

APPENDIX A

(Cross Connection Design Standards)

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Definitions

As used in this article, the following terms shall have the meanings provided in this section unless the context clearly indicates otherwise.

Air-gap: an unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or any other device and the flood level rim of the receptacle. The vertical separation shall be at least twice the diameter of the supply pipe or fixture opening, but in no case shall the air-gap be less than one (1) inch.

Approved: Certified in writing by the Director of Public Utilities or his designee as an acceptable assembly or methodology for the purpose of backflow prevention. All approved backflow assemblies must meet or exceed standards set forth by the University of Southern California for Cross Connection Control and Hydraulic Research (USCFCCHR) and/or the American Society of Sanitary Engineering (ASSE) by being on the agency's approval list. Non in-line testable backflow assemblies must meet or exceed standards set forth by the ASSE. Backflow assemblies to be used on fire suppression systems must have the additional approval from Factory Mutual (FM) and comply with the National Fire Protection Association (NFPA) code.

ASSE: American Society of Sanitary Engineering

Atmospheric vacuum breaker: (AVB) a device designed to allow air to enter the downstream water line to prevent backsiphonage as described in AWWA Recommended Practice for Backflow Prevention and Cross-Connection Control Manual M-14. This device shall not be subject to continuous pressure or backpressure backflow.

Auxiliary intake: any piping connection or other device whereby water may be secured from a source other than the public water supply. (e.g.well)

Auxiliary water supply: any water other than the City of Raleigh public water supply as defined herein; including, but not limited to recycled water, grey water, rain water, well water, cistern water, reuse water and any other water supply from other water purveyors.

Backflow: any flow of water into the public water supply from any other source due to a cross-connection, auxiliary intake, interconnection, backpressure, backsiphonage, any combination thereof, or other cause.

Backflow assembly: an approved effective mechanical assembly or method used to prevent backflow from occurring in the potable water supply. The type of assembly required shall be based on degree of hazard, existing or potential. An assembly is testable in line to its utilization and is unaltered from the manufacturer's configuration and includes shutoffs.

Backflow device: an approved effective device or method used to prevent backflow from occurring in the potable water supply. The type of device required shall be based on degree of hazard, existing or potential. A device is not testable in line to its utilization.

Backpressure: any pressure on any source of water other than the public water supply which may be greater than the pressure on the public water supply and may result in a backflow.

Backsiphonage: any circumstance in which the pressure on the public water supply may be reduced to the point that the elevation and atmospheric pressure on a source of water other than the public water supply may result in a pressure to be greater than the pressure on the public water supply and may result in a backflow.

Building story: a building story is equal to 10' for the purpose of cross connection hazard determination.

Certified tester: a person who has proven his/her competency to test, repair, overhaul and make reports on backflow prevention devices as evidenced by certification of successful completion of a training program approved by the Director of Public Utilities.

Consumer: any person, firm, or corporation responsible for any property at which water from the City of Raleigh public water supply is received. In the absence of other parties or the failure of other parties to accept the responsibilities herein set forth, the owner of record shall be ultimately responsible.

Containment assembly: a backflow prevention assembly, as approved and required, installed at the point of separation between the public water supply and a private service or private distribution system or at the point of metering.

Containment protection: backflow prevention provided at the property boundary to protect the public water supply from contamination. Containment includes special or existing conditions, which do not allow installation at the property boundary and where alternative locations have been approved by the Director of Public Utilities or his designee.

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

Cross-connection: any physical or potential connection between the public water supply and any other piping system, any other water supply system, whether public or private, either inside or outside of any building or buildings, sewer fixture, container, or device arranged in such a manner whereby water or other liquids, mixtures or substances may flow into the public water supply either through the manipulation of valves or because of ineffective check or back-pressure valves, or because of any other arrangement or circumstance.

Cross-connection coordinator: the official position established and authorized by the City and designated by the Director of Public Utilities to administer, interpret this section and who shall be a certified tester and may serve as Operator in Responsible Charge as recognized by North Carolina Department of Environment and Natural Resources 15A NCAC 18D.0701.

Double check valve assembly: (DCVA) a backflow prevention assembly composed of two single, spring-loaded independently operating check valves, including tightly closing shut-off valves located at each end of the assembly, and having approved connections for testing the water tightness of each check valve. Assembly must be approved by USC and ASSE 1015.

Double check detector assembly: (DCDA) an assembly containing two single, spring-loaded independently operating check valves with tightly closing shut-off valves on each side of the check valves, plus properly located test cocks for the testing of each check valve and a bypass containing a water meter (reading in cubic feet). Assembly must be approved by USC and ASSE 1048.

Dual check valve: a device containing two independently acting check valves in series. Not inline testable with no shut-offs.

Enclosure: ASSE 1060 approved Class 1.

Fire line: a system of pipes and equipment used to supply water in an emergency for extinguishing fire.

Interconnection: any system of piping or other arrangement whereby the public water supply is connected directly with a sewer, drain, conduit, pool, heat exchanger, storage reservoir, or other device which does or may contain sewage or other waste or substance which would be capable of imparting contamination to the public water supply.

Isolation assembly: a backflow prevention assembly, as approved and required, installed within a private plumbing or distribution system to isolate a localized hazard from the remainder of said system.

Isolation protection: the act of confining a localized hazard within a plumbing or distribution system by installing approved backflow prevention assemblies.

Moderate hazard: actual or potential threat of contamination or pollution that presents a potential long-term danger to public health with consequence of chronic illness or death. This may also include nuisance, aesthetically

objectionable or other undesirable alterations of the drinking water supply, as determined by the Director of Public Utilities.

Potable Water: water, which is approved for drinking and other household uses and provided by the City of Raleigh Public Utilities Department.

Non-potable water: water, which is unapproved and or unfit for drinking and other household uses.

Pressure vacuum breaker: (PVB) an approved assembly containing an independently operating spring loaded check valve and an independently operating loaded air inlet valve located on the discharge side of the check valve. The assembly must be equipped with approved connections for testing the proper operation of the device and tightly closing shut-off valves located at each end of the assembly.

Public water supply: the water and waterworks system of the City of Raleigh and its customers outside the corporate limits, for general use as potable water and which is recognized by the North Carolina Department of Environment and Natural Resources as system number 03-92-010.

Reduced pressure zone principle backflow assembly: (RPZ): an approved assembly containing within its structure two spring loaded independently operating check valves, together with an automatically operating pressure differential relief valve located between the two (2) 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 checks shall be less than the supply pressure. In case of leakage of either check valve, the differential relief valve, by discharging to the atmosphere, shall operate to maintain the pressure between the check valves less than the supply pressure. This assembly shall have approved connections for testing the proper operation of the assembly, including tightly closing shut-off valves located at each end of the assembly. Assembly must be approved by USC and ASSE 1013.

Reduced pressure detector assembly: (RPDA): an assembly containing two spring-loaded independently operating check valves, with an automatically operating pressure differential relief valve located between the two check valves, plus tightly closing shut off valves on each side of the check valves, and properly located test cocks for testing the check valves. Assembly must be approved by USC and ASSE 1047.

Severe hazard (Health Hazard): actual or potential threat of contamination as determined by the Director of Public Utilities that presents either an imminent danger to the public health with consequence of serious illness or a potential long term danger to public health with consequence of chronic illness or death.

SECTION 1 - GENERAL INSTALLATION REQUIREMENTS

The City of Raleigh Public Utilities Department as the water purveyor for Raleigh, Garner, Rolesville, Wake Forest, Knightdale, Zebulon and Wendell has the primary responsibility of protecting the public water supply from potential sources of contamination and/or pollution. All commercial and residential connections to the public water supply are required to be protected with a backflow assembly as determined by Section D., Water Quality of the Raleigh City Code and the policies and design criteria identified within this document. This document may be appended by technical bulletin or as published by annual updates of this manual.

Any water fee only service, which is split from the primary domestic service (see detail W-34 and W-35) will be considered an "irrigation service" for the purposes of this cross connection policy. This water fee only service may not be used as domestic water and may not enter or cross under any existing or proposed structure. This also applies to water fee only meters, which are installed for irrigation or to serve a yard hydrant or other purpose.

For any application not specifically mentioned within this document level of hazard shall be determined by the Public Utilities Director or his designee.

No backflow assembly shall be installed in a manner as to allow the assembly to be looped around or by-passed either temporarily or permanently.

