ST. LUCIE COUNTY UTILITIES DEPARTMENT

CROSS-CONNECTION CONTROL MANUAL

ST. LUCIE COUNTY UTILITIES DEPARTMENT

CROSS-CONNECTION CONTROL MANUAL

Established March 1995

Updated By:

St. Lucie County Utilities Department

May 2016

CROSS-CONNECTION CONTROL MANUAL

TABLE OF CONTENTS

CROSS-CONNECTION CONTROL MANUAL

TABLE OF CONTENTS

APPENDICES

SECTION 1 - INTRODUCTION

A cross-connection is defined in the rules of the Florida Department of Environmental Protection (FDEP), Chapter 62-550 Florida Administrative Code (F.A.C.) as "any physical arrangement whereby a public water supply is connected, directly or indirectly with any other water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or other device which contains or may contain contaminated water, sewage or other waste, or liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water supply as the result of backflow. By-pass arrangements, jumper connections, removable sections, swivel or changeable devices and other temporary or permanent devices through which or because of which backflow could occur are considered to be cross-connections." See Appendix A, Glossary for additional definitions. Consequently, either cross-connections or the chance of backflow must be eliminated to prevent degrading the high quality of water that water suppliers strive to maintain.

Initially, the primary responsibility for safeguarding water quality on private property was left to local health agencies and building departments. Beginning with the Federal Safe Drinking Water Act, dated December 16, 1974, a sequence of laws and regulations evolved that resulted in the current State requirement (Florida Safe Drinking Water Act, Sections 403.850 403.864, Florida Statutes) that all community public water systems have a cross-connection control program. Cross-connection control programs, as administered by water suppliers, are now common in the state of Florida.

The Rules of the FDEP, Chapter 62-555, F.A.C. require the following:

> Community water systems, and all public water systems that have service areas that are also served by reclaimed water systems regulated under Part III of Chapter 62-610, F.A.C., shall establish and implement a routine cross-connection control program to detect and prevent cross-connections and prevent backflow of contaminants into the water system. This program shall include a written plan that is developed using recommended practices of the American Water Works Association as set forth in "Recommended Practice for Backflow Prevention and Cross-Connection Control", AWWA Manual M14 [Second Edition], as incorporated into Rule 62-555.330, F.A.C.
>
> Cross-connection control programs specific to reuse systems shall consider the following:
>
> - Enhanced public education efforts toward prevention of cross-connections, and

- Enhanced inspection programs for portions of the distribution system in areas of reuse for detection and elimination of cross-connections.

Upon discovery of a prohibited cross-connection, public water systems shall either eliminate the cross-connection by installation of an appropriate backflow prevention device acceptable to the FDEP or shall discontinue service until the contaminant source is eliminated.

The National Interim Primary Drinking Water Regulations, as recorded in the Federal Register, Vol. 40, No. 248 dated December 24, 1975, made clear that contaminants added to the water by circumstances under the control of the consumer are not the responsibility of the supplier of water. As a matter of policy, this statement is interpreted to mean that the water supplier is not responsible for water quality degradation caused by a failure within and on the customer's property; e.g., caused by a cross-connection. However, should a failure result in water quality degradation taking place within a private facility but traveling to another private facility, (backflow or backsiphonage), the water supplier could be held responsible unless it is possible to show that the water supplier took reasonable precautions to protect the public water supply.

In compliance with the rules of the FDEP, the 2010 Florida Building Code – Plumbing and the third edition of AWWA Manual M14, the following is the St. Lucie County Utilities Department Policy on Cross-Connection Control. This Cross-Connection Control policy is based on the ordinance passed and duly adopted on May 21, 1996 and complements the information in the St. Lucie County Code of Ordinances (See Appendix B).

We urge you to acquaint yourself with the policies and information presented in this manual. It is only through the education and commitment of persons like yourself that we can control the hazards presented by cross-connections within our public drinking water supply. The St. Lucie County Utilities Department stands behind this policy and its enforcement, and will offer its assistance to all who share the responsibility of safe water.

SECTION 2 - GENERAL

A. PURPOSE

It is the purpose of this manual to establish rules and regulations concerning cross-connections and backflow prevention devices for protection of the County's water systems; requiring installation, inspection, testing, maintenance and repair of the devices.

B. ACCESS TO PREMISES FOR INSPECTION AND TESTING

The St. Lucie County Utilities Department shall have free access to the premises of any user of its water supply for the purpose of inspecting and/or testing the backflow device installed or to inspect the premises to determine if there are any cross-connections. If installation is required, then appropriate backflow devices shall be installed so that they are easily accessible for inspection, testing, maintenance and repair.

SECTION 3 - OVERVIEW

A. PURPOSE

The purpose of this Policy is to protect the public potable water supply of St. Lucie County from the possibility of contamination; to promote the elimination or control of existing cross-connections, actual or potential, between its customers' on-site plumbing fixtures / industrial piping and the public water supply; and to provide for the maintenance of a continuing program of cross-connection control that will systematically and effectively prevent the contamination of the potable water distribution system. More exactly, this Policy is intended to prevent delivered water (water that has passed beyond the public water system and is in the private distribution systems of consumers, e.g., beyond the customer's water meter) from re-entering the public distribution system and being subsequently delivered to consumers and to allow persons active in piping design and installation to incorporate and install appropriate backflow prevention devices correctly.

B. CAUSES OF BACKFLOW

The causes of backflow cannot be eliminated completely since backflow is often initiated by accidents or unexpected circumstances. However, some causes of backflow can be partially controlled by good design and informed maintenance. Listed below are the many causes of backflow as outlined under the two types of backflow: backsiphonage and backpressure.

1. Backsiphonage: Backsiphonage is caused by reduced or negative pressure being created in the supply piping. The principal causes of backsiphonage are:

    a. Line repair or break that is lower than a service point connection. This will allow negative or reduced pressures to be created by water trying to flow to a lower point in the system and thus allow water to flow from a customer's location back into the public supply system.

    b. Undersized piping if water is withdrawn from a pipe at a very high velocity, pressure in the pipe is reduced and the pressure differential created can cause water to flow into the pipe from a contaminated source.

    c. Lowered pressure in water main due to high water withdrawal rate such as fire fighting, water main flushing or water main breaks.

    d. Reduced supply main pressure on suction side of a booster pump.

2. Backpressure: Backpressure may cause backflow to occur where a potable water system is connected to a non-potable system of piping, and the pressure in the non-potable system of piping exceeds that in the potable system. The principal causes of backpressure are:

    a. Booster pump systems designed without backflow prevention devices.

    b. Potable water connections to boilers and other pressure systems without backflow prevention devices.

    c. Connections with another system that may, at times, have a higher pressure.

    d. Water stored in tanks or plumbing systems that by virtue of their elevation would create head sufficient to cause backflow if pressure were lowered in the public system.

C. CONTROL OF BACKFLOW

Backflow prevention assemblies shall be installed by the customer on the service connection of any premises that has been identified by the St. Lucie County Utilities Department as having a potential for backflow. Backflow devices shall also be installed by the customer within the premises if potable water is also used for industrial, commercial and/or fire-fighting purposes. The St. Lucie County Utilities Department Cross-Connection Control Manual shall serve as a guide to defining potential cross-connections and the solutions for preventing backflow into the County's water supply system. Unless otherwise stated in this manual or in other County, State or Federal laws and regulations, the recommendations of Manual M14, AWWA, Recommended Practice for Backflow Prevention and Cross-Connection Control, Third Edition shall be used and shall apply to both the customer and the County.

Backflow prevention assemblies must be tested and inspected once a year by a Certified Tester. Maintenance and repair of the backflow prevention devices must be performed by a Certified Backflow Technician. The cost of this work shall be borne by the customer.

SECTION 4 - PROHIBITION OF CROSS-CONNECTIONS

All cross-connections not protected by approved backflow preventers are prohibited and shall be corrected within the sixty (60) day period following written notification in an existing installation. In the case of proposed installations, approved backflow preventers must be installed prior to the certificate of occupancy.

If the cross-connection poses a severe hazard to the public health, the St. Lucie County Utilities Department shall be empowered to immediately terminate the customer's water service until the situation has been corrected.

