, anodizing, stripping, pickling or other processes shall have an approved reduced pressure principle assembly installed at the water service connection to the facility.
- M. **Recirculated Process Waters:** Any facility, other than an approved potable water treatment plant, that recirculates, processes or treats potable water, shall have an approved reduced pressure principle assembly installed at the water service connection to the facility.
- N. **Solar-Heating Systems:** In any facility or premises where a liquid-based solar-heating system is installed, whether utilized for space or water heating, backflow protection of the public potable water system and exchange of heat shall be accomplished by way of an approved vented double-walled heat exchanger. An exception to this requirement may be granted by the Backflow coordinator for a single-walled heat exchanger if the exchanger is used in conjunction with an expansion tank and an approved reduced pressure principle assembly.
1. In the case of premises where a single fluid solar domestic hot water preheat system, which utilizes drain-down design for freeze protection, is being used, properly trapped and vented receptor with a visible air-gap separation of at least three times the diameter of said drain line with a fixed minimum air-gap separation of 1 inch above the flood level rim of the receptor.
 2. In the case of premises where a solar-heating system utilizes an approved fancoil unit to exchange heat from the hot air to preheat water for domestic uses, no backflow prevention assembly will be required; however, if the fancoil unit utilizes drain-down freeze protection, said drain from the exchange coil shall conform to the same requirements of the aforementioned single fluid drain-down solar-heating systems.
- O. **Steam-Generating Facilities:** All steam-generating facilities and lines which may contain boiler compounds, including but not limited to pentachlorophenol, hydrazine, cyclohexylamine, or any other hazardous, toxic, or aesthetically objectionable substances, shall be separated from the public potable water system by an approved reduced pressure principle assembly. In addition, an approved method of preventing steam from entering the public potable water system shall be provided.
- P. **Stock Tanks:** All stock tanks that are supplied with or in any way are connected to the public potable water system shall have an approved air-gap separation. The air-gap separation shall be

located at the point where the public potable water line feeds into the stock tank and shall have no threaded fitting on the end of the line.

- Q. Use of Fire Hydrants:** No person shall connect to and/or transfer water from any fire hydrant to or into any container, tank, vessel, pipe, conduit, pond, lake, reservoir, stream or other body of water by use of a hose, tube, conduit, pipe or other means, unless the receiving unit is separated from the hydrant by an approved air-gap separation or an approved reduced pressure principle assembly.

3.3 INSTALLATION

A. GENERAL REQUIREMENTS

1. Containment backflow prevention assemblies shall be installed at the meter, at the property line of the premises when meters are not used, or at any other location designated by the backflow coordinator.
2. Backflow prevention assemblies shall only be installed in conformance with these Rules and Regulations as herein provided and in conformance with the drawings attached hereto or in such other manner as approved by the backflow coordinator.
3. The provisions for these Rules and Regulations shall apply to all existing consumer water systems as well as to all consumer water systems coming into existence after the adoption of these Rules and Regulations, except for consumer water systems legally in existence at the time of the adoption of these Rules and Regulations that are not in strict compliance with these Rules and Regulations shall be permitted to be used by consumers only if, in the opinion of the backflow coordinator, such consumer water systems do not constitute a health hazard, a pollution hazard or a system hazard to the public potable water system.
4. All backflow prevention assemblies shall be installed in an accessible location and with adequate clearances in accordance with accepted design standards to facilitate maintenance, testing and repair. All reduced pressure principle and double-check valve assemblies installed in a confined area should maintain minimum clearances as follows or as directed by the backflow coordinator:
 - a) Minimum 12 inches and maximum 36 inches above finish floor or final grade.
 - b) Minimum 12 inches from the adjacent or back wall.
 - c) Minimum 24 inches from the opposing or facing wall.
 - d) Minimum 24 inches above the assembly.
 - e) Adequate clearance shall be provided at each end for operation of valves and/or repair of the assembly.
5. All reduced pressure principle and double check valve backflow prevention assemblies

shall be installed in a horizontal position unless specific approval has been obtained from the backflow coordinator for installation in a vertical orientation.

