

# Cross-Connection Control Manual

Fort Collins Utilities  
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The following section regarding the control of cross connections is excerpted from the Fort Collins Municipal Code and is presented for informational purposes.

#### **DIVISION 7. CROSS-CONNECTION CONTROL\***

##### **Sec. 26-186. Cross-connection prohibited; exception.**

- (a) It is unlawful for any person to have a connection between a private line carrying well water and a line carrying city water or to make, install, maintain or permit to exist any other cross-connection between the city's or user's potable water system and any pipe, plumbing fixture, tank, receptacle, equipment or other appurtenance on the user's premises unless it is protected with a backflow prevention assembly approved by the city.
- (b) No water connection to any premises shall be installed or maintained by the utility unless the potable water supply is protected as required by state laws and regulations and this Code. The Director shall discontinue water utility service to any premises if it is found that an unprotected cross-connection exists on the premises or that a backflow prevention assembly required under this Section has not been installed and tested or that the required backflow prevention assembly has been removed, bypassed, improperly maintained or improperly tested. Service shall not be restored until such conditions or defects are corrected to the satisfaction of the Director.  
(Ord. No. 165, 1986, § 1(112-66(A), (B)), 11-4-86; Ord. No. 77, 1994, 6-7-94)

##### **Sec. 26-187. Backflow prevention assembly.**

The extent of cross-connection control and the type of backflow prevention assembly to be required shall depend upon the degree of hazard presented by the cross-connection on the premises. When backflow prevention assemblies are required they shall be installed at the service connection or location designated by the Director. The assembly shall be located so as to be readily accessible for in-line maintenance and testing and where no part of the assembly will be submerged.  
(Ord. No. 165, 1986, § 1(112-66(C)), 11-4-86; Ord. No. 77, 1994, 6-7-94)

##### **Sec. 26-188. Contamination prohibited.**

A user of city water is responsible for preventing pollutants and contaminants from entering the user's potable water system and the city's water system. A user's responsibility starts at the point of delivery of city water to the private service line and includes all of such user's water systems. A user shall install, operate, test and maintain backflow prevention assemblies at the user's expense as directed by the city or the state and keep accurate records of tests and repairs made to such assemblies in accordance with the provisions of this Section and any derivative rules, regulations, policies and procedures.  
(Ord. No. 165, 1986, § 1(112-66(D)), 11-4-86; Ord. No. 77, 1994, 6-7-94)

##### **Sec. 26-189. Prevention program.**

The City Manager is authorized and directed to conduct surveys as to the extent of cross-connection problems and establish a program to control and eliminate cross-connection hazards. The Council may, upon recommendation of the City Manager, adopt by ordinance such supplemental rules and regulations as may be necessary to implement and administer the cross-connection control program. It shall be unlawful for any person to violate any such rules and regulations enacted by the City Council pursuant to this Section.  
(Ord. No. 165, 1986, § 1(112-66(E)), 11-4-86; Ord. No. 77, 1994, 6-7-94)

**Secs. 26-190—26-205. Reserved.**

(Footnotes)

\*Cross reference—Plumbing standards, § 5-125 et seq.

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## **SECTION 15431**

### **CROSS-CONNECTION CONTROL RULES AND REGULATIONS**

# PART 1

*General*

# PART 1 - GENERAL

## 1.1 DESCRIPTION AND DEFINITIONS

- A. This specification pertains to the specific requirements for the installation, use and testing of approved backflow prevention assemblies generally required in Sections 26-186, 26-187, 26-188 and 26-189 of the *Code of the City of Fort Collins*.
- B. 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 Director as being in compliance 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) and 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 backsiphonage.

6. **Backflow Prevention Assembly:** Any assembly or method 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. **Backsiphonage:** 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.
9. **Certified Cross-Connection Control Technician (Certified Technician):** A person who has proven his or her competency to the satisfaction of the Colorado Department of Health and who is listed by the Department of Health as a certified cross-connection control technician.
10. **Check Valve:** A self-closing device that is designed to permit the flow of fluids in only one direction.
11. **Consumer:** The owner or operator of a consumer water system.
12. **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.
13. **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.
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 multipoint 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. **Director:** The director of Fort Collins Water Utilities.
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 director 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. **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.
23. **Nonpotable Water:** Water that is not safe for human consumption or that has not been approved by the Colorado Department of Health as being safe for human consumption.
24. **Nontestable Assemblies:** Backflow prevention assemblies not approved by the FCCC&HR because of not being in-line testable.
25. **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.
26. **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.

