

# Cross-Connection Control Policy

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#### **DEFINITIONS**

#### APPROVED

Accepted by PW as meeting the applicable specification stated or cited in this Policy or as suitable for the proposed use.

#### AUXILIARY WATER SUPPLY

Any water supply on or available to the customers' premises other than the PW approved water supply. Auxiliary water supplies may include water from other water purveyor's public potable water systems or any natural source(s), such as well, spring, river, stream, harbor, used waters, or industrial fluids.

#### BACKFLOW

The reversal of flow in a water distribution system as a result of back pressure or back siphonage.

#### BACK PRESSURE

A pressure, higher than the supply pressure, caused by a pump, elevated tank, elevated piping system, boiler, or any other means that may cause pressures greater than the public water supply.

#### BACK SIPHONAGE

Backflow caused by negative or reduced pressures in the supply piping. Decreases in pressures in the public water supply piping are usually the result of increased supply demands, such as firefighting, water main breaks, or loss of pressures due to water mains being shut off for maintenance.

#### BACKFLOW PREVENTION ASSEMBLY

An assembly or piping arrangement designed and approved to prevent backflow.

(1) <u>AIR GAP</u>

The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet conveying water to a tank, plumbing fixture, receptor, and the flood rim of the receptacle. The air gap shall be at least twice the diameter of the water supply outlet above the flood rim of the receptacle, and never less than one inch.

- (2) <u>REDUCED PRESSURE PRINCIPLE ASSEMBLY (RP device)</u>
  - An assembly consisting of two independently acting spring assisted check valves with a hydraulically operating differential relief valve between the check valves and beneath the first check valve. The unit shall have properly located resilient seated test cocks, and resilient seated, or ball type shut off valves at each end of the assembly. This assembly shall be readily accessible for in-line testing and maintenance in a location that is never subject to possible flooding. This assembly is approved for high hazard category cross connections. This assembly shall require approval of SCDHEC and PW.

#### (3) DOUBLE CHECK VALVE ASSEMBLY (DCVA device)

An assembly of two independently operating spring assisted check valves with properly located resilient seated test cocks and resilient seated or ball type shut off valves at each end of the assembly. This device shall be readily accessible for inline testing and maintenance. This assembly is approved for low hazard category cross connections. This assembly shall require approval of SCDHEC and PW.

#### (4) DOUBLE DETECTOR CHECK ASSEMBLY

A specially designed and approved main line double check valve assembly with a small bypass line that includes a double check valve assembly and a meter to detect leakage or unauthorized use of water (typically on fire line taps).

# (5) <u>RESIDENTIAL DUAL CHECK</u>

An assembly of two independently operating spring assisted check valves. This assembly is not equipped with shut off valves or test cocks. This assembly is used for selectively approved low hazard category cross connections such as residential irrigation. At PW, these devices are changed out on a 10-year rotation at the customer's water meter.

#### CERTIFIED TESTER

Any person successfully completing the SCDHEC training and certification seminar that results in a SCDHEC tester certification card and approval for testing backflow devices.

#### CONTAMINATION

An impairment of the potable water quality by physical, chemical, biological, or radiological substance or matter which creates an actual health hazard.

#### CROSS CONNECTION

Any actual or potential connection or physical arrangement between a public water supply and any other source or system through which it is possible to introduce into the potable water system used water, industrial fluid, gas or substance other than the intended potable water with which the system is supplied. Bypass arrangements, jumper connections, removable sections, swivel, or changeover devices and other temporary or permanent devices through which or because of which backflow can or may occur are considered to be cross connections.

#### CROSS CONNECTION CONTROL BY CONTAINMENT

Installation of an approved backflow prevention assembly at the water service connection to any customer's premises. This is usually immediately downstream of the meter.

#### CROSS CONNECTION CONTROL MANUAL (CCCM)

The latest edition of the PW CCC Policy. Up to date copies are available in the PW Project Coordinating Office (864-404-2107).

#### **CUSTOMER**

Any person or premises that receives water from PW with an established account.

#### DEGREE OF HAZARD

Determination of the potential risk to public health, and adverse effects upon the potable water system. This risk is defined below in two categories:

(1) <u>HIGH HAZARD</u>

An existing or potential threat to the public water supply of a physical or toxic nature that would be an immediate danger to public health.

(2) <u>LOW HAZARD</u>

A hazard that does not constitute an immediate threat to health but may cause an actual or potential threat to the physical properties of the water and cause a nuisance or be aesthetically objectionable.

#### FLOOD LEVEL RIM

The level from which liquid in plumbing fixtures, appliances, or vats could overflow to the floor, when all drain and overflow openings built into the equipment are obstructed.

#### HEALTH OFFICIAL

The South Carolina Department of Health and Environmental Control (SCDHEC) employees.

#### INDUSTRIAL FLUIDS

All types of process and used waters that may be chemically, biologically, or otherwise contaminated would be a health hazard if introduced into the potable water supply.

#### POTABLE WATER

Water which is safe for human consumption according to recognized standards.

#### USED WATER

Any water supplied by the Water Purveyor that has passed the water service connection and meter.

#### WATER PURVEYOR

The owner or operator of a public e potable water supply.

#### WATER SERVICE CONNECTION

The point where the public potable water system and the customer's water system connect. This water service connection may be at the downstream end of a water meter, the property line of unmetered service connections, fire hydrant outlets, or other temporary or emergency service connections.

#### **INTRODUCTION**

The South Carolina Department of Health and Environmental Control (SCDHEC) defines crossconnection as any actual or potential connection or structural arrangement between a public water supply and any other source or system through which it is possible to introduce into any part of the potable system any used water, industrial fluid, gas or substance other than the intended potable water which the system is supplied. Bypass arrangements, jumper connections, removable pipe sections, swivels or changeover devices and other temporary or permanent devices through which or because of which backflow can or may occur are considered to be cross-connections.