6. In no case is it permissible to have connections or tees installed on the water service line between the meter and the backflow prevention assembly except that irrigation system supply lines may be connected to the potable water service line between the water meter and the backflow prevention assembly provided the following conditions are met:

The irrigation system supply line shall be equipped with a tightly closing resilient seated isolation valve installed directly downstream of the connection to the potable water service line. This line must also have an approved reduced pressure principle assembly.

- a) installed per these Rules and Regulations.
 - b) Any irrigation system utilizing compressed air to purge the system for winterization shall not have any air injection port larger than 1/4 inch in diameter installed upstream of the backflow prevention assembly. Any size can be located downstream of the assembly. The air injection port shall not have a usable hose connection. See Illustration on page 27.
7. All systems protected with a backflow prevention assembly should meet all requirements for pressure relief valves set forth in the most recent edition of the State of Colorado Plumbing Code.
 8. Isolation valves furnished as part of the backflow prevention assembly shall not be used as the inlet or outlet valve of the meter. Testcocks shall not be used as supply connections.
 9. Approved backflow prevention assemblies shall be installed without any bypass, unless the bypass line is also protected by an approved backflow prevention assembly providing an equivalent degree of protection.
 10. Backflow prevention assemblies shall not be located in any enclosure or hooded area containing corrosive, toxic or poisonous fumes.
 11. Buried stop and waste valves upstream of backflow prevention assemblies shall not be permitted in any system. Stop and waste valves installed upstream of backflow prevention assemblies are permitted above grade in basements, crawl spaces or in the yard, provided they do not have a usable hose connection.

B. SPECIFIC REQUIREMENTS

1. When used as containment backflow protection an approved air-gap separation shall be installed downstream of the water service connection and in such a manner so that no hose, piping arrangement or other fixture may be attached to defeat the air-gap separation.
 - a) Approved air-gap separations must have a properly sized and located drain to adequately drain the maximum discharge from the public potable water system service line.

- b) b. Approved air-gap separations that are protecting the public potable water system shall be considered a backflow prevention assembly and shall be subject to the same testing and inspection required by these Rules and Regulations for all other backflow prevention assemblies.
2. An approved reduced pressure principle assembly shall not be installed in any below- grade pit or vault.
- a) Basement installations, although a form of pit, are allowed providing the following conditions are met:
 - i. A drain large enough to allow the maximum flow of water the assembly is capable of discharging under twice the normal static water pressure, AND
 - ii. Installation of a high water alarm system. Electrical systems and/or components shall not be installed in the same general area, OR
 - iii. as approved by the backflow coordinator
 - b) Shall be installed in such a manner that the relief valve opening shall never have a water level under the assembly come within a vertical distance of 12 inches of the relief valve discharge port. The relief valve discharge port shall be oriented down.
 - c) The relief valve discharge port on a reduced pressure principle assembly shall not be connected to any sump or sanitary sewer.
 - d) Only factory supplied funnels shall be used to remove the periodic discharge from the assembly and the piping system must have an approved air-gap at the termination of the run.
3. An approved double check valve assembly may be installed in below-grade pits or vaults if approved by the backflow coordinator and provided these pits or vaults are properly constructed in accordance with accepted design standards and insulated and/or heated to prevent freezing.
4. An approved pressure vacuum breaker shall be installed as follows:
- a) It shall be installed with the critical level (C/L) of the assembly a minimum of 12 inches above the highest downstream plumbing.
 - b) b. It shall be installed in an upright position and in locations where the assembly may be subjected to continuous pressure but in no event shall the assembly be subjected to backpressure or become submerged.
5. An approved atmospheric vacuum breaker shall be installed as follows:
- a) It shall be installed with the critical level (C/L) of the assembly a minimum of 6 inches above the flood-level rim of the vessel being protected or the highest

downstream plumbing.

- b) It shall not be used in installations where the assembly would be submerged or subjected to continuous static line pressure or backpressure (no valves downstream) or be installed where it would be under pressure for more than 12 hours in any 24-hour period.