27. **Potable Water:** Water from any source that has been approved by the Colorado Department of Health as safe for human consumption.
28. **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.
29. **Public Potable Water System:** Fort Collins Utilities, 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.
30. **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.
31. **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.
32. **Utility:** Fort Collins Utilities.
33. **Vacuum:** Any pressure less than atmospheric pressure.
34. **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 Director for use as hereinafter set forth in these Rules and Regulations. 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. An approved air-gap separation, reduced pressure principle assembly, pressure vacuum breaker assembly or an atmospheric vacuum breaker assembly shall be used where there is an existing or potential health or system hazard.

2. 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.

# PART 2

*Products*

## 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.
- 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. A single check valve or two single check valves linked in tandem is not considered an approved backflow prevention assembly.
- D. **Pressure Vacuum Breaker:** An assembly containing one or two independently operating, internally loaded check valves and an independently operating loaded air-inlet valve located on the discharge side of the check valves and fitted with two properly located testcocks and two resilient seat isolation valves.
- E. **Atmospheric Vacuum Breaker:** An assembly containing a shut-off valve followed by a valve body containing a float-check, a check seat and an air-inlet port.
- F. **Nontestable Assemblies:** Nontestable assemblies that are approved by the ASSE shall only be used for single-family residential applications and are limited to the following:
  - 1. **Dual Check with Atmospheric Vent:** A double check valve assembly with an atmospheric vent located between the two check valves.

2. **Standard Residential Dual Check:** Same as the dual check with atmospheric vent assembly, but it does not have an intermediate atmospheric vent.
3. **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*



## 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 that are not correctable, 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.

### 3.2 TYPE 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, the type of cross-connection control assembly required shall be determined based on the degree of hazard.
2. All fire sprinkler systems shall conform to the National Fire Protection Association Rules and Regulations and the local Fire Code.

**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 shall have an approved reduced pressure principle assembly installed at the water service connection to the facility.

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.
2. Ethylene glycol shall not be used in any heating/cooling system that is connected to the public potable water system. Heating/cooling systems utilizing ethylene glycol solutions in any concentration shall be separated from the public potable water system by an approved air gap separation.
3. FDA. approved nontoxic propylene glycol is allowed for use in heating/cooling systems connected to the public potable water system.

**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 principal 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. Irrigation and lawn sprinkling systems 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, shall be separated from the public potable water system by an approved air-gap separation or an approved reduced pressure principle assembly.
  2. In irrigation and lawn sprinkling systems that do not incorporate the use of an injection system or booster pump(s), a 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 a pressure vacuum breaker assembly installed on the system. Irrigation and lawn sprinkling systems using the subsurface drip method shall also have a pressure vacuum breaker assembly installed on the system.

3. 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.
  4. 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 director. 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 Director 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. 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 director.
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 director.
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 director, 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:

- 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 backflow prevention assemblies shall be installed in a horizontal position unless specific approval has been obtained from the director 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:
- a. 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 backflow preventer 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  $\frac{1}{4}$  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.

7. All systems protected with a backflow prevention assembly shall meet all requirements for pressure relief valves set forth in the most recent edition of the Uniform Plumbing Code adopted by reference into the Code of the City of Fort Collins.
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. 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. 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 unless there is a drain sized twice the nominal pipe diameter of the assembly and which drain discharges to daylight.
    - 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.
    - 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 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 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 point of downstream usage.

- 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 point of use.
  - b. It shall not be used in installations where the assembly would be submerged or subjected to continuous static line pressure or backpressure 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 whenever the assemblies are found to be defective.
- B. Any existing backflow prevention assembly installed on a consumer's premises that is not approved by an approved testing laboratory shall be tested every 120 days, and upon failure of any valve within the assembly, the backflow assembly shall be replaced within a period of 10 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. 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 technician 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 technician.
- B. Testable backflow assemblies installed for the lawn sprinkler systems of single-family residences, where there is no injection or mixing of fertilizer or any foreign substance, shall be exempt from the annual testing requirements. However, these assemblies shall be tested upon installation, repair, replacement or at least every three years. If the hazard is deemed great enough, the director may require a more frequent testing schedule.
- C. 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 director may require that certified inspections and operational tests be performed at more frequent intervals.
- D. 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 technician 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 director.
- E. All testing gauges used by Certified Technicians shall be checked for accuracy at least yearly, and proof of compliance shall be submitted to the Utility upon request.