The State Primary Drinking Water Regulations promulgated pursuant to Section 44-55-10 through 44-55-120 South Carolina Code of Laws, R-61-58.7F <u>Cross-Connection Control</u> section also mandates that:

- (1) All public water systems shall initiate and maintain a viable cross-connection control program. Such a program shall consist of:
  - (a) Locating and eliminating unprotected cross connections in a defined water distribution system.
  - (b) Maintaining records pertaining to the specific location of existing backflow prevention assemblies, type, serial number, model #, size of each assembly and records of repair and annual test results.
- (2) No person shall install, permit to be installed or maintain any cross-connection between a public water system and any other non-public water system, sewer or a line from any container of liquids or other substances, unless an approved backflow prevention device is installed between the public water system and the source of contamination.
- (3) A connection between an approved public water system and a service or other water system not hazardous to health but not meeting the standards of the approved public water system and not cross-connected within its system with a potentially dangerous substance shall be considered a low hazard category cross-connection. An approved backflow prevention device must be installed for any identified low hazard cross-connection.
- (4) A connection between an approved public water system and a service or other water system which has or may have any material in the water dangerous to health, or connected to any material dangerous to health, that is or may be handled under pressure, or subject to negative pressure, shall be considered a high hazard category cross-connection. Protection shall be by air-gap separation or an approved reduced pressure principle backflow prevention assembly.

- (5) Reduced pressure principle backflow prevention assemblies shall not be installed in any location subject to possible flooding. This includes pits or vaults which are not provided with a positive gravity drain to the ground's surface.
- (6) Fire line sprinkler systems, except those in high hazard category shall be protected by an approved double detector check valve assembly that is equipped with a PW approved metering device on the bypass. High hazard category fire sprinkler systems shall include, but not be limited to stagnant fire system piping, antifreeze protected systems, foam systems, systems charged from or tied into ponds, lakes, streams, or any water source other than the approved public water supply. High hazard category fire sprinkler systems shall comply with the requirements of Paragraphs (4) and (5) previously mentioned in this section. An approved backflow device must be installed in an approved and fully accessible vault at the customer property line.
- (7) SCDHEC shall prepare and publish a list of approved backflow prevention assemblies for use in South Carolina, and this list shall be updated periodically and available on the SCDHEC website.
- (8) When testable double check valve assemblies, pressure vacuum breakers, and/or reduced pressure principle backflow prevention assemblies are installed to protect a public water system against the possibility of backflow from a customer's water service, annual testing of the assemblies shall be performed by a certified tester and promptly reported to the water purveyor.
  - (a) Each assembly shall be tested by a certified tester after installation and before use by the customer. Each assembly shall be tested at least once annually by a certified tester approved by SCDHEC. Each owner of these devices will be reminded annually to perform these tests in a timely manner.
  - (b) The public water system is to receive a written report of the inspection and testing results for all assemblies tested within its distribution system. The report shall be submitted by the certified tester making the inspection and test on the SCDHEC approved forms.
  - (c) All backflow prevention assemblies shall be tested immediately after repairs of any kind are made to the assembly.
- (9) There are four (4) types of certified testers of backflow prevention assemblies, General Tester, Limited Tester, Inspector Tester and Manufacturer's Agent. The definition of each type of certified tester is specified in R.61-58(A).
  - (a) Each certified tester's license shall expire three (3) years from the date of issue. In order to renew this certification for three (3) more years, the tester shall come before a designated person approved by SCDHEC and shall successfully complete a written examination with a passing score of 70% and

perform the prescribed test on an approved reduced pressure principle backflow prevention assembly, double check valve assembly, and a pressure vacuum breaker using the tester's own differential pressure gauge. The gauge must be accurate within 2% of full scale or plus or minus 0.3 pounds per square inch differential (PSID). Any gauge found to be inaccurate, or malfunctioning will be required to be calibrated or repaired as needed to bring it into compliance before certification will be renewed.

- (b) Any applicant for recertification who fails to properly perform the above prescribed tests will have his certification revoked immediately and will have to successfully complete the state sponsored backflow prevention training and certification course in order to become re-certified as a tester of backflow prevention assemblies in South Carolina.
- (c) A certified tester may have his tester's certification revoked due to incompetence or falsification of test results, as determined by the Department.
- (d) SCDHEC shall reserve the right to charge or allow for the charge of a nominal fee for the administration of the recertification of testers.

In compliance with this State mandate, the following is <u>Powdersville Water's</u> (hereinafter referred to as PW) <u>Cross-Connection Control Policy</u>.

#### **OVERVIEW**

Technology has made it possible to deliver safe drinking water of high quality to the distribution systems of public water supplies. However, to ensure safe water at the customer's tap, it is essential that physical cross-connections, which create actual or potential backflow possibilities, are eliminated from both the distribution systems and the plumbing systems of customer taps. Where elimination is impractical, protection by installation of an approved backflow prevention assembly or specific piping arrangements become necessary to protect PW's water distribution system.

The discharge side of the consumer's water meter is the end of the water supply system and the beginning of the customer's responsibility. This is typically where backflow prevention devices are installed. Backflow from secondary or unsafe water supplies into the public supply is recognized as a potential hazard wherever such supplies are interconnected.

Continued surveillance in a cross-connection control program is necessary because piping systems are constantly being installed, altered, or extended.

# The primary objective of the Cross-connection Control Policy is to protect PW's water distribution system from potential contamination and to provide safe drinking water to all of our customers.