It shall be unlawful for the customer to make or allow others to create a cross-connection of potable water lines with either auxiliary water systems or piping and equipment containing toxic, harmful or objectionable substances. The customer shall be held responsible for adhering to this prohibition.

SECTION 5 - RESPONSIBILITY

A. CROSS-CONNECTION PROGRAM

The responsibilities of the St. Lucie County Utilities Department Cross-Connection Control Program, in accordance with the rules of Chapter 62-555, Florida Administrative Code (F.A.C.), are as follows:

1. To protect the St. Lucie County water supply from the possibility of contamination by isolating within its consumers' private plumbing systems, contaminants or pollutants that could, under adverse conditions, backflow through uncontrolled cross-connections into the public water system.

2. To eliminate or control existing cross-connections, actual or potential, between the consumer's on-site potable water plumbing system(s) and non-potable water system(s), plumbing fixtures, and industrial piping systems.

3. To provide a continuing inspection program of cross-connection control, which will systematically and effectively control all actual or potential cross-connections, which may be installed in the future.

B. CUSTOMERS

The customer’s responsibility starts at the point of delivery from the public potable water system and includes all of their water system. The customer (at their own expense) shall install, operate, test and maintain approved backflow prevention assemblies, as directed by the St. Lucie County Utilities Department. The customer shall maintain accurate records of tests and repairs made to backflow prevention assemblies and provide St. Lucie County Utilities Department with copies of such records. The records shall be on forms approved or provided by the St. Lucie County Utilities Department. In the event of accidental pollution or contamination of the public or consumer's potable water system due to backflow on or from customer's premises, the owner shall promptly take steps to confine further spread of pollution or contamination within the customer's premises, and shall immediately notify the St. Lucie County Utilities Department of the hazardous condition.

C. BACKFLOW PREVENTION ASSEMBLIES INSTALLERS

The installer's responsibility is to make proper installation of backflow prevention assemblies in accordance with manufacturer instructions and any additional instructions approved by the St. Lucie County Utilities Department. Installer is also responsible to make sure an assembly is working properly when it is installed, and is required to furnish

the following information to the St. Lucie County Utilities Department immediately after a backflow preventer is installed:

1. Service address where device is located,
2. Name of owner,
3. Description of assembly's location and size,
4. Date of installation,
5. Type of assembly,
6. Manufacturer,
7. Model number, and
8. Serial number.

All Reduced Pressure Backflow Prevention Assemblies (RPBA), Double Check Valve Assemblies (DCVA), and Pressure Vacuum Breakers (PVB) are required to be tested, following installation, by a certified backflow prevention technician. Record keeping is discussed in further detail in **Section 13**.

SECTION 6 - INSPECTIONS

A. FREQUENCY

Due to changes in models or components of equipment, methods of manufacturing and additions to plants, buildings, etc., water use requirements undergo continual change. As a result new cross-connections may be installed and existing protection may be by-passed, removed or made otherwise ineffective; therefore, an annual detailed inspection by the customer of all water usage is required. Actions for non-compliance are detailed in **Section 11**.

B. PROPOSED CONSTRUCTION

All new construction plans and specifications for multifamily residential, industrial and commercial facilities shall be reviewed by the St. Lucie County Utilities Department to determine the degree of possible cross-connection hazards and applicable backflow prevention requirements. Facilities not listed shall be reviewed on a case-by-case basis. For all proposed construction classified as multifamily residential, commercial or industrial, where the application is unknown or undetermined, a reduced pressure backflow assembly (RPBA) shall be the minimum requirement.

All proposed new single family residences shall have, at minimum, a Double Check Valve Assembly (DCVA) on each water service line to the site when a low hazard exists. If site inspections find that a high hazard exists (including any of the following: pets, livestock, fish, chemicals, pools, fountains, tanks, irrigation, dialysis equipment, developing equipment, gray water, reclaimed water, an auxiliary water supply, heating and cooling equipment), an air gap separation or RPBA is required on each water service line to the site.

C. NEW AND EXISTING FACILITIES

In order to determine the degree of hazard to the public potable water system, a survey will be made of the consumer's presently installed water system. This survey need not be a detailed inspection of the location or disposition of the water lines, but can be defined to establish the water uses on the premises, the existence of cross-connections and the availability of auxiliary or used water supplies. On-site inspections are made of new and existing facilities, and should any devices or plumbing changes be required, a follow-up inspection will be made of the same facilities at a later date.

SECTION 7 - METHODS OF BACKFLOW CONTROL

A. HAZARD CLASSIFICATION

Each method of backflow prevention is classified by:

1. The type of backflow it prevents: backpressure or backsiphonage,

2. The type of installation: internal or service; and

3. The degree of the hazard it can prevent against: high and low.

The types of backflow are described in **Section 3**; the types of installation and the degrees of the hazard are described in the following section.

Type of Installation (Internal Protection or Service Protection)

Two types of installations are considered to protect the water system include:

1. Internal Protection: Relies on the installation of backflow preventers at each plumbing fixture in the customer's system. These installations are also known as "fixture protection" or "in-premise protection."

2. Service Protection: Isolates the customer through the installation of a backflow preventer on the water supply pipe. This procedure is also referred to as "containment" or "premises isolation." Typically, in these cases the backflow preventer is owned by the customer and installed downstream of the point of service. However, the backflow preventer may also be owned by the St. Lucie County Utilities Department when the assembly is installed upstream of the point of service.

The St. Lucie County Utilities Department currently employs internal protection. With internal protection, the County relies on its customers and their individual fixture protection(s). As a result, the St. Lucie County Utilities Department, or an authorized representative, may survey[1] the plumbing to determine if the protection provided is satisfactory. With internal protection, the County also relies on compliance with the plumbing code.

[1] *These surveys are to inspect backflow prevention into the water supply system only. These surveys are not to inspect the plumbing to determine compliance with regulations or to ensure protection of the occupants of the premises.*

Under certain situations deemed necessary by the St. Lucie County Utilities Department, a service protection type of cross-connection control program may be adopted. To implement the service protection, each customer must be evaluated to determine the overall health risk to the public water system imposed by the customer's plumbing system. Evaluations may involve an assessment of each customer's premises.

Degree of Hazard (High or Low)

The degree of hazard increases as a function of both the probability that backflow will occur and the toxicity of the nonpotable substance that may backflow. The risk associated with a substance's toxicity (or virulence) is of greater concern than the probability of backflow. Additionally, 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. A potential cross-connection becomes an actual cross-connection if one or more of the following elements are present:

- Bypass arrangements,
- Jumper connections,
- Removable sections,
- Swivel or changeover assemblies,
- Hoses and hose bibbs; or
- The presence of an abundance of piping that cannot be easily traced.

High Hazard Classification

Mandatory protection is required for high-hazard categories of customers either with an air gap (AG) or Reduced Pressure Backflow Prevention Assembly (RPBA). High-hazard categories include the following:

- Radioactive material processing plants or nuclear reactors;
- Sewer treatment plants, sewage pump stations, or waste dump stations;
- Hospitals; medical centers; medical, dental, and veterinary clinics; and plasma centers;
- Mortuaries;

- Laboratories;
- Metal-plating facilities;
- Food-processing and beverage-bottling facilities;
- Car washes;
- Premises with an auxiliary water supply;
- Premises where access is restricted;
- Piers and docks, graving docks, boat marinas, dry docks, and pump stations;
- Premises with fire sprinkler systems and/or private fire hydrants; and
- Irrigation systems.

Low Hazard Classification

Low hazard classifications are typically designated when actual or potential cross-connection involves a substance(s) that would not be a health hazard but would constitute a nuisance or be aesthetically objectionable, if introduced into the potable water supply. Some low hazard classifications have backflow control / prevention options in addition to AGs and RPBAs, including Double Check Valve Assemblies (DCVA) and Dual Checks (DC).

A summary of the approved backflow preventers for various categories, in addition to and including those types of facilities listed above, can be found in **Section 8** (Table 2).

