

Cross-Connection Control Program

Procedural Manual

Introduction

The Texas Commission on Environmental Quality (TCEQ) is responsible for implementing the standards of Public Law 93-523 – Federal Safe Drinking Water Act and Amendments of 1986. In doing so, the Commission requires public water suppliers to prohibit connections to establishments where an actual or potential contamination or system hazard exists unless the public water supply is protected by approved backflow prevention assemblies. The public water supplier also is required to establish a program whereby the backflow prevention assemblies are tested upon installation and at least annually thereafter.

Lower Valley Water District (LVWD) has established and will provide the maintenance for a Cross-Connection Control Program pursuant to Title 30, Texas Administrative Code, Chapter 290. This program protects the public water supply from contamination or pollution due to cross connections by containing hazards at the service connection. The program assigns or clarifies responsibilities of LVWD, LVWD Customer Service Inspectors, the customer and the certified backflow prevention technician.

This manual is intended to augment LVWD's Cross-Connection Control Program and to serve as the minimum standard for implementing the program. Included in the manual are technical specifications and standards to define proper backflow prevention assembly applications, installation details and criteria, assembly test procedures, care of test equipment, and forms.

No manual can remain current indefinitely. Additions, deletions, and amendments should be anticipated by all holders of this manual. Subsequent changes will be available from Lower Valley Water District.

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Texas Rules

Title 30 of the Texas Administrative Code (30 TAC), Chapter 290, prohibits PWSs (Public Water System) from connecting to an actual or potential contamination hazard without first protecting the potable-water supply. The TCEQ rules require PWSs to:

- Adopt a plumbing ordinance, regulations, or service agreements
- Require customer-service inspections
- Require backflow protection using appropriate backflow prevention assemblies
- Require those assemblies to be tested to ensure that they are working correctly

This document refers to the Texas rules in the applicable sections throughout. Implementing these rules constitutes a cross-connection control program.

TCEQ rules place the responsibility for recognizing and evaluating hazards within the PWS's distribution system on the PWS. When a hazard is identified, you must ensure that your consumers are protected from contamination by that hazard. The PWS may terminate water service to any connection where an unprotected health hazard is found and only restore service when the health hazard no longer exists or after it has been properly isolated using a backflow prevention assembly.

Any hazard must be isolated from the drinking-water supply regardless of when the hazard was first created, or the site was built. **Because the effects of a backflow event can be so significant, there are no grandfather clauses that apply to cross-connection control and backflow prevention in the TCEQ's regulations on backflow and siphonage.** However, the landscape-irrigation regulations do contain some provisions for existing irrigation systems.

A backflow incident qualifies as an accident that has a negative impact on the delivery of safe and adequate drinking water and must be reported to the TCEQ [30 TAC 290.46 (w)(5)]. The TCEQ maintains a 24-hour toll-free number for reporting backflow incidents and other emergencies: 888-777-3186. Additionally, you should submit a detailed summary of any backflow incident to the above-mentioned address.

Plumbing Ordinance, Regulations, or Service Agreements [30 TAC 290.46 (i)]

Every PWS is required to adopt either:

- A plumbing ordinance,
- Plumbing regulations, or
- Service agreements.

These give the local public water supplier the authority to implement a cross-connection control program. Whichever is adopted, it must have provisions for proper enforcement in order to prohibit cross-connections and other unacceptable plumbing practices.

PWSs serve a wide variety of customers throughout Texas. The potential cross-connections found in a rural area can be very different from those found in a urban setting. Each PWS should carefully consider the types of hazards that may be present in its distribution system before adopting a plumbing ordinance, regulations, or service agreement. This will allow the PWS to tailor the adopted rules to better protect the potable-water supply against a category of specific potential hazards in the PWS's local area. ***Important: the adopted ordinance, regulations, or service agreement may be more stringent than the TCEQ regulations but cannot be less stringent.***

For example, if you supply water to residential customers who have irrigation systems and also have animals on their lot, run a business from their house, or have an auxiliary water supply – which increases the contamination hazard – you may require more rigorous testing of the backflow preventers for those customers. While TCEQ rules address the hazards posed to the potable water supply, specific requirements adopted in the local ordinance, regulations, or service agreement will strengthen your enforcement of these requirements-increasing awareness of the rules and reducing the numbers of questions.

Note that an investor-owned utility has only limited authority to adopt more stringent requirements than the TCEQ rules [30 TAC 291.93(5)].

A. Approved Backflow Prevention Assembly

An approved backflow prevention assembly shall mean an assembly that has been manufactured in compliance with the American Water Works Association standards C510 and C511 and is listed by the Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California.

B. Backflow

Backflow is the unintended or undesirable reversal of the normal water flow.

There are two forms of backflow:

1. Back siphonage

Back siphonage is the drawing or pulling water in a reverse flow as a result of a negative or decreased pressure in the water supply.

2. Backpressure

Backpressure is the forcing or pushing water in a reverse flow as a result of increased pressure in the customer's water system.

C. Backflow Prevention Assembly

A backflow prevention assembly is an effective device used to prevent backflow of water into the public water supply or the customer's water system. The types of backflow prevention assemblies are as follows:

1. AF (Air Gap)

2. RP (Reduced Pressure)

3. RPDA (Reduced Pressure Principle Detector Assembly)

4. DC (Double Check Valve Assembly)

5. DCDA (Double Check Valve Detector Assembly)

6. PVB (Pressure Vacuum Breaker)

7. SVB (Spill-Resistant Pressure Vacuum Breaker Assembly)

8. AVB (Atmospheric Vacuum Breaker)

D. Certified Backflow Prevention Technician

An individual who has taken a forty-hour course approved by the Texas Commission on Environmental Quality and has received certification from Texas Commission on Environmental Quality and agrees to comply with Lower Valley Water District Rules & Regulations and the Code of Ethics.

E. Containment Cross-Connection Control

Containment cross-connection control provides protection of the public water supply from the backflow of contaminants or pollutants from the customer's premises by the use of an air gap or an approved backflow prevention assembly at each water service connection to a customer's water system.

Containment cross-connection control does not provide protection to the occupants of the premises but shall be considered as additional backflow protection and shall not negate the use of backflow prevention on internal hazards by isolation control as outlined and enforced by the LVWD Customer Service Inspectors.

F. Contamination

Contamination is the presence of any foreign substance (organic, inorganic, radiological, or biological) in water which tends to degrade its quality so as to constitute a health hazard or impair the usefulness of the water.

G. Cross Connection

A cross connection is a point in the public water supply or in the customer's water system that is connected directly, or has the potential of being connected, to a source of non-potable substance through which contaminants or pollutants may enter the public water supply or the customer's water system.

H. Cross Connection – Controlled

A controlled cross connection is a cross connection with an approved backflow prevention assembly properly installed and maintained so that it will continuously afford protection commensurate with the degree of hazard.

