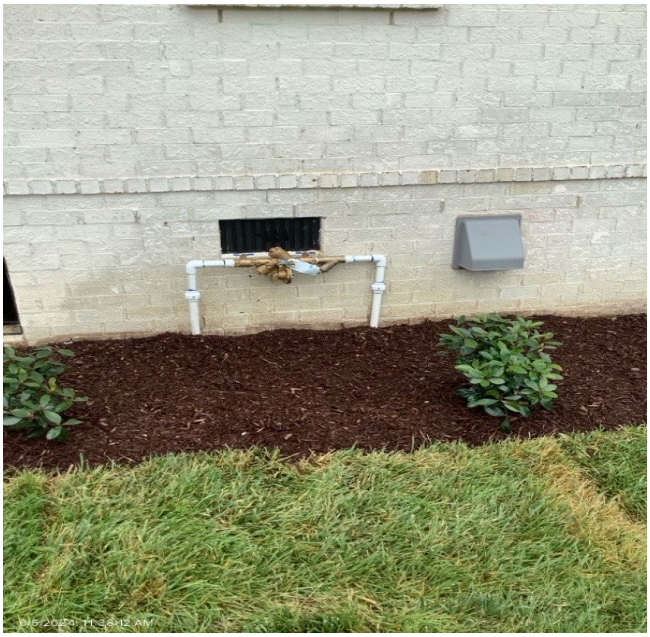
CITY OF BRENTWOOD

CROSS CONNECTION CONTROL GUIDELINES



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City of Brentwood
Cross-Connection Control Plan

I. Introduction

A. Mission

The mission of the City of Brentwood Water Department is to provide a safe and dependable supply of drinking water at sufficient volumes and pressures to meet customers' needs for domestic use and fire protection by being fiscally responsible stewards of our natural resources.

As a part of meeting that mission, the Water Services Department must have a comprehensive and proactive program aimed at reducing the possibility of backflow due to cross connections. Such situations may pose a risk to public health by allowing the public water system to become a transmitter of diseased organisms, toxic materials, or other hazardous substances that may adversely affect large numbers of people. A critical component for the public's protection against such occurrences is the elimination of cross connections and the isolation of such hazards from the water supply lines by properly installed and maintained backflow prevention assemblies. The City of Brentwood must continue maintenance of a continuing program of cross connection control to systematically and effectively prevent the contamination or pollution of all potable water systems.

B. Plan of Action

This cross connection plan outlines a course of action designed to control cross connection within the area served by the Brentwood water system. This plan is intended to be a practical guide for safeguarding the quality of water distributed from becoming contaminated or polluted through backflow.

II. Authority for Cross Connection Control

Section 70-179 of the Brentwood City Code establishes authority for the city to implement a cross-connection program. A copy of the most recent ordinance, adopted November 3, 2008, is attached to this plan as Appendix 1. This ordinance prohibits cross connections within water systems, authorizes the water system to make inspections of the customer's premises, requires that cross-connection hazards be corrected and provides for enforcement. This ordinance is considered to be a sound basis for the control of cross-connection hazards by the operating staff and management of the City of Brentwood. The provisions, contained within this ordinance, are in keeping with the requirements set forth in Section 68-221-711 (6) of Tennessee Code Annotated and Section 1200-5-1-.17(6) of Tennessee Department of Environment and Conservation Rules governing Public Water Systems.

III. Program Outline

The City of Brentwood maintains an active on-going cross-connection control program. This program is to be a continuing effort to locate and correct existing cross-connection hazards and to discourage the creation of new problems.

A. Staffing

The Brentwood Water Services Department has designated staffing to ensure that the program to control cross-connections is pursued in an aggressive and effective manner. Organizationally, a Utility Program's Coordinator reports directly to the Water Services Department Director. The primary function of this position is to manage the program and oversee the monitoring and testing of cross-control devices, whether that is performed by that individual, other licensed individuals in the Department, or an outside contractor.

B. Cross-Connection Control Surveys/Inspections

The Brentwood Water Services Department, will regularly inventory the distribution system, including both residential and nonresidential customers, for possible cross-connections. If it is determined from the surveys that possible cross-connections may exist, the premises will be inspected. The need for backflow protection will be determined based on the results from the inspection, and the Director will make the determination as to what measure of backflow prevention is required. Notification of the type of backflow prevention assembly required and a date of compliance will be sent to the customer.

Non-Residential:

All nonresidential and commercial establishments are required to have an approved backflow preventer installed that is commensurate with the hazard present**.** Surveys will be performed on all new establishments before water service is established. Non-residential establishments not initially requiring an assembly will be inspected if there is reason to believe a backflow device might be warranted. For example, if an establishment changes ownership (name listed on water bill), if plumbing permits are issued, irrigation systems installed, or a well is drilled within on that property, then an inspection will need to be performed. The need for backflow protection will be determined based on the results from the inspection. Notification of the type of backflow prevention assembly required and a date of compliance will be sent to the customer.

Residential:

New residential customers will be notified, upon request for water service, that they are responsible for preventing any backflows or potential backflows that might contaminate the public water system. If an inspection of the site reveals that a potential cross-connection may be present, backflow protection will be required of that customer's service. The type of backflow protection required will be determined by the Director.