Under certain circumstances, atmospheric vents and relief valves on backflow preventers could allow the entry of aerosols, toxic fumes, or airborne solid particles into the system. Wherever there is a physical connection between a potable water system and a non-potable environment, backflow may occur due to either back-siphonage or backpressure.

Back-siphonage is backflow caused by negative or reduced pressure in the supply piping. Examples of back-siphonage are:

- (1) Line repair of a broken water main that is lower in elevation than its service point. This will allow negative pressures to be created by water trying to flow to a lower point in the system.
- (2) Undersized piping if water is withdrawn from a pipe at a very high velocity, the pressure in the pipe is reduced and the pressure difference creates a situation which causes the water to flow into the pipe from the contaminated source.
- (3) Lowered residual pressure in the water main due to a large water withdrawal such as firefighting, water main flushing, or a broken water main.
- (4) Reduced supply main pressure on the suction side of a water main booster pump.

Backpressure may cause backflow to occur whenever a potable system is connected to a nonpotable supply operating under a higher pressure by means of a pump, boiler, elevation difference, air or steam pressure, and so forth. There is a high risk that non-potable water may be forced into the potable water system whenever these inter-connections are not properly protected. Examples of cause of backpressure are:

- (1) Booster pump systems designed without backflow prevention devices.
- (2) Connections with another system, which may at times, have a higher system pressure. A simple private well pump that is interconnected with house plumbing that is also supplied by PW is a good example.
- (3) Connections to boilers and other high-pressure systems without backflow protection.
- (4) Water stored in tanks or a plumbing system which by virtue of their elevation difference would create sufficient pressure to cause backflow in the public system.

# **SECTION 1 – GENERAL POLICY**

#### **1.1** The purpose of this Policy is:

- (1) To protect PW's potable water supply from the possibility of contamination or pollution by isolating within the customer's internal distribution system(s) or the customer's private water system(s) such contaminates or pollution that could backflow into PW's water distribution system; and,
- (2) To promote the elimination or control of existing cross-connections, actual or potential, between the customer's private potable water system(s) and other non-potable water systems, plumbing fixtures, and industrial piping systems; and,
- (3) To provide for the maintenance of a continuing program for cross-connection control that will systematically and effectively prevent the contamination or pollution of all potable water systems.

#### **1.2** The responsibilities of PW's cross-connection program are as follows:

- (1) To prevent contamination to the public water system due to backflow of contaminants or pollutants through any water service connection. This responsibility begins at the source and includes the entire water distribution system and ends at the user meter connections. If, in the judgment of PW, an approved backflow prevention assembly is required for the safety of the water system, PW shall give a dated notice in writing to the customer to install such approved backflow prevention assembly(s) at specific location(s) on their premises. The customer shall immediately install such approved assembly(s) at their expense; and failure, refusal, or inability on the part of the customer to install, have tested, and maintain said assembly(s) shall constitute grounds for discontinuing water service to the premises until such requirements have been satisfactorily met.
- (2) To promulgate and enforce laws, rules, regulations, and policies necessary to carry out designated responsibilities.
- (3) To make inspections of private premises and determination of the degree of hazard customers present to PW's system.
- (4) To make and maintain all necessary records in accordance with this Policy.
- (5) To maintain a list of approved cross-connection prevention assemblies for use in PW's system.

# 1.3 Customers

The water user has the primary responsibility to keep contaminants out of the potable water system. This responsibility begins at the user's metered connection and includes any and all water piping on the premises beyond this metered point. If a cross-connection or a potential for a cross-connection exists, the water user, at the water user's expense, must install, have tested, and maintain approved backflow preventers as required by this Policy.

In the event of accidental cross-connection to PW's water supply system, the user shall immediately notify PW and must confine further spread of pollution or contamination within the user's premises.

# **1.4 Backflow Prevention Assembly Installers**

It is the responsibility of the installer of backflow prevention assemblies to make sure that each assembly is working properly. <u>The assembly shall be tested when</u> installed prior to the system being placed into service and every year thereafter. All testing and repair reports (approved SCDHEC form) must be submitted to PW.

# SECTION 2 - REQUIREMENTS AND TESTING

# 2.1 Water System

- (1) Water distribution is considered to be made up of two parts: PW's distribution piping network and the customer's plumbing system beyond the water meter.
- (2) PW's system shall consist of the distribution system and shall include all those facilities of the water system under the complete control of PW, up to the discharge side of the customer's meter.
- (3) The source shall include all components of the facilities utilized in the production, treatment, storage, and delivery of water to the distribution system. In PW's case, the treatment facilities are owned and controlled by other entities. The water is master metered into the PW system at various locations.
- (4) The distribution system shall include the network of pipes used for the delivery of water from the source master meter to the customer's water meter.
- (5) The customer's system shall include those parts of the facility beyond the meter that are utilized in conveying domestic water to the premises.

# 2.2 Policy

- (1) No water service connection to any premises shall be installed or maintained by PW unless the water supply is protected as required by state law and regulations and this Cross-Connection Control Policy. <u>Service of water to any premise shall be discontinued by PW if a backflow prevention assembly required by this Cross-Connection Control Policy is not installed, tested, and maintained properly, or if it is found that a backflow prevention assembly has been removed, by-passed, or if an unprotected cross-connection exists on the premises. Service will not be restored until such conditions or defects are corrected. Very little warning will be provided to the customer in this situation.</u>
- (2) The customer's system should be available for inspection at all reasonable times to authorized representatives of SCDHEC and PW to determine where cross-connection or other structural or sanitary hazards, including violations of the regulation may exist. When such a condition becomes known, PW may deny or immediately discontinue service to the premises by providing for a physical break in the service line until the customer has corrected the condition(s) in conformance with state, county, town, or city statutes relating to plumbing and water supplies and the regulations adopted pursuant hereto.