I. Cross-Connection Control Program Coordinator

A Cross- Connection Control Program Coordinator shall mean a person designated by Lower Valley Water District to administer and enforce the cross-connection control program.

J. Lower Valley Water District

Lower Valley Water District is a municipal water and sewer agency located in and serving the people of Socorro, Sparks, San Elizario, Clint and Cuadrilla. LVWD is authorized to administer and enforce the provisions of these regulations.

K. Hazard, Degree of

Degree of hazard is determined by the Lower Valley Water District based on an evaluation of conditions within a customer's premises.

Hazards are classified as follows:

1. Health Hazard

An actual or potential cross connection involving any substance that could, if introduced into the public water supply or the customer's water system, cause death, injury, illness or spread of disease.

2. Non-Health Hazard

An actual or potential cross connection involving any substance that generally would not be a health hazard but would constitute a nuisance, or be aesthetically objectionable, if introduced into the public water supply or the customer's water system.

3. System Hazard

A system hazard shall mean a actual or imminent threat of the contamination to the public water supply which presents a danger to public health.

L. Isolation Cross-Connection Control

Isolation cross-connection control provides protection to the occupants within the customer's premises by the installation of approved backflow prevention assemblies at each cross connection within the customer's water system.

M. Premises

Premises refers to any and all areas on a customer's property that is served or has the potential to be serviced by Lower Valley Water District.

N. Pollution

Pollution is the presence of any foreign substance in water that tends to degrade its quality so as to constitute a non-health hazard or impair the usefulness of the water.

O. Water Service Connection

The service connection is that point in the customer's water supply system beyond the sanitary control of Lower Valley Water District and is generally considered to be the outlet end of the water meter.

Responsibilities

I. Lower Valley Water District

- A. Lower Valley Water District shall be responsible for the protection of the public water supply from the backflow of contaminants or pollutants through the customer's water service connection to the public system.
- B. Lower Valley Water District shall administer and enforce all the provisions of the cross-connection control program including monitoring of, and/or annual inspection and testing.

II. Lower Valley Water District Customer Service Inspector

- C. LVWD Customer Service Inspector shall be responsible for reviewing plumbing plans, inspect plumbing as it is installed, and inspect initial installations of backflow prevention assemblies within its jurisdictional limits. LVWD Customer Service Inspector shall require unacceptable plumbing practices to be promptly eliminated to prevent possible contamination or pollution of the public water supply.
- D. LVWD Customer Service Inspector's responsibility for inspection begins at each water service connection and extends throughout the entire length of the customer's water system. However, Lower Valley Water District will be responsible for final approval of the containment device installation prior to granting water service.

III. Customer

- E. The Customer shall be responsible for the prevention of contaminants or pollutants originating on the customer's premises from entering the public water supply as well as the customer's water system.
- F. The customer is responsible for the expenses incurred for the proper installation, testing, maintenance, and relocation of approved backflow prevention assemblies.
- G. The customer shall keep accurate records of tests, inspections, and repairs made to backflow prevention assemblies for a period of three years.
- H. The customer's responsibility begins at the customer side of each water service connection and extends throughout the entire length of the water system within the premises.
- I. The customer is responsible for the expenses for maintenance and repair of the water system within their premises beyond the water meter box.

General Requirements

I. Containment Cross-Connection Control

No water connection from the public water supply shall be made to any establishment handling substances deleterious or hazardous to the public health without an air gap separation or an approved backflow prevention assembly installed at the establishments water service connection.

- A. **Mandatory Containment Cross-Connection Control**
Installations that require backflow prevention assemblies at premises where the conditions or activities exist or occur that are deemed to present a sufficient contamination hazard such that containment cross-connection control is mandatory are shown in the table, "Minimum Requirements for Containment Cross-Connection Control." This table may be supplemented by the cross-connection control coordinator upon a finding of potential hazard to the public water supply.
- B. **New Water Service Connections**
Lower Valley Water District shall review all requests for new water service connections to determine if containment cross-connection control is needed. If it is determined that a containment backflow prevention assembly is required, the assembly must be installed, inspected and tested for proper operation by a certified backflow inspection technician before water service is granted.

C. Containment Inspections of Premises

Facilities not specifically listed in the table “Minimum Requirements for Containment Cross-Connection Control,” but suspected to pose an actual or potential threat of contamination or pollution to the public water supply, shall be subject to a water use survey upon written notice to the customer by Lower Valley Water District. If actual or potential cross connections exist during the premise water use survey that could result in the backflow of contaminants or pollutants into the public water supply, Lower Valley Water District shall evaluate the degree of hazard and proceed with the following criteria:

1. In the event a system hazard is determined to exist, Lower Valley Water District shall immediately terminate water service to the premises. Lower Valley Water District shall restore water service to the premise when the system hazard has been controlled or eliminated. Lower Valley Water District reserves the right to install backflow prevention assemblies in emergency situations where there is an imminent threat to the public water supply at customer’s expense.

2. In the event no system hazards exist, but actual or potential cross connections require containment control, Lower Valley Water District shall give the customer written notice to comply. The customer shall submit a design and plan for implementation to the District within 45 Days of the date of the written notice and have the backflow prevention assembly installed, inspected and tested. Lower Valley Water District shall terminate water service to the premises for failure, refusal, or inability on the part of the customer to install, have tested, and maintain such assembly until the requirements are met.

D. Premises with Private Wells

Premises having existing private wells and who desire to connect to the public water supply shall have the following two options:

1. Customers shall agree to permanently abandon use of the private wells by plugging the well in accordance with Lower Valley Water District procedures prior to connecting to the public water supply, or

2. Customer who wish to maintain their private wells shall agree to completely and permanently sever the private well from the premises water supply system in accordance with Lower Valley Water District procedures prior to connecting to the public water supply or shall install an approved backflow prevention assembly, as determined by Lower Valley Water District, at the water service connection.

II. Parallel Installations

Parallel installations of two or more backflow prevention assemblies is an effective means of the customer insuring that uninterrupted water service is maintained during testing or repair of assemblies and is strongly recommended when the customer desires such continuity. The decision to opt for a parallel installation and its design rests solely with the customer. The customer shall submit a design and plan of implementation to the Cross-Connection Control Coordinator for approval before installation of the assemblies.

III. Fire Protection Systems

All existing and new fire protection systems shall have an approved reduced pressure principle detector assembly at the water service connection except that, under the following circumstances, a contractor may petition the Lower Valley Water District to allow containment cross-connection control by an approved double check valve detector assembly on existing fire protection systems:

- a) Fire protection systems with no reservoirs, no fire (or jockey) pumps, no connections from auxiliary water systems or storage tanks, no antifreeze or other additives, no fire hydrants, no fire hose connections, and with all sprinkler drains discharging through an approved air gap, constructed with acceptable potable water piping materials conforming to ANSI/NFG Standard 61 and certified by an organization accredited by ANSI, except as otherwise required by the Rules and Regulations.*
- b) Fire Protection systems on which hydraulic calculations or other suitable evidence provided by the contractor indicate that use of a reduced pressure principle detector assembly would reduce the operating pressure below the design operating system pressure.*

IV. Thermal Expansion

The installation of non-return devices “such as backflow prevention assemblies, check valves, dual check valves, pressure reducing or regulating valves, and in some instances water softeners between the water service connection and the premises domestic water heater may create a “closed domestic water system.” It is the responsibility of the customer to control thermal expansion created by the installation of any device that prevents pressure relief through the building supply.