Upon identification of the potential for contamination or a hazard to the City of Raleigh's drinking water supply system, or a failure to comply with a requirement of this handbook, the Public Utilities Director or his designee shall notify, by first-class mail, the owner of record of the property at which the potential contamination or hazard exists, of the location and nature of the potential contamination or hazard, the number of the applicable section of the Public Utilities ordinance and handbook, and the order of the Public Utilities Director or his designee regarding actions to be taken. Notice shall be deemed received three days after mailing.

The Public Utilities Director or his designee shall, among other things, determine if an imminent danger to the drinking water supply or to public health exists, which determination shall impact deadlines for compliance as described in the City of Raleigh's Public Utilities ordinance or handbook. The Public Utilities Director or his designee may issue any follow-up orders he/she deems necessary, including order for testing and other actions related to compliance.

No person shall interfere with the staff of the Cross Connection Control Program in the performance of the duties and responsibilities established by this article.

SECTION 2 – Irrigation Systems- Residential/Commercial (Severe Hazard)

A City of Raleigh commercial potable water only meter service connection serving irrigation, car washing, yard hydrant use, pool filling or similar outdoor use shall be protected with a Severe Hazard containment assembly in the form of a Reduced Pressure Zone Principle Backflow assembly (RPZ) that will be required to have an operational test upon installation and every three years thereafter according to City of Raleigh Cross Connection Ordinance Sec. 8-2148(a).

2.1 ACCESSIBILITY:

All *containment* backflow assemblies must be installed where the Director of Public Utilities or his designee deems them readily accessible. Readily accessible is having direct access to a backflow assembly without the need of removing any panel, door or similar covering of the item described, and without requiring the use of portable ladders, chairs, etc. The proper installation of an approved insulated enclosure may be deemed readily accessible. Enclosure clearances shall comply with ASSE Standard 1060. Clearances shall allow adequate room for servicing and maintaining the backflow assembly in the enclosure.

2.2 ALTERATIONS/MODIFICATIONS:

No backflow assembly shall be altered or modified from its approved factory configuration unless such modifications are made with strict adherence to manufacturer's recommendations. All alterations or modifications must be inspected by the Public Utilities Director or his designee.

2.3 ALTERNATE APPROVAL:

When a special circumstance precludes the ability to comply with any portion of this code, the Director of Public Utilities or his designee when presented with a detailed description of the issue may consider other options for approval.

2.4 AUTHORIZED PLUMBERS: Any assembly required to be installed by the provisions of this article or by a corrective order issued by the City of Raleigh's Public Utilities Director or his designee shall be installed by a licensed North Carolina plumbing contractor.

2.5 AUXILIARY WATER SUPPLY-COMMERCIAL (RECYCLED WATER, GREY WATER, RAIN WATER, REUSE WATER, IRRIGATION WELL, CISTERN):

Interconnections between an auxiliary water supply and the public water supply are not permitted and considered unlawful. (Sec. 8-2143) Premises where an auxiliary water supply exists or is installed shall have an approved containment RPZ installed on the public water supply service line. (Sec. 8-2147) Make-up water connections to an auxiliary water supply including but not limited to cisterns, grey water, rain water, reuse water, recycled water, and irrigation well systems shall have a containment assembly in form of an approved RPZ and/or an air gap. Any unapproved interconnection between an auxiliary water supply and a public water supply shall be corrected according to City of Raleigh's Cross Connection Ordinance, Sect. 8.

2.6 BACKFLOW ASSEMBLY APPROVALS:

All *containment* testable RPZ backflow prevention assemblies must meet or exceed standards set forth by ASSE1013 (The American Society of Sanitary Engineering) and AWWA C511(American Water Works Association) as listed by the agency's current published list and adheres to applicable ANSI and ASTM standards. You can find the list of approved backflow assemblies on the City of Raleigh's website www.raleighnc.gov or contact the Raleigh Cross-Connection Control Office, at 919-996-2373 or email, cross.connection@raleighnc.gov.

2.7 DRAIN REQUIREMENTS:

RPZ backflow assemblies are not allowed to be installed below ground level. RPZ assemblies installed in above ground enclosures shall be installed so that the relief outlet of the assembly does not become submerged. A minimum clearance of 12" must be maintained from the most bottom part of the assembly to concrete pad or floor of the enclosure. Drain port is a minimum of 4" or two times the size of the backflow assembly whichever is greater and provide positive drainage with adequate gravity drainage to atmosphere.

2.8 ENCLOSURES:

All backflow assemblies shall be centered and secured on a 4” concrete pad, fiberglass, or approved mounting pad is unionized for winterization. (Any backflow assembly installed on an irrigation system that is unionized for winterization is not required to have a concrete pad.) All enclosures must be a minimum Class II A.S.S.E. standard 1060 insulated weatherproof enclosure. Property owner is to ensure backflow assembly is drained during winter months and protected from freezing.

If multiple backflows assemblies are installed within one enclosure, all components of each backflow assembly must be accessible for testing, repair and or replacement without having to remove another backflow assembly or piping that serves another assembly. The test cocks to all backflow assemblies must be accessible. Enclosures that are damaged and do not provide adequate freeze protection may be required to be repaired or replaced.

2.9 FLOOD PRONE AREAS:

Backflow assemblies installed in a flood plain must be installed at least 1ft above regulatory flood plain level. Raleigh City Code 10-6037

2.10 IDENTIFICATION TAG:

No one shall remove any manufacturers tag or stamp that bears pertinent information about the unit. If a manufacturers tag or stamp is removed or damaged and rendered unreadable the backflow assembly must be replaced.

2.11 INSPECTIONS:

The local Plumbing Inspector having jurisdiction shall inspect every backflow assembly that is installed, relocated or removed (other than for winterization). It is the responsibility of the installer of a backflow assembly to secure the permit and inspection or re-inspection by the local Plumbing Inspector.

2.12 LOCATION:

Provided there are no unprotected taps before the backflow assembly, lawn irrigation backflow assemblies may be installed within 50’ from the most downstream edge of the meter box in a landscaped area. The backflow assembly must remain accessible and visible after landscape maturity. Backflow assemblies may not be installed in a hazardous location, traffic site triangle or within the right-of-way (ROW). The Public Utilities Director or his designee may approve alternate locations.

2.13 MATERIALS:

Piping materials shall conform to one of the standards listed in table 605.3 for water service pipe and 605.4 for water distribution pipe.

2.14 METER CONNECTION:

Piping materials from the meter to the backflow shall conform to one of the standards listed in table 605.3 for water service pipe and 605.4 for water distribution pipe.

2.15 ORIENTATION:

All backflow assemblies shall be installed in an orientation as approved by the ASSE.

2.16 PERMITS (SEE SECTION 7):

A plumbing permit is required for all new and relocated backflow installations. Replaced backflow assemblies may require a plumbing permit. To determine if a plumbing permit is required, call the local Inspections Department or permitting agency for your area. Assemblies that have been winterized are not required to have a permit for installation but are required to have an operational test before they can be put into service.

OTHER IMPORTANT NUMBERS:

- City of Raleigh Inspections Department-919-996-2495**
- Town of Garner Inspections Department- 919-773-4433**
- Town of Wake Forest inspections Department-919-435-9530**
- Town of Rolesville Permits- 919-856-6060 (Wake County Inspections Department)**
- Town of Knightdale Permits- 919-856-6060 (Wake County Inspections Department)**

Town of Zebulon Permits- 919-856-6060 (Wake County Inspections Department)
Town of Wendell Permits- 919-856-6060 (Wake County Inspections Department)

2.17 PRE-EXISTING NON-COMPLIANCE ISSUE:

Any location that currently has a backflow assembly that is not installed according to the City of Raleigh's installation requirements will be considered a pre-existing noncompliance issue. If the noncompliant assembly fails its operational test and cannot be repaired, the new replacement assembly will be installed according to the COR's installation requirements for irrigation systems. Any property with a noncompliant assembly that has a test due date of more than one year overdue will no longer be considered pre-existing. All non-repairable assemblies will not be considered pre-existing. It is the consumer's responsibility to ensure that all paperwork showing compliance is submitted to the Public Utilities Cross Connection Program within the required time limit.

2.18 RELIEF OUTLET PIPING AND VALVE:

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

- They must include an approved pre-fabricated "air gap drain" as available from backflow prevention assembly manufacturers.
- All relief port drain lines shall be piped to an outside point of termination and when run horizontally, shall be installed with a fall conforming with the current North Carolina State Building Code, Volume II - Plumbing.
- The RPZ relief valve shall be a minimum of 12" above any material or ground.

