
# Backflow / Cross Connection Control Program

City of Elizabeth City
Public Utilities Department
Water and Sewer Maintenance Division

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## Introduction: What is Backflow / Cross Connection Control?

A water distribution system is designed to allow water to travel in one direction from the treatment plant to the customer. Under certain conditions, water can flow in the opposite direction from the normal flow. This unwanted process is known as backflow or cross connection. When this occurs, harmful contaminants can mix with drinking water and potentially threaten the safety of our water supply. Backflow prevention devices keep non-potable water from flowing backwards toward a potable water source.

Mandatory regulations require water suppliers take steps to ensure that water delivered to homes or businesses remains clean and safe. To address this, approved backflow prevention devices are required for industrial, commercial, and irrigation customers connecting to the City of Elizabeth City water utility. The customer is responsible for installation and maintenance of the device. The City works to protect the water supply by ensuring backflow devices are maintained properly and cross connection sources are eliminated.

It is the intent of the City of Elizabeth City Public Utilities Department to keep persons who are involved with the installation or upkeep of backflow prevention assemblies supplied with current information.

## Definitions

Atmospheric Vacuum Breaker (ASSE Approval #1001):
May be used at the discharge of the control valve when located at least six inches above the flood rim of the container. This device shall not be subject to continuous pressure or backpressure backflow.

Continuous Pressure: 12 or more hours of water usage in any 24-hour period.

Double Check Valve Assembly (DCVA) (ASSE Approval #1015):
This assembly may be used singly or in parallel with any flow requirements. This assembly shall not include contact with toxic chemicals or liquids that may be a health hazard.

Severe Hazard (Health Hazard):
Actual or potential threat of contamination that presents an imminent danger to the public health with consequence of serious illness or death.

Moderate Hazard (Non-Health Hazard):
One that presents foreseeable and significant potential for pollution, nuisance, aesthetically objectionable or other undesirable alterations of the drinking water supply.

Hose Bibb Vacuum Breaker (ASSE Approval #1011):
May be used on hose bibs and hose hydrants except when usage would be at a point 6 inches higher than the vacuum breaker and when usage would include contact with toxic chemicals or liquids which may be a health hazard.

Pressure Type Vacuum Breaker (ASSE Approval #1020):
This assembly must be installed at a minimum of 12 inches above all downstream piping and shall not be subjected to backpressure backflow. It may be used under continuous pressure applications.

Readily Accessible:
Having direct access to a backflow preventer without the need of removing any panel, door or similar covering of the item described, and without requiring the use of portable ladders, chairs, etc.

Reduced Pressure Assembly (RP) (ASSE Approval #1013):
This assembly may be used singly or in parallel with any flow requirements.

# General Backflow Requirements

## Notification

Any person planning to install, remove, or relocate a backflow prevention assembly shall notify Public Utilities Department. Backflow preventers must be tested by a certified tester when first placed in service. To receive a current list of certified backflow prevention assembly testers or request other information, please call Public Utilities Department at (252) 337-6628.

OTHER IMPORTANT NUMBERS:
PUBLIC UTILITIES DIRECTOR (252) 337-6628
CITY INSPECTION (252) 337-6868
CITY FIRE CHIEF (252) 338-3913

## Inspections

Public Utilities Department – Utility Systems Superintendent shall inspect backflow prevention assemblies installed, removed, or relocated within the City's right of way. They shall also inspect backflow installations for new constructions as instructed by Community Development Division.

## Backflow Preventer Approvals

All in-line testable backflow prevention assemblies must meet or exceed standards set forth by USCFCCHR (The University of Southern California Foundation for Cross-Connection Control and Hydraulic Research) or ASSE (The American Society of Sanitary Engineering). Backflow prevention assemblies to be used in fire suppression systems must have the additional approval of FM (Factory Mutual) and comply with the NFPA (National Fire Protection Association) Code. To determine whether a particular size and model is approved by the above agencies, contact the Public Utilities Department.

## Facilities and Applications Requiring Backflow Prevention

Facilities are broken into two categories:

### Moderate Hazard-DCVA

- Fire Sprinkler systems without booster pump facilities or chemical additives
- Connection to tanks, lines and vessels that handle non-toxic substances
- Lawn sprinkler systems without chemical injection or booster pumps
- Automotive service stations, bakeries, beauty shops with no health hazard and bottling plants with no back pressure
- Most commercial establishments
- Etc.