V. Isolation Cross-Connection Control

- A. As a condition of continuous water service, the customer shall install, maintain, and operate their plumbing systems in accordance with the requirements of Lower Valley Water District.
- B. The Lower Valley Water District shall conduct Customer Service Inspections at the customer's premises: a) when there is a requirement for a new water service connection, b) where LVWD has reason to believe that uncontrolled cross connections or other unacceptable plumbing practices exist, c) after any material improvement correction, or d) upon an addition or material change to the customer's water system.
- C. Lower Valley Water District shall provide copies of the Customer Service Inspections indicating satisfactory findings to the Cross-Connection Coordinator. Lower Valley Water District shall provide the forms to the Cross-Connection Coordinator and shall keep copies on file for a minimum of ten years.
- D. LVWD Customer Service Inspectors are authorized to conduct inspections of premises served by Lower Valley Water District within the district's city limits and to a distance of five miles beyond the city limits to determine compliance with the provisions of cross connection isolation requirements in order to protect the public health, safety and welfare.
- E. In the event actual or potential cross connections require isolation control, LVWD Customer Service Inspectors shall direct the customer to have approved backflow prevention assembly installed at specific location(s) within the customer's water system. Requirements for approved backflow prevention assemblies to be installed within the customer's water system are for the safety and protection of the customer's water system.
- F. In the event a system hazard is determined to exist, LVWD Customer Service Inspector shall notify Lower Valley Water District to immediately terminate water service to the premises. Lower Valley Water District shall restore water service to the premises when the system hazard has been controlled or eliminated.
- G. Lower Valley Water District shall respond to customer's water quality complaints by conducting inspections of the customer's premises to determine compliance with the provisions of cross connection isolation requirements. Lower Valley Water District shall notify the LVWD Customer Service Inspector in the event actual or potential cross connections require isolation control.
- H. All backflow prevention assemblies shall be installed in their required orientation, in accordance with the proper degree of hazard and pressure condition as indicated in this manual.

VI. Backflow Prevention Assembly Enclosures

- A. Backflow Prevention assemblies shall be protected from freezing and vandalism by a method acceptable to Lower Valley Water District. Protective enclosure design, installation and maintenance shall comply with OSHA 29 CFR, Part 1910.146- "Confined Spaces."
- B. The customer shall be responsible for the cost of design, installation and maintenance of protective enclosures required to prevent the backflow prevention assemblies from freezing and vandalism. The protective enclosure shall provide for adequate drainage from testing, flushing or relief valve discharging.
- C. Protective enclosures must be installed and maintained so that backflow prevention assemblies are safely and readily accessible for testing, maintenance and repairs and any insulation installed directly on the assembly shall be designed and constructed to allow for verification of the assembly size, make, model, and serial number for identification purposes during annual testing.

Backflow Prevention Assembly Application Table

Backflow Prevention Assembly Application Table						
	Sewer	Health Hazar	Non-Health Hazard	Back Pressure	Back-Siphonage	Continuous Pressure
Air Gap	YES	YES	YES	YES	YES	YES
RP	NO	YES	YES	YES	YES	YES
DC	NO	NO	YES	YES	YES	YES
PVB/SVB	NO	YES	YES	NO	YES	YES
AVB	NO	YES	YES	NO	YES	YES

- ° The air gap is the only backflow preventer used for sewer connections.
- ° The reduced pressure assembly is the only mechanical assembly allowed for use in high hazard applications with backpressure
- ° The double check valve assembly is the only assembly that is not allowed in high hazard applications. It is restricted for use in low hazard applications only!
- ° The requirements for the spill-resistant pressure vacuum breaker and the pressure vacuum breaker are the same.
- ° The pressure and atmospheric vacuum breakers must not be subjected to backpressure.
- ° The atmospheric vacuum breaker must not be subjected to continuous pressure.
- ° The atmospheric vacuum breaker is limited to isolation applications only.

AG (Air Gap)

RP (Reduced Pressure)

RPDA (Reduced Pressure Principle Detector Assembly)

DC (Double Check Valve Assembly)

DCDA (Double Check Valve Detector Assembly)

PVB (Pressure Vacuum Breaker Assembly)

SVB (Spill Resistant Pressure Vacuum Breaker Assembly)

AVB (Atmospheric Vacuum Breaker)

Minimum Containment Requirement	
Minimum Requirements for Containment Cross-Connection Control	
Type of Facility	Type of Assembly
Auxiliary water supply	AG,RP
Car washing facilities	AG,RP
Commercial Laundry	AG,RP
Construction water service points	AG,RP
Dairy product processing	AG,RP
Dental Offices	AG,RP
Drawing water from public fire hydrants for filling trucks	AG,RP
Electroplating	AG,RP
Firelines	RPDA
Food and beverage processing facilities, including restaurants	AG,RP
Garment finishers	AG,RP
Green houses	AG,RP
Hospitals and Clinics	AG,RP
Landscape irrigation systems connected directly to public water supply	AG, RP, PVB
leased space (shopping centers, warehouses)	AG, RP
Metal finishing	AG, RP
Metal molding and forming	AG, RP
Metal plating	AG, RP
Mortuaries and morgues	AG, RP
Nursing and convalescent homes	AG, RP
Petroleum processing or storage facilities	AG, RP
Pharmacies	AG, RP
Photographic film processing	AG, RP
Plants using radioactive material	AG, RP
Plastic injection	AG, RP
Premises with more than one connection to the public water supply	AG, RP
Premises where inspection is restricted	AG, RP
Premises that are totally or partially outside the State of Texas	AG, RP
Premises containing extremely toxic substances	AG, RP
Premises with uncontrolled cross connections	AG, RP
Premises with complex piping systems	AG, RP
Private wells	AG, RP
Radiator Shops	AG, RP
Ready-mix concrete	AG, RP
Reclaimed water systems	AG, RP
Sand and gravel plants	AG, RP
Schools and colleges with laboratories	AG, RP
Sewage Lift Stations	AG, RP
Sewage treatment plants	AG, RP
Tall building (protection against excessive head of water only)	DC, RP
Taxidermy	AG, RP
Veterinary and animal grooming	AG, RP