2.19 RELOCATION AND REPLACEMENT:

A permit is required to relocate/replace an irrigation backflow assembly. Any backflow assembly that is relocated/replaced shall be installed according to City of Raleigh's Cross Connection ordinances, handbook, and NC State Plumbing Code. Upon relocation/replacement of the backflow assembly, an operational test shall be performed by an approved City of Raleigh tester. The make, model, permit number, serial number and new location of the relocated/replaced assembly shall be noted in comments on the test report for the new assembly. (See: Permits 2.17)

2.20 REPAIRS:

If an assembly fails its operational test, the property owner will have 15 days from the annual test due date to have all repairs made. If it cannot be repaired, the assembly will need to be replaced with an approved RPZ backflow assembly according to the City of Raleigh's Cross Connection ordinances, handbook, and NC State Plumbing Code. The defective parts must be replaced with factory approved parts.

2.21 RIGHT OF ENTRY:

As a condition of water service, the City of Raleigh's Public Utilities Director or his designee shall have the right to enter any building or premises served by the City of Raleigh's water system for the purpose of performing the duties established by this handbook and ordinance.

2.22 SERVICE VALVE:

The #1 shut-off valve is part of the backflow assembly may not be used as a service valve. A service valve shall be installed after the meter and prior to every backflow assembly to allow testing, maintenance and replacement of the backflow without the use of a City of Raleigh Public Utilities operating valve.

2.23 SIZING:

In no case shall a backflow assembly be smaller in line size than its outlet piping.

2.24 SUPPORT:

Backflow assemblies shall be properly supported so that stress on surrounding piping does not occur. Adequate support must be provided for the assembly in the approved orientation either vertically or horizontally. The assembly may not be supported by other piping or unapproved methods of support. (See: NC Plumbing Code Section 308.5)

2.25 TESTING:

After June 1, 2014, all irrigation backflow assemblies are to be tested every three years. Testing of backflow assemblies shall be conducted by an approved City of Raleigh Tester at the customer's expense. Additional testing requirements may be requested or imposed as determined by the Director of Public Utilities or his designee. It is the consumer's responsibility to keep a complete, written record of any repairs and testing of the backflow prevention assembly for at least three years.

Those residential customers who have had their irrigation backflow tested prior to 2014 will not be required to test every three years until the year of their next test due date.

Any location that does not have a current passing operational test report on file with the Cross Connection Program will be considered noncompliant. Residents that are in noncompliance can bring their residence into compliance by:

- **Test:** Hire a City of Raleigh approved tester to perform an operational test and submit the report to the Cross Connection Program. All test and maintenance reports shall be submitted to Cross Connection Program within 15 days of testing. Fax: 919-996-1868 or cross.connection@raleighnc.gov
- **Inactivate:** If an irrigation meter is present, it may be removed by calling 919-890-3245 and the meter will be pulled and the irrigation account marked inactive. Upon notification from the consumer and verification of the CC program that the irrigation account is inactive, the resident's information will be removed from the current backflow records.
- **Terminate:** To permanently remove an irrigation backflow assembly, all controls and valves shall be removed with the piping capped or plugged below ground near the source of connection. The meter box, if existing shall be removed. A plumbing permit and inspection is required to cap or plug piping. **Note:** Irrigation systems that are re-activated must be done with a separate meter and all City of Raleigh and NC Plumbing code policies on new installations must be followed.

Failed Operational Test: If an assembly fails its operational test, the consumer will have 15 days to have all repairs made. If the assembly cannot be repaired, the assembly will need to be replaced with an approved RPZ backflow assembly according to the City of Raleigh's Cross Connection ordinances, handbook, and NC State Plumbing Code.

2.26 WINTERIZATION:

Irrigation backflow assemblies may be removed for the winter and shall be installed once the danger of frost has passed. The backflow assembly for a lawn irrigation system may be removed for winterization when installed with unions and an upstream shut off valve not subject to freezing.

Upon reinstallation of a winterized backflow assembly, an operational test must be conducted and the test report submitted to the Cross Connection Control Program.

2.27 WATER SERVICE:

To start a water service account with the City of Raleigh, please call Utility Billing at 919-890-3245. All commercial accounts and residential customers that have an irrigation and/or fire sprinkler system are required to have approved containment backflow assemblies. A *Certificate of Compliance* must be obtained before a water service account can be started. (See Section 7: Certificate of Compliance)

2.28 WYE STRAINER:

Irrigation assemblies shall have a wye strainer installed after the meter and before the #1 shutoff valve of the backflow assembly.

SECTION 3 – Domestic Systems- (Moderate and Severe Hazard)

The following are the requirements for domestic service connections to the City of Raleigh Water System: There shall not be any unprotected interconnection between potable water and fire lines or auxiliary water supplies. All backflow assemblies installed on domestic systems shall be either a Double Check backflow assembly (DCVA) for moderate hazard installations or a Reduced Pressure Zone backflow assembly (RPZ) for severe hazard installations

3.1 ACCESSIBILITY:

All *containment* backflow assemblies must be installed where the Director of Public Utilities or his designee deems them readily accessible. Readily accessible is having direct access to a backflow assembly without the need of removing any panel, door or similar covering of the item described, and without requiring the use of portable ladders, chairs, etc. The proper installation of an insulated enclosure may be deemed readily accessible. Enclosure clearances shall comply with ASSE Standard 1060. Clearances shall allow adequate room for servicing and maintaining the backflow assembly in the enclosure.

3.2 ALTERATIONS/MODIFICATIONS:

No backflow assembly shall be altered or modified from its approved factory configuration unless such modifications are made with strict adherence to manufacturer's recommendations. All alterations or modifications must be approved by the Public Utilities Director or his designee.

3.3 ALTERNATE APPROVAL:

When a special circumstance precludes the ability to comply with any portion of this code, the Director of Public Utilities or his designee when presented with a detailed description of the issue may consider other options for approval.

3.4 AUTHORIZED PLUMBERS: Any assembly required to be installed by the provisions of this article or by a corrective order issued by the City of Raleigh's Public Utilities Director or his designee shall be installed by a licensed North Carolina plumbing contractor.

3.5 AUXILIARY WATER SUPPLY-RESIDENTIAL (RECYCLED WATER, GREY WATER, RAIN WATER, REUSE WATER, IRRIGATION WELL, CISTERN):

Interconnections between an auxiliary water supply and the public water supply are not permitted and considered unlawful. (Sec. 8-2143) Premises where an auxiliary water supply exists or is installed shall have an approved containment RPZ installed on the public water supply service line. (Sec. 8-2147) Make-up water connections to an auxiliary water supply including but not limited to cisterns, grey water, rain water, reuse water, recycled water, and irrigation well systems shall have a containment assembly in form of an approved RPZ and an air gap. Any unapproved interconnection between an auxiliary water supply and a public water supply shall be corrected according to City of Raleigh's Cross Connection Ordinance, Sect. 8.

3.6 BACKFLOW ASSEMBLY APPROVALS:

All *containment* RPZ backflow assemblies must meet or exceed standards set forth by ASSE 1013 (The American Society of Sanitary Engineering) and AWWA C511 (American Water Works Association) and DCVA backflow assemblies must meet or exceed standards set forth by ASSE 1015 and AWWA C511as listed by the agency's current published list and adhere to applicable ANSI and ASTM standards. You can find the list of approved backflow assemblies on the City of Raleigh's website www.raleighnc.gov or contact the Raleigh Cross-Connection Control Office, at 919-996-2373 or email, cross.connection@raleighnc.gov.

3.7 BYPASS /PARALLEL INSTALLATION:

Facilities that by the nature of their business cannot shut down their water systems to provide for backflow assembly testing, repairs, etc. shall be required to install a bypass backflow assembly of the same type and in some *cases* the same size as the main line unit. The rule to size the bypass/parallel unit is the assembly must have the square diameters equal to the square of the supply service "tap". For instance an 8" service would need at a minimum two six inch assemblies in parallel. This is a minimum; ultimately the total capacity of the assemblies should equal or exceed the required flow for the application.

3.8 CULINARY USE:

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

3.9 DEAD END:

A containment backflow assembly shall be installed on a private distribution system that dead ends.

