

City of Norton

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Cross Connection Control & Backflow Prevention Program

October 28, 2008

Approved:

City of Norton – October 28, 2008
Virginia Department of Health - ????

OFFICE OF DRINKING WATER
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By *Richard W. [Signature]*, Field Director



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City of Norton

**Cross Connection Control
and
Backflow Prevention
Program**

I. Program Purpose

Purpose of this Program is to abate or control actual or potential cross connections and protect the public health. This Program establishes the requirements and enforcement action(s) to protect the City of Norton's (City) waterworks from pollution and/or contamination through cross connection control and backflow prevention in accordance with the Commonwealth of Virginia, State Board of Health, *Waterworks Regulations* 2006, or as amended. This Program is directed at:

A. Service Line Containment:

Abate and/or control actual or potential cross connections and protect the public health by installation of an appropriate backflow prevention assembly or by installation of a backflow elimination method, at the service connection.

B. Voluntary Isolation in Lieu of Containment

Evaluate the alternative of point-of-use isolation protection in lieu of service line containment will be evaluated at each premise where containment is required.

C. Public Education and Assistance

Provide a cross connection awareness public education program and provide public assistance where requested.

D. Premise Owner/Occupants Awareness

Provide advice to those affected advising that service line containment does not provide protection from cross connections beyond the service connection.

II. Program Authority

Authority for the City's Cross Connection Control and Backflow Prevention Program is mandated through Commonwealth of Virginia, Department of Health (VDH), *Waterworks Regulations*, Part II, Article 3: Cross Connection Control and Backflow Prevention in Waterworks. This Article requires as a condition for the issuance and continued use of the operation permit for the City, that the owner of the waterworks establish and enforce a program of cross connection control and backflow prevention.

This cross connection control and backflow prevention program is approved by the State Health Commissioner.

III. Definitions & Acronyms

A. Definitions

As used in this Program, the words and terms shall be as defined in the Commonwealth of Virginia, State Board of Health, *Waterworks Regulations* 2006, or as amended. In addition, the following definitions apply to this Program:

- City – City of Norton, Virginia
- Continuous Operating – Operating under continuous flow or pressure. This condition usually applies to devices installed inline and may have valves downstream of the device.
- Cross Connect Control Program Coordinator – The City of Norton’s Water Treatment Plant Supervisor or his/her qualified designee.
- Customer’s or Owner’s Water Supply System(s) – Those lines, storage, treatment systems, valves, and all other associated appurtenances from the service connection to a free flowing outlet(s) on the premises and any off-premise line or system with a direct connection to the on-premise system.
- Local Building Official – The City of Norton’s Building Official or his/her qualified designee.
- Non-continuous Operating – Intermittently operating not to exceed 12 hours under continuous pressure or flow for a 24-hour period. This condition usually applies to devices which are connected to hose bibbs, hydrants, or faucets that are open to the atmosphere. Valves should not be located downstream of these devices.
- Non-residential Connection – Any connection that is not a Residential Connection.
- Program – The City of Norton’s Cross Connection Control and Backflow Prevention Program.
- Residential Connection – A single connection for on-premise domestic use. Sole proprietorships and/or businesses operating out of a residence may be subject to the requirements of a Non-residential Connection, depending on the services, products or business activities provided at, conducted or based on the property.
- Service Connection – The point within the waterworks where the responsibility of the City ends and operating and maintaining the customer or owner’s water supply begins. For metered connections, it begins at the discharge side of the meter. For non-metered connections, it begins at the property line. For temporary or emergency connections and/or temporary or permanent water loading stations, it begins at the connection to the waterworks.
- Waterworks – The water system owned, operated and maintained by the City, within and outside of the corporate limits, including all lines up to the service connection, water source, water treatment, storage, pumping stations, and associated appurtenances.

B. Acronyms

The following acronyms are used as reference in this Program:

- ASSE – American Society of Sanitary Engineers
- AVB – Atmospheric vacuum breaker

- AWWA – American Water Works Association
- BP – Backflow by backpressure or superior pressure
- BS – Backflow by backsiphonage
- DG-DC – Double gate-double check valve
- HBVB – Hose bibb vacuum breaker
- PPBP – Pressure principal backflow prevention
- PVB – Pressure vacuum breaker
- RPZ – Reduced pressure principal backflow prevention
- USC – University of Southern California Foundation for Cross Connection Control and Hydraulic Research
- VDH – Commonwealth of Virginia Department of Health

IV. Program Enforcement

A. Request for Information

Upon request, the property owner or occupants of property served by the waterworks shall furnish to the City pertinent information regarding the customer's water supply system or systems on such property for the purpose of assessing the customer's water supply system for cross connection hazards and determining the degree of hazard, if any. The refusal of such information, when requested, shall be deemed evidence of the presence of a high degree of hazard cross connection.

B. Notice of Corrective Action

Any customer's water supply system owner who may be in violation of any provision of this Program shall be served a written notice sent certified mail to the customer's water supply system owner's last known address, stating the nature of the apparent violation, corrective action required, and providing a reasonable time limit, not to exceed 30 days, from the date of receipt of the notice, to bring the customer's water supply system into compliance with this Program.

C. Enforcement

The City shall take positive action to ensure that the waterworks is adequately protected from cross connections and backflow at all times. Appropriate preventive and control measures shall be required and installed. If a required backflow prevention assembly is not installed, tested, and maintained in accordance with the applicable sections of this Program; or if a required backflow prevention assembly has been removed or bypassed; or if unprotected cross connections exist on the premises and the City has determined that there is inadequate backflow prevention at the service connection, the City shall discontinue or refuse the water service to the customer and water service shall not be restored until the deficiencies have been corrected or eliminated to the satisfaction of the City.