TYPICAL ISOLATION REQUIREMENTS

Typical Isolation Applications for Backflow Prevention Assemblies					
Type of Use	Air Gap	RP	DC	PVB/SVB	AVB
Air conditioning systems	Yes	Yes	No	Yes	Yes
Air washers	Yes	Yes	No	Yes	Yes
Aspirators	Yes	Yes	No	Yes	Yes
Auxiliary water supply	Yes	Yes	No	No	No
Boilers (hot water/steam)	Yes	Yes	No	No	No
Can and bottle washers	Yes	Yes	No	Yes	Yes
Chilled water systems	Yes	Yes	No	No	No
Cooling Towers	Yes	Yes	No	No	No
Compressors (water cooled)	Yes	Yes	No	No	No
Decorative ponds	Yes	Yes	No	No	No
Degreasing equipment	Yes	Yes	No	No	No
Dental Equipment	Yes	Yes	No	Yes	Yes
Drinking fountains	Yes	Yes	No	No	No
Evaporative coolers	Yes	Yes	No	Yes	Yes
Fountains	Yes	No	No	No	No
Garbage disposals	Yes	Yes	No	No	No
Hose Bibs	Yes	Yes	No	Yes	Yes
Hydrants	Yes	Yes	No	Yes	Yes
Lawn Irrigation Systems	Yes	Yes	No	Yes	Yes
Medical Equipment	Yes	Yes	No	Yes	Yes
Non-pressure vessel	Yes	Yes	No	Yes	Yes
Photo processing equipment	Yes	Yes	No	No	No
Post mix beverage dispenser units CO2	Yes	Yes	No	Yes	Yes
Reclaimed water system	Yes	Yes	No	No	No
Recreational vehicle dump station	Yes	Yes	No	No	No
Sewer	Yes	No	No	No	No
Sinks (hand, janitor, dish, science)	Yes	No	No	No	No
Solar water heating equipment	Yes	Yes	No	No	No
Swimming Pools	Yes	Yes	No	No	No
Truck mounted water tanks	Yes	Yes	No	No	No
Tubs (hot baths)	Yes	Yes	No	No	No
Veterinary equipment	Yes	No	No	No	No
Water closets	Yes	Yes	No	Yes	Yes

I. Defined

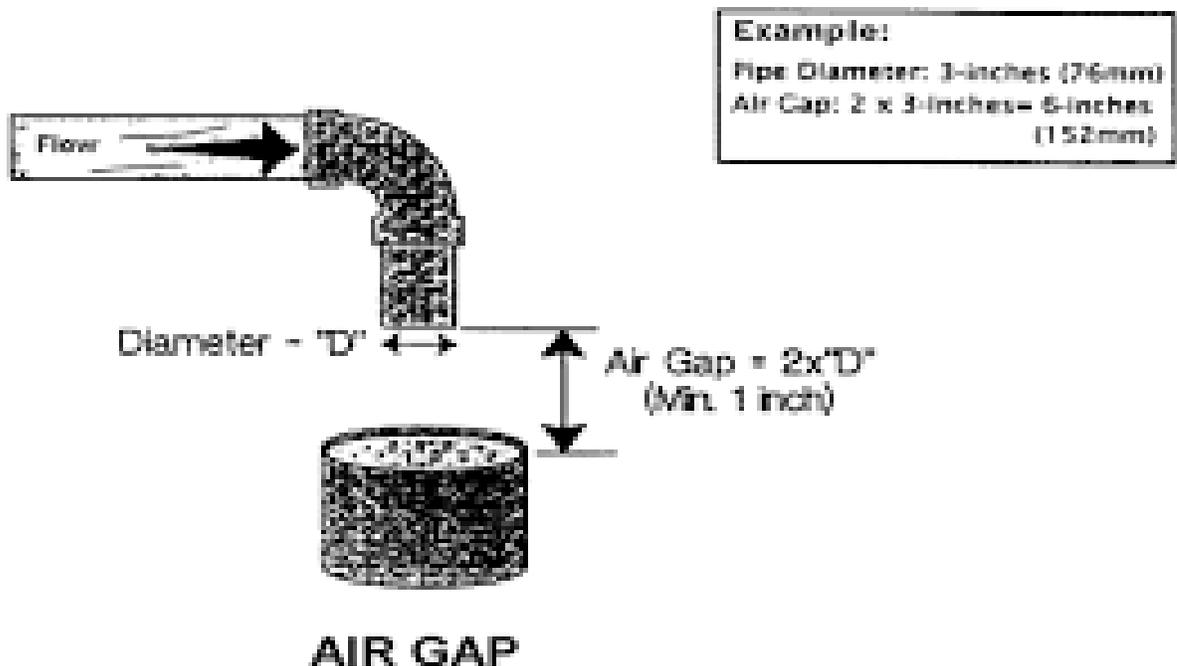
An air-gap is the unobstructed vertical distance through the free atmosphere between discharge end of a potable water supply pipe and the flood level rim of an open or non-pressure vessel.

II. Installation Requirements

- A. The air gap must either be at least twice the diameter of the supply pipe outlet above the flood level rim of the vessel or not less than one inch, whichever is greater.
- B. The air gap shall be installed with adequate access and clearance for inspection and located outside any enclosure or hooded area containing fumes that are toxic, poisonous, or corrosive.
- C. A permanent platform is necessary whenever the assembly is installed more than five feet above floor or grade. The platform must be within five feet of the lowest part of the assembly and must meet all applicable safety standards and codes.

III. Testing Requirements

Air Gaps must be inspected as frequently as the testing requirements for mechanical backflow prevention assemblies.



Reduced Pressure Principle Assembly

I. Defined

A reduced pressure backflow prevention assembly consists of two independently acting internally loaded check valves, a hydraulically operating, mechanically independently pressure differential relief valve located between the check valves and below the first check valve. The assembly shall be equipped with two properly located resilient seated test ports, and two resilient seated isolation valves at each end of the assembly.

II. Installation Requirements

- A. The reduced pressure principle assembly (RP) must be installed between 12" and 36" above grade from the lowest part the assembly for containment installations, and between 12" and 60" above floor or grade from the lowest part of the assembly for isolation installations. The assembly shall not be subjected to flooding.
- B. Drainage requirements for RP must hydraulically calculated to handle the maximum relief valve discharge rate. Most manufacturer's air-gap drains are designed to only handle occasional spitting from the relief valve and will not accommodate a full discharge. An approved air-gap separation at the relief valve is required.
- C. RPs must be installed in locations where intermittent and continuous discharge form the relief valve will not be objectionable.
- D. In cold climates, RPs must be protected from freezing with a positive heat source. Whenever the RP is insulated, precautions must be taken to prevent blockage of the relief valve opening and access to components. The insulation must be easy to remove in order to facilitate testing and repair.
- E. RPs must be installed horizontal and plumb unless specifically noted int the "List of Approved Backflow Prevention Assemblies" published by the Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California.
- F. Thermal expansion and/or water hammer in the outlet piping of the assembly can cause excessive pressure (backpressure). A water hammer arrestor, thermal expansion tack, resilient seated check valve, or surge suppressor installed in the outlet piping is recommended to avoid damage to the piping system and assembly.
- G. Fluctuating inlet pressure may cause intermittent discharge of the relief valve and eventual fouling of the assembly. In a static condition, the zone between the two check valves must be maintained at least 2.0 psi below the supply pressure. A resilient seated check valve installed in the inlet piping of the RP is recommended to maintain constant pressure of the zone during water supply pressure fluctuations.
- H. Assemblies 2-1/2" and larger must be adequately supported.
- I. Immediately after installation and before the assembly is tested or service is restored, the assembly must be thoroughly flushed. This is accomplished by completely removing the No. 1 check valve and opening the No. 1 shut-off valve to flush debris that may foul the assembly.
- J. The size of the RP shall not be less than the size of the water supply piping.