B. METHODS OF BACKFLOW CONTROL

Backflow, whether caused by backpressure or backsiphonage, is controlled by eliminating the cross-connection and installing a backflow prevention assembly or device. Selecting the correct method requires knowledge of several variables, as described previously, including:

- Type of backflow (Backpressure and/or Backsiphonage)
- Degree of hazard (High Hazard or Low Hazard)
- Type of installation (Internal Protection or Service Protection)

Mechanical backflow preventers are broken into two categories: assemblies and devices. Assemblies are required to have specific components such as test cocks and shutoff valves,

to have the ability to be tested and repaired in line and to meet approval standards for performance and design. Devices typically do not include shutoff valves or test cocks and usually cannot be tested or repaired in place. Devices are typically used only in private plumbing systems. Currently, there are several assemblies and devices that are used for the prevention of backflow. They include the following:

- Assemblies:
  - Air Gap Separation (AG)
  - Reduced Pressure Backflow Prevention Assembly (RPBA)
  - Double Check Valve Assembly (DCVA)
  - Pressure Vacuum Breaker (PVB)
  - Spill-Resistant Vacuum Breaker (SVB)
- Devices:
  - Atmospheric Vacuum Breaker (AVB)
  - Dual Check (DC)
  - Dual Check With Atmospheric Vent (DCWAV)

The following describes the backflow control methods, their application and details about recommended installation.

Air Gap Separation (AG)

Description: The only absolute way to eliminate backflow is through the use of an approved air gap (assembly). Air gaps are unobstructed vertical spaces between the lowest point of an outlet water supply and the fixture or assembly's flood level rim into which the outlet discharges. At a minimum, these vertical, physical separations must be twice the diameter of the water supply outlet, but never less than 1 inch.

Theoretically, well-designed and appropriately maintained air gaps are the best protection against backflow. However, air gaps are not always practical and can be vulnerable to bypass arrangements, which invalidate its effectiveness. Another major disadvantage of an air gap is that the system pressure is lost. In extremely hazardous installations, an approved air gap separation is recommended and reduced pressure assemblies may be also required on such supply lines. These assemblies are required to be constructed such that it is difficult to connect a hose to the supply pipe.

Air gaps are subject to the annual inspection to ensure infractions do not occur.

Application: Air gaps can be used for internal or service protection of backsiphonage backflow under high and low hazard conditions. Air gaps are not recommended for backpressure applications. Although air gaps are considered the maximum protection available, continuous protection is not guaranteed. The issue is that air gaps can be bypassed. The application of an air gap, rather than a RPBA, depends on the requirements of St. Lucie County Utilities Department and on the assessment of the probability of the air gap being bypassed.

Installation: Refer to the general installation tips at the end of this section.

Reduced Pressure Backflow Prevention Assembly (RPBA)

Description: The RPBA assembly consists of two independent, check valves in series with a hydraulically operated, mechanically independent pressure differential relief valve located in between the check valves at a lower elevation than the first check valve. These units must also be located between two resilient-seated shutoff valves and must contain four resilient-seated test cocks.

Under normal operating conditions, the first check valve creates a reduced pressure zone between the two check valves. During normal flow conditions, both check valves are open to allow water to flow downstream. The relief valve is held closed by the supply pressure acting on a diaphragm within the relief valve. In no-flow or static-pressure conditions, both check valves close and the pressure holds the relief valve shut.

If the supply pressure drops, the relief valve maintains a minimum pressure of 2 psi lower than the supply pressure between the check valves by releasing water. If the supply pressure becomes less than 2 psi, the relief valve opens to discharge the material in the reduced pressure zone to the atmosphere.

If the pressure downstream of the assembly were to increase, in other words reversing the direction of flow, both check valves in the assembly would close tightly to prevent backflow. If the second check valve fails or does not close tightly, there will be leakage into the reduced pressure zone increasing the pressure and causing the relief valve to open.

If the supply pressure decreases to atmospheric pressure or within 2 psi of the reduced pressure zone, the relief valve will create an internal air gap by opening. Any leakage from the second check valve would discharge through the relief valve.

Application: The RPBA is effective against backflow caused by backpressure and backsiphonage, can be used for internal or service protection and can be considered under high and low hazard applications. RPBAs are normally used in locations where approved air gaps are not practical. A major advantage is the visible flow should failure of the assembly occur.

RPBAs are mechanical assemblies that must be tested annually and serviced regularly to maintain protection.

Installation: The following are several design installation criteria. For additional information, refer to manufacturer recommendations and general installation tips at the end of this section.

- The drain must provide adequate drainage from the RPBA relief valve port. Minimum relief valve port diameters and RPBA relief valve flow rates are set forth in manufacturer literature.
- Before RPBA installation:
    - Make sure that the RPBA relief valves are in working order. Pressure could build up if the relief valves are not functioning properly, which could lead to an explosion or escape of hot liquid under pressure.
    - Flush the lines.
- RPBAs are not recommended in areas that may be exposed to corrosive fumes or gases as those gases may result in an inoperable assembly.
- It is the intent of the manufacturer that the test cocks be plugged and not used for any other purpose except testing.

Double Check Valve Assembly (DCVA)

Description: This assembly is comprised of two check valves, internally loaded either by spring or weight, between two resilient-seated shutoff valves as a unit, and includes four test cocks.

Application: DCVAs are effective against backflow caused by backpressure and backsiphonage, can be used for internal or service protection but are typically employed under low hazard conditions only such as safeguarding water systems from pollutants that do not constitute actual health hazards, but that may disrupt the overall water supply system.

Installation: The following are design installation criteria. For more information, refer to manufacturer recommendations, the latest approved Florida Building Code – Plumbing and general installation tips at the end of this section.

- Before installing a DCVA:
    - Test that the relief valves are in good working condition. Pressure could build up if the relief valves are not functioning properly, which could lead to an explosion or escape of hot liquid under pressure.
    - Make sure that drain pipes are properly directed to floor drains.
    - Flush the lines.

Pressure Vacuum Breaker (PVB)

Description: A PVB assembly consists of (1) one internally loaded check valve, (2) one loaded air inlet valve located on the discharge side of the check valve, (3) two resilient-seated test cocks and (4) two resilient-seated shutoff valves attached at each end of the assembly. The internally loaded check valve and loaded air inlet valve both operate independently.

Under normal flow, the check valve is open and the air inlet valve is closed. Under backsiphonage conditions, the check valve closes, which precludes the backsiphonage of water from the PVB body and downstream piping (unless the check valve is fouled). If the check valve is fouled, the air inlet valve provides redundant backflow control by opening with the cessation of normal flow to allow air to enter the supply pipe through the fouled check valve, thereby, breaking the vacuum and not permitting backsiphonage from the downstream piping.

Application: PVBs are only effective against backflow caused by backsiphonage, can be used for both low and high hazard conditions and are most appropriate in internal protection situations only. However, PVBs may also be used for service protection (e.g., for irrigation connections) when the possibility of the assembly being circumvented is designed for by isolating the area or premises. PVBs should not be used if it is possible for backpressure in the downstream piping.

Installation: Following are several installation criteria. For more information, refer to manufacturer specifications and general installation tips at the end of this section.

- PVBs are able to operate under constant pressures for long periods of time.

- Adequate drainage to floor drains should be designed to accommodate spillage unless the PVB is installed in an area where water spillage through the vacuum relief valve (air vent) is not objectionable.
- PVBs should not be installed in vent hoods or near toxic or objectionable fumes.
- Low inlet pressure will make it very difficult to close the air inlet port.
- It is possible that water hammer will occur if the air inlet valve closes.

Spill-Resistant Vacuum Breaker (SVB)

Description: The SVB assembly shall contain one check valve (internally loaded), one air-inlet valve (loaded) located on the discharge side of the check valve, two resilient seated shutoff valves (one inlet and one outlet) and one resilient-seated test cock / vent valve.

Under normal flow, the check valve is open and the air inlet valve is closed. Under backsiphonage conditions, the check valve closes, which precludes the backsiphonage of water from the SVB body and downstream piping (unless the check is fouled). If the pressure in the SVB body is reduced by usage on the downstream side, the pressure will be relieved until the point the air inlet opens. If the check valve is fouled or does not seal properly, the air inlet valve provides redundant backflow control by opening with the cessation of normal flow to allow air to enter the supply pipe through the fouled check valve, thereby, breaking the vacuum and not permitting backsiphonage from the downstream piping.

Application: SVBs are designed to prevent backflow only from backsiphonage, can be used for both high and low hazard applications and is normally authorized for internal protection only.