V. City of Norton General Responsibilities

Effective cross connection control and backflow prevention requires the cooperation of the City, the owner(s) of the property served the Local Building Official, and the Cross Connection Control Program Coordinator.

- A. The Program shall be carried out in accordance with the Commonwealth of Virginia, State Board of Health, *Waterworks Regulations* and shall as a minimum provide containment of potential contaminants at the customer's service connection.
- B. The City has full responsibility for maintaining water quality in the distribution system and for the construction, maintenance and operation of the waterworks beginning at the water source and ending at the service connection.
- C. The owner of the property served shall be solely responsible for water quality and for the construction, maintenance, and operation of the customer's water supply system from service connection to the free flowing outlet(s).
- D. The City shall, to the extent of its jurisdiction, provide continuing identification and evaluation of all cross connection hazards having potential for impairing the quality of the water as delivered. Continuous identification and evaluation shall include assessments of each residential and non-residential customer's water supply system and a determination of the degree of hazard, if any, to the waterworks. (Refer to Table 1: Determination of Degree of Hazard.) Assessments shall be conducted annually as a minimum.
- E. To facilitate assessing each residential and non-residential customer's water supply system, the City shall maintain an up-to-date inventory of all users of the waterworks, both metered and non-metered.

VI. Customer's Water Supply System Owner General Responsibilities

- A. The customer's water supply system owner(s), at their own expense, shall have inspections and operational tests made at least annually of backflow prevention assemblies, devices, or backflow elimination methods which are required by this Program.
- B. Operational testing or work shall be performed by Backflow Prevention Device Workers certified by the Virginia Department of Professional and Occupational Regulation, Virginia Board for Contractors, under the Tradesman Regulations, to test and repair assemblies.
- C. Up to two (2) years from the date of adoption of this Program, individuals who have obtained a Certificate of Completion of a course of instruction of 16 hours or more recognized by the Tradesman Regulations may have their work accepted.
- D. The customer's water supply system owner(s) shall cause all backflow prevention assemblies, devices, or backflow elimination methods required under Section X: Prevention and Elimination Measures for Containment – Where Required, to be maintained in good working order and shall not make or cause to be made any piping or other arrangements or modifications for the purpose of bypassing or defeating assemblies, devices, or backflow elimination methods.

- E. The customer's water supply system owner(s) shall provide copies of test results, maintenance records, and overhaul records to the City within 30 days of completion of such testing or work. Failure to provide these records within 30 days may result in the City discontinuing or refusing the water service to the customer. Once water service is discontinued, water service shall not be restored until the records have been provided to the City.

VII. Non-residential Customer Assessments

A. General

The non-residential customer's water supply system owner will be advised in writing of the results of each assessment, the assigned degree of hazard, and if any backflow safeguards are required or recommended.

B. Frequency

Assessments of each non-residential customer's water supply system and a determination of the degree of hazard, if any, to the waterworks will be made at least annually. The City may, at its discretion, schedule more frequent assessments at high hazard facilities.

C. Type

Assessments will be conducted by on-site interview, questionnaire, or voluntary survey. An initial on-site interview will be conducted with the property owner or property owner's representative of each non-residential customer's water supply system identified in Section X: Prevention & Elimination Measures for Containment – Where Required. A Questionnaire will be sent to each remaining non-residential customer's water supply system owner at the discretion of the City. The Questionnaire may be completed by telephone interview. Subsequent assessment type will be determined on a case-by-case basis by the City.

D. Assessment By On-site Interviews

1. Available information about the premises to be surveyed will be gathered prior to the interview.
2. The reasons for cross connection control and backflow prevention will be explained to the customer's water supply system owner or its, his/her designated representative.
3. Interviews will follow a prepared Questionnaire used to assess the need for cross connection control by containment.
4. Water uses after it enters the premises will be determined.
5. During these interviews, each installed device or separation will be inspected for appropriateness, proper installation and general appearance.
6. Plans for future expansion and possible additional protection requirements will be discussed.
7. An inspection of the premises will be requested to determine if point-of-use isolation should be installed for the protection of the customer's water supply system users or considered as a substitution for containment.

8. All information will be recorded on the prepared questionnaire. This will include water uses, assessment of degrees of hazard, diagrams and other pertinent information for that individual system.

E. Assessment By Mailed Questionnaire

1. The appropriateness, proper installation, and general appearance of each installed assembly, device or elimination method will be evaluated by the customer's water supply system owner or owner's designated representative for those facilities where annual Questionnaires will be mailed.
2. The results of the annual Questionnaires will be reviewed by the City to reaffirm the degree of hazard and to assess the facility for new hazards. Based on the response to the Questionnaires, cross connection control interviews will be scheduled and appropriate assemblies, devices, or separations required providing containment and/or point-of-use isolation where appropriate. During these interviews, each installed assembly, device, or elimination method will be discussed and evaluated to determine appropriateness, proper installation, and general appearance. Point-of-use isolation protection may also be discussed with the property owner.

F. Assessment By Telephone Interview

1. For those facilities where telephone interviews will be conducted, the Questionnaire used for mailings will be completed by the caller to reaffirm the degree of hazard and to assess the facility for new hazards.
2. During these interviews, each installed assembly, device, or elimination method will be discussed and evaluated to determine appropriateness, proper installation, and general appearance. Point-of-use isolation protection will be discussed with the property owner or its, his/her designated representative.