3.4 MAINTENANCE

- A. Backflow prevention assemblies shall be repaired, overhauled or replaced by the consumer at the consumer's expense within 60 days of discovery of failure whenever the assemblies are found to be defective.
- B. Any existing backflow prevention assembly installed at the water service connection that is not approved by an approved testing laboratory shall be replaced within a period of 60 days with an approved backflow prevention assembly as required by these Rules and Regulations.
- C. Only those replacement and/or repair parts produced or specifically recommended by the manufacturer of the backflow prevention assembly shall be used in the repair of the assembly. Any other repair parts utilized shall be considered a modification of the factory design, and the assembly shall be considered unapproved.

3.5 TESTING, INSPECTION AND ACCEPTANCE

- A. Cross Connection Inspection: All Non-Single Family Residential water service connections shall be available for inspection by ELCO staff. An inspection may consist of an onsite survey, facility survey form completed by the property owner or other methods identified as appropriate to identify the level of cross connection risk as determined appropriate by ELCO staff
- B. Except as provided in paragraph B. below, it shall be the duty of the consumer at any premises where backflow prevention assemblies are required by these Rules and Regulations to be installed, to have such assemblies tested and inspected annually by a certified Backflow Assembly Tester to assure the assembly is functioning properly. Non-testable assemblies that are approved under these Rules and Regulations for use in single-family residences are exempt from this testing and inspection requirement.
 - 1. Backflow prevention assemblies shall not be considered as accepted under these Rules and Regulations until a certified inspection and test is made on the installed assembly and the assembly has passed such inspection and testing.
 - 2. The inspections and tests shall be at the expense of the consumer and shall be performed by a certified Backflow Assembly Tester.
- C. Testable backflow assemblies installed for the lawn sprinkler systems of single-family residences shall be exempt from the annual testing requirements. Residential dedicated lawn sprinkler systems shall have an approved reduced pressure principle assembly installed at the water service connection to the facility. These assemblies must be annually tested and inspected by a certified backflow assembly tester.

- D. Certified tests and inspections of backflow prevention assemblies shall occur at least annually. In those instances where the hazard is deemed to be great enough, the backflow coordinator may require that certified inspections and operational tests be performed at more frequent intervals.
- E. Records of all tests, inspections, repairs and overhauls of backflow prevention assemblies shall be kept by the consumer and by the certified technician for a period of three years after such tests, inspections, repairs and overhauls. The Certified Backflow Assembly Tester shall file with the Utility a copy of the records of all such tests, inspections, repairs, and overhauls, within 10 days of completing such tests, inspections, repairs and overhauls. In addition, the consumer shall provide the Utility with copies of such records if requested by the backflow coordinator.
- F. All testing gauges used by Certified Backflow Assembly Tester shall be checked for accuracy at least yearly, and proof of compliance shall be submitted to the Utility upon request.

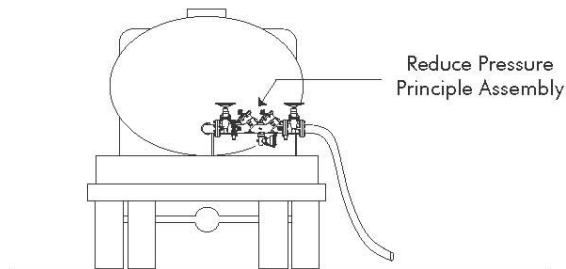
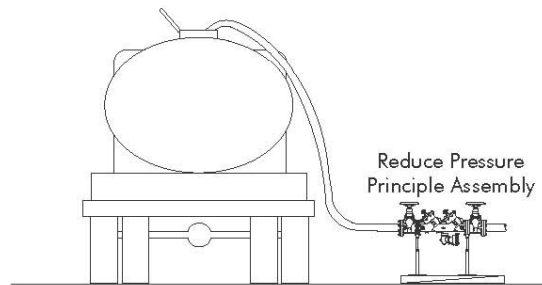
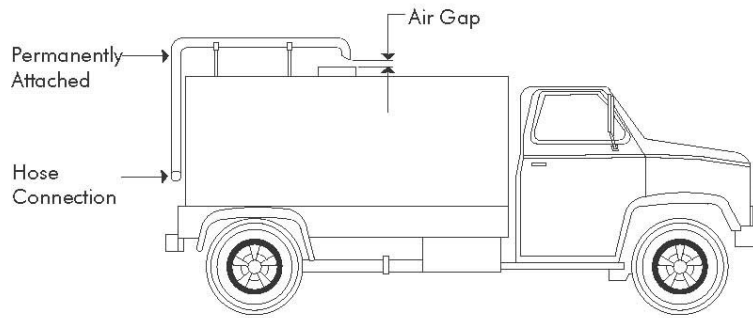
4.1 FAILURE TO COMPLY