# PART 4

## *Compliance and Appeal Procedures*

## **PART 4 - COMPLIANCE AND APPEAL PROCEDURES**

### **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 Utility may discontinue water service to the consumer until the consumer is in compliance with these Rules and Regulations. Violation of these Rules and Regulations is a misdemeanor offense punishable upon conviction as provided in Section 1-15 of the Code of the City of Fort Collins.

### **4.2 PROCEDURE FOR APPEAL**

- A. Any consumer affected by and dissatisfied with any decision, action, or determination made or taken by the director or the Utility in interpreting, enforcing or implementing the provisions of these Cross-Connection Control Rules and Regulations, shall file with the Director a written request for reconsideration within 10 working days of such decision, action or determination, setting forth in detail the facts supporting the request, whereupon the Director shall hold a hearing within 10 working days of such request. All requests for reconsideration shall be acted upon by the Director within 10 working days from the date of the hearing. The decision, action, or determination shall remain in effect during the reconsideration period.
- B. If the consumer requesting the reconsideration is not satisfied with the final decision of the director and wishes to appeal the decision, such consumer shall appeal the director's final decision to the City Council, which appeal shall be filed and conducted in accordance with the appeals procedure provided in Division 2 of Article II of Chapter 2 of the Code of the City of Fort Collins, and shall be subject to all the same terms and conditions applicable to the appeals by appellants from boards and commissions of the City as provided in Division 2.

# PART 5

## *Assembly Applications*

# PART 5 - ASSEMBLY APPLICATIONS

## 5.1 APPLICATION TABLES

- A. The following tables indicate which type of backflow prevention assembly should be used for a particular application. Obviously, every possible application is not addressed in this document, however, sufficient information is provided to allow the reader to make an informed decision in most situations as to the appropriate assembly to be used based on the degree of hazard. Questions regarding a specific assembly application should be referred to the utility.

	Backsiphonage Only		Backsiphonage or Backpressure
	Continuous Use	Intermittent Use	
Health Hazard	Air Gap RP PVB	Air Gap RP PVB AVB	Air Gap RP
Non-Health Hazard	Air Gap RP DC PVB	Air Gap RP DC PVB AVB	Air Gap RP DC

Source: G.J. Angele Sr., Cross-Connections and Backflow Prevention, AWWA, Denver, (2nd ed., 1974)

† Where hazard is extreme, both an air gap and a reduced pressure principle device may be required to provide protection.

## 5.2 RECOMMENDED ASSEMBLIES

### Degree of Hazard and Recommended Backflow Prevention Devices

Type of Potential Cross Connection	Degree of Hazard S = Severe M = Moderate L = Low	Recommended Type of Backflow Prevention Device				
		Backflow/Backsiphonage Caused by Backpressure			Backsiphonage	
		Air Gap	RP Device	Double Check Valve	Pressure Vac. Breaker	Atmospheric Vac. Breaker
<b>DIRECT CONNECTIONS SUBJECT TO BACKPRESSURE</b>						
1. Pump and/or Tanks Handling: • Sewage & Lethal Substances • Toxic Substances • Non-toxic Substances						
Sewage or Other Lethal Substances	S	†	†			
Toxic Substances	S	†	†			
Non-Toxic Substances	M					
2. Boiler/Steam Systems with:						
Toxic Substances in Boiler Water	S					
Non-Toxic Substances in Boiler Water	M					
3. Fire System w/Auxiliary Water						
	S					
<b>DIRECT OR INDIRECT CONNECTIONS NOT SUBJECT TO BACKPRESSURE</b>						
4. Sewer Connected Waste Lines						
	S					
5. Low Inlet to Tank w/Toxic Substance						
	S					
6. Low Inlet to Tank w/Non-Toxic Substance						
	M					
7. Low Inlet to Potable Water Tank						
	L	Each Case Treated Separately				
8. Lawn Irrigation Systems						
	S					
9. Coil or Jacket Type Heat Exchanger:						
Connected to Sewer Line	S					
Connected to Toxic Substance Line	S					
Connected to Non-Toxic Substance Line	M	Each Case Treated Separately				
10. Flush-Valve (non-tank type) Toilet						
	S					
11. Toilet and Urinal Tanks						
	M					
12. Trough Urinal						
	M					
13. Valve/Outlet with Plug Attached to:						
Toxic Substance Tank or Line	S					
Non-Toxic Substance Tank or Line	M					