3.10 DRAIN REQUIREMENTS:

DCVA DRAINAGE REQUIREMENTS:

DCVA backflow assemblies are not allowed to be installed below ground level. DCVA assemblies installed in an above ground enclosure shall be installed so that the assembly does not become submerged. A minimum of clearance of 12" must be maintained from the most bottom part of the assembly to the concrete pad or floor of the enclosure. Drain size shall be twice the diameter of the backflow assembly or 4" minimum whichever is greater and must provide a means of positive drainage with adequate gravity drainage to atmosphere.

Existing Installations:

All existing DCVAs installed below ground shall be considered a pre-existing noncompliance issue. (See: Pre-existing noncompliance)

RPZ BACKFLOW DRAIN REQUIREMENTS:

All RPZ backflow assemblies are not allowed to be installed below ground level. RPZ assemblies installed in above ground enclosures shall be installed so that the relief outlet of the assembly does not become submerged. A minimum clearance of 12" must be maintained from the most bottom part of the assembly to concrete pad or floor of the enclosure. Drain size shall be twice the diameter of the backflow assembly or 4" minimum whichever is greater and must provide a means of positive drainage with adequate gravity drainage to atmosphere.

Existing Installation:

All existing RPZ assemblies installed below ground or at a location will be considered pre-existing noncompliance issue. (See: Pre-existing Noncompliance)

3.10 ENCLOSURES:

All backflow assemblies installed above ground shall be centered and secured on a 4" concrete, fiberglass, or approved mounting pad. All approved containment backflow assemblies must be protected from freezing. All enclosures must be an A.S.S.E. standard 1060 Class I- Freeze Protection Enclosure (Heated) or a Class II Freeze Retardant Enclosure (Non-Heated).

If multiple backflows assemblies are installed within one enclosure, all components of each backflow assembly must be accessible for testing, repair and or replacement without having to remove another backflow assembly or piping that serves another assembly. The test cocks to all backflow assemblies must be accessible. Enclosures that are damaged and do not provide adequate freeze protection may be required to be repaired or replaced.

3.11 FLOOD PRONE AREAS:

Backflow prevention assemblies installed in a flood plain must be installed at least 1ft above regulatory flood plain level. Raleigh City Code 10-6037

3.12 HAZARDOUS USES:

Hazards are divided into the following categories:

A) Residential Moderate Hazard- Dual Check Valves

Single family residential service 3/4" and 1" without an auxiliary water supply or other high hazard application within the property boundaries shall have a dual check valve installed.

B) Moderate Hazard – DCVA:

1. All other connections not defined as high hazard, including but not limited to individual office buildings for Lawyers, Insurance Agents, Financial Advisors, Real Estate Agencies, Banks etc. (conditional upon the existence of a higher hazard within the building as listed below)
2. Fire sprinkler systems without chemicals

C) Severe Hazard- RPZ and/or Air Gap:

1. All lawn sprinkler systems or yard hydrants.
2. Wastewater treatment plants, pumps and tanks handling sewage, sewer waste lines.
3. Make-up water connections to a private non-potable auxiliary water system water supply including but not limited to cisterns, grey water, rain water collection and irrigation well systems. RPZ and AIR GAP required.
4. Connection to tanks, pumps, lines, boiler and steam connections and vessels that handles sewage, lethal substances toxic or radioactive substances. Coils or jackets used as heat exchangers, flush valve toilets without vacuum breaks, bacterial and viral materials, water systems or hose connections, with booster pumps, carbonation equipment or similar hazard.
5. Buildings with five or more stories above ground level.
6. Hospitals, dental offices and other medical facilities that may have x-ray equipment, laboratory, medical washing equipment, autoclaves etc., vacuum pumps.(Includes psychology and psychiatric offices that administer medications)
7. Morgues, mortuaries and autopsy facilities
8. Metal plating or fabrication facilities
9. Bottling plants
10. Canneries, Packing House, Poultry House
11. Battery manufacturers
12. Exterminators
13. Lawn care companies, Green house
14. Chemical processing plants
15. Dairies
16. Film laboratories
17. Car wash facilities
18. Dye works
19. Laundries
20. Swimming pools
21. Water front facilities
22. Restaurants
23. Flex space occupancies such as strip centers and mall buildings or spaces approved for multiple types of occupancy use.
24. Power plant, Nuclear Reactor
25. In any location where an approved containment RPZ is required for isolation of a contaminant an approved RPZ is required for containment.
26. Single family residential properties that have an auxiliary water supply or other high hazard application within the property boundaries shall install an approved containment RPZ on the public water supply service line or a meter designed to detect backpressure. A water fee only meter requires an approved containment RPZ regardless of proposed use.
27. Hazard level is unknown at the time of review.

Notes:

- 1) Under no circumstances will a potable water line be directly or indirectly connected to any piping or equipment that conveys sewage.
- 2) No person shall fill special use tanks or tankers containing pesticides, fertilizers, or other toxic chemicals or their residues from a public water system except at a location equipped with an approved air gap (2 times diameter of supply pipe with a 1" minimum) No supplier of water shall permit filling of such special use containers except at locations so equipped.
- 3) This is not an exhaustive list. Any other hazard not specifically listed shall be determined by the Public Utilities Director or his designee.

3.13 IDENTIFICATION TAG:

No one shall remove any manufacturers tag or stamp that bears pertinent information about the unit. If a manufacturers tag or stamp is removed or damaged and rendered unreadable the assembly must be replaced.

3.14 INSPECTIONS:

The local Plumbing Inspector having jurisdiction shall inspect every assembly that is installed, relocated or removed. It is the responsibility of the installer of a backflow prevention assembly to secure the permit and inspection or re-inspection by the local Plumbing Inspector.

3.15 LOCATION:

Backflow assemblies may not be installed in a hazardous location, traffic site triangle or within the right-of-way (ROW). For example: the slope of a hill without a level work area. Containment backflow assemblies shall be installed within 50’ of the downstream (private) side of the meter box. Provided there are no unprotected taps before the backflow assembly, backflows may be installed inside of buildings. Containment backflow assemblies installed inside a building may require an approved backflow assembly to contain the private distribution system that dead ends or loops. The backflow assembly must remain accessible and visible after landscape maturity. The Public Utilities Director or his designee may approve alternate locations for facilities with zero lot line limitations.

3.16 LOOPED SYSTEMS:

Each individual service (fire, domestic or irrigation) on a private looped system shall be protected with a backflow assembly as well as each point of connection of the looped system to the main. When looping is not possible, a containment backflow assembly shall be installed on the dead end at the ROW. *See PUD Handbook WATER DESIGN PRIVATE for definition of Looped Systems.*

3.17 MATERIALS:

Piping materials shall conform to one of the standards listed in table 605.3 for water service pipe and 605.4 for water distribution pipe.

3.18 METER CONNECTION:

Piping materials from the meter to the backflow shall conform to one of the standards listed in table 605.3 for water service pipe and 605.4 for water distribution pipe.

3.19 ORIENTATION:

All backflow assemblies shall be installed in an orientation as approved by the ASSE.

3.20 PERMITS (SEE SECTION 7):

A plumbing permit is required for all new and relocated backflow installations. Replaced backflow assemblies may require a plumbing permit. To determine if a plumbing permit is required, call the local Inspections Department or permitting agency for your area. Assemblies that have been winterized are not required to have a permit for installation but are required to have an operational test before they can be put into service.

OTHER IMPORTANT NUMBERS:

City of Raleigh Inspections Department-919-996-2495

Town of Garner Inspections Department- 919-773-4433

Town of Wake Forest inspections Department-919-435-9530

Town of Rolesville Permits- 919-856-6060 (Wake County Inspections Department)

Town of Knightdale Permits- 919-856-6060 (Wake County Inspections Department)

Town of Zebulon Permits- 919-856-6060 (Wake County Inspections Department)

Town of Wendell Permits- 919-856-6060 (Wake County Inspections Department)

3.21 PRE-EXISTING NON-COMPLIANCE ISSUE:

Any location that currently has a backflow assembly that is not installed according to the City of Raleigh’s installation requirements will be considered a pre-existing noncompliance issue. If the noncompliant assembly fails its operational test and cannot be repaired, the new replacement assembly will be installed according to the COR’s installation requirements for commercial irrigation systems. Any property with a noncompliant assembly that has a

test due date of more than one year overdue will no longer be considered pre-existing. All non-repairable assemblies will not be considered pre-existing. It is the consumer's responsibility to ensure that all paperwork showing compliance is submitted to the Public Utilities Cross Connection Program within the required time limit.