Installation: SVBs must not be subjected to conditions that exceed their maximum pressure and temperature ratings. The increased pressure that can happen from the creation of a closed system also must be evaluated, because an SVB cannot be exposed to backpressure. For more information, refer to manufacturer specifications and general installation tips at the end of this section.

Atmospheric Vacuum Breaker (AVB)

Description: An AVB device consists of one check seat, one air inlet valve and may include one optional shutoff valve immediately upstream.

During normal conditions, the air inlet valve will be closed to allow flow to pass. Under backsiphonage conditions, the air inlet valve opens to the check seat due to the termination of flow. When the air inlet valve seals against a check seat, the AVB prevents backsiphonage into the downstream piping.

Application: AVBs are effective against backsiphonage backflow only and shall not be permitted if backpressure backflow is possible in the downstream piping. Additionally, AVBs can be used for the control of low and high hazards applications and for internal protection only. AVBs do not meet the requirements of a backflow-prevention assembly.

Installation: Following are several design installation criteria. For more information, refer to manufacturer recommendations, the latest approved Florida Building Code on Plumbing and general installation tips at the end of this section.

- AVBs are not suitable for more than twelve (12) hours of continuous operation. When used for long periods of time, the air inlet disc could become stuck in the closed position.

- It is recommended that AVBs be installed downstream of the last shutoff valve in a system with the discharge side of the AVB exposed to atmosphere. If the last shutoff is after the AVB, it could create a sustained static pressure condition that would force the air inlet disc in the closed position for an extended period of time, which could lead to failure.

- AVBs should not be installed in vent hoods or near toxic or objectionable fumes.

- Adequate drainage to floor drains should be designed to accommodate spillage unless the AVB is installed in an area where water spillage through the vacuum relief valve (air vent) is not objectionable.

Dual Check (DC)

Description: DC devices are comprised of two check valves that are internally loaded and independently operating.

In a backpressure condition, the check valves will close due to the increase in pressure. Redundancy is provided if the second check valve is not functional, with the first check valve acting as a backup to stop the backpressure from going through the device.

Under backsiphonage conditions, a vacuum condition is present at the inlet and the check valves will close due to due to the loading on the check valves.

Application: DC devices can be used to stop backflow from backpressure and/or backsiphonage, for low hazard conditions only and for internal protection applications only. A dual check does not meet the requirements of a backflow-prevention assembly.

Installation: DCs must not be subjected to conditions that exceed their maximum pressure and temperature ratings. The increased pressure that can happen from the creation of a closed system also must be evaluated, because DCs cannot be exposed to backpressure. For more information, refer to manufacturer specifications and general installation tips at the end of this section.

Dual Check With Atmospheric Vent (DCWAV)

Description: The DCWAV device consists of two check valves (internally loaded) and a vent valve. The vent valve is located between the two check valves. The vent valve opens when subjected to backpressure.

Under normal operating conditions, the device's inlet and outlet check valves are open and the vent valve is closed. When backpressure conditions develop, the increased pressure at the outlet causes the outlet check valve to close. If the second check valve does not close, the increased pressure causes the vent valve to open as it is subjected to backpressure. Under a backsiphonage condition, the inlet pressure will be reduced to a vacuum and cause both check valves to close.

Application: DCWAVs can prevent backflow from backpressure and/or backsiphonage, should be used only for low hazard applications and for internal protection only. DCWAVs do not meet the requirements of backflow-prevention assemblies.

Installation: DCWAVs must not be subjected to conditions that exceed their maximum pressure and temperature ratings. The increased pressure that can happen from the creation of a closed system also must be evaluated, because DCWAVs cannot be exposed to backpressure. For more information, refer to manufacturer specifications and general installation tips at the end of this section.

General Installation Tips:

- Installation of any approved assembly or device shall be in the position recommended by the manufacturer unless approved by St. Lucie County.
- Install assemblies with adequate space to facilitate regular servicing, maintenance and testing. If possible, platforms, ladders or lifts should not be required for

assembly access. Adequate clearance from the floor, ceiling and walls must be provided to facilitate the removal of assembly components.

- Assemblies with relief valve ports cannot be submerged in groundwater. Submergence creates a cross-connection that may be more serious than the hazard that the assembly isolates.

- Installation may require the assembly to be installed a minimum of 6-12 in. above all downstream piping and/or the highest outlet or flood level rim. Refer to manufacturer literature.

- Assemblies are typically installed in line and are the same size as the supply and discharge piping. However, assemblies' size should be verified hydraulically to take into account both the volume requirements of the service and the head loss of the assembly. Please refer to manufacturer head loss pressure curves as the head loss of the assembly is not necessarily directly proportional to flow. Additionally, strainers are not considered to be part of any approved backflow prevention assembly. If a strainer is required, the additional head loss of the strainer must be taken into account in the sizing.

    - Strainer may not be used in a fire line without the approval of the insurance underwriters or the authority having jurisdiction.

    - Strainers require frequent cleaning and inspection to ensure against fouling and deterioration of the mesh.

- Provide proper support assemblies to prevent sagging and maintain a ridged system.

- Consult manufacturer literature for recommendations on temperature ranges. Certain assemblies must be protected from freezing temperatures. Other assemblies have specific models for temperatures that reach 110 °F.

General Maintenance Tips:

It shall be the responsibility of the building premises owners or tenants to maintain, in good working condition, all backflow preventers within the building or on the premises. The following are a few helpful hints on general maintenance:

- All approved assemblies are designed for in-line repairs to eliminate the need to remove for service. Once removed, no protection is provided.

- Do not reassemble a backflow prevention device with any previously removed parts while waiting for delivery of replacement parts. This creates a false sense of protection if the device appears to be operational.

- Clean all debris from strainers or screens on a regular basis.

- Valve springs on large assemblies are strong; remove with caution. Check manufacturer literature for procedures.

- Bleed off entrapped air after completing repairs and reassembly.

- On RPBAs, the parts in check valve 1 are not necessarily interchangeable with the parts in check valve 2.

- If the RPBA is continuously draining from the relief port, the first check valve, the second check valve or the relief valve has failed. Clean the check valves of possible debris and check elastomeric disks for damage.

- If shutoff valve 2 on the RPBA is closed tight and water begins to discharge from the relieve valve port, it is likely that check valve 1 or the relief valve diaphragm is leaking. Clean the check valve of possible debris and check elastomeric disks for damage. If both shutoff valves to an RPBA are closed and test cock 2 is open, water should begin to discharge from the relief valve port.

- Refer to assembly or device manufacturer's recommendations for other maintenance instructions.

Backflow Preventer Summary

Table 1indicates practical applications of the aforementioned assemblies and devices.

Table 1
Means of Backflow Prevention

Type of Unit	Degrees of Hazard			
	Low Hazard		High Hazard	
	Back-siphonage	Back-pressure	Back-siphonage	Back-pressure
Assemblies:				
Air Gap (AG)	X		X	
Reduced Pressure Backflow Prevention Assembly (RPBA)*	X	X	X	X
Double Check Valve Assembly (DCVA)*	X	X		
Pressure Vacuum Breaker (PVB)	X		X	
Spill-Resistant Pressure Vacuum Breaker (SVB)	X		X	
Devices:				
Atmospheric Vacuum Breaker (AVB)	X		X	
Dual Check Device (DC)	X	X		
Dual Check With Atmospheric Vent Device (DCWAV)	X	X		

** AWWA Manual M14 [Third Edition] also mentions a "Double Check Valve Detector Backflow Prevention Assembly" and a "Reduced Pressure Detector Backflow Prevention Assembly". These methods are mainly for fire protection and consist of a main line with a DCVA or RPBA, respectively, and a bypass arrangement around the main assembly, which includes a bypass water meter and a bypass DCVA or RPBA, respectively. These systems operate like the original unit except the bypass is engineered to detect the first three gpm of flow through the bypass assembly.*

SECTION 8 - RECOMMENDED BACKFLOW PROTECTION REQUIRED FOR VARIOUS CATEGORIES

The correct selection of a backflow preventer requires a thorough knowledge of the unit's operating function, the limitations of the unit, the cause of backflow and a correct assessment of the degree of hazard. Because of the subjective nature in determining the proper backflow preventer, a guide has been developed from past experiences. Table 2 presents the approved backflow prevention assembly or device that shall be installed on the water service to eliminate backflow by category.