G. Lack of Response to Assessment

A lack of, incomplete or no response from the property owner to a Questionnaire or telephone interview may prompt an on-site interview. Refusal of an interview request or access to the site for an interview or inspection or any other provision of the Program to secure pertinent information may prompt the designation of a high hazard premise and the requirement to install a high hazard service line containment assembly or a backflow elimination method.

VIII. Residential Customer Self-Assessments

In lieu of an annual assessment of residential connections, a continuous public education program will be provided to increase the awareness of cross connections and the public health hazards of backflow. The public education program will be designed to prompt residential customer self-assessments.

A. Public Education

The public education program will be a program targeted to the residential customer and the business and industries serving the residential dwelling market, both rental and purchase.

The cross connection control and backflow prevention program public education program will consist of a discussion of relevant information regarding:

1. Conditions that lead to backflow.
2. Residential plumbing hazards having the potential for cross connections and backflow.
3. Health effects of cross connections and backflow.
4. Public education materials and methods of delivery.
5. Clubs, organizations, civic organizations, school systems, etc. use and content.
6. Guidance/resources to identify actual or potential cross connections.
7. Safeguards to control or eliminate the hazards at the point-of-use.
8. Contact information for assistance.
9. Sources for additional information.

IX. Prevention & Elimination Measures for Containment - Location

A. Service Connection Containment

A backflow prevention assembly or backflow elimination method shall be installed at the service connection to a customer's water supply system where, in the judgment of the City a health, pollutional, or system hazard to the waterworks exists or may exist.

B. Containment Beyond the Service Connection

When, as a matter of preference or practicality, the backflow prevention assembly or backflow elimination method may be located downstream of the service connection but prior to any unprotected takeoffs. Inside the building is the preferred location.

C. Point-of-Use Isolation In Lieu of Service Connection Containment

Where, in the judgment of the City, all actual or potential cross connections can be easily abated or controlled at each point-of-use and where the customer's water supply system is not intricate or complex, point-of-use isolation protection by application of appropriate backflow prevention assemblies or devices or backflow elimination methods may be applied in lieu of installing a backflow prevention assembly or backflow elimination method at the service connection. Table 2: Assembly & Device Application shall be used as a guide to determine the appropriate backflow assembly or device where point-of-use isolation protection is being applied in lieu of service line containment. Based on an individual customer's water supply system, the City reserves the right to require more stringent backflow prevention assemblies or devices or backflow elimination methods than those cited in Table 2: Assembly & Device Application.

D. The location of service line containment assemblies or backflow elimination methods will be determined by property survey, where necessary. Containment measures serving public buildings or other public facilities may be located on public property.

E. Where the assembly or backflow elimination method will be located within the jurisdiction of the Local Building Official, it must be located prior to any unprotected takeoffs. The Local Building Official and the Cross Connect Control Program Coordinator will be advised and both concur prior to installation.

X. Prevention & Elimination Measures for Containment – Where Required

- A. A backflow prevention assembly or backflow elimination method shall be installed where any of the following conditions exist. The type of assembly or method required shall depend on the degree of hazard determined according to Table 1: Determination of Degree of Hazard.
1. Premises on which any substance is handled in such a manner as to create an actual or potential hazard to the waterworks (this shall include premises having auxiliary water systems or having sources or systems containing process fluids or waters originating from the waterworks which are no longer under the control of the City.
 2. Premises having internal cross connections that, in the judgment of the City may not be easily correctable or having intricate plumbing arrangements that make it impracticable to determine whether or not cross connections exist or where there is a potential of a cross connection(s).
 3. Premises where, because of security requirements or other prohibitions or restrictions, it is impossible or impractical to make an assessment of all cross connection hazards having the potential for impairing the quality of the water as delivered.
 4. Premises having a repeated history of cross connections being established or reestablished.
 5. Premises having fire protection systems, lawn sprinkler systems, or irrigation systems.
 6. Premises having frost-proof yard hydrants, drinking fountains or other appurtenances or plumbing fixtures with below-grade weep holes subject to contamination.
 7. Other premises having conditions specified by the City where cause can be shown that a potential cross connection hazard not enumerated above exists.
- B. Premises having booster pumps or fire pumps connected directly to the waterworks or indirectly through a service connection shall have the pumps equipped with a pressure sensing device to shut off or regulate the flow from the pumps when the pressure at any service connection in the distribution system drops below the minimum working pressure required of 20 psi. In no case shall the pressure sensing device be set lower than 10 psi gauge.
- C. An approved backflow prevention assembly or backflow elimination method shall be installed at, however not necessarily limited to, the following types of facilities:
1. Hospitals, mortuaries, clinics, veterinary establishments, nursing homes, dental offices and medical buildings;
 2. Laboratories;
 3. Piers, docks, waterfront facilities;
 4. Sewage treatment plants, sewage pumping stations, or storm water pumping stations;
 5. Food and beverage processing plants;
 6. Chemical plants, dyeing plants and pharmaceutical plants;
 7. Metal plating industries;
 8. Petroleum or natural gas processing or storage plants;
 9. Radioactive materials processing plants or nuclear reactors;
 10. Car washes and laundries;

11. Water loading stations;
 12. Lawn care companies and their vehicles with storage or mixing tanks;
 13. Slaughter houses, poultry processing plants and other food processing operations;
 14. Farms where the water is used for other than household purposes;
 15. Commercial greenhouses and nurseries;
 16. Health clubs with swimming pools, therapeutic baths, hot tubs or saunas;
 17. Paper and paper products plants and printing plants;
 18. Pesticide or exterminating companies and their vehicles with storage or mixing tanks;
 19. Schools or colleges with laboratory facilities;
 20. High-rise buildings (4 or more stories);
 21. Multi-use commercial, office, or warehouse facilities;
 22. High density, multi-use residential complexes served through a master meter.
 23. Others specified by the City when reasonable cause can be shown for a potential backflow or cross connection hazard.
- D. Where lawn sprinkler systems, irrigation systems or fire protection systems are connected directly to the waterworks with a separate service connection, a backflow prevention assembly or backflow elimination method shall be installed.
- E. All temporary or emergency service connections shall be protected where in the judgment of the City a health, pollutional, or system hazard to the waterworks exists or may exist for a potential backflow or cross connection hazard.