### Severe Hazard-RPZ or Air Gap

- All directly connected to lawn sprinkler systems
- Wastewater treatment plants
- Connection to an unapproved water system or unapproved auxiliary water supply
- Connection to tanks, pumps, lines, steam boilers and vessels that handle sewage, lethal substances, toxic, or radioactive substances
- Fire sprinkler systems with booster pump facilities or chemical additives
- Buildings with five or more stories above ground level
- Hospitals, dental offices and other medical facilities
- Morgues, mortuaries and autopsy facilities
- Metal plating facilities
- Bottling plants subject to backpressure
- Canneries
- Battery manufacturers
- Exterminators
- Lawn care companies
- Chemical processing plants
- Dairies
- Film laboratories
- Car wash facilities
- Dye works
- Laundries
- Swimming pools
- Water front facilities

Notes:

- Under no circumstance will a potable water line be directly or indirectly connected to any piping or equipment that conveys sewage.
- An approved double check detector assembly (DCDA) is required on a low hazard fire system and an approved reduced pressure detector assembly (RPDA) is required on a high hazard fire system.
- This is not an exhaustive list.

## Testing Requirements

The below listed backflow prevention assemblies are required to be tested on an annual basis:

- Pressure & spill resistant type vacuum breaker assemblies (PVB or SVB)
- Double check valve assemblies (DCVA)
- Double check detector assemblies (DCDA)
- Reduced pressure assemblies (RPA)
- Reduced pressure detector assemblies (RPDA)
- Reduced pressure zone assemblies (RPZ/RPZA)

The City of Elizabeth City requires a certified tester perform all testing. See *Certified Testers* portion for additional details.

### Scheduling a Test

It is the responsibility of the Customer to contact an approved tester to schedule a test. Tests for new installations must be completed and submitted to the Public Utilities Department as soon as the device is installed. Annual testing must be completed and submitted to the Public Utilities Department 10 days after the date of the test but before the devices registered annual test date.

#### Notices and Penalties

If a successful test report is not received by the annual test date, the Public Utilities Department will send out a first notice to the owner of the device to notify them their device is out of compliance. Following **thirty days** of the first notice, a second notice will be mailed certified giving the owner **fifteen days** to comply. After fifteen days of the second notice, a third and final notice will be hand delivered to the property, notifying them they will have only **five days** to comply before the City will be obligated to hire a private contractor to perform the work for them. If the device is not in compliance following the five-day period of the third notice, the City will contact an appropriately licensed contractor to test the assembly or perform testing themselves. Once this occurs, the owner will be responsible for paying any expenses accrued from the test, any repairs that may need to be done, and an administrative fee to the City. **Depending on the severity, the owner could be subject to a delay in services for their property any time following thirty days of the first notice.**

### What if the device fails annual testing?

If the backflow device does not pass annual testing, **it is the responsibility of the tester to notify the customer of their failed test and submit the failed maintenance report to Public Utilities.** The owner must then notify Public Utilities of their action plan for repairs and retesting. Depending on the degree of hazard, the device must be repaired and retested within **five business days for severe hazard devices**

and **ten days for moderate hazard devices**. Depending on the severity of the device, the owner could be subject to a delay in services for their property if their device is not in compliance within the allotted time.

### Certified Testers

The City of Elizabeth City requires that a certified tester perform all testing. A certified tester is a person who has proven their competency to test, repair, overhaul and make reports on backflow prevention assemblies as evidenced by the successful completion of an approved Cross Connection Control School. The Public Utilities Department will compose a list of known local backflow testers annually to assist owners with the testing of their device. Testers wishing to be considered must submit up to date State Certification to be considered. The certified tester is responsible for submitting all test forms to the City's Public Utilities Department. However, The City of Elizabeth City Public Utilities Department highly encourages owners to confirm with their tester the test has been submitted and received by The City of Elizabeth City Public Utilities Department.

### Authorized Installers:

Any assembly required to be installed by the provision of this policy shall be installed by a properly licensed plumber. The plumber shall only be allowed to install backflow preventers on applications covered under their license. Any new device installed must be retested by a properly licensed tester.