Table 2
Type of Backflow Protection Required

	Protection Recommended	
Description of Cross-Connection	**Low Hazard**	**High Hazard**
Auxiliary Water Systems	DCVA	AG or RPBA
Beverage-Bottling Plants and Breweries	DCVA	AG or RPBA
Chemical Plants and Other Facilities		
Cleaning	AG or RPBA	AG or RPBA
Manufacturing	AG or RPBA	AG or RPBA
Processing	AG or RPBA	AG or RPBA
Compounding	AG or RPBA	AG or RPBA
Servicing	AG or RPBA	AG or RPBA
Treatment	AG or RPBA	AG or RPBA
Washing	AG or RPBA	AG or RPBA
Cooling Systems (open or closed)	AG or RPBA	AG or RPBA
Dairies and Cold-Storage Plants	AG or RPBA	AG or RPBA
Dye Plants	AG or RPBA	AG or RPBA
Film Laboratories (photo and x-ray)	AG or RPBA	AG or RPBA
Fire Hydrants	AG or RPBA	AG or RPBA
Fire Sprinkler Systems (commercial)[1]	DCVA	RPBA
Food Related Facilities		
Canneries	AG or RPBA	AG or RPBA
Packing Houses	AG or RPBA	AG or RPBA
Food Service Facilities	AG or RPBA	AG or RPBA
Restaurants	AG or RPBA	AG or RPBA
Reduction Plants	AG or RPBA	AG or RPBA

Table 2 (continued)
Type of Backflow Protection Required

Description of Cross-Connection	Protection Recommended	
	Low Hazard	High Hazard
Medical Related Facilities		
Hospitals	AG or RPBA	AG or RPBA
Laboratories	AG or RPBA	AG or RPBA
Medical Offices and Facilities	AG or RPBA	AG or RPBA
Medical Research Centers	AG or RPBA	AG or RPBA
Sanitariums	AG or RPBA	AG or RPBA
Morgues	AG or RPBA	AG or RPBA
Mortuaries	AG or RPBA	AG or RPBA
Autopsy Facilities	AG or RPBA	AG or RPBA
Other Human or Animal Clinics	AG or RPBA	AG or RPBA
Irrigation Systems[2]	AG or RPBA	AG or RPBA
Laundry and Dye Works (commercial)	AG or RPBA	AG or RPBA
Marine Facilities and Dockside Watering Points	3	3
Metal Manufacturing, Cleaning, Processing and Fabricating Facilities	DCVA	AG or RPBA
Multistoried Buildings[4]	DCVA	AG or RPBA
Oil and Gas Production, Storage or Transmission Properties	AG or RPBA	AG or RPBA
Paper and Paper-Product Plants	AG or RPBA	AG or RPBA
Plating Plants and Facilities	AG or RPBA	AG or RPBA
Radioactive Material or Substances, Plants or Facilities Handling	AG or RPBA	AG or RPBA
Reclaimed or Recycled Water[5]	AG or RPBA	AG or RPBA
Residential Water Services	DCVA	AG or RPBA
Residential, Single Family Fire Sprinkler Systems	DCVA	AG or RPBA
Restricted, Classified or Other Closed Facilities	AG or RPBA	AG or RPBA

Table 2 (continued)
Type of Backflow Protection Required

	Protection Recommended	
Description of Cross-Connection	**Low Hazard**	**High Hazard**
Solar Domestic Hot-Water Systems		
Single Wall With No Leak Protection	DC	RPBA
Double Wall With No Leak Protection	None	RPBA
Double Wall With Leak Protection	None	None
Steam Boiler Plants	AG or RPBA	AG or RPBA
Water Hauling Equipment	AG or RPBA	AG or RPBA

1. "Fire Sprinkler Systems (commercial)" now encompass the following categories of fire-suppression systems: (1) new wet-pipe systems, (2) existing wet-pipe systems, (3) dry-pipe nonpressurized systems (Deluge), (4) dry-pipe pressurized and preaction systems and (5) other systems. See AWWA Manual M14 [Third Edition] for details. Previous editions of AWWA Manual M14 classified fire-suppression systems into six classifications based on the complexity of the individual system. The third edition eliminated these classifications. Note: this category does not include residential, single family fire sprinkler systems.

2. PVBs may be used for service protection if the water service is the sole source of supply to the premises or property, if it is strictly used for irrigation (such as median islands or parking strips) and if there is no means or potential means for backpressure. PVBs in this installation are subject to approval by the County.

3. Minimum system protection for marine installations may be accomplished in one of the following ways:

a. Where water is delivered directly to vessels for any purpose, an RPBA must be installed at the pier hydrants. All hydrants in the dockside area that are used (or are available to be used) to provide water to vessels should also be protected. If an auxiliary water supply, such as a saltwater fire system, is used, the entire dockside area should be isolated from the water supplier's system by an approved AG. Where water is delivered to marine facilities for fire protection only, and no auxiliary supply is present, all service connections should be protected by an RPBA. If hydrants are available for connection to a vessel's fire system, an RPBA should be installed at the user connections as well.

b. Where water is delivered to a marine repair facility, an RPBA should be installed at the user connection. Where water is delivered to small-boat moorages that maintain hose bibs on a dock or float, an RPBA should be installed at the user connection and a hose connection vacuum breaker should be installed on each hose bib. If a sewage pump station is provided, the area should be isolated by installation of an RPBA. Water used for fire protection aboard ship, connected to dockside fire hydrants, shall not be taken aboard from fire hydrants unless the hydrants are on a fire system that is separated from the domestic system by an approved RPBA or unless the hydrants are protected by portable, approved RPBAs.

4. RPBAs are recommended where takeoffs for sanitary facilities on lower floors are connected to the suction side of booster pump(s)

5. An AG or RPBA are recommended on each potable water line entering the reclaimed water site.

SECTION 9 - OTHER CROSS-CONNECTION HAZARDS

Any device, equipment or situation not covered by this cross-connection policy, which may constitute a potential health hazard, will be examined for appropriate treatment by the St. Lucie County Utilities Department, or authorized agent. Single check valves will not be accepted as a means to protect the potability of drinking water and therefore may only be used to prevent backflow that would affect the functioning of a plumbing system such as to prevent recirculation of potable hot water. Where single check valves are improperly used, they will be required to be replaced by an appropriate approved backflow prevention assembly or device as applicable.

SECTION 10 - TESTING OF BACKFLOW PREVENTERS

It shall be the duty of the customer at any premises where air gaps (AG), reduced pressure backflow prevention assemblies (RPBA), double check valve assemblies (DCVA), pressure vacuum breakers (PVB) and/or spill-resistant pressure vacuum breakers (SVB) are installed to have thorough inspections and operational tests performed at least once a year or more often in those instances where inspections indicate a need. These inspections and tests shall be at the expense of the customer and be performed by a certified technician[1]. The water supplier will notify the customer when tests are required and supply the necessary test forms and instructions. These forms will be completed and returned to the water supplier by the date indicated.

Field testing of backflow prevention assemblies is required on occasions including, but not limited to:

1. Immediately following initial installation,
2. Whenever an assembly is relocated,
3. Whenever supply piping is altered,
4. Whenever an installed assembly is newly discovered and previous testing records are not available,
5. Whenever an assembly is taken apart for repair,
6. Whenever the administrative authority requires more frequent testing to ensure continued protection; and
7. Whenever the assembly has been taken out of service and is returned to service.

All backflow prevention assemblies are required to be tested with a minimum frequency of once per year[2]. For facilities that require an uninterrupted supply of water, and when it is not possible to provide water service from two separate meters, provisions shall be

1 A certified technician is a person who has successfully completed a training course and passed a certification course for backflow prevention assembly testers.

2 The current cross-connection rules in F.A.C. 62-555.360 are in the process of being revised to include biannual inspections for residential backflow preventers (in lieu of annual inspections) and allowing dual check devices, among other changes. More information about these proposed rule changes can be found at http://www.dep.state.fl.us/water/rules_dr.htm#waste. It is anticipated that the updated cross-connection rules will be implemented in 2014.

made for a "parallel installation" of backflow prevention assemblies. The St. Lucie County Utilities Department will not accept any unprotected bypass around a backflow preventer when the assembly is in need of testing, repair or replacement.