XI. Protection Type Required

The type of protection required shall depend on the degree of hazard, which exists or may exist. The degree of hazard, either "high," "moderate," or "low," is based on the nature of the contaminant; the potential health hazard; the method of backflow (either by backpressure or by backsiphonage); and the potential effect on waterworks structures, equipment, and appurtenances used in the storage, collection, purification, treatment, and distribution of pure water. Table 1: Determination of Degree of Hazard shall be used as a guide to determine the degree of hazard for any situation. Based on an individual customer's water supply system, the City reserves the right to require more stringent protection requirements than those cited in Table 1.

- A. Backflow elimination methods, which include the air gap, physical disconnection, and discontinuance or refusal of service, give the highest degree of protection and shall be used whenever practical to do so in high hazard situations subject to backpressure.
- B. An air gap, a physical disconnection, a reduced pressure principle backflow prevention assembly (RP or RPZ – refer to Table 2: Assembly & Device Application), or discontinuance or refusal of service will protect against backpressure and backsiphonage.
- C. The reduced pressure principle backflow prevention assembly shall be used in high hazard situations subject to backpressure where it is impractical to eliminate the cross connection by an air gap or physical disconnection.

- D. Pressure vacuum breaker assemblies (PVB – refer to Table 2) will not protect against backpressure, but will protect against backsiphonage. Pressure vacuum breakers may be used in low, moderate or high hazard situations subject to backsiphonage only.
- E. A double gate - double check valve assembly (DG-DC – refer to Table 2) will protect against backpressure and backsiphonage but it shall not be used in high hazard situations.
- F. Backflow prevention devices consisting of dual independent check valves with or without an intermediate atmospheric vent shall only be used in low hazard situations.
- G. Barometric loops are not acceptable.
- H. Interchangeable connections or changeover devices are not acceptable.

XII. Approved Backflow Prevention Assemblies, Devices & Backflow Elimination Methods for Containment

- A. Backflow prevention assemblies for containment shall be the reduced pressure principle backflow prevention assembly (PPBP – refer to Table 2), the double gate-double check valve assembly (DG-DC – refer to Table 2), and the pressure vacuum breaker assembly (PVB – refer to Table 2).
- B. Backflow elimination methods shall be an air gap, physical disconnection, or discontinuance or refusal of service. The minimum air gap shall be twice the effective opening of a potable water outlet unless the outlet is a distance less than three (3) times the effective opening away from a wall or similar vertical surface, in which case the minimum air gap shall be three (3) times the effective opening of the outlet. In no case shall the minimum air gap be less than one (1.0) inch. Physical disconnection and discontinuance or refusal of service eliminates any connection, direct or indirect, between a waterworks and a non-potable or questionable quality system.
- C. Backflow prevention assemblies shall conform to the latest available American Water Works Association (AWWA) standards; shall hold current University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USC) approval; and shall be listed by the American Society of Sanitary Engineers (ASSE).
- D. Backflow prevention assemblies shall be installed, maintained, and repaired in accordance with the USC and the manufacturer's instructions. Orientation of the assembly shall be as approved by the USC.
- E. For the purpose of application of point-of-use isolation protection in lieu of service line containment, assemblies or devices, or backflow elimination methods shall be as specified by City where reasonable assurance can be shown that the assembly, device, or method will protect the waterworks. As a minimum, devices used in point-of-use isolation shall be listed by the ASSE and comply with the Uniform Statewide Building Code. Assemblies used in point-of-use isolation shall be in compliance with this Section (Section XII) Paragraphs C. and D. Refer to Table 2: Assembly & Device Application.
- F. Backflow prevention devices or assemblies with openings, outlets, or vents that are designed to operate or open during backflow prevention shall not be installed in areas subject to flooding or in pits and shall be installed in a free atmosphere.

- G. Backflow prevention devices and assemblies shall not be subjected to operating parameters which exceed the performance evaluation standards of the ASSE or USC which the device or assembly is listed or approved under.

XIII. Inventory

An inventory will be maintained of all required backflow prevention assemblies and devices and backflow elimination methods including all backflow prevention assemblies, devices, and backflow elimination methods installed as a result of residential customer self-assessments.

XIV. Testing & Inspection

- A. The schedule of testing and inspection of all required backflow prevention assemblies, devices, and backflow elimination methods shall not exceed one (1) year. The City may, at its discretion, schedule more frequent testing and inspection at high hazard facilities.
- B. The operational testing and inspection schedule will include all backflow prevention assemblies, devices, and backflow elimination methods installed as a result of residential customer self-assessments.
- C. The City will review and track the cross connection control operational verification reports and notify the customer's water supply system owner in writing as to any testing, inspecting, or overhauling requirements 60 days prior to their due date.
- D. Copies of test results, maintenance records, and overhaul records will be reviewed for completeness and accuracy and a determination as to pass or fail made. The City will notify the customer's water supply system owner within ten (10) working days of receipt of such testing or work and of its acceptance.