# (3) An approved backflow prevention assembly shall be installed on the service line to a customer's water system at or near the property line.

- (a) In the case of premises having an auxiliary water supply that is not or may not be of safe bacteriological or chemical quality and that is not acceptable by PW, the customer's system shall be protected against backflow by installing an approved testable backflow device in the service line, appropriate to the degree of hazard that is determined.
- (b) In the case of premises on which any industrial fluids or any other objectionable substances are handled in such a fashion as to create an actual or potential hazard to PW's water system. PW's water system shall be protected from backflow from the premises by installing an approved testable backflow prevention assembly in the service line, appropriate to the degree of hazard. This shall include the handling of process waters and waters originating from PW's system that have been subject to deterioration in quality.
- (c) In the case of premises having (1) internal cross-connections that cannot be permanently corrected and controlled, or (2) intricate plumbing and piping arrangements or where entry to all portions of the premises is not readily accessible for inspection purposes, making it impractical or impossible to ascertain whether or not dangerous cross-connections exist, PW's water system shall be protected against backflow from the premises by installing and approved testable backflow prevention assembly at the meter location in the service line.
- (4) The type of protective assembly required under subsection 2.2 shall depend upon the degree of the hazard that exists. The requirement of specific devices outlined in this section shall be at PW's discretion based upon the degree of hazard and site-specific circumstances:
  - (a) In the case of any premises where there is an auxiliary water supply, it will be considered a "High Hazard" and PW's water system shall be protected by an approved air-gap separation or an approved reduced-pressure principle backflow prevention assembly.
  - (b) In the case of any premises where there is water or a substance that would be objectionable but not hazardous to health if introduced into PW's water system, it will be considered a "Medium Hazard" and PW's water system shall be protected by an approved double-check valve assembly.
  - (c) In the case of any premises where there is any material dangerous to health that is handled in such fashion as to create an actual or potential hazard to PW's water system, it will be considered a "High Hazard" and PW's water system shall be protected by an approved air-gap separation or an approved reduced-pressure principle backflow prevention assembly. Examples of premises where these

conditions will exist include sewage treatment plants, chemical manufacturing and processing plants, medical facilities, mortuaries, and metal plating operations.

- (d) In the case of any premises where there are "uncontrolled" cross-connections, either actual or potential, it will be considered a "High Hazard and PW's water system shall be protected by an approved air-gap separation or an approved reduced-pressure principle backflow prevention assembly at the service connection.
- (e) In the case of any premises where, because of security requirements or other prohibitions or restrictions, it is impossible or impractical to make a complete inplant cross connection survey, it will be considered a "High Hazard" and PW's water system shall be protected by an approved air-gap separation or an approved reduced- pressure principle backflow prevention assembly at each service to the premises.
- (f) In the case where, in the opinion of PW, an undue health threat is posed because of the presence of extremely toxic substances, PW may require an approved airgap separation at the service connection to protect PW's water system.
- (g) In the case of any <u>residential</u> premises where a lawn irrigation system exists that is not equipped with any chemical injection or addition, it will be considered a "low hazard" and shall be protected by a dual check. If the customer elects to install an additional testable device the maintenance and testing responsibility of this device shall be borne by the customer. If chemical addition is used, it will be considered a "high hazard" and shall be protected by a reduced-pressure device. All non-testable dual checks shall be on a 10-year replacement cycle by PW for taps with residential lawn irrigation.
- (h) In the case of any <u>commercial</u> (non-residential) premises where a lawn irrigation system exists, it will be considered a "medium hazard" and shall be protected by a minimum of a double check valve assembly.
- (5) Any testable backflow prevention assembly required herein shall be a model and size approved by SCDHEC and PW. The term approved backflow prevention assembly shall mean an assembly that has been manufactured in full conformance with the standards established by the American Water Works Association titled:

AWWA C510-89 – Standard for Double Check Valve Backflow Prevention Assembly, and AWWA C511-89 – Standard for Reduced-Pressure Assembly

(6) It shall be the duty of the customer/user at the premises where backflow prevention assemblies are installed to have certified inspections and operational tests made at least once a year by a certified tester. In those instances where SCDHEC or PW deems the hazard to be great enough, certified inspections may be required at more frequent intervals. These inspections shall be at the expense of the water user. A copy of all testing and repair reports shall be submitted to PW with the original to be retained on site.

(7) All testers of backflow prevention devices located in PW's system shall be certified by SCDHEC and must be in good standing with SCDHEC. PW is authorized at any time to verify the validity of tests performed by certified testers in the distribution system. If PW determines that test records are falsified in any manner, the subject tester will be banned from performing work in PW's system and this information will be forwarded to SCDHEC's Cross Connection Control Department.

# 2.3 Testing

All backflow prevention assemblies shall be tested by certified testers in accordance with SCDHEC and PW regulations.

#### (1) NEW ASSEMBLIES

All new testable assemblies shall be tested upon installation and before use by the <u>customer</u>. The installer shall contact a certified tester to test the device and forward the successful test report to PW. The report must be received by PW before water service is established.

#### (2) EXISTING ASSEMBLIES

Customers with existing backflow prevention assemblies in PW's inventory will be notified annually by letter from PW to have the periodic test performed. The customer will be responsible for contacting a certified tester and having the test completed within <u>90 DAYS</u> of notification. If the assembly fails the required test and cannot be repaired immediately, the device must be replaced immediately, tested successfully and the test report submitted to PW promptly. Customers failing to return completed test reports to PW within the 90-day period shall be considered in noncompliance. At that time, PW will proceed with administrative actions up to and including immediate discontinuance of water service.