Each variety of backflow assembly requires a significantly different field-test procedure. Examples of step-by-step procedures for the testing of backflow prevention assemblies can be found in Appendix A of AWWA Manual M14 [Third Edition]; a reference copy of this document is available at the St. Lucie County Utilities Department, 2300 Virginia Avenue, Fort Pierce, FL 34982. In addition to manufacturer literature, the following publications provide test procedures for RPBAs, DCVAs, and PVBs and/or SVBs:

- Cross-Connection Control Manual, 6th ed., Appendix F, Pacific Northwest Section of AWWA
- Cross-Connection Control Manual, 1989, USEPA publication 570/9-89-007
- Backflow Prevention Assemblies—Series 5000, 2000, American Society of Sanitary Engineering
- Field Test Procedures (Position Paper), New England Water Works Association
- Manual of Cross-Connection Control, 10th ed., Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California

Sample installation forms and field testing forms are provided by St. Lucie County (see Appendix C). After the certified tester has properly performed the field-test procedure on a backflow-prevention assembly, the data collected shall be recorded on the field-test report form. Copies of the field-test report form should be sent to the St. Lucie County Utilities Department, 2300 Virginia Avenue, Fort Pierce, FL 34982, and the water user. The tester shall retain copies of the test data for a minimum of five (5) years.

If the testing finds the assembly to be working at less than its minimum design criteria, as established by the field-test procedure, it shall be repaired / replaced and returned to its full ability to prevent backflow. A written notification detailing all cross-connections found during the inspection will be sent to the owner or authorized agent of the owner of the building or premises, stating that corrections must be made and setting a reasonable time for compliance.

All backflow-prevention assemblies have been designed to be repaired by manufacturer repair / replacement parts. Typically, the repair process involves the disassembly of the backflow preventer and the proper placement of the new repair parts. After the repair is

performed, the backflow-prevention assembly shall be field-tested by a certified tester to ensure that the repair procedure has restored the assembly to proper working condition. In certain cases, it may not be possible to repair some backflow-prevention assemblies due to irreplaceable parts such as check seats that are cast into the body of some of the older assemblies or because the original manufacturer may no long produce repair parts for its older assemblies. In these cases, the assembly will need to be replaced.

SECTION 11 - PENALTIES FOR NON-COMPLIANCE

Termination of Service: A written notification detailing all cross-connections found during the inspection will be sent to the owner or authorized agent of the owner of the building or premises, stating that corrections must be made and setting a reasonable time for compliance. Upon failure of the owner or authorized agent of the owner of the building or premises to have the defect(s) corrected by the specified time the water supplier shall cause the water service to the building or premises to be terminated. The water supplier shall cause discontinuance of water service if a required backflow prevention assembly has been bypassed or failed to be tested or properly maintained as required by this policy statement. The water supplier shall also cause discontinuance of water service if an air-gap separation system is compromised.

SECTION 12 - RETROFITTING EXISTING FACILITIES

All premises of the type where cross-connections are suspected may be surveyed by the St. Lucie County Utilities Department to determine if a detailed inspection will be required. The customer shall be notified in writing thirty (30) days in advance to secure an appointment for inspection of the premises. The customer or their authorized representative may accompany the inspector during the tour of the premises.

An inspection form will be completed by the inspector. The customer shall be made aware of any corrective measures needed. All official letters of notification shall be sent to the customer indicating what corrective measures must be taken. Upon conformance of the requirements in the notification letter, the customer shall immediately notify the St. Lucie County Utilities Department to schedule a date for reinspection.

All existing facilities, which qualify as cross-connection risks will be retrofitted with backflow prevention assemblies or devices, appropriate to their classification, on the customer's side of the meter, or point of service. Proof of proper installation / operation of the assembly must be submitted to the St. Lucie County Utilities Department. The installation / testing form(s) must be signed by a recognized, certified installer / tester.

In the event that the report is not received within ninety (90) days of notification, service will be immediately discontinued unless a schedule of compliance has been submitted to, and approved by the St. Lucie County Utilities Department.

The customer will be responsible for any and all applicable fees, charges or other costs associated with retrofitting. The customer will be responsible for the annual, or more frequent, retesting, maintenance, repair or replacement of the assembly. The requirement for more frequent testing will be determined on a case by case basis by the St. Lucie County Utilities Department, primarily based upon the degree of hazard. Any work done to, or testing of, the assembly shall be reported to the St. Lucie County Utilities Department within seven (7) days of the incident.

SECTION 13 - RECORD KEEPING

It is essential that the program administrator of a cross-connection control program keep adequate records of all transactions. In addition to keeping records of all correspondence, particular emphases must be placed on developing a record system that accommodates monitoring of the following:

- Installation date of assemblies
- Location of backflow-prevention assemblies
- Inspection and testing of backflow-prevention assemblies
- The performance of backflow-prevention assemblies
- The performance of licensed testers

SECTION 14 - REVIEW AND UPDATE

The St. Lucie County Utilities Department will, on an annual basis, review and, if necessary, update the cross-connection control policy to meet current local, state and federal standards.

APPENDIX A

GLOSSARY

Glossary

1. **Air-Gap Separation** – The term air-gap separation shall mean a physical separation between the free-flowing discharge end of a potable water supply pipeline and an open or non-pressure receiving vessel. An approved air-gap separation shall be a distance of at least two times the diameter of the supply pipe measured vertically above the top rim of the vessel with a minimum distance of 1 in.

2. **Approved** – Accepted by the Director of St. Lucie County Utilities Department as meeting an applicable specification of St. Lucie County Utilities or of the Florida Department of Environmental Protection.

3. **Assembly** – An assemblance of one or more approved body components and including approved shutoff valves.

4. **Atmospheric Vacuum Breaker** – A backflow prevention device which is operated by atmospheric pressure in combination with the force of gravity. The unit is designed to work on a vertical plane only. The one moving part consists of a poppet valve which must be carefully sized to slide in a guided chamber and effectively shut off the reverse flow of water when a negative pressure exists.

5. **Auxiliary Water Supply** – Any water supply on or available to the premises other than the supplier's approved public potable water supply. These auxiliary waters may include water from another supplier's water supply, a private non-potable water supply or any natural source(s) such as a well, spring, river, stream, harbor, etc., or "used waters" or "industrial fluids". These waters may be contaminated or they may be objectionable, and constitute an unacceptable water source over which the water supplier does not have sanitary control.

6. **Backflow** – The flow of water or other liquids, mixtures or substances under pressure into the distribution pipes of a potable water supply system from any source or sources other than its intended source.

7. **Backflow Preventer** – An assembly, device or method used to prevent backflow into a potable water system. The type of assembly used should be based on the degree of hazard, either existing or potential.

8. **Backflow Prevention Assembly Approved** – The term approved backflow prevention assembly shall mean an assembly that has met the requirements of one or more of the following standards:

   a. AWWA - C511-07 Standard for "Reduced-Pressure Principle Backflow Prevention Assembly".

   b. AWWA - C510-07 Standard for "Double Check Valve Backflow-Prevention Assembly"

   c. ASSE - 1020 Performance Requirements for Pressure Vacuum Breaker Assembly

   d. ASSE - 1024 Performance Requirements for Dual Check Type Backflow Preventers

   e. ASSE - 1013 Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers and have completely met the laboratory and field performance specifications of the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (USC-FCCC)

9. **Backpressure** – Backpressure shall mean any elevation of pressure in the downstream piping system (by pump, elevation of piping, or steam and/or air pressure) above the supply pressure at the point of consideration which would cause or tend to cause, a reversal of the normal flow.

10. **Backsiphonage** – The flow of water or other liquids, mixtures or substances into distributing pipes of a potable water supply system from any source other than its intended source caused by the reduction of pressure in the potable water system.

11. **Certified Backflow Prevention Assembly Technician** – The term certified backflow prevention technician shall mean a person who has proven their competency to the satisfaction of the St. Lucie County Utilities Department. Each person who is certified to make competent tests or to repair, overhaul and make reports on backflow prevention assembly shall be conversant with applicable laws, rules, and regulations and shall have attended and successfully completed the Florida Water and Pollution Control Operators Association (FW & PCOA) or Training, Research, and Education for Environmental Occupations Center, University of Florida (TREED) certification programs for backflow prevention

assembly testers and repair specialists or other programs acceptable to the St. Lucie County Utilities Department.