XV. Backflow Events

In the event of the backflow of pollution or contamination into the waterworks, the City will promptly take or cause corrective action to confine and eliminate the pollution or contamination. The City will report to the appropriate VDH, Office of Drinking Water, Field Office in the most expeditious manner (usually by telephone) when backflow occurs and will submit a written report by the 10th day of the month following the month during which backflow occurred. The report will address the incident, its causes, effects, and preventative or control measures required or taken.

XVI. Customer Notification

The City will notify the customer's water supply system owner in writing as to the required location of any device or separation; type of device or separation, including applicable USC, ASSE, and AWWA approvals, listings, or standards; installation requirements; and the deadline for completing the installation, usually 15 days.

- A. If the customer's water supply system owner fails to install any required device or separation within the deadline or fails to complete testing, inspecting or overhauling as required, a second notification will be prepared and will include a notification of discontinuance of water service unless compliance is obtained within 30 days. Failure to

respond to the second notification may result in the City discontinuing or refusing the water service to the customer. Once water service is discontinued, water service shall not be restored until required device or separation is installed to the satisfaction of the City.

XVII. Records

Records of inspections of backflow prevention assemblies or devices or backflow elimination methods; test results of backflow prevention assemblies; assessments of customer's water supply systems; and backflow incidence reports, for both residential and non-residential customers will be maintained by the City for ten (10) years.

Continuous public education program records will be maintained by the City for ten (10) years. Continuous public education program records will include: education materials and methods of delivery; other educational activities; and documentation of public contacts including assistance provided.

XVIII. Point-of-Use Isolation Protection

Any premises, residential, commercial, industrial, institutional, or civic where all actual or potential cross connections can be easily correctable at each point-of-use and where the customer's water supply system is not intricate or complex, point-of-use isolation protection by application of appropriate backflow prevention assemblies, devices or elimination methods may be used in lieu of installing a containment device at the service connection if the following conditions are met:

- A. The method of protection provided shall be, in the judgment of the Cross Connection Control Program Coordinator, the method which best provides protection; and
- B. The customer's water supply system owner grants access for inspections; and makes a request in writing for point-of-use isolation protection; and
- C. The Local Building Official and the Cross Connect Control Program Coordinator concurs.
- D. Assemblies, devices, or elimination methods installed under this section will be selected from Table 2: Assembly & Device Application.

Point-of-use isolation protection applied in lieu of service line containment will be in accordance with the Memorandum of Agreement between the Board of Housing and Community Development and VDH. Refer to the appended Memorandum.

XIX. Pressure Sensing Devices

Hydraulic analysis will be used to determine the set point of required pressure sensing devices used to shut off or regulate the flow from pumps connected directly or indirectly to the distribution system. The device shall be set at the service connection pressure which corresponds to the minimum working pressure required at the critical node in the affected distribution system subsystem. Refer to *Waterworks Regulations* § 12 VAC 5-590-690C. for minimum working pressure requirements. In no case shall the pressure sensing device be set lower than 10 psi gauge.

XX. Ensuring Backflow Assemblies Hold Current Approval

The City will ensure that all backflow prevention assemblies hold current approval by the USC. The customer's water supply system owner will be notified of any USC Special Notice which may affect the status of an installed assembly.

XXI. Temporary or Emergency Connections & Water Loading Stations

Requests for temporary or emergency service connections and temporary or permanent water loading stations will be directed to the Cross Connection Control Program Coordinator for approval.

The City will perform periodic inspections of these facilities.

XXII. Coordination

- A. The City will route through the Local Building Official all new plans for service connections to serve fire service connections, lawn sprinkler systems, or irrigation systems and will route through the Local Building Official all backflow prevention recommendations beyond the service connection.
- B. The City will ensure coordination between the Local Building Official and Cross Connection Control Program Coordinator of cross connection control requirements at new premises, premises where usage has changed, premises where booster or fire pumps are used, and all others where plumbing modifications occur.
- C. Required assemblies shall be tested and inspected and required elimination methods shall be inspected by the City prior to issuance of a certificate to occupy.
- D. A follow up test and inspection of required assemblies will be performed by the City within 30 days of occupancy.

XXIII. Premises with Individual Water Supplies

- A. Premises with individual water supplies requesting a new service connection or reconnection to the waterworks will be assessed by on-site interview for cross connection hazards and the appropriate separation installed, inspected, and operational prior to making the service connection.
- B. Premises with individual water supplies, i.e., an auxiliary water system, may, upon approval of the City, maintain the water supply on the premises if the auxiliary water system is physically disconnected from the customer's water supply system. Maintenance of the physical disconnection and access for must be included in the City's User Agreement. The Local Building Official's concurrence will be required.
- C. Subsequent assessment type will be determined on a case-by-case basis by the City. Assessments will be conducted to verify the maintenance of the physical disconnection.