#### (3) QUALITY CONTROL TESTING

PW will randomly select a number of recently returned test reports and retest the assembly, at its expense, to ensure certified testers are providing an effective service The customer will be notified in advance of this retest if service is to be interrupted.

# **SECTION 3 – INSPECTIONS**

#### **3.1 Proposed Construction**

All new construction plans and specifications for residential, commercial, and industrial facilities shall be reviewed by PW to determine the degree of possible cross-connections hazard. During this review, backflow prevention requirements in accordance with this Policy will be determined and passed along to the owner/developer of the property.

# **3.2** New and Existing Facilities

To determine the degree of hazard to PW's water system, a survey or inspection may be made of the customer's presently installed water system. This inspection may be to establish the water uses on the premises, the possible existence of cross-connections, the availability of auxiliary or used water supplies and/or the degree of hazard that the customer's system presents. On-site inspections are made of new or existing facilities, and should any assemblies or plumbing changes be required, a follow-up inspection will be made of the same facilities at a later date to ensure compliance with this Policy.

# 3.3 Right of entry

Whenever it shall be necessary for the purpose of compliance or enforcement of this Policy, PW's representative by demonstration of proper ID, may enter upon any property or premises at reasonable times for the purpose of:

- (a) Inspection of any equipment, facilities, or plumbing lines,
- (b) Sampling of any water suspected of any cross-connection,
- (c) Testing of any backflow prevention devices that are due to be tested.

PW and/or SCDHEC may enter upon the property at any hour under emergency circumstances to perform any investigation required to enforce this Policy.

#### **3.4** Inspection and testing

Annually, each testable device will be inspected, tested, and repaired for compliance with this Policy. PW shall maintain accurate records of tests and repairs made to backflow prevention assemblies. The owner of the device(s) is responsible for making sure that periodic testing is performed of any device located on their property. All records shall be on forms approved by SCDHEC. Following any repair, overhaul, re-piping, or relocation of the assembly, the customer shall have the assembly tested to ensure that it is in good working condition and will prevent backflow. However, this testing may be more often in those instances where successive inspections indicate repeated failure to properly maintain such assembly or assemblies.

# 3.5 Fees

All fees shall be set by PW on an annual basis for inspection and testing, are attached in Appendix "A" of this Policy and are subject to change from time to time. Fees for testing will only be charged by PW when the customer has failed to submit to PW a current successful test report after a second public notice. If PW determines a failure in the device, water service will be discontinued until the customer provides PW with a repair and test report from a certified tester.

# **SECTION 4 – HAZARD DETERMININATION**

In applying the Policy outlined in this manual, two degrees of hazards are considered and defined as follows:

*Health* (*containment*): A cross-connection or potential cross-connection involving any substance that could, if introduced into the potable water supply, cause death, illness, spread disease, or have a high probability for causing such effects.

*Non-health* (*pollutant*): A cross-connection 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 domestic potable water supply.

In assessing a potential cross-connection, the probability must be considered that piping may be changed, equipment may be used incorrectly, or negligence on the part of the customer may result in a backflow condition. Therefore, a potential cross-connection exists if one or more of the following elements are present: bypass arrangements, jumper connections, removable sections, swivel or changeover assemblies, hoses and hose bibs, or the presence of an abundance of piping that cannot be readily traced.

The degree of hazard increases as a function of both the probability that backflow will occur and the toxicity of the substance that may backflow. The risk associated with the substance's toxicity (or virulence) is always a greater concern.

# SECTION 5 – TYPICAL CROSS-CONNECTION OCCURRENCES AND RECOMMENDED PROTECTION

#### 5.1 **Protection recommended**

*Public potable water system interconnections.* Interconnection between PW's approved public water supply and another approved public potable water supply over which PW does not have sanitary control. This may be accomplished in the following manner:

- (1) An air-gap separation or a reduced-pressure principle backflow prevention assembly is required at the service connection when the auxiliary water is or may be contaminated to a degree that would constitute a health hazard.
- (2) A double check valve assembly is required at the service connection when the auxiliary water supply is being operated under a public health permit but is not acceptable to PW as a source.
- (3) Backflow protection at the service may not be required if the auxiliary water system has a properly conducted cross-connection control program and sanitary control program in force, and the auxiliary water supply is acceptable to PW as a source.

*Private water supply.* A physical separation must be made between any private water supply, including a well, and the PW system.

# **SECTION 6 – METHODS OF BACKFLOW CONTROL**

The control of backflow, whether caused by backpressure or back-siphonage, requires the elimination of the cross-connection and the installation of an air-gap or a backflow prevention assembly.

Currently there are several general methods or types of assemblies that are used for the prevention of backflow, they include the following:

- (1) Air-Gap (AG) an approved air-gap is the unobstructed vertical distance through free atmosphere between the lowest point of a water supply outlet and the flood level rim of the fixture or assembly into which the outlet discharges. These vertical, physical separations must be at least twice the diameter of the water supply outlet, but never less than one inch (25mm).
- (2) Reduced-Pressure Principle Backflow Prevention Assembly (RPBA) The approved reduced-pressure principle backflow prevention assembly consists of two independently acting, approved check valves together with a hydraulically operating, mechanically independent pressure differential relied on valve located between the check valves and below two tightly closing resilient-seated shutoff valves, as an assembly, and are equipped with properly located resilient-seated test cocks.
- (3) Double Check Valve Assembly (DCVA) An approved double check valve assembly consists of two internally loaded check valves, either spring-loaded or internally weighted, installed as a unit between two tightly closing resilient-seated shutoff valves as an assembly, and fittings with properly located resilient-seated test cocks.
- (4) Pressure Vacuum Breaker (PVB) A pressure vacuum breaker assembly consists of an independently operating internally loaded check valve and an independently operating loaded air inlet valve located on the discharge side of the check valve, with properly located resilient-seated test cocks and tightly closing resilient-seated shutoff valves attached at each end of the assembly. Where provided, pressure vacuum breakers shall be installed a minimum of twelve (12) inches above the highest downstream piping and shall not be subject to backpressure.
- (5) Atmospheric Vacuum Breaker (AVB) The atmospheric vacuum breaker is an assembly that performs similarly to a pressure vacuum breaker. The AVB consists of a float check, a check seat, and an air inlet port. A shutoff valve immediately upstream may be an integral part of the assembly.