12. **Contamination** – An impairment of the quality of the potable water supply by any solid, liquid, gaseous compounds or mixtures to a degree which would create a danger to the public health, or would create an unacceptable taste, odor or color to the potable water.

13. **Consumer** – The owner, operator or customer having a service from the St. Lucie County water supply system. See also CUSTOMER.

14. **Cross-Connection** – A cross-connection is defined in Chapter 62-550 F.A.C. as "any physical arrangement whereby a public water supply is connected, directly or indirectly with any other water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or other device which contains or may contain contaminated water, sewage or other waste or liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water supply as the result of backflow. By-pass arrangements, jumper connections, removable sections, swivel or changeable devices and other temporary or permanent devices through which or because of which backflow could occur are considered to be cross-connections."

15. **Cross-Connection Control** – A cross-connection program to eliminate, monitor, protect and prevent cross-connections from allowing backflow.

16. **Customer** – Any person, business or other entity whose name or names appear on billing for a water service connection. See also Consumer.

17. **Director, Utilities Department** – The Director of the Utilities Department of St. Lucie County who is invested with the authority and responsibility for the implementation of an effective cross-connection program and for the enforcement of the provisions of this policy.

18. **Double Check Detector Backflow-Prevention Assembly** – A specially designed backflow assembly composed of a line-size approved double check valve assembly with a bypass containing a specific water meter and an approved double check valve assembly. The meter shall register accurately for only very low rates of flow up to 3 gpm and shall show a registration for all rates of flow. This assembly shall only be used to protect against a non-health hazard (i.e, a pollutant).

19. **Double Check Valve Assembly** – An assembly composed of two single, independently acting, check valves, including tightly closing shut-off valves located at each end of the assembly and suitable connections for testing the watertightness of each check valve. A check valve is a valve that is drip-tight in the normal direction of low when the inlet pressure is 1 psi and the outlet pressure is zero. The check valve shall permit no leakage in a direction reverse to the normal flow. The closure element (e.g., clapper) shall be internally weighted or otherwise internally loaded to promote rapid and positive closure.

20. **Field Testing** – A procedure to determine the operational and functioning status of a backflow preventer.

21. **Fire Sprinkler Systems (Commercial)** – The following are types of fire protection systems. For further information on fire protection systems, refer to National Fire Protection Association publications.

    a. Antifreeze System: A wet-pipe sprinkler system containing antifreeze.

    b. Combined Dry Pipe-Preaction System: A sprinkler system containing air under pressure with a supplemental detection system installed in the area of the sprinklers. The detection system actuates tripping devices that open water inlet and air exhaust valves, which generally precedes the opening of the sprinklers. The detection system additionally serves as a fire alarm system.

    c. Deluge System: A sprinkler system having open sprinkler heads connected to a water supply. The sprinkler system piping is dry until the fire-detection system opens the water supply valve to the system.

    d. Dry-Pipe System: A sprinkler system containing air or nitrogen under pressure and connected to a water supply. A sprinkler head opening allows the air or nitrogen to be released from the system and water to enter the system. Dry-pipe systems are to be maintained dry at all times. Exception: During nonfreezing conditions, the system can be left wet if the only other option is to remove the system from service while waiting for parts or during repair activities.

    e. Foam Water Sprinkler and Spray Systems: A special fire protection system pipe connected to a source of foam concentrate and to a water supply. The system may discharge the foam agent before, after, or with the water over the area to be protected.

f. Preaction System: A sprinkler system containing air that may or may not be under pressure and connected to a water supply but having a supplemental detection system in the area of the sprinklers that would open a supply valve, allowing water to flow into the system and to be discharged by any open sprinkler.

g. Sprinkler System: A system of underground and overhead piping hydraulically designed and constructed to which sprinkler heads are attached for extinguishing fire.

h. Standpipe System: A piping system having valves, hose connections, and allied equipment installed within a premises, building, or structure where the hose connections are located in a manner to discharge water through an attached hose and nozzle to extinguish a fire. These systems may be wet or dry and may or may not be directly connected to a drinking water supply system. They may also be combined with a sprinkler system. There are three classes of standpipe systems. Class I service provides 21/2-in. hose stations from a standpipe or combined riser. Class II service provides 11/2-in. hose stations from a standpipe, combined riser, or sprinkler system. Exception: A minimum 1-in. hose may be used for Class II Light Hazard Occupancies if investigated, listed, and authorized by the authority having jurisdiction. Class III service provides 11/2-in. and 21/2-in. hose connections or 1 1/2-in. or 2 1/2-in. hose stations from a standpipe or combination riser.

i. Wet-Pipe System: A sprinkler system containing water and connected to a water supply.

22. **Flood Level Rim** – That 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.

23. **Hazard, Degree of** – The term degree of hazard is a qualification of the potential risk to public health and the adverse effect upon the public water system that may result from cross-connections within a water using facility. Establishing the degree of hazard is directly related to the type and toxicity of contaminates that could feasibly enter the public water supply system and is determined by the St. Lucie County Utilities Department.

24. **Hazard-Plumbing** – A plumbing-type cross-connection in a consumer's potable water system that has not been properly protected by an approved air gap or an approved backflow-prevention assembly.

25. **Hazard-System** – An actual or potential threat of severe damage to the physical properties of the public potable water system or the consumer's potable water system or of a pollution or contamination that would have a protracted effect on the quality of the potable water in the system.

26. **Health Hazard** – A cross-connection or potential cross-connection involving any substance that could, if introduced in the potable water supply, cause death, illness, spread disease, or have a high probability of causing such effects. See also High Hazard.

27. **High Hazard** – A cross-connection or potential cross-connection involving any substance that could, if introduced in the potable water supply, cause death, illness, spread disease, or have a high probability of causing such effects. See also Health Hazard.

28. **Industrial Piping System, Consumers** – The term consumer's industrial piping system shall mean any system used by the consumer for transmission of or to store any fluid, solid or gaseous substance other than an approved water supply. Such a system would include all pipes, conduits, tanks, receptacles, fixtures, equipment and appurtenances to produce, convey, or store substances which are or may be polluted or contaminated.

29. **Inspection** – A visual examination of backflow preventer equipment, materials, workmanship or portion thereof to verify installation and/or operational performance.

30. **Inspector** – An individual working for the St. Lucie County Utilities Department or authorized agent to ensure code compliance.

31. **Internal Protection** – Fixture isolation and/or isolation of an area or zone. Protection at the fixture means installing an approved backflow preventer at the source of the potential hazard within a specific area.

32. **Low Hazard** – 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 potable water supply. See also Non-Health Hazard.

33. **Non-Health Hazard** – 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 potable water supply. See also Low Hazard.

34. **Plumbing System** – All potable water and distribution pipes, fixtures, traps, drainage pipe, gas pipe, water treating or using equipment, vent pipe, including joints, connections, devices, receptacles and appurtenances within the property lines of a premises.

35. **Pollution** – See Low Hazard.

36. **Potable Water** – Water that is safe for human consumption.

37. **Premises Isolation** – Preventing backflow into a public water system from a user's premises by installing a suitable backflow preventer at all the user's potable water connections. See Service Protection.

38. **Pressure Vacuum Breaker** – A pressure vacuum breaker is similar to an atmospheric vacuum breaker except that the checking unit "poppet valve" is activated by a spring. This type of vacuum breaker does not require a negative pressure to react and can be used on the pressure side of a valve.

39. **Reclaimed Water** – Water that has received at least secondary treatment and is reused after flowing out of a wastewater treatment facility.

40. **Reduced Pressure Backflow Preventer** – An assembly containing within its structure a minimum of two independently acting, approved check valves, together with an automatically operating pressure differential relief valve located between the two check valves. The first check valve reduces the supply pressure a predetermined amount so that during normal flow and at cessation of normal flow the pressure between the check valves shall be less than the supply pressure. In case of leakage of either check valve, the differential relief valve by discharging to atmosphere; shall operate to maintain the pressure between the check valves less than the supply pressure. The unit shall include tightly closing shut-off valves located at each end of the device, and each device shall be fitted with properly located test clocks.