XXIV. Records

- A. An up-to-date listing of all customers (users, metered and non-metered) will be maintained by the City. The list will contain:
1. Owner of premises
 2. Tenant
 3. Name of premises
 4. Service address
 5. Phone number
 6. Contact person
 7. Number of service connections
 8. Size of service connection
 9. Assessment type: (on-site interview) (mailed questionnaire) (telephone interview) (other)
 10. Assigned degree of hazard
 11. Assessment frequency
- B. An up-to-date listing of customer's water supply system owners who have cross connection safeguards installed will be maintained by the Cross Connection Control Program Coordinator. The list will contain:
1. Owner of premises
 2. Tenant
 3. Name of premises
 4. Service address
 5. Phone number
 6. Contact person
 7. Location of cross connection safeguards
 8. Type of prevention or elimination measures (service line containment) (point-of-use isolation) (isolation in lieu of containment)
 9. Type of protection (USC assembly) (ASSE device) (pressure sensing device) (air gap) (physical disconnection)
 10. Manufacturer
 11. Model number
 12. Serial number
 13. Size
 14. ASSE number
 15. Testing and inspection frequency (annually) (semi-annually) (quarterly)
 16. Pressure sensing device pressure set point
 17. Access documentation (on file) (denied) (not necessary)
- C. An up-to-date listing of customer's water supply system owners who have an auxiliary water system available to the premises. In addition to the applicable records noted above, the water usage records will be reviewed to determine if the auxiliary water system is being used.

- D. Questionnaires will be maintained by the City for ten (10) years. The Questionnaire will contain:
1. Owner and address of residence
 2. Occupant if different from owner
 3. Telephone number
 4. Brief explanation of the program
 5. Brief explanation of causes of backflow and preventative and control measures
 6. Some likely cross connections:
 - a. A garden hose with its outlet submerged
 - b. Kitchen sink spray hose with its spray head submerged
 - c. Hand-held shower massager with its head submerged
 - d. Garden hose used as an aspirator to spray soap or garden chemicals
 - e. Spring, hot-tub, cistern, or swimming pool connected to the house plumbing system
 - f. Water softeners improperly connected
 7. Specific questions which will include however not be limited to:
 - a. Individual wells, springs or cisterns on the property
 - b. Pressure booster pumps
 - c. Water storage tanks
 - d. Water treatment systems
 - e. Outside hose bibs used in conjunction with:
 - Chemical sprayers
 - Jet spray washers
 - Swimming pools, hot tubs, saunas, etc.
 - Lawn sprinkler or irrigation systems
 - f. Photographic developing
 - g. Utility sinks with hoses extending below sink rim
 - h. Animal watering troughs
 8. Existing cross connection control safeguards:
 - a. Working properly
 - b. Leaking, noisy
 - c. Any modifications or repairs made
 - d. Date of last test
 - e. Any problems with hot water tank relief valve or faucet washers not lasting very long
 9. Also included with the Questionnaire should be:
 - a. Educational material
 - b. Who to contact for further information
 - c. Who to contact if contamination is ever suspected
 - d. A deadline to respond to the questionnaire

- E. Assessment reports shall be maintained by the City for 10 years. The report will contain:
1. Inventory information as noted above
 2. Completed questionnaire
 3. Assessment report of:
 - a. Degree of hazard
 - b. Appropriateness of device or separation
 - c. Installation acceptable
 - d. General condition of device or separation
 - e. Repair/replacement recommendations
 - f. New/additional device or separation recommendations
 - g. Any indication of thermal expansion problems
- F. Testing Reports shall be maintained by the City for ten (10) years. Testing Reports will contain:
1. Inventory information as noted above
 2. Line pressure
 3. Results of testing
 4. Test method used
 5. Date, signature, and certification number of the Backflow Prevention Device Worker
 6. If repairs were made, the Test Report will contain:
 - a. Which parts replaced
 - b. Replacement parts used
 - c. Probable cause of test failure
 - d. Preventative measures taken

XXV. Assembly, Device & Separation Selection Guidelines

- A. Virginia Cross Connection Control Association — Recommended Best Practice
- B. International Plumbing Code and its Commentary
- C. EPA *Cross-Connection Control Manual*
- D. Virginia *Waterworks Regulations*
- E. AWWA M-14 Cross Connection Control Manual
- F. University of Southern California, Foundation for Cross-Connection Control and Hydraulic Research

XXVI. Examples

Types of facilities, probable degree of hazard and type of containment assembly required. All containment assemblies will comply with AWWA Standards, be approved for containment by the USC, and be listed by the ASSE. In high hazard situations subject to backpressure, backflow prevention by an elimination method should be the method of choice, wherever practical. Refer to Table 2: Assembly & Device Application for additional information.)

- A. Hospitals, mortuaries, clinics, veterinary establishments, dental offices, nursing homes, and medical buildings: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- B. Laboratories: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- C. Piers, docks, waterfront facilities: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- D. Sewage treatment plants, sewage pumping stations, or storm water pumping stations: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- E. Food and beverage processing plants: Generally, a moderate hazard, Double Gate-Double Check Valve Assembly (DG-DC) ASSE #1015; Use of toxics, etc., in processing: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- F. Chemical plants, dyeing plants and pharmaceutical plants: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- G. Metal plating industries: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- H. Petroleum processing or storage plants: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- I. Radioactive materials processing plants or nuclear reactors: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- J. Car washes and laundries: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- K. Water loading stations: High hazard, Air Gap Physical Disconnection or Reduced Pressure Principle Device (RPZ) ASSE #1013
- L. Lawn sprinkler systems, irrigation systems: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013 or Atmospheric Vacuum Breakers (AVB) ASSE #1001 or Pressure Vacuum Breaker (PVB) ASSE #1020, depending on method of backflow and pressure or flow conditions
- M. Fire service systems: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- N. Slaughter houses, poultry processing plants and other food processing operations: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- O. Farms where the water is used for other than household purposes: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- P. Commercial greenhouses and nurseries: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- Q. Health clubs with swimming pools, therapeutic baths, hot tubs or saunas: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- R. Paper and paper products plants and printing plants: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013