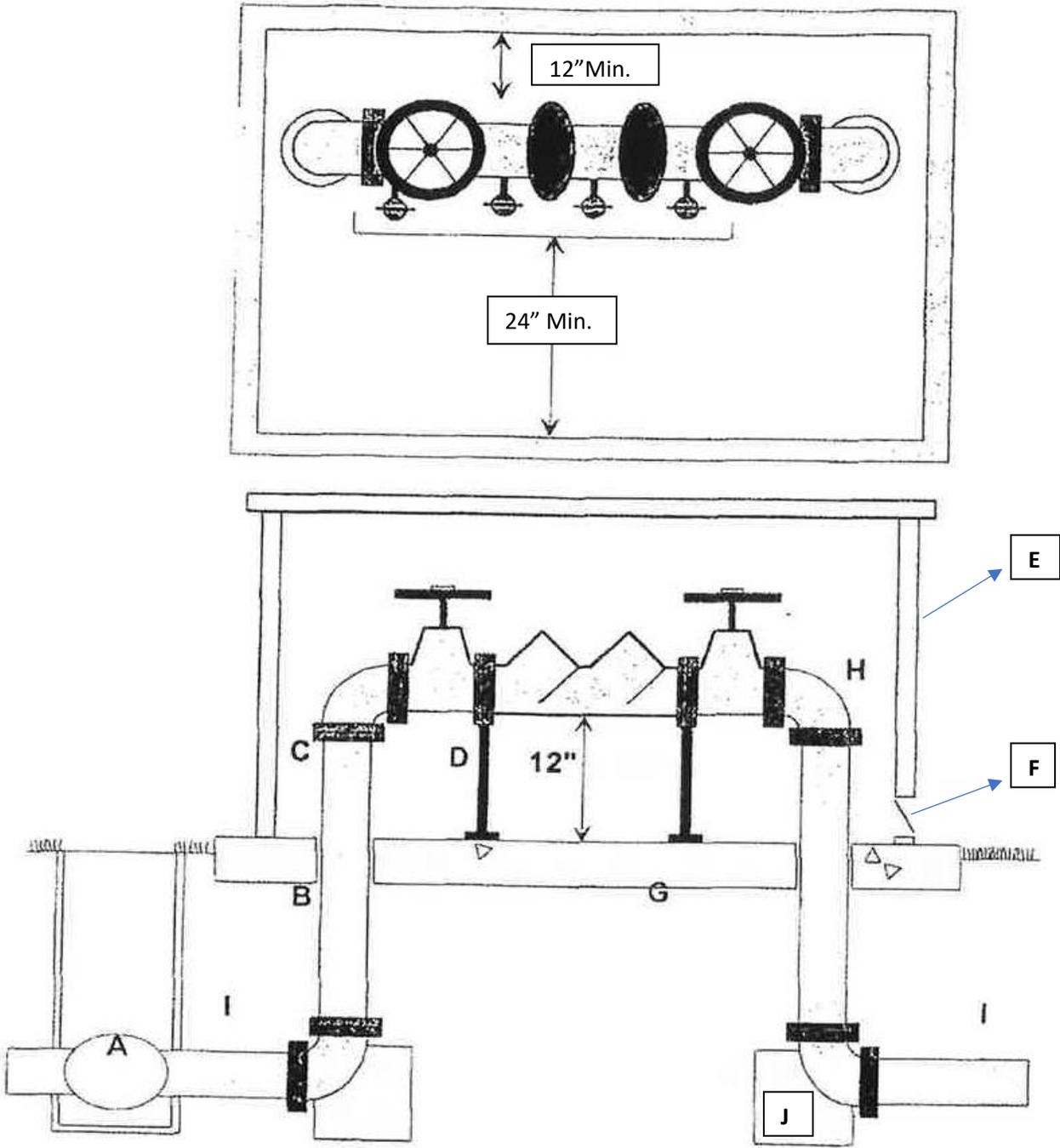
- K. The RP shall be installed in accordance with the assembly's operating pressure and temperature rating.
- L. The RP shall be installed with adequate access and clearance for testing, maintenance, and repairs and outside any enclosure or hooded area containing fumes that are toxic, poisonous, or corrosive.
- M. A permanent platform is necessary whenever the assembly is installed more than five feet above floor or grade. The platform must be within five feet of the lowest part of the assembly and must meet all applicable safety standards and codes.
- N. The RP shall be installed in accordance with the manufacturer's flow rate specifications. The flow rates and pressure loss due to increasing or decreasing flow rates will vary from one manufacturer to another.

III. Testing Requirements

Reduced pressure principle assemblies must be tested to ensure proper operation by a certified backflow prevention technician upon installation, repair, or relocation and at least annually thereafter. The following steps shall be used by certified backflow prevention technicians when testing reduced pressure principle assemblies.

1. Determine the apparent pressure differential pressure of check valve No. 1 (referred to as the "apparent reading") in the direction of flow. This step shall not be recorded on the test report form; it is used in comparison with the confirmed reading – step 4.
2. Test the operation of the differential pressure relief valve. The differential pressure relief valve must operate to maintain the zone between the two check valves at least 2.0 psi less than supply pressure. Record the differential pressure reading, psid, at which the relief valve opened on the test form.
3. Determine if CV-2 closes tight in reverse flow. The check valve is required to close tight. Record whether check valve No. 1 leaked or closed tight on the test form.
4. Determine the differential pressure of check valve No. 1 in the direction of flow. Record this reading (referred to as the 'confirmed reading') on the test form. Also record whether check valve No. 1 leaked or closed tight.
5. Determine the differential pressure of check valve No. 2 in the direction of flow. The differential pressure shall be at least 1.0 psid. Record this reading for check valve No. 2 on the test report.
6. Compare the two readings of check valve No.1 – steps 1 and 4. These readings should be within 1.0 psid. This value is not recorded in the test report form; it is used to determine if the technician properly tested the assembly.
7. The difference between the readings of check valve No.1 (step 4) and the relief valve opening point (step 2) shall be at least 3.0 psi or greater. This difference is known as the "buffer". The buffer prevents the relief valve from discharging due to small line pressure fluctuations. This value is not recorded in the test report form.