# SECTION 7 – GUIDE TO SELECTION OF ASSEMBLIES

The correct selection of a backflow assembly requires a thorough knowledge of the assembly's operating function, the limitations of the assembly, the cause or potential cause of backflow, and the correct assessment of the degree of hazard. Because of the subjective nature in determining the proper backflow prevention assembly, this guide has been developed from past experience. However, when selecting the type of assembly, the health hazard should govern the final choice.

Description of Cross-Connection	Minimum Type of Protection	
Aspirator (medical)	AVB, PVB	
Aspirators	AVB	
Autoclaves	RPBA	
Autopsy Equipment	AVB, PVB	
Bedpan washers	AVB, PVB	
Clinics	RPBA	
Commercial laundry	RPBA	
Connection to sewer pipe	AG	
Connection to plating tank	RPBA	
Connection to saltwater cooling system	RPBA	
Connection to industrial fluid system RPBA		
Cooling towers with chemical additives	RPBA	
Degreasing equipment	DCVA	
Dock and dockside facilities RPBA		
Domestic space heating boiler	RPBA	
Dye vats or machines	RPBA	
Food & beverage processing plants RPBA		
Fire fighting system (toxic liquid foam)	RPBA	
Heating equipment - commercial	RPBA	
Fire Sprinkler Systems DCVA		
Irrigation systems with chemical additives RPBA		
Irrigations systems (non-residential))	DCVA	
Kitchen equipment	AVB	
Laboratories	RPBA	
Lab bench equipment	AVB, PVB	
Mortuary equipment	RPBA	
Ornamental fountains	DCVA	
Petroleum processing or storage facilities RPBA		
Plants using radioactive material	material RPBA	
ating or chemical plants RPBA		
leasure boat marina RPBA		
Premises where inspection is restricted	RPBA	

Reclaimed water systems	RPBA
Sewage treatment plants	RPBA
Sewage lift stations	DCVA
Steam generators	RPBA
Steam plants	RPBA
Sterilizers	RPBA
Specimen tanks	AVB, PVB
Swimming pools - public	DCVA
Tall buildings	DCVA
Tank vats or vessels containing toxic substances	RPBA
Vending machines	RPBA, PVB
Washing equipment	AVB

Device Abbreviations Legend	
AG: Air-Gap	
AVB: Atmospheric Vacuum Breaker	
DCVA: Double Check Valve Assembly	
PVB: Pressure Vacuum Breaker	
RPBA: Reduced-Pressure Principle Backflow Assembly	

# SECTION 8 – INSTALLATIONS REQUIRING CONTINUOUS SERVICE: PARALLEL INSTALLATION

All backflow prevention assemblies with test cocks are required to be tested once per year at a minimum. Testing may require a water shutdown usually lasting five (5) to twenty (20) minutes. For facilities that require an uninterrupted supply of water and when it is not possible to provide water service from a separate meter, provisions shall be made for a "parallel installation" of backflow prevention assemblies.

Multi-story buildings which have a number of flushometer toilets should be equipped with parallel assemblies. Experience has shown if the water supply is shut off to this type of building, flushometers may have to be manually reset.

During testing, one assembly is left on while the other is being tested.

PW will not accept an unprotected bypass around a backflow preventer when the assembly is in need of testing, repair, or replacement.

# **SECTION 9 – EXTERMINATING COMPANIES**

All tanks, tank trucks, and spraying apparatus used to convey or mix pesticides or herbicides are required to use only overhead (air-gap) piping arrangements. All filling locations will consist of overhead piping arrangements with correctly installed pressure vacuum breakers. If for any reason an overhead piping arrangement cannot be used, a reduced pressure principle backflow assembly shall be installed on the service line at the meter.

#### Never submerge a filling hose into any type of mixing tank.

# SECTION 10 – CROSS-CONNECTION REQUIREMENTS FOR FIRE PROTECTION SYSTEMS

Fire protection systems consist of sprinklers, hose connections, piping and hydrants. Sprinkler systems may be wet or dry, open or closed. Systems of fixed spray nozzles may be used indoors or outdoors for protection of flammable liquids and other hazardous processes. It is required that these systems be protected based on the following classifications:

Class 1 – Direct connections from public water mains only; no pumps, tanks or reservoirs; no physical connection from other water supplies; no antifreeze or additives of any kind; all sprinkler drains discharging to atmosphere, dry wells, or other safe outlets.

Class 2 – Same as Class 1, except that booster pumps may be installed in the connection from PW's distribution system.

Class 3 – Direct connection to PW's distribution system, plus one or more of the following: elevated storage tanks, fire pumps taking suction from above-ground covered reservoirs or tanks and pressure tanks. All storage facilities shall be filled from the potable water supply and maintained in a potable condition.