## Backflow Preventer Repairs

Backflow prevention devices shall be retested and recertified on a yearly basis. All testing and maintenance must be performed by a certified professional. Recertification is also required after any maintenance is performed on the reduced pressure assembly. Backflow preventers are required to be repaired or replaced within five days (Severe Hazard) and ten days (Moderate Hazard) once they are determined to be failing. Backflow preventers are required to be brought up to current installation standards when the backflow preventer failure occurs. This section also applies to backflow preventers that are installed in a manner that can create a health risk to the water system. Since the Public Utilities Department's regulations are primarily health code based, existing backflow preventers are not grandfathered as they are subject to the plumbing code. Contact the Public Utilities Department, Utility Systems Superintendent to determine if an installation meets present cross connection control specifications. If the installation does not meet requirements, the Superintendent will inform the property owner or their agent of any deficiencies and discuss options available for remedy.

Current code requires that backflow preventers are:

1) ready-access;
2) installed so that they are not submerged in liquid or soil;

3) equipped with a wye mesh strainer installed immediately before the #1 shutoff valve of the backflow preventer (on every application except fire system use); and
4) installed according to their listing in USCFCCHR manual.

Refer to the Standard Details for WYE strainer location and installation clearances.

## Backflow Prevention Assembly Installation Requirements

### Support

Backflow preventers shall be properly supported so stress on surrounding piping does not occur.

### Materials

All materials used in conjunction with a backflow preventer installation shall conform to the specifications of The North Carolina State Building Code.

### Accessibility

All backflow preventers shall be installed where the Public Utilities System Supervisor deems them readily accessible. All RPZ, RPDA, DCVA and DCDA backflow preventers are required to be installed at least 12" off the floor (the vertical distance measured from the lowest point of the backflow prevention assembly to the floor, grade or nearest obstruction) up to a maximum height of 60" off the floor (the vertical distance measured from the highest point on the backflow prevention assembly to the floor or grade. Approved minimum clearance above and around the backflow preventer must also be provided.

### Backflow Preventer Orientation

All RPZ, RPDA, DCVA and DCDA backflow preventers shall be installed in the horizontal position unless preapproved in writing by the Public Utilities Director.

### Freeze Protection

No backflow preventer shall be installed in a manner by which it is subject to freezing. All backflow preventers shall be protected from freeze damage, by utilizing an approved insulated enclosure. Lawn irrigation systems are an exception to this requirement and may be installed with unions and an upstream shut off valve not subject to freezing.

### Alterations

No backflow preventer shall be modified from its approved factory configuration.

## Shut-off Valves

All backflow prevention assemblies with in-line testing capabilities shall include approved shut-off valves attached to both the inlet and outlet side of the backflow preventer. Shut-off valves are broken into the following categories:

### Assemblies 2-Inches in size and Smaller (Non-Fire System Use)

Backflow prevention devices 2-inches in size and smaller are required to include quarter turn, full port, resilient seated, bronze ball valve shut-off valves.

### Assemblies 2-Inches in size and smaller (Residential Fire System Use)

These systems shall use quarter turn, full port, resilient seated, bronze ball valve shut-off valves with the additional requirement that the valve handles be locked in full open position using a pad lock and aviation cable as approved by the Fire Marshal's office.

### Assemblies 2.5-Inches in size and Larger (Non-Fire System Use)

Backflow prevention devices 2.5-inches in size and larger are required to include "resilient wedge" gate valves.

### Assemblies 2.5-inches in size and larger (Fire System Use)

Backflow prevention devices used on fire suppression systems are required to include Factory Mutual approved resilient wedge OS&Y (outside stem and yoke) gate valves.

## Wye Strainers

No strainer shall be allowed on a fire suppression system. However, all other systems utilizing reduced pressure, double check valve or pressure vacuum breaker assemblies shall have an approved wye mesh strainer as provided by the manufacturer installed immediately upstream of the backflow preventer's inlet shut-off valve.

## Strainers in Potable Piping Systems

All strainers installed in piping systems used for culinary purposes such as canned food preparation for public consumption or in dairies must have a FDA approved coating.

## Water Hammer

All backflow preventers subject to water hammer (hydronic shock) shall be protected by adequate water hammer arrestors.

## Backflow Preventer Sizing

In no case shall a backflow preventer be smaller in line size than its outlet or downstream piping

## Identification Tag

No one shall remove any manufacturers tag or stamp that bears pertinent information about the unit.

## Labeling of Non-potable Piping:

All non-potable piping downstream of isolation backflow preventers installed on the domestic water system shall be identified, with the words non-potable, with a durable yellow paint at intervals of not more than 10ft. and at all branches as specified by Plumbing Code.