**Reduced Pressure Principle Assembly
Containment Installation**



- A. Water Meter**
- B. No outlets between assembly and meter**
- C. Union/Flanges**
- D. Metal supports**
- E. Protective Enclosure**

- F. Drain Required**
- G. Minimum 4" reinforced concrete slab**
- H. Sleeves/Insulation**
- I. Service Line**
- J. Joints to be adequately restrained**

Reduced pressure Principle Detector Assembly

I. Defined

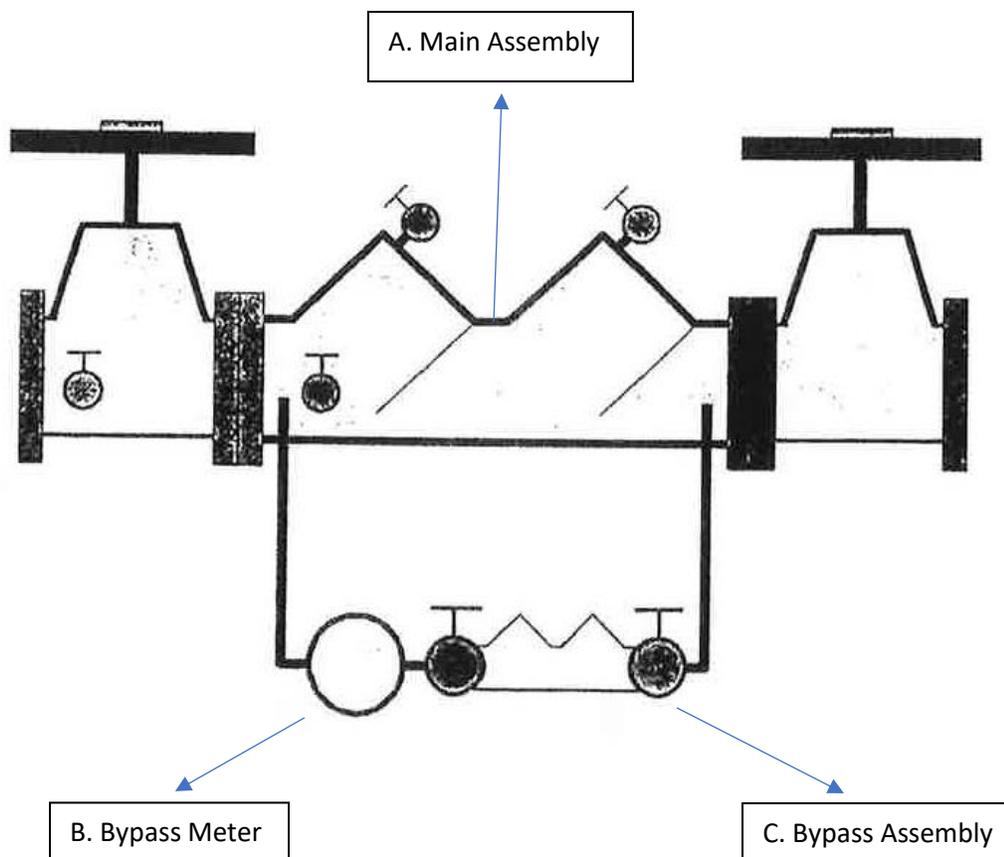
A reduced pressure principle detector assembly consists of a line sized approved reduced pressure principle assembly with a bypass containing a water meter and another approved reduced pressure principle assembly. The meter shall register accurately for low flow rates from 0 to 3 gpm and shall register for all rates of flow. The reduced pressure principle detector assembly is used primarily on fire sprinkler systems.

II. Installation Requirements

The installation requirements for the reduced pressure principle detector assembly are the same as the requirements for the reduced pressure principle assembly.

III. Testing Requirements

The testing requirements for the mainline and bypass assemblies are the same as the reduced pressure principle assembly. However, in order to force water through the bypass, the total differential across the main line assembly must be higher than the bypass assembly. At the conclusion of the test, water flow must be verified through the assembly; this may be accomplished by opening the main drain of the fire sprinkler system.



Pressure Vacuum Breaker Assembly

I. Defined

A pressure vacuum breaker assembly consists of an independently operating internally loaded check valve, an independently operating loaded air inlet valve on the discharge side of the check valve. The assembly shall be equipped with two properly located resilient seated test ports and two resilient seated isolation valves at each end of the assembly.

II. Installation Requirements

- A. The pressure vacuum breaker assembly (PVB) shall be installed between 12" and 60" above grade, floor, or platform and at a minimum of 12" above the highest point of the assembly's outlet piping. The assembly installation shall include unions.
- B. There shall be adequate drainage provisions to accommodate water discharge from flushing and testing.
- C. In cold climates, PVBs must be protected from freezing with a positive heat source. Whenever the PVB is insulated, the insulation must be easy to remove in order to facilitate testing and repair.
- D. PVBs must be installed horizontal and plumb.
- E. Immediately after installation and before the assembly is tested or services is restored, the assembly must be thoroughly flushed. This is accomplished by completely removing the air inlet valve and check valve and opening the No. 1 shut-off valve to flush debris that may foul the assembly.
- F. The size of the PVB shall not be less than the size of the water supply piping.
- G. The PVB shall be installed in accordance with the assembly's operating pressure and temperature rating.
- H. The PVB shall be installed with adequate access and clearance for testing, maintenance, and repairs and outside an enclosure or hooded area containing fumes that are toxic, poisonous, or corrosive.
- I. A permanent platform is necessary whenever the assembly is installed more than five feet above floor or grade. The platform must be within five feet of the lowest part of the assembly and must meet all applicable safety standards and codes.
- J. The PVB shall be installed in accordance with the manufacturer's flow rate specifications. The flow rates and pressure loss due to increasing or decreasing flow rates will vary from one manufacturer to another.
- K. In containment applications, the PVB shall only be used for dedicated irrigation systems such as parks, medians, and golf courses.