3.22 RELIEF OUTLET PIPING AND VALVE:

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

- They must include an approved pre-fabricated "air gap drain" as available from backflow prevention assembly manufacturers.
- All relief port drain lines shall be piped to an outside point of termination and when run horizontally, shall be installed with a fall conforming with the current North Carolina State Building Code, Volume II - Plumbing.
- The RPZ relief valve shall be a minimum of 12" above any material or ground.

3.23 RELOCATION AND REPLACEMENT:

A permit is required to relocate/replace a backflow assembly. Any backflow assembly that is relocated/replaced shall be installed according to City of Raleigh's Cross Connection ordinances, handbook, and NC State Plumbing Code. Upon relocation/replacement of the backflow assembly, an operational test shall be performed by an approved City of Raleigh tester. The make, model, permit number, serial number and new location of the relocated/replaced assembly shall be noted in comments on the test report for the new assembly. (See: Permits 3.21)

3.24 REPAIRS:

If an assembly fails its operational test, the property owner will have 15 days to have all repairs made. If it cannot be repaired, the assembly will need to be replaced with an approved backflow assembly according to the City of Raleigh's Cross Connection ordinances, handbook, and NC State Plumbing Code. The defective parts must be replaced with factory approved parts.

3.25 RIGHT OF ENTRY:

As a condition of water service, the City of Raleigh's Public Utilities Director or his designee shall have the right to enter any building or premises served by the City of Raleigh's water system for the purpose of performing the duties established by this handbook and ordinance.

3.26 SERVICE VALVE:

The #1 shut-off valve of the backflow assembly may not be used as a service valve. A service valve shall be installed after the meter and prior to every backflow assembly to allow testing, maintenance and replacement of the backflow without the use of a City of Raleigh Public Utilities operating valve. The service valve shall be installed underground and a minimum of 18" distance from meter.

3.27 SIZING:

In no case shall a backflow assembly be smaller in line size than its outlet piping.

3.28 SUPPORT:

Backflow assemblies shall be properly supported so that stress on surrounding piping does not occur. Adequate support must be provided for the assembly in the approved orientation either vertically or horizontally. The assembly may not be supported by other piping or unapproved methods of support. (See: NC Plumbing Code Section 308.5)

3.29 TESTING:

Testing of backflow assemblies shall be conducted by an approved City of Raleigh Tester at the customer's expense. All newly installed backflow assemblies are to be tested by an approved tester after the meter is set and every three years thereafter. The meter will not be set until the backflow assembly is installed. Meter jumpers are not approved under any condition. All water use for construction purposes is to be metered. See "construction water" under the policies and procedures section of the Public Utilities handbook. Additional testing requirements may be requested

or imposed as determined by the Director of Public Utilities or his designee. It is the consumer's responsibility to keep a complete, written record of any repairs and testing of the backflow assembly for at least three years.

Any location that does not have a current passing operational test report on file with the Cross Connection Program will be considered noncompliant. Consumers that are in noncompliance can bring their facility into compliance by:

- **Test:** hire a City of Raleigh approved tester to perform an operational test and submit the report to the Cross Connection Program. All test and maintenance reports shall be submitted to Cross Connection Program within 15 days of testing. Fax: 919-996-1868 or cross.connection@raleighnc.gov
- **Terminate:** To permanently remove a backflow assembly, all controls and valves shall be removed with the piping capped or plugged below ground near the source of connection. The meter box, if existing shall be removed. A plumbing permit and inspection is required to cap or plug piping.

Failed Operational Test: If an assembly fails its operational test, the approved tester shall submit the failing test and maintenance report within 15 days and the property owner will have 15 days to have all repairs made. If the assembly cannot be repaired, the assembly will need to be replaced with an approved RPZ backflow assembly according to the City of Raleigh's Cross Connection ordinances, handbook, and NC State Plumbing Code.

3.30 THERMAL EXPANSION:

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

3.31 WATER SERVICE

To start a water service account with the City of Raleigh, please call Utility Billing at 919-890-3245. All commercial accounts and residential customers that have an irrigation and/or fire sprinkler system are required to have approved containment backflow assemblies. A *Certificate of Compliance* must be obtained before a water service account can be started. (See Section 7: Certificate of Compliance)

3.32 WYE STRAINER:

Domestic backflow assemblies shall have a wye strainer installed after the meter and before the #1 shutoff valve of the backflow assembly.

SECTION 4 – Fire (Moderate and Severe Hazard)

The following are the requirements for fire service connections to the City of Raleigh Water System:

There shall not be any unprotected interconnection between potable water and fire lines. All backflow prevention assemblies installed on fire suppression systems shall be either a Double Check Detector Assembly (DCDA) for moderate hazard installations or a Reduced Pressure Detector Assembly (RPDA) for severe hazard installations. All meters on the detector by-pass must read in cubic feet. All fire backflow prevention assemblies shall meet all installation requirements as applicable. All assemblies used in fire suppression systems must have USC and ASSE, FM or UL approvals as required by the Raleigh City Code and the North Carolina Building Code. (Fire and Plumbing)

4.1 ACCESSIBILITY:

All *containment* backflow assemblies must be installed where the Director of Public Utilities or his designee deems them readily accessible. Readily accessible is having direct access to a backflow assembly without the need of removing any panel, door or similar covering of the item described, and without requiring the use of portable ladders, chairs, etc. The proper installation of an insulated enclosure may be deemed readily accessible. Enclosure clearances shall comply with ASSE Standard 1060. Clearances shall allow adequate room for servicing and maintaining the backflow assembly in the enclosure.

4.2 ALTERATIONS/MODIFICATIONS:

No backflow assembly shall be altered or modified from its approved factory configuration unless such modifications are made with strict adherence to manufacturer's recommendations. All alterations or modifications must be inspected by the Public Utilities Director or his designee.

4.3 ALTERNATE APPROVAL:

When a special circumstance precludes the ability to comply with any portion of this code, the Director of Public Utilities or his designee when presented with a detailed description of the issue may consider other options for approval.

4.4 AUTHORIZED INSTALLERS: Any containment fire sprinkler backflow assembly required to be installed by the provisions of this article or by a corrective order issued by the City of Raleigh's Public Utilities Director or his designee shall be installed by a licensed North Carolina plumbing contractor or fire sprinkler contractor.

4.5 AUXILIARY WATER SUPPLY-RESIDENTIAL (RECYCLED WATER, GREY WATER, RAIN WATER, REUSE WATER, IRRIGATION WELL, CISTERN):

Interconnections between an auxiliary water supply and the public water supply are not permitted and considered unlawful. (Sec. 8-2143) Premises where an auxiliary water supply exists or is installed shall have an approved containment RPZ installed on the public water supply service line. (Sec. 8-2147) Make-up water connections to an auxiliary water supply including but not limited to cisterns, grey water, rain water, reuse water, recycled water, and irrigation well systems shall have a containment assembly in form of an approved RPZ and an air gap. Any unapproved interconnection between an auxiliary water supply and a public water supply shall be corrected according to City of Raleigh's Cross Connection Ordinance, Sect. 8.

4.6 BACKFLOW ASSEMBLY APPROVALS:

All *containment* RPZ backflow assemblies must meet or exceed standards set forth by ASSE 1013 (The American Society of Sanitary Engineering) and AWWA C511 (American Water Works Association) and DCVA backflow assemblies must meet or exceed standards set forth by ASSE 1015 and AWWA C511as listed by the agency's current published list and adhere to applicable ANSI and ASTM standards. All *containment* Reduced Pressure Detector (RPDA) backflow assemblies must meet or exceed standards set forth by ASSE 1047 and Double Check Detector (DCDA) backflow assemblies must meet or exceed standards set forth by ASSE 1048. You can find the list of approved backflow assemblies on the City of Raleigh's website www.raleighnc.gov or contact the Raleigh Cross-Connection Control Office, at 919-996-2373 or email, cross.connection@raleighnc.gov.

4.7 BYPASS /PARALLEL INSTALLATION:

Facilities that by the nature of their business cannot shut down their water systems to provide for backflow assembly testing, repairs, etc. shall be required to install a bypass backflow assembly of the same type and in some cases the same size as the main line unit. The rule to size the bypass/parallel unit is the assembly must have the square diameters equal to the square of the supply service “tap”. For instance an 8-in service would need at a minimum two six inch assemblies in parallel. This is a minimum; ultimately the total capacity of the assemblies should equal or exceed the required flow for the application.