- S. Pesticide or exterminating companies and their vehicles with storage or mixing tanks: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013 at service connection and on vehicles
- T. Schools or colleges with laboratory facilities: High hazard, Reduced Pressure Principle Device (RPZ) ASSE #1013
- U. High-rise buildings (4 or more stories): Unless otherwise covered, Moderate hazard, Double Gate-Double Check Valve Assembly (DG-DC) ASSE #1015
- V. Multiuse commercial, office, or warehouse facilities: Unless otherwise covered, Moderate hazard, Double Gate-Double Check Valve Assembly (DG- DC) ASSE #1015
- W. High-density, multi-use residential complexes served through a master meter: Unless otherwise covered, Moderate hazard, Double Gate-Double Check Valve Assembly (DG-DC) ASSE #1015

XXVII. Device Testability & Serviceability

- A. Containment or point-of-use isolation assemblies used within the customer's water supply system that are capable of being tested and repaired in-line include the RPZ, DG-DC and PVB.
- B. Residential Dual Checks without an intermediate atmospheric vent and Boiler Dual Checks with an intermediate atmospheric vent are testable, however most of these ASSE listed devices must be removed for testing. Some can be overhauled in-line.
- C. Generally, a visual inspection is the only means to inspect most Hose Bibb Vacuum Breakers (HBVBs) since they cannot be removed if installed in accordance with the manufacturer's instructions. Some manufacturers do provide frost-proof wall hydrants with HBVBs which can be easily removed for inspection and replacement.
- D. Pipe connected Atmospheric Vacuum Breakers (AVBs) can be inspected by removing the top cover.
- E. Air gaps, physical disconnection, and discontinuance or refusal of water service require only a visual inspection.

XXVIII. Thermal Expansion

Customers will be advised of the potential for thermal expansion prior to or during installation of a backflow prevention device. Solutions to thermal expansion will be at the discretion of the customer's water supply system owner and at the expense of the customer's water supply system owner. Refer to Appendix A: Thermal Expansion Control for additional information.

XXIX. Attachments

- A. Table 1: Determination of Degree of Hazard
- B. Table 2: Assembly & Device Application
- C. Department of Housing and Community Development Memorandum of Agreement
- D. Appendix A – Thermal Expansion Possible
- E. Backflow Prevention Device Worker Test Form
- F. List of Certified Backflow Prevention Device Workers
- G. Typical Installation Sketches
- H. Education Literature
- I. Questionnaire
- J. Report of Assessment
- K. Device Testing Due
- L. Device Repair Needed
- M. Transmittal of Test Results
- N. Device Required
- O. Notice of Violation
- P. Termination of Service
- Q. Verification of Auxiliary Water Supply Physical Disconnection Due

Table 1: Determination of Degree of Hazard

Cross connections that meet or may meet the following conditions shall be rated at the corresponding degree of hazard.	
High Hazard	<p>The contaminant is toxic, poisonous, noxious or unhealthy.</p> <p>In the event of backflow of the contaminant, a health hazard would exist.</p> <p>A high probability exists of a backflow occurrence either by backpressure or by backsiphonage.</p> <p>The contaminant would disrupt the service of piped water for drinking or domestic use.</p> <p>Examples — Sewage, used water, non-potable water, auxiliary water systems and toxic or hazardous chemicals.</p>
Moderate Hazard	<p>The contaminant would only degrade the quality of the water aesthetically or impair the usefulness of the water.</p> <p>In the event of backflow of the contaminant, a health hazard would not exist.</p> <p>A moderate probability exists of a backflow occurrence either by backpressure or by backsiphonage.</p> <p>The contaminant would not seriously disrupt service of piped water for drinking or domestic use.</p> <p>Examples — Food stuff, nontoxic chemicals and non-hazardous chemicals</p>
Low Hazard	<p>The contaminant would only degrade the quality of the water aesthetically.</p> <p>In the event of backflow of the contaminant, a health hazard would not exist.</p> <p>A low probability exists of the occurrence of backflow.</p> <p>Backflow would only occur by backsiphonage.</p> <p>The contaminant would not disrupt service of piped water.</p> <p>Examples — Food stuff, nontoxic chemicals and non-hazardous chemicals.</p>

Table 2: Assembly & Device Application

Degree of Hazard	Method of Backflow	Pressure or Flow Conditions	Device	ASSE #
High	BP or BS	Continuous	RPZ*	1013 & 1047
	BS only	Non-continuous	Pipe Applied AVB*	1001 & 1035
		Non-continuous	Hose Bibb AVB	1011 & 1052
		Non-continuous	Wall Hydrant w/AVB	1019
		Continuous	PVB*	1020 & 1056
Moderate	BP or BS	Continuous	DG-DC*	1015 & 1048
Low	BS only		Dual Check:	
		Continuous	w/o Vent	1024 & 1032
		Continuous	w/ Vent	1012 & 1022

NOTES:

1. * USC approved containment assemblies are available
2. Degree of Hazard - See Table 1 — Determination of Degree of Hazard.
3. BS means backflow by backsiphonage.
4. BP means backflow by backpressure or superior pressure.
5. Continuous means operating under continuous flow or pressure. This condition usually applies to devices installed inline and may have valves downstream of the device.
6. Non-continuous means operating intermittently not to exceed 12 hours under continuous pressure or flow in a 24-hour period. This condition usually applies to devices which are connected to hose bibs, hydrants, or faucets which are open to the atmosphere. Valves should not be located downstream of these devices.
7. RPZ means a reduced pressure principal backflow prevention assembly.
8. Pipe applied AVB means an atmospheric vacuum breaker permanently installed in the plumbing or on faucets.
9. Hose bibb AVB means a hose bibb type atmospheric vacuum breaker with a single or with dual checks and a vent. ASSE 1052 is preferred.
10. Wall hydrant w/AVB means a through-the-wall, frost-proof self-draining type wall hydrant with AVB attached or built in.
11. PVB means a pressure vacuum breaker.
12. Spill resistant AVB have the same ASSE # as standard, pipe applied AVB.
13. Spill resistant PVB have ASSE # 1056.
14. DG-DC means a double gate-double check valve assembly.
15. Dual Check without a vent means a device composed of two independently acting check valves ("residential dual check" and "beverage dispenser dual check").
16. Double check with a vent means a device composed of two independently acting check valves with an intermediate atmospheric vent ("boiler dual check").

MEMORANDUM OF AGREEMENT
between the
Board of Housing and Community Development
and the
Virginia Department of Health

In accordance with Section 36-97 "et seq." Code of Virginia, the Virginia Department of Health (hereafter referred to as the "Department") and the Board of Housing and Community Development (hereafter referred to as the "BHCD") on this June 28, 2002, agrees to coordinate the Uniform Statewide Building Code (hereafter referred to as the "USBC") and the Virginia Waterworks Regulations (hereafter referred to as the "Regulations"). The parties agree to the following:

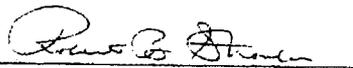
1. That adoption and promulgation of the USBC is the responsibility of the BHCD; that enforcement of the USBC is the responsibility of the local building department; and that adoption, promulgation and enforcement of the Regulations is the responsibility of the Department.
2. That the jurisdiction of the USBC includes all buildings and structures and their internal service plumbing, up to the point of connection to the water meter; and that the jurisdiction of the Regulations includes the meter, all public water supply transmission mains, treatment facilities, and raw water collection and transmission facilities. Where no meter is installed, the point of demarcation between the jurisdiction of the USBC and of the Regulations is the point of connection to the public water supply main; or, in the case of an owner of both public water supply system and the building served, the point of demarcation is the point of entry into the building;
3. That both the USBC and the Regulations will include a clear reference to jurisdiction of the other document.
4. That the Regulations will require each waterworks owner to have a cross-connection prevention program consistent with the Regulations. The regulations will require, as a minimum, a containment device at each service connection where a health, pollution or system hazard to the waterworks exists. It is recognized that in lieu of such containment devices, point of use devices shall comply with the provisions of the USBC. Point of use devices approved by the waterworks owner/Department shall be deemed to be in compliance with the USBC.
5. That wherever public water supply and/or water treatment equipment or facilities are located in a building or structure, the Regulations apply to all such equipment and the USBC applies to the structure and all of its incidental utilities (i.e. heating, electrical, house plumbing, etc.).
6. That the building official is required by the USBC to be assured that the water supply to a building is safe and of adequate capacity before issuing a building permit. Building permits involving a new water connection or extension of an existing connection to a public water supply main shall not be issued when the Department has notified the building official in writing that the water supply system is at or above its permitted capacity.

7. That appropriate amendments, additions, or deletions will be made to the Regulations and to the USBC to insure that there is no jurisdictional conflict between the two documents.
8. That it is the intention of both the BHCD and the Department to cooperate with each other in resolving any technical conflicts between the Regulations and the USBC, and in developing and implementing operational procedures to insure and promote a constructive working relationship between building and health officials.
9. That, except in matters of imminent danger to public health or safety, whenever conflicts or disagreements arise between the two agencies or their staffs, all appropriate regulatory procedures will be exhausted prior to any judicial action.

10. This Agreement may be amended or terminated by mutual consent of the parties.

The undersigned agree to the conditions of this Agreement.


William C. Shelton
Director, Department of Housing and
Community Development
for the Board of Housing and
Community Development


Dr. Robert B. Stroube
State Health Commissioner,
Virginia Department of Health

Appendix A

Thermal Expansion Control

Normally, as water is heated and expands it would back up in the service line into the main if no usage was occurring. Installation of backflow prevention devices or certain plumbing appurtenances (pressure reducing valves) at the service connection or within the customer's water supply system prevent thermally expanded water from flowing from the premises into the distribution system. When the water heater is operating, water is expanding and pressure is increasing, thermal expansion in a closed plumbing system under no flow conditions may cause the emergency temperature and pressure relief valve to open and close frequently and may reduce the life of plumbing fixtures and piping.

The temperature and pressure (T & P) relief valve is an emergency relief valve, not an operating control valve. If the T & P relief valve is used frequently, its useful life will be shortened and it could cease to function.

Thermal expansion can cause damaging stress and strain to water heaters, solenoid valves, O-rings, float valves, pump seals, and plumbing fixtures or fittings.

Generally, 80 psi for a short period of time is the maximum pressure under no flow conditions most fixtures, appliances or appurtenances should be subjected to.

Where thermal expansion is a problem the following devices could be installed:

1. a bladder or diaphragm type expansion tank;
2. an auxiliary pressure relief valve;
3. an anti-siphon ball cock with auxiliary relief valve into the toilet tank set at no more than 80 psi.

Installation should be in strict accordance with the manufacturer's instructions, the Uniform Statewide Building Code and the National Sanitation Foundation.

Refer to Section 607.3 of the International Plumbing Code Commentary for additional information.