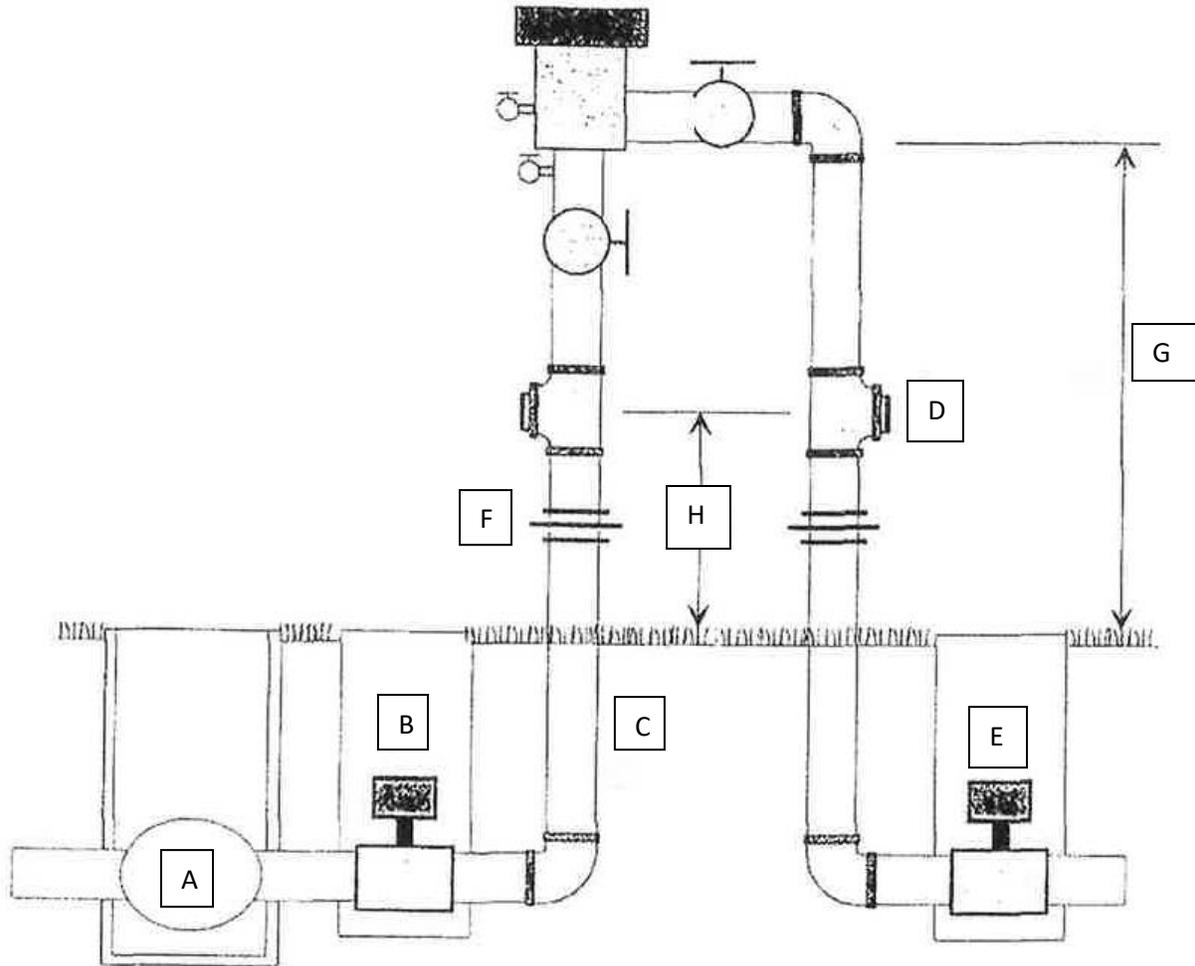
III. Testing Requirements

Pressure Vacuum Breakers assemblies must be tested to ensure proper operation by a certified backflow prevention technician upon installation, repair, or relocation and at least annually thereafter. The following steps shall be used by certified backflow prevention technicians when testing pressure vacuum breaker assemblies.

- A. Determine the pressure in the body when the air inlet valve opens. The air inlet valve shall open when the pressure in the body is at least 1.0 psi.
- B. Determine the differential pressure of the check valve in the direction of flow. The differential pressure shall be at least 1.0 psid.

Pressure Vacuum Breaker Assembly

Containment Installation



- A. Water Meter
- B. Master control valve (optional)
- C. Service line – no outlets between meter and assembly allowed.
- D. Tee with drain tee or ball valve (optional)
- E. Zone Control Valve
- F. Unions
- G. 12” minimum above all outlet piping and components – 60” maximum
- H. Tee with drain plug or ball valve, minimum of 6” above grade (typical)

Spill-Resistant Pressure Vacuum Breaker Assembly

I. Defined

A Spill-resistant pressure vacuum breaker assembly consists of an independently operating internally loaded check valve, an independently operating loaded air inlet valve on the discharge side of the check valve. The assembly shall be equipped with one properly located resilient seated test port and vent valve and two resilient seated isolation valves at each end of the assembly.

II. Installation Requirements

- A. The spill-resistant pressure vacuum breaker assembly (SVB) is intended for indoor installations.
- B. The SVB shall be installed between 12” and 60” above grade, floor, or platform and at a minimum of 12” above the highest point of the assembly’s outlet piping. The assembly installation shall include unions.
- C. There shall be adequate drainage provisions to accommodate water discharge from flushing and testing.
- D. In cold climates, SVBs must be protected from freezing with a positive heat source. Whenever the SVB is insulated, the insulation must be easy to remove in order to facilitate testing and repair.
- E. SVBs must be installed horizontal and plumb.
- F. Immediately after installation and before the assembly is tested or service is restored, the assembly must be thoroughly flushed. This is accomplished by completely removing the air inlet valve and the check valve and opening the No. 1 shut valve to flush debris that may foul the assembly.
- G. The size of the SVB shall not be less than the size of the water supply piping.
- H. The SVB shall be installed in accordance with the assembly’s operating pressure and temperature rating.
- I. The SVB shall be installed with adequate access and clearance for testing, maintenance, and repairs and outside any enclosure or hooded area containing fumes that are toxic, poisonous, or corrosive.
- J. A permanent platform is necessary whenever the assembly is installed more than five feet above floor or grade. The platform must be within five feet of the lowest part of the assembly and must meet all applicable safety standards and codes.
- K. The SVB shall be installed in accordance with the manufacturer’s flow rate specifications. The flow rates and pressure loss due to increasing or decreasing flow rates will vary from one manufacturer to another.

III. Testing Requirements

Spill-resistant pressure vacuum breaker assemblies must be tested to ensure proper operation by a certified backflow prevention technician upon installation, repair, or relocation and at least annually thereafter. The following steps shall be used by certified backflow prevention technicians when testing spill-resistant pressure vacuum breaker assemblies.

- A. Determine the pressure in the body when the air inlet valve opens. The air inlet valve shall open when the pressure in the body is at least 1.0 psi.
- B. Determine the differential pressure of the check valve in the direction of the flow. The differential pressure shall be at least 1.0 psid.

I. Defined

An atmospheric vacuum breaker consists of a float check, a check seat, and an air inlet port.

II. Installation Requirements

- A. The atmospheric vacuum breaker (AVB) shall be installed between 6” and 60” above grade, floor, or platform and at a minimum of 6” above the highest point of the device’s outlet piping. The installation shall include unions.
- B. There shall be adequate drainage provisions to accommodate water discharge from flushing and testing.
- C. In cold climates, AVBs must be protected from freezing with a positive heat source. Whenever the AVB is insulated, the installation must be easy to remove in order to facilitate testing and repair.
- D. AVBs must be installed horizontal and plumb.
- E. Immediately after installation and before service is restored, the device must be thoroughly flushed. This is accomplished by completely removing the float check and opening an inlet shut-off valve to flush debris that may foul the device.
- F. The size of the AVB shall not be less than the size of the water supply piping.
- G. The AVB shall be installed in accordance with the devices’ operating pressure and temperature rating.
- H. The AVB shall be installed with adequate access and clearance for testing, maintenance, and repairs and outside any enclosure or hooded area containing fumes that are toxic, poisonous, or corrosive.
- I. A permanent platform is necessary whenever the device is installed more than five feet above floor or grade. The platform must be within five feet of the lowest part of the device and must meet all applicable safety standards and codes.
- J. The AVB shall be installed in accordance with the manufacturer’s flow rate specifications. The flow rates and pressure loss due to increasing or decreasing flow rates will vary from one manufacturer to another.