Class 4 – Directly supplied from public mains similar to Classes 1 and 2, and with an auxiliary water supply dedicated to fire department use and available to the premises, such as an auxiliary supply located within approximately 1,700 feet of the pumper connection.

Class 5 – Directly supplied from public mains, and inter-connected with auxiliary supplies, such as: pumps taking suction from reservoirs exposed to contamination, or rivers and ponds; driven wells; mills or other industrial water system; or where antifreeze or other additives are used.

Class 6 – Combined industrial and fire protection system supplied from PW's distribution system only, with or without gravity storage or pump suction tanks.

Protection required:

Class 1 & 2	Double Detector Check Valve
Class 3	Double Detector Check Valve
Class 4 & 5	AG or RPBA
Class 6	Determined by inspection of system

#### **10.1** Fire protection guidelines for the service area

Prior to any connection of new or renovated fire sprinkler systems to PW's water distribution system, the following procedures are required. Complete details for fire system connections can be found in Section 02772 of the PW Water System Guidelines for Design and Construction, please contact PW Customer Service at 864-269-5440 for a complete copy.

- (1) Two sets of plans and hydraulic design data must be submitted for review to PW. All plans must be prepared or reviewed by a professional engineer and plans must be signed and embossed with the engineer's seal. A hydraulic modeling of the proposed connection may be necessary, and the developer must absorb this cost.
- (2) The plans will be reviewed, and one set returned with any required changes. Changes will be noted on the plans. The plans will also be accompanied by a review letter. One set of plans will be retained for PW files.
- (3) Any booster pump installations will be designed to ensure that pressure in the distribution system does not fall below 30 psi residual. A minimum of 30 psi residual must be maintained in the distribution system at all times. Detailed specifications on any fire pumping facilities are required for review for installation. A back pressure sustaining valve may be required.
- (4) No anti-freeze or similar chemicals will be allowed in Fire Sprinkler Systems unless approved by PW.

#### **10.2** Backflow Prevention Requirements

All new, renovated, or existing Fire Sprinkler Systems will be required to have an approved double detector check valve assembly with a PW approved by-pass meter. The bypass line is also required to have a line size double check valve assembly. The double detector check valve must meet all requirements of AWWA Standard C-506-79 or latest amendment.

If deemed necessary by PW that a UL meter is required for the fire protection system, a standard double check valve assembly will be allowed downstream of the UL meter. **See Appendix I of the PW Development Policy and Procedure Manual**. Please contact PW Customer Service at 864-269-5440 for a complete copy of the manual.

#### **10.3** Installation of Devices

Installation of the double detector check valve and bypass meter is the owner's responsibility. The double detector check valve and bypass meter will in all cases be installed so that they are readily accessible for testing, maintenance, and inspection. Applications for the backflow

assembly and fire meters must be made by a licensed fire suppression contractor or licensed plumber.

# **10.4** Maintenance Requirements

It will be the responsibility of the owner to maintain the Fire Sprinkler System from the valve at PW's water distribution system to the inside of the building including the backflow assembly. PW will maintain from the main to the discharge side of the customer's water meter.

# SECTION 11 – THERMAL PROTECTION – OWNER RESPONSIBILITY

All customer water systems that have been closed or contained by the installation of a backflow assembly or similar checking device must make the necessary alterations to the plumbing system to protect against thermal expansion.

If water is heated and stored in a consumer's system, in which any branch or all of the system has been closed by the installation of a backflow preventer, a pressure reducing valve, or any other checking device, an approved auxiliary relief valve shall be installed at an accessible location between the checking device and the water heating equipment, to limit the thermal expansion of the water being heated to not more than 80 pounds per square inch no-flow pressure at any fixture on the system. A discharge line not less than <sup>1</sup>/<sub>4</sub> inch inside diameter shall be piped to an approved location where no water damage would result from the discharge, and any water in the discharge pipe would drain by gravity and be protected from freezing.

The installation of a device to control thermal expansion will be the responsibility of the owner and plumbing officials having jurisdiction. All plumbing arrangements installed beyond PW's meter are the customer's sole responsibility. This includes but is not limited to residential water heaters and other appliances.

# **SECTION 12 – FREEZE PROTECTION – OWNER RESPONSIBILITY**

Customer owned water systems that have backflow assemblies shall be protected from freezing.

Installation of systems in outdoor settings may be subject to freezing. **The addition of freeze protection to protect the system will be the responsibility of the backflow device owner**. Freeze protection shall not interfere with the inspection, operation, or maintenance of the assembly. Any damage to devices caused by weather is the account owner's responsibility.

# SECTION 13 – PLAN REVIEW FOR NEW INSTALLATIONS

# **13.1** Drawing submittals

Plans and specifications for the backflow assembly installation must be submitted to PW for approval prior to installation of the device.

# **13.2** Design specifications

Any backflow prevention assembly required shall be a model and size approved by PW. The term "Approved Backflow Prevention Assembly" shall mean a device that has been manufactured in full conformance with the standards established by the American Water Works Association AWWA-0506-78 Standards for Reduced Pressure Principle Assembly and Double Check Valve Backflow Assembly and as listed on SC DHEC's list of approved devices.