4.8 DRAIN REQUIREMENTS:

DCVA/DCDA DRAINAGE REQUIREMENTS:

DCVA/DCDA backflow assemblies are not allowed to be installed below ground level. DCVA/DCDA assemblies installed in an above ground enclosure shall be installed so that the assembly does not become submerged. A minimum of clearance of 12” must be maintained from the most bottom part of the assembly to the concrete pad or floor of the enclosure. Drain size shall be twice the diameter of the backflow assembly or 4” minimum whichever is greater and must provide a means of positive drainage with adequate gravity drainage to atmosphere.

Existing Installations:

All existing DCVA/DCDA backflow assemblies installed below ground shall be considered a pre-existing noncompliance issue. (See: Pre-existing noncompliance)

RPZ/RPDA BACKFLOW DRAIN REQUIREMENTS:

All RPZ/RPDA backflow assemblies are not allowed to be installed below ground level. RPZ/RPDA backflow assemblies installed in above ground enclosures shall be installed so that the relief outlet of the assembly does not become submerged. A minimum clearance of 12” must be maintained from the most bottom part of the assembly to concrete pad or floor of the enclosure. Drain size shall be twice the diameter of the backflow assembly or 4” minimum whichever is greater and must provide a means of positive drainage with adequate gravity drainage to atmosphere.

Existing Installation:

All existing RPZ/RPDA backflow assemblies installed below ground or at a location will be considered pre-existing noncompliance issue. (See: Pre-existing Noncompliance)

4.9 ENCLOSURES:

All backflow assemblies installed above ground shall be centered and secured on a 4” concrete pad. All enclosures must be a Class 1 A.S.S.E. Standard 1060 certified. Installing a permanent hard piped electrical service according to NC Electrical code to a thermostatically controlled heater or heat trace is required to ensure that the unit does not freeze during prolonged periods of extreme cold weather conditions.

If multiple backflows assemblies are installed within one enclosure, all components of each backflow assembly must be accessible for testing, repair and or replacement without having to remove another backflow assembly or piping that serves another assembly. The test cocks to all backflow assemblies must be accessible. Enclosures that are damaged and do not provide adequate freeze protection may be required to be repaired or replaced.

4.10 FIRE DEPARTMENT CONNECTIONS:

If a FDC is installed on a heated enclosure, there is a minimum of 4’ of empty pipe required between check valve and outside of box. (See Detail Drawing FP-17, FP-18) If the building has a fire pump, the FDC must be installed on the system side of the pump and not at the enclosure. The FDC cannot be installed on the supply at the street if the backflow assembly is inside the building.

4.11 FLOOD PRONE AREAS:

Backflow prevention assemblies installed in a flood plain must be installed at least 1ft above regulatory flood plain level. Raleigh City Code 10-6037

4.12 HAZARDOUS USES

HIGH HAZARD FIRE SPRINKLER SYSTEMS REQUIRING A CONTAINMENT RPDA:

- Systems with booster pump facilities (such as fire department connections [FDCs])
- Systems with transfer pumps

- Systems with storage tanks (plus air gap)
- Systems with antifreeze solutions
- Systems serving 5 or more stories above ground level of the backflow assembly
- Systems that are not behind a master meter (RPZ allowed on systems after a master meter)

LOW HAZARD FIRE SPRINKLER SYSTEMS REQUIRING A CONTAINMENT DCDA:

- Systems less than 5 stories above ground level with no pumps, storage tanks or chemical additives
- Dry pipe systems
- Systems that are not behind a master meter (DCVA allowed on systems after a master meter)

4.13 IDENTIFICATION TAG:

No one shall remove any manufacturers tag or stamp that bears pertinent information about the unit. If a manufacturers tag or stamp is removed or damaged and rendered unreadable the assembly must be replaced.

4.14 INSPECTIONS:

The local Plumbing Inspector and Fire Inspector having jurisdiction shall inspect every fire backflow prevention assembly that is installed, relocated or removed. It is the responsibility of the installer of a backflow prevention assembly to secure the permit and inspection or re-inspection by the local Plumbing Inspector.

4.15 LOCATION:

Backflow assemblies may not be installed in a hazardous location, traffic site triangle or within the right-of-way (ROW). For example: the slope of a hill without a level work area. Containment backflow assemblies shall be installed within 50' of the downstream (private) side of the meter or ROW (End of meter box or ROW line to end of backflow pad). Provided there are no unprotected taps before the backflow assembly, backflows may be installed inside of buildings. Containment backflow assemblies installed inside a building may require an approved backflow assembly to contain the private distribution or fire sprinkler system that dead ends or loops. The backflow assembly must remain accessible and visible after landscape maturity. The Public Utilities Director or his designee may approve alternate locations for facilities with zero lot line limitations.

4.16 LOOPED SYSTEMS

Each individual service, (fire, domestic or irrigation) to the private loop shall be protected with a backflow assembly. When looping is not possible, a containment backflow assembly shall be installed at the ROW. *See PUD Handbook WATER DESIGN PRIVATE for definition of Looped Systems.*

4.17 MATERIALS:

Piping materials shall conform to one of the standards listed in table 605.3 for water service pipe and 605.4 for water distribution pipe.

4.18 METER CONNECTION:

Piping materials from the meter to the backflow shall conform to one of the standards listed in table 605.3 for water service pipe and 605.4 for water distribution pipe.

4.19 MODIFICATION OF DCDA/RPDA UNITS:

When the DCDA/RPDA bypass is in need of replacement, the defective parts must be replaced with factory approved parts (i.e. the bypass backflow assembly or bypass meter must be replaced with a unit of the same size, brand and model number) since the detector assembly and main line unit are a matched set from the factory. All components of a backflow assembly shall be accessible without having to remove piping that serves the FDC connection.

4.20 ORIENTATION:

All backflow assemblies shall be installed in an orientation as approved by the USC Foundation for Cross Connection Control.

4.21 PERMITS (SEE SECTION 7):

A plumbing permit is required for all new and relocated backflow installations. Replaced backflow assemblies may require a plumbing permit. To determine if a plumbing permit is required, call the local Inspections Department or permitting agency for your area. Assemblies that have been winterized are not required to have a permit for installation but are required to have an operational test before they can be put into service.

OTHER IMPORTANT NUMBERS:

City of Raleigh Inspections Department-919-996-2495

Town of Garner Inspections Department- 919-773-4433

Town of Wake Forest inspections Department-919-435-9530

Town of Rolesville Permits- 919-856-6060 (Wake County Inspections Department)

Town of Knightdale Permits- 919-856-6060 (Wake County Inspections Department)

Town of Zebulon Permits- 919-856-6060 (Wake County Inspections Department)

Town of Wendell Permits- 919-856-6060 (Wake County Inspections Department)

4.22 PRE-EXISTING NON-COMPLIANCE ISSUE:

Any location that currently has a backflow assembly that is not installed according to the City of Raleigh's installation requirements will be considered a pre-existing noncompliance issue. If the noncompliant assembly fails its operational test and cannot be repaired, the new replacement assembly shall be installed according to the COR's installation requirements for fire systems. Any property with a noncompliant assembly that has a test due date of more than one year overdue will no longer be considered pre-existing. All non-repairable assemblies will not be considered pre-existing. It is the consumer's responsibility to ensure that all paperwork showing compliance is submitted to the Public Utilities Cross Connection Program within the required time limit.

4.23 PRIVATE FIRE HYDRANTS AND DEAD END MAIN LINES:

All fire systems, fire hydrant lines and dead end mains extending more than 75 feet from the Right of Way (ROW) are considered to be dead end systems. To avoid accumulation of stagnant water in the city main an approved backflow prevention assembly shall be installed within 10 feet of the ROW/Private Property line. Backflows may not be installed in the ROW or in within a traffic sight triangle.

4.24 RELIEF OUTLET PIPING:

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

- They must include an approved pre-fabricated "air gap drain" as available from backflow prevention assembly manufacturers.
- All relief port drain lines shall be piped to an outside point of termination and when run horizontally, shall be installed with a fall conforming with the current North Carolina State Building Code, Volume II - Plumbing.
- The RPZ relief valve shall be a minimum of 12" above any material or ground.