41. **Reduced Pressure Detector Backflow-Prevention Assembly** – A specially designed backflow assembly composed of a line-size approved reduced pressure principle backflow prevention assembly with a bypass containing a specific water meter and an approved reduced pressure principle backflow prevention assembly. The meter shall register accurately for only very low rates of flow up to 3 gpm and

shall show a registration for all rates of flow. This assembly shall only be used to protect against a non-health hazard (i.e., a pollutant) or a health hazard (i.e., a contaminant).

42. **Residential Dual Check** – A compact unit manufactured with two independent spring actuated check valves. The residential dual check is acceptable only as added back-flow prevention in areas served by reuse systems defined in Chapter 62-610, Part III, F.A.C. A residential dual check must be in-line, testable and repairable.

43. **Reuse** – The deliberate application of reclaimed water in compliance with the Florida Department of Environmental Protection and water management district rules, for a beneficial purpose.

44. **Service Connection** – The terminal end of a service connection from the public potable water system, that is, where the water supplier loses jurisdiction and sanitary control over the water at its point of delivery to the customer's water system. If a meter is installed at the end of the service connection, then the service connection shall mean the downstream end of the meter. There should be no unprotected takeoffs from the service line ahead of any meter or backflow-prevention assembly located at the point of delivery to the customer's water system. Service connection shall also include water service connection from a fire hydrant and all other temporary or emergency water service connections from the public potable water system.

45. **Service Protection** – Containment protection or secondary protection refers to the backflow protection installed on the water supply line to a premise as close to the service connection to the public water system as possible.

46. **Single Check Valve** – A single check valve is a directional flow control valve, but not an approved backflow preventer.

47. **Spill-Resistant Pressure Vacuum Breaker** – A backflow assembly containing an independently operating, internally loaded check valve and independently operating, loaded air-inlet valve located on the discharge side of the check valve. The assembly is to be equipped with a properly located resilient-seated test cock, a properly located bleed/vent valve, and tightly closing resilient-seated shutoff valves attached at each end of the assembly. This assembly is designed to protect against a non-health (i.e., a pollutant) or a health (i.e., contaminant) hazard under backsiphonage conditions only.

48. **Test Equipment** – An electronic or mechanical instrument recognized by the St. Lucie County Utilities Department to field test the operational performance of a backflow preventer.

49. **Water Supplier** – The term water supplier shall mean the owner or operator of the public potable water system supplying an approved water supply to the public. The utility shall be one that is operating under a valid permit from the Florida Department of Environmental Protection. As used herein the term water supplier and the St. Lucie County Utilities Department may be used synonymously.

50. **Water System, Customers** – The term customers water system shall include any water system located on the consumer's premises, whether supplied by a public potable water system or any auxiliary water supply. The system or systems may be either a potable water system or an industrial piping system.

51. **Water-Used** – Any water supplied by a water supplier from a public potable water system to a customer's water system after it has passed through the point of delivery and is no longer under the sanitary control of the water supplier.

APPENDIX B

RELEVANT SECTIONS OF THE ST. LUCIE COUNTY CODE OF ORDINANCES

ARTICLE IV. ST. LUCIE COUNTY CROSS CONNECTION CONTROL POLICY*

_____

***Cross references:** Environmental protection, § 1-7.6-1 et seq.

_____

Sec. 1-10-35. Definitions.

The following words when used in this article shall have the meanings ascribed to them in this section.

Backflow shall mean the undesirable reversal of flow in a potable water distribution system as a result of a cross connection.

Backflow prevention device shall mean a backflow prevention device which has been approved by the utility director pursuant to the criteria set forth in the Cross Connection Manual.

Contamination shall mean an impairment of a potable water supply by the introduction or admission of any foreign substance that degrades the quality and creates a health hazard.

Cross connection shall mean a connection or potential connection between any part of a potable water system and any other environment containing other substances in a manner that, under any circumstances would allow such substances to enter the potable water system. Other substances may be gases, liquids, or solids, such as chemicals, waste products, steam, water from other sources (potable or non-potable), or any matter that may change the color or add odor to the water.

Cross Connection Control Manual shall mean the latest version of the St. Lucie County Cross Connection Manual as adopted and approved by the board of county commissioners for St. Lucie County by resolution. All of terms and conditions of the Cross Connection Control Manual are incorporated into this article by this reference. A copy of the Cross Connection Control Manual shall be on file in the office of the county utility services director.

Customer shall mean the person, firm, association, corporation, government agency or other entity or organization that is lawfully authorized to receive water and/or sewer service from the St. Lucie County utility services department.

Pollution shall mean 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.

Potable water shall mean water that is safe for human consumption as described by the Florida Department of Environmental Protection.

Utility shall mean the St. Lucie County utility services department.

Utility director shall mean the St. Lucie County utility services director.

(Ord. No. 96-05, Pt. A, 5-21-96)

Sec. 1-10-36. Purpose.

The purpose of this article is:

(1) To protect the public potable water supply of the St. Lucie County utility services department from the possibility of contamination or pollution by isolating within its customers' internal distribution system or the customers' private water system such contaminants or pollutants that could backflow into the utility water system; and

(2) To promote the elimination or control of existing cross connections, actual or potential, between the customers' potable water system and non-potable water systems, plumbing fixtures, and industrial piping systems; and

(3) To provide for the maintenance of a continuing program of cross-connection control that will systematically and effectively contribute to the prevention of contamination or pollution of all public potable water systems.

(Ord. No. 96-05, Pt. A, 5-21-96)

Sec. 1-10-37. Backflow prevention devices required.

A backflow prevention device shall be required, tested and maintained when necessary to protect the utility potable water system from potential or actual contamination or pollution. It shall be the responsibility of the utility director to determine when a backflow prevention device is required for the protection of the utility potable water system. Such determination shall be in accordance with the Cross Connection Control Manual.

(1) *New service.* If the utility director determines that a backflow prevention device is required, the device shall be installed at the customer's expense before water service is provided to the customer's property. It shall be the responsibility of the customer to maintain and test the backflow prevention device in accordance with the Cross Connection Control Manual.

(2) *Existing service.* If the utility director determines that a backflow prevention device is required, the utility director or his designee shall give notice in writing to the customer to install a backflow prevention device at specific location or locations on the customer's property. The customer shall install the backflow prevention device in accordance with the Cross Connection Control Manual at the customer's expense. Failure, refusal, or inability by the customer to install, have tested, and maintain the backflow prevention device shall constitute grounds for discontinuing water service to the premises until such requirement has been satisfactorily met.

(Ord. No. 96-05, Pt. A, 5-21-96)

APPENDIX C

FORMS

St. Lucie County Utilities

Backflow Prevention Device Test & Maintenance Report

Customer: _____ **Commercial** ___ **Residential** ___

Street Address: _____ _____

Mailing Address: _____ **Contact #** _____

Device Information

Location of property: _____ New ___ Existing ___ Repl. ___

Type of Assembly: RP ___ DC ___ DDC ___ PVB ___ SVB ___

Manufacturer: _____ **Model:** _____ **Serial No:** _____

Assembly Size: _____ **Water Meter #** _____

*if replacing device, provide failed test report and old serial #

	Reduced Pressure Assemblies			Pressure Vacuum Breaker	
	Double Check Assemblies		Differential Pressure Relief Valve	Spill Resistant Vacuum Breaker	
	1st Check	2nd Check		Air Inlet	Check Valve
Initial Test	Leaked: ___ Closed Tight: ___	Leaked: ___ Closed Tight: ___	Opened at ___ PSID Did Not Open: ___	Opened at ___ PSID Did not Open: ___	Held at ___ PSID Leaked: ___
Differential Pressure Across CV.	___ PSI	___ PSI	**Outlet shut-off valve** Leaked: ___ Closed Tight: ___		
Line Pressure	___	PSI	DC Meter Reading		
Repairs & Materials Used					
Test After Repair	Leaked: ___ Closed Tight: ___ Held at ___ PSID	Leaked: ___ Closed Tight: ___ Held at ___ PSID	Opened at ___ PSID	Opened at ___ PSID	Held at ___ PSID

Tester Information

Tester Name: _____ **License #** _____

Business Name: _____ **Phone #** _____

Business Address: _____

Test Gauge Used: Make/Model _____ **Serial #** _____

Accuracy Test Date: _____

Remarks: _____

Backflow Test Status: Pass ___ Fail ___ **Assembly Installed to Code?** Yes ___ No ___

_____

Signature of License Tester **Date of Test**