Source: G.J. Angele Sr., Cross-Connections and Backflow Prevention, AWWA, Denver, (2nd ed., 1974)

† Where hazard is extreme, both an air gap and a reduced pressure principle device may be required to provide protection.

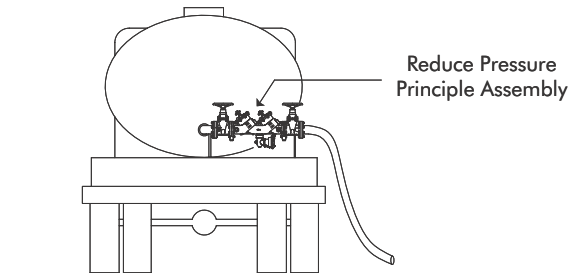
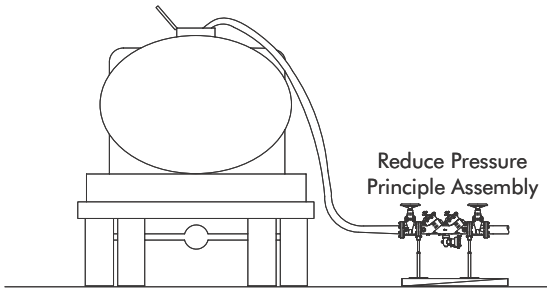
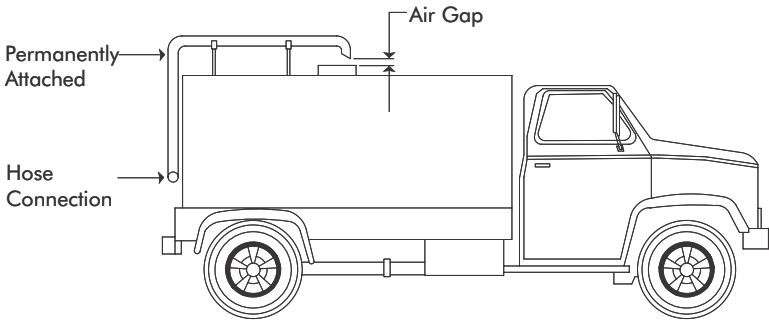


# PART 6

## *Standard Drawings*

# WATER TANKER TRUCKS

## APPROVED FILLING METHODS

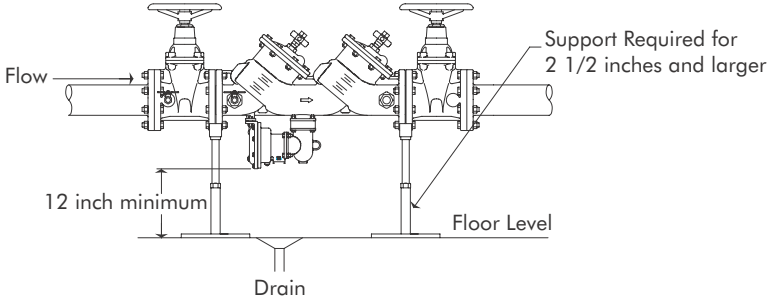


# REDUCE PRESSURE PRINCIPLE ASSEMBLIES

## INDOOR INSTALLATION

### NOTE:

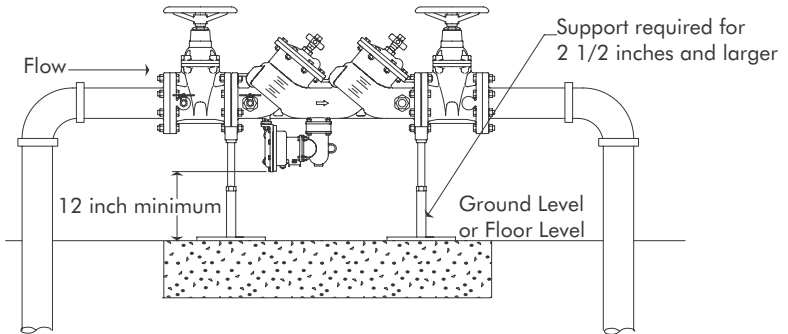
Install where assembly is accessible for periodic testing and spillage is not objectionable.