4.25 RELOCATION AND REPLACEMENT:

A plumbing and fire permit is required to relocate/replace a backflow assembly. Any backflow assembly that is relocated/replaced shall be installed according to City of Raleigh's Cross Connection ordinances, handbook, and NC State Plumbing Code. Upon relocation/replacement of the backflow assembly, an operational test shall be performed by an approved City of Raleigh tester. The make, model, permit number, serial number and new location of the relocated/replaced assembly shall be noted in comments on the test report for the new assembly.

When the DCDA/RPDA bypass is in need of replacement, the defective parts must be replaced with factory approved parts (i.e. the bypass backflow assembly or bypass meter must be replaced with a unit of the same size, brand and model number) since the detector assembly and main line unit are a matched set from the factory. All components of a backflow assembly shall be accessible without having to remove piping that serves the FDC connection.

(See: Permits 4.21)

4.26 REPAIRS:

If an assembly fails its operational test, the property owner will have 15 days to have all repairs made. If it cannot be repaired, the assembly will need to be replaced with an approved RPZ backflow assembly according to the City of Raleigh's Cross Connection ordinances, handbook, and NC State Plumbing Code. The defective parts must be replaced with factory approved parts.

4.27 RIGHT OF ENTRY:

As a condition of water service, the City of Raleigh's Public Utilities Director or his designee shall have the right to enter any building or premises served by the City of Raleigh's water system for the purpose of performing the duties established by this handbook and ordinance.

4.28 SERVICE VALVE:

The #1 shut-off valve of the backflow assembly may not be used as a service valve. A service valve shall be installed after the meter and prior to every backflow assembly to allow testing, maintenance and replacement of the backflow without the use of a City of Raleigh Public Utilities operating valve. The service valve shall be brass or ductile iron, installed underground, a minimum of 18" distance from meter.

4.29 SIZING:

In no case shall a backflow assembly be smaller in line size than its outlet piping.

4.30 SUPPORT:

Backflow assemblies shall be properly supported so that stress on surrounding piping does not occur. Adequate support must be provided for the assembly in the approved orientation either vertically or horizontally. The assembly may not be supported by other piping or unapproved methods of support. (See: NC Plumbing Code Section 308.5)

4.31 TESTING:

Testing of backflow assemblies shall be conducted by an approved City of Raleigh Tester at the customer's expense. All newly installed backflow assemblies are to be tested after the meter is set and every three years thereafter. The meter will not be set until the backflow assembly is installed. Meter jumpers are not approved under any condition. A Fire service water line may not be used to provide water for any purpose other than fire sprinkler systems. All water use for construction purposes is to be metered. See "construction water" under the policies and procedures section of the Public Utilities handbook. Additional testing requirements may be requested or imposed as determined by the Director of Public Utilities or his designee. It is the consumer's responsibility to keep a complete, written record of any repairs and testing of the backflow assembly for at least three years.

Any location that does not have a current passing operational test report on file with the Cross Connection Program will be considered noncompliant. Consumers that are in noncompliance can bring their facility into compliance by:

- **Test:** hire a City of Raleigh approved tester to perform an operational test and submit the report to the Cross Connection Program
- **Terminate:** To permanently remove a backflow assembly, all controls and valves shall be removed with the piping capped or plugged below ground near the source of connection. The meter box, if existing shall be removed. A plumbing permit and inspection is required to cap or plug piping.

Failed Operational Test: If an assembly fails its operational test, the property owner must immediately notify the *Fire Marshal's* office. The property owner will have 15 days to have all repairs made and the passing operational test turned into the Cross Connection Control Program. If the assembly cannot be repaired, the assembly will need to be replaced with an approved backflow assembly according to the City of Raleigh's Cross Connection ordinances, handbook, and NC State Plumbing Code.

4.31 WATER SERVICE

To start a water service account with the City of Raleigh, please call Utility Billing at 919-890-3245. All commercial accounts and residential customers that have an irrigation and/or fire sprinkler system are required to have approved containment backflow assemblies. A *Certificate of Compliance* must be obtained before a water service account can be started. (See Section 7: Certificate of Compliance)

4.32 WYE STRAINER:

No strainer shall be allowed on a fire suppression system.

SECTION 5 – Auxiliary Water Systems- (Severe Hazard)

5.1 AUXILIARY WATER SUPPLY (RECYCLED, GREY WATER, RAIN WATER, IRRIGATION WELL, and CISTERN):

Interconnections between an auxiliary water supply and the public potable water supply are not approved. The minimum system separation shall be an air gap and/or a RPZ installed for containment protection of the public water service supply at locations where an auxiliary water system is proposed or exists.

5.2 RESIDENTIAL/COMMERCIAL AUXILIARY WATER SYSTEMS:

Interconnections between an auxiliary water supply and the public water supply are not permitted and considered unlawful. (Sec. 8-2143) Premises where an auxiliary water supply exists or is installed shall have an approved containment RPZ installed on the public water supply service line or a water meter designed to detect backpressure and/or backsiphonage. (Sec. 8-2147) Make-up water connections to an auxiliary water supply including but not limited to cisterns, grey water, rain water, reuse water, recycled water, and irrigation well systems shall have a containment assembly in form of an approved containment RPZ and an air gap. Any unapproved interconnection between an auxiliary water supply and a public water supply shall be corrected according to City of Raleigh's Cross Connection Ordinance, Sect. 8.

When a reservoir or elevated tank is filled from a supply other than a public water supply and the public water supply is used as a supplemental supply, the pipeline from the public water supply shall be installed in such a manner that the water will be discharged over the top or rim of the reservoir or elevated tank. There shall be a complete physical break between the outlet end of the fill pip and the top or overflow rim of the tank or reservoir of at least twice the inside diameter of the inlet pipe.

No public water supply shall be connected by any means whatever to another source of water supply or to a storage facility. No physical connection shall be made between an approved public water supply and unapproved public water supply.

Section 6 - Authorized Testers and Repair Technicians

The City of Raleigh requires that a certified tester perform all testing. A certified tester is a person who has proven their competency to perform an operational test using a nationally accepted process, repair, overhaul and accurately complete reports on backflow assemblies as evidenced by the successful completion of an approved Cross-Connection Control School and compliance with all rules, regulations and policies associated with the City of Raleigh Public Utilities, State of North Carolina DENR rules, The North Carolina Plumbing Code and the applicable Contractors licensing board. All contractors who wish to test within the Raleigh Water System must be registered with the City of Raleigh's Cross Connection Control Program and attend an annual orientation.

Information regarding training programs recognized by the City of Raleigh's Cross Connection Control Program, tester's lists and test kit information is available by contacting the City of Raleigh's Cross Connection Program Staff at 919-996-2373 or cross.connection@raleighnc.gov. Additional requirements may be implemented at the request of the Director of Public Utilities or his designee or to comply with the rules regulations and policies of the State of NC Public Water Supply, the City of Raleigh Public Utilities, the NC Plumbing Code and the associated NC Contractors licensing rules.

A current copy of the following information is required to be on file with the Cross Connection Control Program office in order to be eligible to test within the City of Raleigh's water service area:

- Testers Certificate of training and subsequent recertification training
- Annual Test kit calibration
- Completed Orientation packet

The certified tester is responsible for correctly completing and submitting all test forms to the City's Cross-Connection Control Program within 15 days of testing. Reports received from testers not registered with the City of Raleigh Cross Connection program will not be accepted. The owner will be notified to provide an operational test performed by a Tester approved to test within the Raleigh water system. It is the owner's responsibility to keep a complete, written record of any repairs and testing of the backflow assembly for at least three years.

The Director of Public Utilities or his designee may suspend, revoke or impose probationary provisions for a tester found guilty of fraud or deceit or who fails to comply with any provision or requirement of the Raleigh City Code, or rule, or policy and for gross negligence, incompetency, or misconduct, in the practice of backflow installation, testing, repair or replacement. The City of Raleigh will recognize and comply with any action taken by another agency to suspend, impose probationary provisions or revoke authorization to test or repair, associated with the business of backflow installation, testing or repair. The Public Utilities Director or his designee may provide an opportunity for an approved tester who has been suspended from testing to obtain reconsideration of said action upon receipt of a written request received no later than 10 days following the effective date of suspension.