## Bypasses

Facilities that by nature of their business cannot shut down their water systems to provide for backflow preventer testing, repairs, etc. shall be required to install a bypass backflow preventer of the same hazard level as the main line unit. The bypass unit must be properly sized to keep critical building services on line while the main line unit is shut down for annual maintenance. Bypasses are broken into the following categories:

### Unapproved

No backflow prevention assembly shall be installed in a manner as to allow the assembly to be looped around or by-passed either temporarily or permanently (Except when in compliance with the section below).

### Approved

All backflow preventers in bypasses shall be equal in hazard level (not necessarily in size) to the unit on the main line. All assemblies in the by-pass shall meet all requirements of an assembly installed in a main line.

## Relief Outlet Piping

In some applications it is practical to install a drain line off the relief port of the Reduced Pressure assembly so in the event there is some spillage form the device the water can be directed to a floor drain. When drains from the relief port of a Reduced Pressure Assembly are utilized, they shall meet the following conditions:

- They must include an approved pre-fabricated "air gap drain" as available from backflow prevention assembly manufacturers.
- All relief port drain lines shall be piped full size to their point of termination and when run horizontally, shall be installed with a fall conforming with the North Carolina State Building Code.

## Pressure Protection

All domestic water backflow preventers subject to abnormally high-water pressure (80 PSI or greater) shall be protected by a pressure reducing valve. The pressure reducing valve (PRV) shall be installed downstream of the backflow preventer unless waterline pressure exceeds the maximum rated capacity of the backflow preventer (this capacity will be listed on the backflow preventer). In this situation, the PRV must be installed upstream of the backflow preventer to protect the unit.

### Thermal Expansion

Where a backflow prevention device, check valve or other device is installed on a water supply system utilizing storage water heating equipment such that thermal expansion causes an increase in pressure, a device for controlling pressure shall be installed.

### Test Cocks

All backflow prevention assemblies with in-line testing capabilities shall have bronze test cocks of the ball valve type. All Reduced Pressure Zone, Double Check Valve, Reduced Pressure Detector and Double Check Detector Assemblies shall have a number one test cock located on the supply side of the number one shut-off valve. When installed in this manner, the number one test cock can be utilized even when the number one shutoff valve is closed.

### Culinary Use

Backflow preventers used for culinary purposes such as canned food preparation or in dairies shall have a FDA (Food and Drug Administration) approved coating and shall be stamped with appropriate seal.

## Minimum Drain Requirements for Backflow Prevention Assemblies

### RPA and RPDA Drainage Requirements

No RPA assembly will be allowed to be installed below ground. RPA assemblies installed in above ground enclosures or inside buildings shall be installed so that the relief outlet of the assembly does not become submerged.

#### Above Ground Installation

All above ground protective enclosures shall incorporate or be equipped with drains that are sized to handle a full port discharge from the assembly.

#### Building Installation

All RPA assemblies installed within a building must have floor drains designed to handle a full port discharge from the assembly.

### DC and DCDA Drainage Requirements

#### Above Ground Installation

All Double Check and Double Check Detector Assemblies installed below ground shall include a positive gravity drain to daylight (i.e. drains are required to terminate out the side of a bank or curb, etc.). Drains piped to storm drain catch basins or that are tied into other vaults or systems in order to drain are not considered a gravity drain to daylight and are unapproved.

Approved vault drains must be sized as follows:

- Assemblies 2-inches in size and smaller shall have a minimum of a 2-inch diameter schedule 40 PVC drain.
- Assemblies 2.5-inches in size and larger shall have a minimum of a 4-inch diameter schedule 40 PVC drain.

### Existing Installations

Existing backflow prevention assemblies that are subject to flooding conditions must have adequate drainage. All existing RPZ and RPDA assemblies shall meet the drainage requirements of a newly Installed RPZ or RPDA Assembly. However, a permanent sump pump with a hard-piped electrical service may be allowed on an existing DC or DCDA assembly if the installation preempted the City of Elizabeth City Cross Connection Policy and a gravity drain is not obtainable.

## Backflow Prevention Assembly Enclosures

No backflow prevention assembly shall be installed in a traffic area unless preapproval in writing is obtained from the Public Utilities Director.

### Above Ground Enclosures

All backflow prevention assemblies installed above ground in a location where freezing conditions could occur shall be protected by approved insulated protective enclosure. All enclosures must have A.S.S.E. standard 1060 approval for minimum "R value" to be approved (unless the backflow preventer is designed to be removed each winter and the enclosure is understood to be for decorative purposes only).