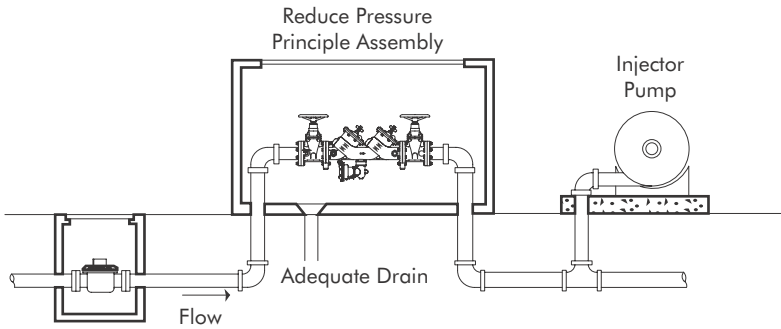


## OUTDOOR INSTALLATION

### NOTE:

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





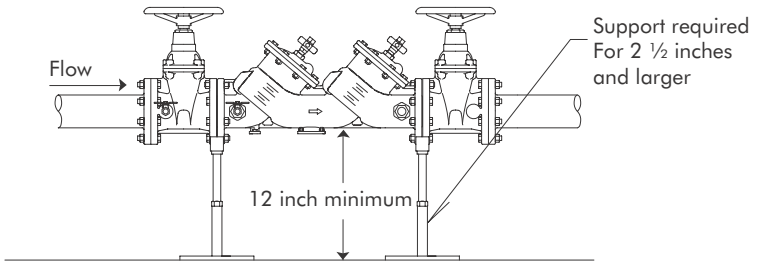
REQUIRED ON ALL IRRIGATION SYSTEMS WHEN:

- A) Use of vacuum breaker is impractical or not allowed; or
- B) Fertilizer, Herbicides or other toxic materials are injected