- A. If any consumer of the Utility fails to comply with any provision of these Cross-Connection Control Rules and Regulations the consumer is in violation of State of Colorado Statutes and Water Quality Regulations. The Utility may discontinue water service to the consumer or other legal action until the consumer is in compliance with these Rules and Regulations.

Part 6

Standard Drawings

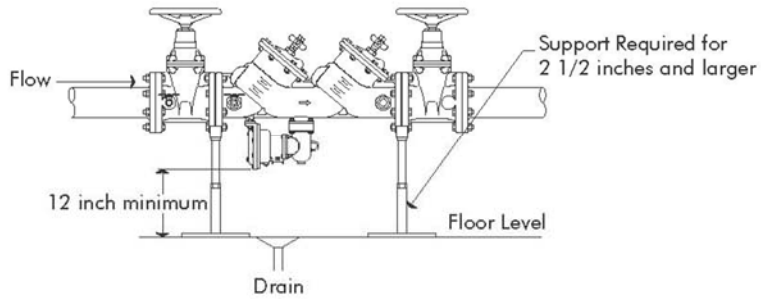
WATER TANKER TRUCKS APPROVED FILLING METHODS



REDUCE PRESSURE PRINCIPLE ASSEMBLIES

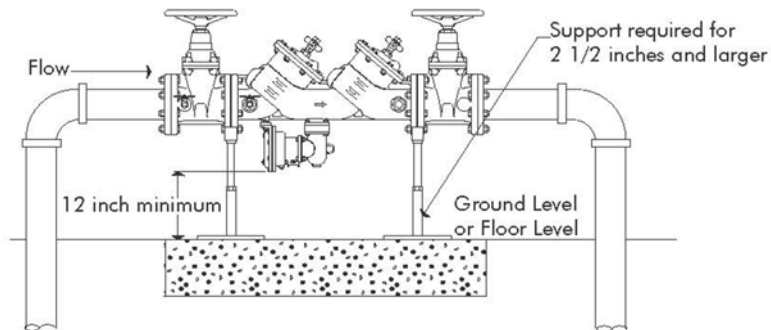
INDOOR INSTALLATION

NOTE:
Install where assembly is accessible
for periodic testing and spillage is
not objectionable.



OUTDOOR INSTALLATION

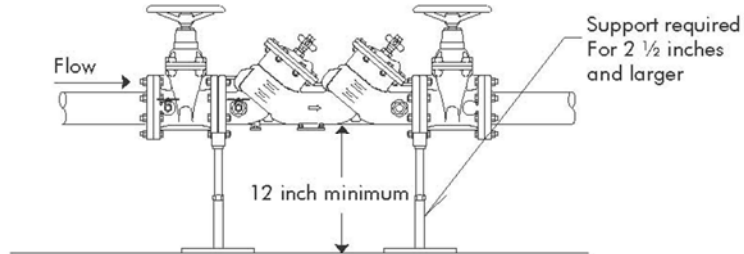
NOTE:
Install where assembly is accessible for
periodic testing and spillage is not
objectionable.