### Vault Size

All vaults shall be adequately sized to allow for testing and maintenance of the backflow preventer.

## Minimum Vault Clearances for Double Check Valve Assemblies (DCVA) and Double Check Detector Assemblies (DCDA)

| BP SIZE/TYPE | LENGTH | HEIGHT | WIDTH |
|---|---|---|---|
| 4″-6″ DCVA | 9.0′ | 5.5′ | 4.5′ |
| 8″ DCVA | 10.0′ | 6.5′ | 5.0′ |
| 10″ DCVA | 12.0′ | 7.5′ | 5.0′ |
| 4″-6″ DCDA | 7.5′ | 5.5′ | 5.0′ |
| 8″ DCDA | 8.5′ | 6.5′ | 5.5′ |
| 10″ DCDA | 10.5′ | 7.5′ | 5.5′ |

Notes:

- All vaults are required to have concrete floors that slope to the vault drain.
- All vaults must incorporate a drain hole (large enough to accommodate a 4″ schedule 40 PVC drain) at the lowest point of the vault floor or wall.
- A minimum of a 48″ x 48″ aluminum access door is required.
- The above chart dimensions are based on a typical backflow preventer and will be suitable for most applications, however, backflow preventer dimensions vary so always check with the Public Utilities Department to ensure it meets the below listed minimum clearances.
- The following minimum clearances must be maintained for the installation to be approved:
    - Clearance beneath unit: 12″ MIN.-60″ MAX. MEASURED FROM THE LOWEST POINT ON THE BACKFLOW PREVENTER TO THE VAULT FLOOR
    - Clearance above unit: 12″ min. measured between the highest point on the unit (operating stem of the shutoff valve) to the vault top. Shutoff valves must be installed in the upright position and cannot be rolled.
    - End Clearance: 12″ min. on each end of the unit measured between ends of the shut off valves and the vault walls. All application (other than fire protection) requires a wye mesh strainer to be installed on the inlet side of the backflow prevention assembly. Refer to manufacturer's literature for strainer dimensions.
    - Front Side (Test Cock Side) of Unit: Minimum of 24″ measured from the vault wall to the nearest point on the backflow prevention assembly.
    - Back Side of Unit: Minimum of 12″ measured from the vault wall to the nearest point on the backflow preventer assembly.

## Fire Protection Backflow Preventer Requirements

The following are the requirements for fire line backflow preventers within the City of Elizabeth City. There shall not be any unprotected interconnection between potable water and fire lines. All backflow prevention assemblies installed on fire suppression systems shall be either a Double Check Detector Assembly (DCDA) for low hazard installations or a Reduced Pressure Detector Assembly (RPDA) for high hazard installations. All meters on the detector by-pass must read in cubic feet. Backflow prevention assemblies installed on fire lines shall be placed in the horizontal position unless prior written approval from the Public Utilities Director is obtained. All assemblies used in fire suppression systems must have USCFCCHR and/or ASSE, as well as FM approvals.

### Severe Hazard Systems Requiring a RPDA

- Systems with booster pumps
- Systems with transfer pumps
- Systems with antifreeze solutions
- Systems serving 5 or more stories above ground level

### Moderate Hazard Systems Required a DCDA

- Systems less than 5 stories above ground level with no pumps or chemical additives
- Lines extending more than 50 feet from a potable water line for the purpose of serving a fire hydrant
- Dry pipe systems

### Dead End Lines

All fire systems and fire hydrant lines extending more than fifty feet from the City water main are considered dead end systems. To avoid accumulation of stagnant water in the City main an approved backflow prevention assembly shall be installed within 50 feet of the City water main. Each change of direction greater than forty-five degrees shall reduce the maximum allowed unprotected footage by twenty-five percent.

### Modification of DCDA/RPDA Units

When a DCDA/RPDA bypass requires replacement, the defective parts must be replaced with factory approved parts (i.e. the bypass backflow preventer or bypass meter must be replaced with a unit of the same size, brand and model number) since the detector assembly and main line unit are a matched set from the factory.

## Lawn Irrigation Backflow Preventer Requirements

### Irrigation Meter FED Systems

To avoid accumulation of stagnant water in the City main, an approved backflow prevention assembly shall be installed within 50 feet of the city water main if using a separate irrigation meter. To obtain information for purchasing an "irrigation only" meter, contact the Public Utilities Director at (252) 337-6628.