The City of Raleigh may disqualify an Approved Certified Tester for failure to meet the qualification established by the Department. The Department shall provide written notice to the Certified Tester, mailed to the address the Tester has provided to the Cross Connection Program, setting forth the reasons for disqualification. Disqualification shall be effective three days after such mailing. The City shall also give either fax or email notification of enforcement to the Tester if the tester has provided a fax or email address. The City shall provide an opportunity for the Tester who has been disqualified to obtain reconsideration by the Public Utilities Director or his designee upon written request received no later than 10 days following the effective date of disqualification.

Any assembly required to be installed by the provision of this article or by a corrective order issued by the Public Utilities Director or his designee or as required by the NC Plumbing Code or NC Fire Code shall be installed by a properly licensed North Carolina State Contractor.

City of Raleigh Approved Testers may only test backflows. Licensed plumbers may install, repair, and replace domestic, irrigation, and fire backflow assemblies. Licensed fire sprinkler contractors can install, repair, and replace backflows on fire sprinkler systems only.

Section 7 – Certificate of Compliance

In order for a water customer to be considered in compliance, all domestic, irrigation, and fire services to a facility or residence are required to be contained with an approved backflow assembly. This is achieved by a dual check device on the meter yoke for residential customers who **do not** have an irrigation and/or fire sprinkler system. For those customers who have a commercial water account or residential irrigation and/or fire sprinkler system, an approved backflow assembly is required according to the hazard.

If you wish to start a commercial water service account or you are a residential water customer that has an irrigation and/or fire sprinkler system, please submit a *Certificate of Compliance Application* to the Cross Connection office. Upon receipt of a completed application and verification that your facility is contained with the proper backflows, you will receive a *Certificate of Compliance*.

If you find that your facility or residence is properly contained, but does not have current test reports on file with the Cross Connection Program, you will be given a *Temporary Certificate of Compliance*. This temporary certificate will allow you 15 days to have all containment backflows tested and paperwork submitted to our office. If you fail to submit the proper paperwork to our office within 15 days, water service to your facility or residence will be terminated.

Facilities that do not have approved containment backflow assemblies installed will not be given water service. Upon installation of all approved containment backflow assemblies, a *Temporary Certificate of Compliance* will be given allowing the water customer to have all backflows tested and the paperwork submitted to our office. Once a *Temporary Certificate of Compliance* is given and you fail to submit the proper paperwork to our office within 15 days, water service to your facility or residence will be terminated.

Section 8: Exemption for backflow installation-commercial domestic services only

Commercial customers who wish to apply for exemption to install a backflow assembly must submit a completed City of Raleigh *Backflow Assembly Installation Exemption Application*. Exemption is only for domestic services where the facility does not nor ever will contain any of the following:

Bidets	Poultry Processing	Chemically Treated Boilers	Beauty Salon and/or Barber Shop
Car Wash	Restaurant/Bakery	Wells (private/groundwater)	Dedicated Fire Protection System
Hotels/Motels	Swimming Pools	Sewage Treatment or Handling	Commercial Kitchen
Nail Salon/Spa	Veterinary Offices	In-ground Sprinkler or Irrigation	Greenhouses
Pharmacy	Embalming Equipment	Water (Recycle or Storage Tanks)	Dairies
Funeral Parlors	Water Cooled Equipment	Delicatessen/Food Preparation	Lawn Care Companies
Distilled Breweries	Automotive Repair/Body Shop	Roof Water Tanks	Building with 5 or more stories
Dye Works	Bottling Plants	Canneries	Packing House
Chemical Processing Plant	Make-up Water Connection	Flex Space/ Strip Centers	
Gas Stations and Mini Marts (Soda Machines/Coffee)		Chemicals used in processing i.e. Photo Laboratories	
Dry Cleaning Equipment/Commercial Laundry Facility		Three or more dwelling units	
Boilers/Booster Pumps/Pressure Tanks		Warehouse (Toxic Chemical Storage)	
Dental Facilities/Laboratory Facilities		Butchers (includes Fish & Livestock)	
Air Conditioning/ Cooling Towers		Warehouse (Toxic Chemical Storage)	
Medical Facilities (includes psychology & psychiatric offices that administer medications)			

After receiving a completed application, the Cross Connection Coordinator and/or his/her designee will decide if a facility will be granted an exemption. Upon acceptance of exemption, a letter of approval as well as a *Certificate of Compliance* will be sent to the facility owner. If a facility is denied exemption, a letter of compliance requesting that approved backflow assemblies be installed will be sent to the facility owner. Failure to comply with a letter of non-compliance could result in enforcement action.

Section 9: Enforcement-User Responsibilities

9.1 COMPLIANCE DEADLINES:

A consumer that has received notice shall comply with the order of the Cross Connection Program. If the order is to install an approved backflow assembly or remove a cross connection, and an imminent danger to the drinking water supply or to public health does not exist, the consumer shall take such action within 90 days from the date notification is deemed received as described in Section???. If the Public Utilities Director or his designee has determined that an imminent danger to the drinking water supply or to public health exists, the Director or his designee may order a shorter time for action. In cases that do not present an imminent danger or danger to public health, the Public Utilities Director or his designee may extend the time for compliance for up to an additional 90 days if compliance efforts are underway and continuing, and the existence of a hardship or special circumstances can be demonstrated. The extension shall only be valid if in writing and signed by the Public Utilities Director or his designee.

9.2 FAILURE TO COMPLY:

A consumer that fails to comply with an order issued by the Public Utilities Director, his designee or with the deadlines described in 8.1 shall be in violation of this handbook and subject to enforcement.

9.3 DISCONTINUANCE OF SERVICE FOR VIOLATIONS:

The City of Raleigh may discontinue water service to any structure or parcel for a violation of this article. Prior to discontinuing water service, the Public Utilities Director or his designee will give written notice of enforcement to the consumer as shown on the revenue billing roll and to the owner, occupant, or other person in apparent control of the structure or parcel. (?)The Public Utilities Director or his designee is not required to provide written notice of enforcement prior to discontinuing irrigation water service.

When service is discontinued as described above, it shall not be reinstated until the Public Utilities Director or his designee determines that appropriate steps have been taken to comply with the City of Raleigh's Public Utilities ordinances and handbook and alleviate any risk to the drinking water system. Prior to restoration, all fees required by the City of Raleigh for restoration of water service shall be paid, in addition to any final civil penalties assessed as described in Section ???/

The City of Raleigh shall bear no liability for damage resulting from the discontinuance of service, pursuant to Section 8.

9.4. VIOLATION OF HANDBOOK:

A person who fails to comply with this handbook, or with any order, certificate, permit issued hereunder, or who installs or alters a plumbing system in nonconformance with approved specifications or plans that address cross connections or backflow assemblies regulated under this handbook, shall be in violation of this handbook.

The City of Raleigh may inspect and test any backflow assembly where an approved inspection or testing has not been performed as required under this article, written notice has been given to the consumer, and the consumer has not provided the approved inspection or testing within the deadline provided in the notice. The fee for a City inspection and testing, plus an administrative fee set by the Public Utilities Director or his designee may be charged to the customer.

A person in violation of the handbook is subject enforcement actions by a civil penalty which may be recovered by the city in a civil action in the nature of the debt if the violator does not pay the penalty with 30 days after the assessment has become final by exhaustion of the appeal process established by the section, or by failure to appeal the assessment. The civil penalty for a non-willful violation shall not exceed \$250.00 per day for each day of violation, or a cumulative penalty of \$5,000.00. The civil penalty for a willful violation shall not exceed \$500.00 per day for each day of a violation, or accumulative penalty of \$10,000.00.

The Public Utilities Director or his designee shall send a violator written notice of enforcement action by certified mail, return receipt requested and/or by first class mail. Such enforcement notifications shall be deemed received three days from the time it is mailed.

A violator may appeal a violation by mailing a written appeal to the Public Utilities Director or his designee including all arguments that support reducing or eliminating the penalty. The appeal must be received within 18 days of the date the enforcement notification of the penalty is deemed received. An appeal mailed by first-class mail shall be deemed received three days from the time it is mailed. The Public Utilities Director or his designee shall review the written appeal and penalty and make a final determination which shall be sent to the violator.

A civil penalty that has become final may be added to a consumer's utility bill, and water service may be terminated for nonpayment.

The provisions of the handbook shall not create any liability for the City of Raleigh for failure to detect any cross connection, mal-performing backflow assembly, hazard, or contamination of the drinking water supply.