III. Testing Requirements

Atmospheric vacuum breakers must be inspected as frequently as the testing requirements for other mechanical backflow prevention assemblies.

Certified Backflow Prevention Technician

- A. A certified backflow prevention technician is a person who is approved to test, maintain, inspect and repair backflow prevention assemblies within the jurisdictional limits of the utility. The Technician's primary responsibility is to Lower Valley Water District. The technician shall have completed a training course on cross-connection control and backflow prevention approved by the Texas Commission on Environmental Quality and agreed to abide by the established Code of Ethics by signing said document. The Code of Ethics is shown in this Manual. In the event the certified tester fails to comply with LVWD Rules and Regulation and the Code of Ethics, his right to test, maintain, inspect, or repair backflow assemblies as a listed Lower Valley Water District Certified Backflow Prevention Technician shall be revoked. Technician classifications are as follows:
1. **General Tester and Repairman**
A General Tester is qualified to test and repair backflow prevention assemblies on any domestic, commercial, industrial or irrigation service. Exception: Firelines – see Fireline Tester and repairman.
 2. **Fireline Tester and Repairman**
A Fireline Tester is qualified to test and repair backflow prevention assemblies on firelines only. The Texas Fire Marshall's office requires that a person performing maintenance on firelines must be employed by and approved fireline contractor.
- B. Technicians shall register with the Cross-Connection Control Program Coordinator prior to testing backflow prevention assemblies within the District. Each technician will be issued a certification number that must appear on all backflow prevention assembly test report forms. Every year the certified tester shall reapply with the Cross-Connection Coordinator for approval to continue installing, maintaining, inspecting, or repairing backflow preventers.
- C. The technician shall test, maintain, inspect, and repair backflow prevention assemblies in accordance with methods and procedures approved by Lower Valley Water District. The technician shall submit reports of assembly testing and repairs to the Cross-Connection Control Program Coordinator within one week from the time the testing and/or repairs were completed. Sample test report forms are available from Lower Valley Water District free of charge.
- D. If the certified backflow prevention technician discovers that any existing backflow prevention assembly is not installed commensurate with the degree of hazard and pressure conditions or if the assembly is not installed in its required orientation the technician shall inform the owner and the Cross-Connection Control Program Coordinator. It is the responsibility of the Cross-Connection Control Program Coordinator to enforce the provisions of the Cross-connection Control Program to bring the assembly into compliance. The technician does not have the authority to discontinue the customer's water service or to alter the design or operation of approved backflow prevention assemblies.
- E. Lower Valley Water District has a contractual relationship with the customer, and not with the certified backflow prevention technician. Therefore, actions related to the customer's non-compliance with the Cross-Connection Control regulations of the Lower Valley Water District will go through the customer and the test technician. However, Lower Valley Water District will deal directly with certified backflow prevention technicians for cases involves violation of Lower Valley Water District's Code of Ethics.

Testing and Maintenance of Backflow Prevention Assemblies

I. Testing Requirements

- A. All containment backflow prevention assemblies within the jurisdiction of Lower Valley Water District shall be tested for proper operation by private sector certified backflow prevention technicians at the time of installation, repair, or relocation and at least on an annual schedule thereafter or more often when required by the Cross-Connection Control Program Coordinator. In addition, containment backflow prevention assemblies installed on new services shall be tested by certified backflow prevention technicians for proper operation immediately upon installation and before water service to the premises is turned on.
- B. The customer shall make necessary arrangements for all required testing of containment backflow prevention assemblies. Certified test technicians shall provide a report to Lower Valley Water District within one week after the test. Within one week from the time the test was completed, an original of the test report indicating satisfactory operation of the backflow prevention assembly, and any repairs done, shall be forwarded to the Cross-Connection Control Program Coordinator and a copy shall be faxed or mailed to the Cross-Connection Control Program Management Firm.
- C. Assemblies shall be tested in accordance with the test procedures set forth in this manual. All records of inspections, tests, repairs, overhauls, and replacements must be maintained by the customer for a period of a least three years.
- D. Assemblies that fail the operational test shall be repaired, overhauled, and retested immediately by a certified backflow prevention technician. Testing of the assemblies shall not be considered to be complete until a test report certifying that the assembly is operating correctly has been received. Failing test reports shall not submitted.
- E. Test reports will only be accepted from certified backflow inspection technicians.

II. Customer Notification

Lower Valley Water District, or its designated Cross-Connection Control Program Coordinator, will give written notice to each affected water customer when it is time for the customer's annual testing of containment backflow prevention assembly(s). at a minimum, two written notices will be sent to the customer. The first written notice shall give the customer thirty days to have the assembly(s) tested. A second written notice shall be sent to the customers that have not had their assembly(s) tested as directed in the first notice; the second notice shall give the customer 10 days to have the assembly(s) tested. If the customer has not complied with the second written notice, Lower Valley Water District may terminate water service until the backflow prevention assembly(s) in question is tested.

III. Tested Equipment Calibration

Equipment used in the testing of backflow prevention assemblies shall be calibrated, to the satisfaction of the Cross-Connection Control Coordinator, for accuracy annually by a qualified calibration facility. The serial number of the test equipment used shall be included on the backflow prevention assembly test report form.

Fees, Violations, and Severability

1. Fees

Inspection Fee – Lower Valley Water District shall charge the customer \$50.00 as an initial acceptance fee on a containment cross-connection control assembly that is installed and tested by a State Certified Backflow Technician.

2. Severability

If any provision, section, subsection, sentence, clause, or phrase of the regulations, or the application of same to any person or set of circumstances, is for any reason held to be unconstitutional void, or invalid the validity of the remaining portions of these regulations shall not be affected and all provisions of the regulation are declared to be severable for the purpose.

3. Violations

- A. Any customer who willfully removes or bypasses any backflow prevention assembly or dual check valve, falsifies test reports, obtains water from a fire hydrant in violation of Cross-Connection Control requirements, allows uncontrolled cross connections to exist, connects a fire protection system to a normal water service, or fails to cooperate in the installation, maintenance testing or inspection of backflow prevention assemblies as required by these regulations shall be grounds for the discontinuance of water service to the customer's premises or for the requirement for an air-gap separation from the public water supply. Water service shall not be restored until such conditions are corrected.
- B. Discontinuance of water service may be summary, immediate and without written notice whenever, in the judgement of Lower Valley Water District, such action is necessary to protect the purity of the safety of the public water supply.