# DOUBLE CHECK VALVE ASSEMBLIES

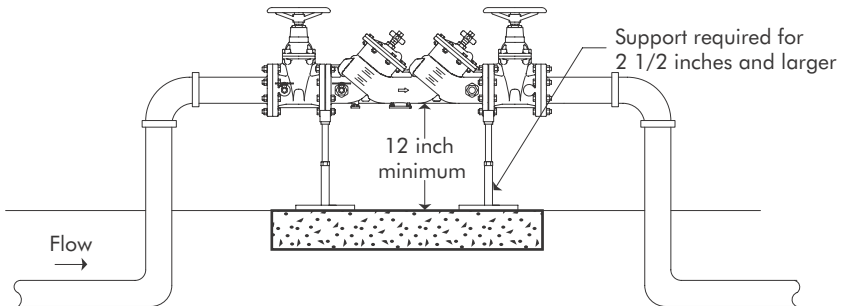
## INDOOR INSTALLATION

NOTE:  
Install where assembly will be accessible for periodic testing



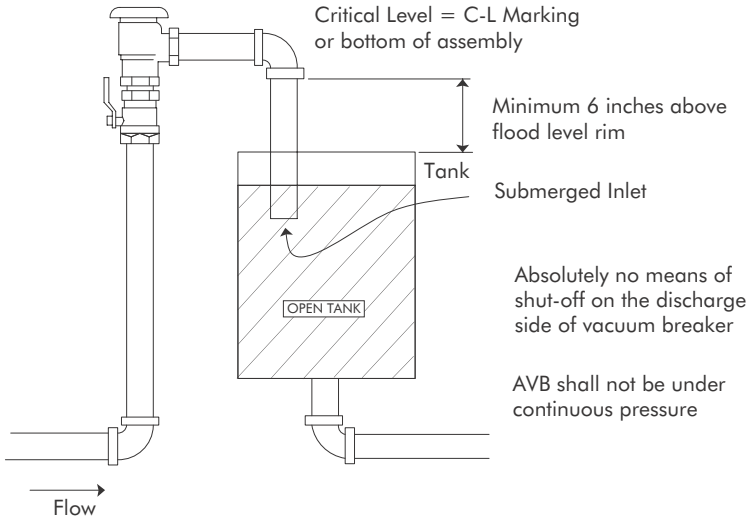
## OUTDOOR INSTALLATION

NOTE:  
Install where assembly will be accessible for periodic testing

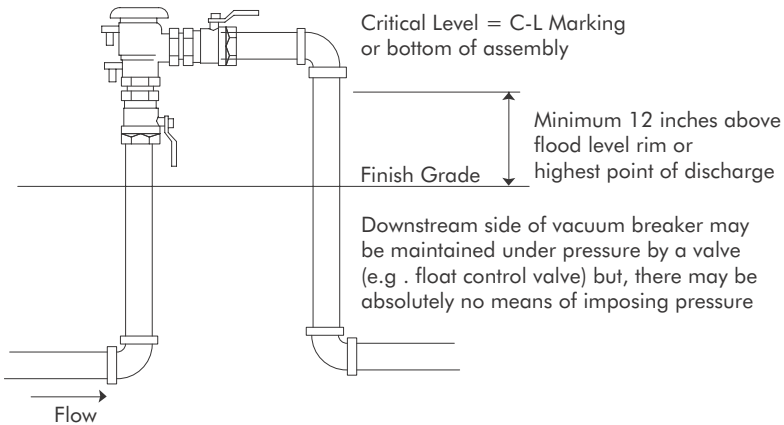


# VACUUM BREAKER

## ATMOSPHERIC VACUUM BREAKER

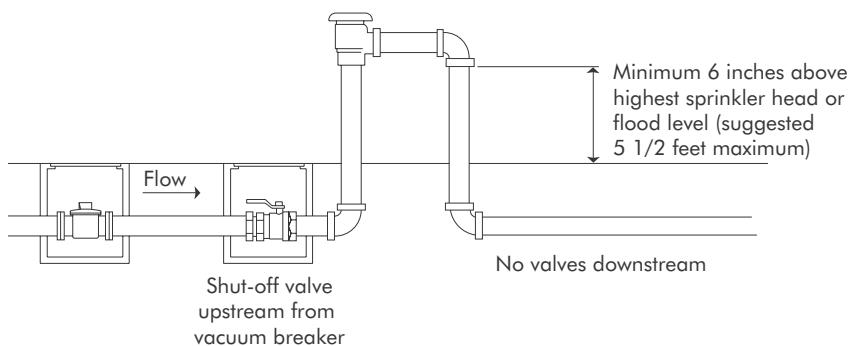


## PRESSURE VACUUM BREAKER

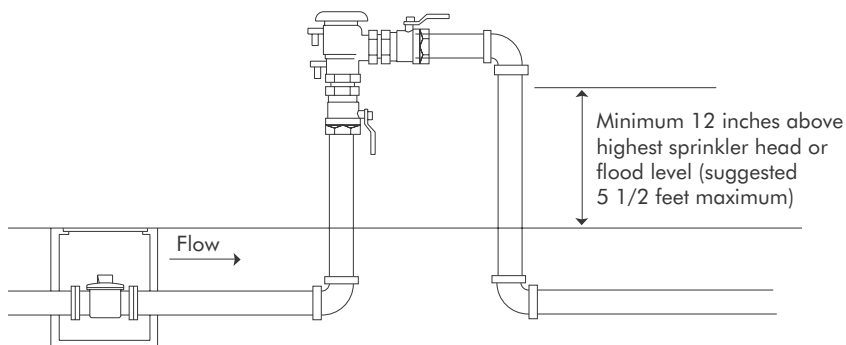