DOUBLE CHECK VALVE ASSEMBLIES

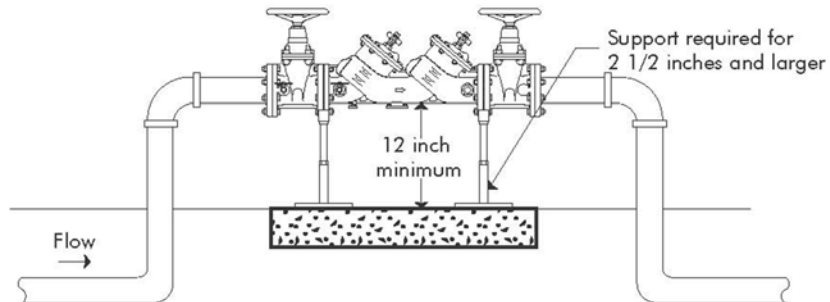
INDOOR INSTALLATION

NOTE:
Install where assembly will be accessible for periodic testing



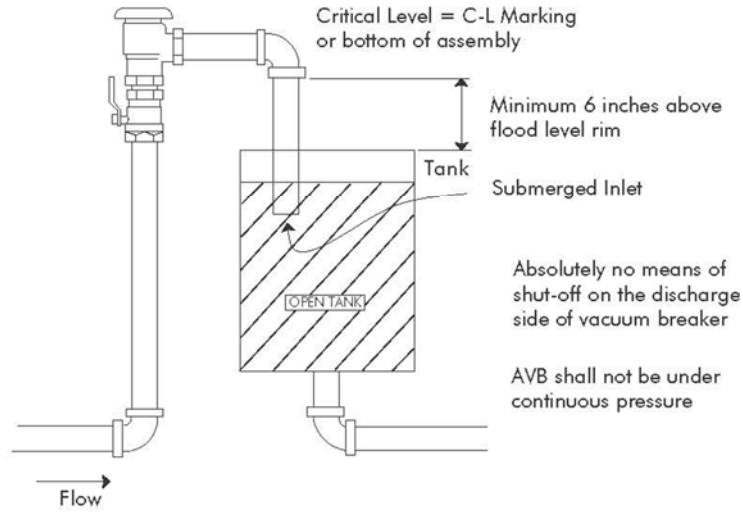
OUTDOOR INSTALLATION

NOTE:
Install where assembly will be accessible for periodic testing

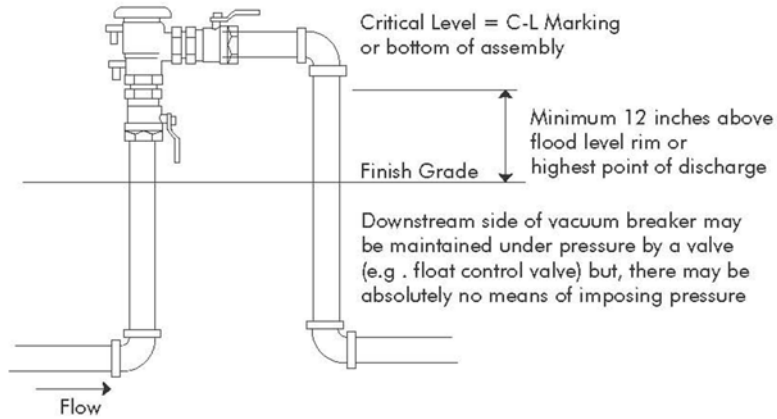


VACUUM BREAKER

ATMOSPHERIC VACUUM BREAKER

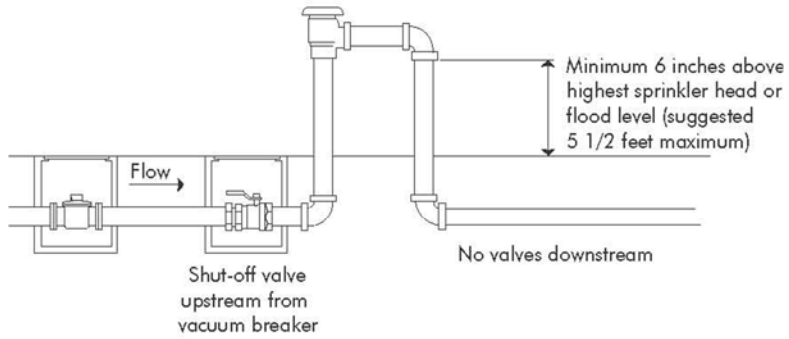


PRESSURE VACUUM BREAKER