# SECTION 14 – NON-COMPLIANCE/ENFORCEMENT PROCEDURES

#### **14.1** Enforcement Procedure

Non-compliance and enforcement procedures will fall into three categories:

- (1) Existing water customers who do not have a cross-connection control device in their system at present but are required to install such a device under this Policy. Customers in this category where contaminants on their property have been determined by PW to represent a health hazard to the public water system will be required to take immediate corrective action upon notification. Customers will be required to install an approved backflow prevention assembly or correct the cited hazard within 30 days of notification when PW has determined that a potential system hazard exists. Failure to comply will result in termination of water service.
- (2) After the effective date of this Cross-Connection Control Policy, any new customer will be required to install an approved backflow prevention device prior to connection to PW's distribution system whenever PW has determined that contaminants or pollution on the customer's property represents a hazard to the public water system. The device must be installed successfully tested and reported before service is established.
- (3) Those existing water customers who have required backflow prevention devices in their system which do not meet PW's standards or have been found to be malfunctioning. These customers will be required to replace backflow prevention devices with assemblies that do meet PW standards. Malfunctioning backflow prevention devices for low hazard conditions must be repaired or replaced by the customers with an approved backflow prevention device within 30 days after notification by PW. For high hazard sources, the malfunctioning backflow prevention device must be replaced or repaired immediately. If not repaired or replaced immediately, water service will be discontinued.

#### 14.2 Termination of Water Service

- (1) Service of water to any premises will be discontinued by PW if a backflow prevention assembly required by law, rules, or regulations is not installed, tested, and maintained; or if it is found that a backflow prevention device has been removed or by-passed or if unprotected cross-connection exists on the premises and there is inadequate backflow protection at the service connections. Water service will not be restored until such conditions and defects are corrected and PW's distribution system is adequately protected.
- (2) Water services will be terminated for water customers who do not comply with PW's Cross-Connection Control Policy. A certified written notice shall be served to the offending party that water service will be terminated if the requirements of this Policy

are not met. PW will not be liable for any losses, damages, or claims arising from termination of water service.

# 14.4 Penalty: Fees for Non-Compliance of this Policy

Fees for non-compliance of the Policy include but are not limited to service charges to lock and unlock meters when a customer fails to comply with testing, maintenance, and repair of devices. See Appendix A for a list of charges.

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#### **SECTION 15 – INSTALLATION REQUIREMENTS**

#### 15.1 Installation within the building establishment

No installation of backflow prevention devices will be allowed inside the building or establishment without authorization from PW. Devices shall be located at the property line. See section 2.2.3.

#### SECTION 16—FIRE HYDRANT USAGE

PW is required by SCDHEC to enforce the proper use of all fire hydrants throughout the water distribution system. Each hydrant is a potential entry point for contaminants into our drinking water. Contamination of the system may easily occur if a backflow or back-siphonage condition occurs in the drinking water system. This may happen anytime that water is removed from the system in large quantities at high velocities. This is not only a public health concern, but a threat to system security, as well. Therefore, the general Policy of PW is to restrict the use of fire hydrants only to PW maintenance employees and fire department personnel for fire-fighting purposes. Only under special conditions will PW allow others to use hydrants in the system. For more information, please contact PW Customer Service at 864-269-5440 and request a copy of the **Fire Hydrant Use Policy**.

# APPENDIX A

# FEES

1.	Test per Unit	
	a. DCVA or RP or PVB less than 8"	\$300.00
	b. DCVA or RP or PVB 8" or larger	\$500.00
2.	Fee to lock/unlock meter Fee to lock/unlock meter after 5 PM	\$35.00 \$47.00

Annual Testing (when customer fails to complete)

A.

All fees are subject to change without notice.

# **APPENDIX B**

# **INSTALLATION DRAWINGS**

<b>PW Standard</b>	Drawing Name
STD-W-14	Reduced Pressure Backflow Preventor Detail
STD-W-15	Double Check Detector Assembly (Private Fire Hydrants & Fire Systems
	Without Tanks and Pumps
STD-W-16	Fire Protection Vault with FDC (Private Fire Sprinkler System with Tank
	and/or Pumps
STD-W-17	Metered Fire Line
STD-W-17 (2)	Metered Fire Line Vault
STD-W-20	Air Gap Separation
STD-W-21	Pressure Vacuum Breaker
STD-W-22	Double Check Valve Assembly



3" AND LARGER

#### NOTES:

1. REDUCED-PRESSURE BACKFLOW PREVENTION DEVICES SHALL BE REQUIRED FOR ANY USE WHERE TOXIC MATERIALS ARE USED OR WHERE POSITIVE PROTECTION FOR THE PUBLIC WATER SUPPLY IS REQUIRED. TYPICAL APPLICATIONS INCLUDE: HOSPITALS, MEDICAL & DENTAL LABS, MORTUARIES, INDUSTRIAL PLANTS, DRY CLEANERS, OR AS DETERMINED BY PW.

2. APPROVED BACKFLOW PREVENTION DEVICES SHALL BE AS LISTED BY PW.

3. BACKFLOW PREVENTION DEVICES SHALL BE INSTALLED ADJACENT TO AND ON PROPERTY SIDE OF SIDEWALK WHERE APPLICABLE. WHERE NO SIDEWALK EXISTS, THE ASSEMBLY SHALL BE INSTALLED AS CLOSE AS POSSIBLE TO THE WATER METER LOCATION UNLESS A MECHANICAL ROOM WITH POSITIVE DRAINAGE IS PROVIDED IN THE BUILDING. FINAL LOCATION TO BE APPROVED BY PW PRIOR TO INSTALLATION.

4. SCREENING AND LANDSCAPING PLACES AROUND DEVICE SHALL ALLOW FOR ACCESS BY PW PERSONNEL.

5. FREEZE PROTECTION IS THE OWNERS RESPONSIBILITY. A DEVICE SUCH AS A "HOT BOX" IS HIGHLY RECOMMENDED.

POWDERSVILLE WATER	POWDERSVILLE WATER	DATE : APRIL 2023	
	REDUCED PRESSURE BACKFLOW PREVENTOR DETAIL	SCALE : N.T.S. JOB NO.: 02400-001	
		SHEET STD-W-14	