# IRRIGATION SYSTEMS WHERE THERE IS NO INJECTION

## ATMOSPHERIC VACUUM BREAKER

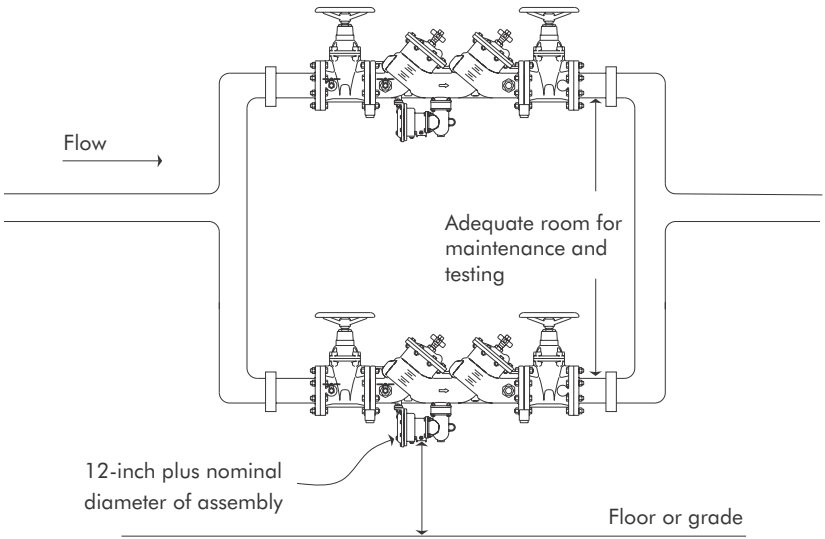


## PRESSURE VACUUM BREAKER



# CONTINUOUS SERVICE INSTALLATION REQUIREMENTS

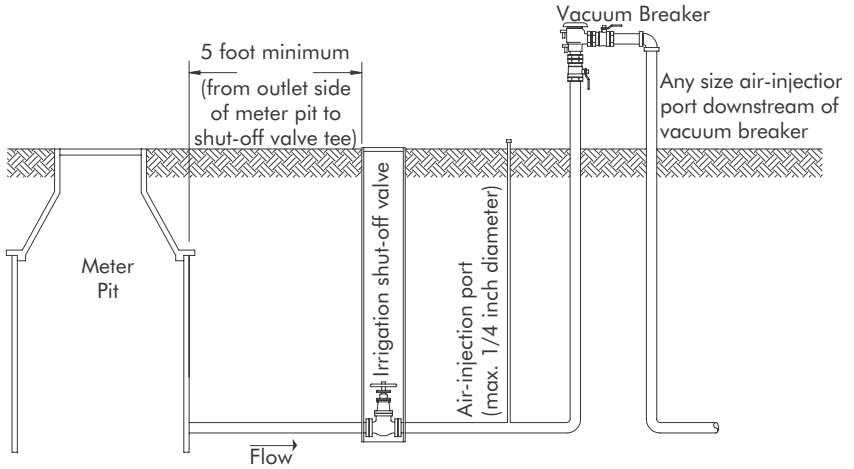
## DOUBLE-CHECK VALVES OR REDUCED PRESSURE PRINCIPLE ASSEMBLIES



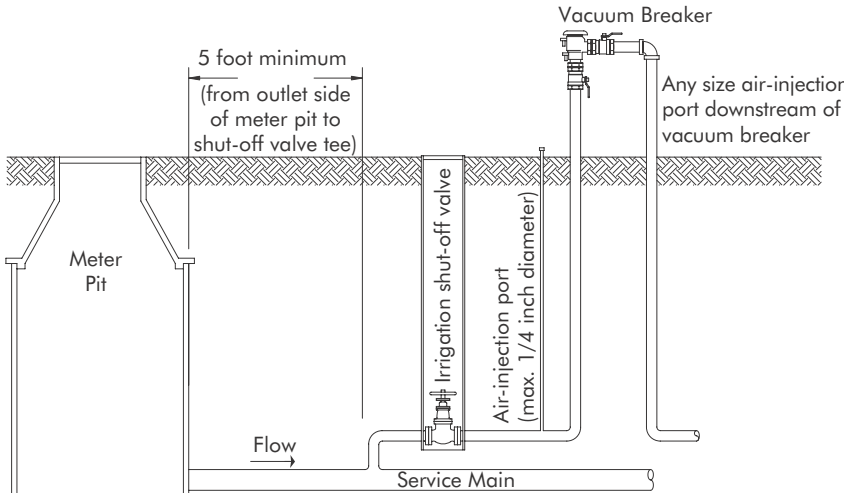


# SPRINKLER SYSTEM DETAIL

## DESIGNATED SPRINKLER SERVICE



## SPRINKLER TAP OFF DOMESTIC SERVICE





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