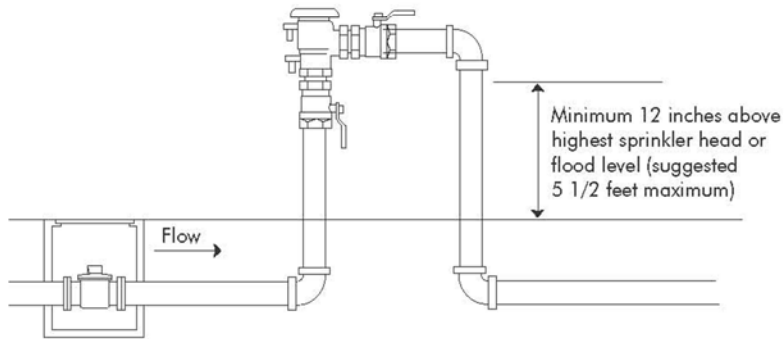


IRRIGATION SYSTEMS WHERE THERE IS NO INJECTION

ATMOSPHERIC VACUUM BREAKER

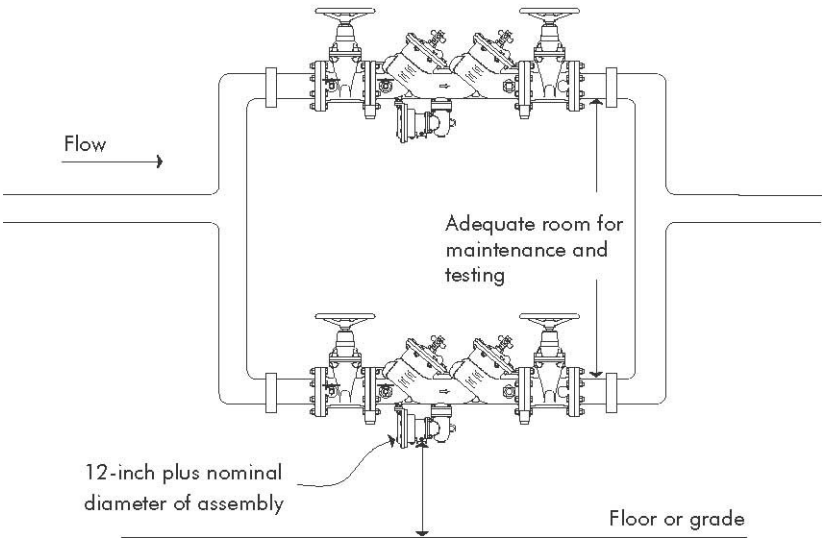


PRESSURE VACUUM BREAKER



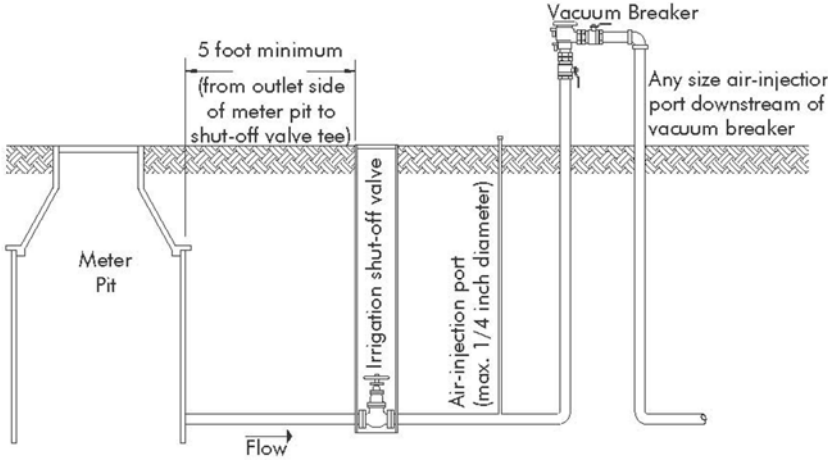
CONTINUOUS SERVICE INSTALLATION REQUIREMENTS

DOUBLE-CHECK VALVES OR
REDUCED PRESSURE PRINCIPLE ASSEMBLIES



SPRINKLER SYSTEM DETAIL

DESIGNATED SPRINKLER SERVICE



SPRINKLER TAP OFF DOMESTIC SERVICE