Customers, both new and existing, will be notified that the installation of the following items will warrant an inspection of the premises and could result in a requirement that appropriate backflow prevention devices be installed:

1. Lawn irrigation systems
2. Residential fire protection systems (closed loop systems will require a double check valve minimum)
3. Pools, Saunas, Hot Tubs, Fountains
4. Auxiliary Intakes and Supplies-wells, cistern, ponds, streams, etc.
5. Hobbies that require extensive amounts of toxic chemicals (taxidermy, metal plating, biodiesel, etc.)
6. Any other situations or conditions listed in the manual or conditions deemed a potential threat by the Department.

All residential lawn irrigation systems require an approved backflow prevention device. Residential customers with pools, saunas, hot tubs not filled by a hard pipe directly or indirectly connected may be allowed to use an air gap (and may be requested to use an atmospheric vacuum breaker at the hose bibb). However, if the pool or vessels is connected directly or indirectly by a hard line, an RP is required at minimum.

Each year, the Utility Program's Coordinator will review meter usage records (high usage) and compare with the backflow device inventory. Those customers with suspected irrigation usage not also included on the backflow device list will be investigated. Additionally, education material will be presented on the Department's web page.

Residential customers required to have backflow prevention assemblies will be informed of possible thermal expansion problems within the establishment and correction of the condition.

Well System Inspections:

Wells drilled on properties that have access to a public water system will be inspected to ensure no cross connection exists. The listing of all known wells is updated at the Nashville Environmental Field Office and should be solicited from them annually. New lines constructed in areas where residential areas have been mainly supplied by well systems are to be surveyed and inspected.

C. Public Education and Awareness Efforts

The City of Brentwood recognizes that it is important to inform its customers of the health hazards associated with cross-connections and to acquaint them with the program being pursued to safeguard the quality of water being distributed. The City will seek to use a variety of means available to acquaint the customers with the health hazards associated with cross connections. Use of customer notification letters, the annual consumer confidence report, City's web site and City social media outlets will be incorporated into the notification plan. Information will be provided to all customers about cross-connection control and backflow prevention by individual pamphlets or through an article in the Consumer Confidence Report (CCR) at least once per year.

The following measures may also be used to inform customers about the need to control cross-connections:

1. Reminders with water bills;
2. Links on the City's website;
3. Annual consumer confidence report;
4. a. Personal visits to commercial, industrial, institutional, and agricultural customers to explain the need for controlling cross-connections.
   b. Whenever possible, any such potential customer will be informed of needed cross-connection measures in the design or construction stage.

D. Customer's Responsibility

Cross-connections, created and maintained by the customer for his convenience, endanger the health and safety of all who depend upon the public water supply. Therefore, the customer who creates a cross-connection problem shall bear the expense of providing necessary backflow protection and for keeping the protective measures in good working order. This includes repair, re-testing, installation, etc.

E. Enforcement

Where cross-connections are found to exist, the City of Brentwood requires that the problem be eliminated or isolated by a properly installed, approved backflow prevention assembly to prevent the possibility of backflow into the distribution system. Every effort will be made to secure the voluntary cooperation of the customer in correcting cross-connection hazards. If voluntary action cannot be obtained with time set forth by written notice (90 days maximum for low hazard,

14 days maximum for high risk / high hazards) to the customer, water service shall be discontinued until conditions are in line with the City's ordinance for the protection of the health and safety of the water distribution system. After surveys or inspections have been completed, the establishments will be contacted by written correspondence outlining any correction (adding or repairing backflow prevention devices) needed and the time schedule allowed for correction of conditions.

The City of Brentwood may give additional warnings of discontinuance and/or bring about penalties before the water service is discontinued. The time period for correction will be determined by the water provider, based on the seriousness of the hazard and risk of contamination, ranging from immediate correction or time period of up to 90 days. The maximum allowable time for correction will be no more than 90 days. Those sites deemed high risk / high hazard shall be corrected within a maximum limit of 14 business days, preferably with immediate correction. If the conditions do not satisfy the ordinance or plan within 90 days, water service could be discontinued. In the case of backflow prevention devices on fire systems, it is recommended that the fire marshal be contacted before water service is discontinued, to prevent harm to anyone in case a fire occurred in a public building.

IV. Procedures for Inspections:

The City of Brentwood's expectation is that efforts to acquaint its customers with the hazards of cross-connections will be successful to the point that the customer will endeavor to maintain their internal water delivery system free of cross-connections. It is recognized that many customers may not be aware that they have a situation that would permit backflow into the water supply lines. Therefore, annually, the department shall review all customer accounts not known to have cross-connection protection or devices installed, and develop a list of at least 5% (minimum per state guidelines) that are determined to have the greatest potential for cross-connection contamination. These sites then shall be inspected for potential cross contamination. Such inspections shall involve the customer's entire water-using equipment and other system components in an effort to locate any actual and potential cross-connections. Since the cross-connection program's inception, this component of the program has been successful in removing or protecting the vast majority of the existing premises. This is being adjusted to continue to monitor new connections and to monitor older connections that once had backflow protection or did not need it but after changes to their systems now require protection.

A. Field Visit Procedures:

During the inspection, a field sheet will be completed showing details of significant findings. The hazards which cross-connections pose will be explained fully to the persons assisting the inspection. The customer will be informed that the information gathered during the survey will be reviewed by the Department and that a written report containing any recommendations and requirements will be mailed to them as soon as possible.

B. Reports to Customers:

The findings of the visit will be summarized and a written report will be sent to the person assisting in the inspection, or the ranking management official of the establishment. Cross-connections found will be described briefly along with recommended method of correction. An effort will made to keep the description of the findings and recommendations clear, concise and as brief as possible. The correspondence will indicate a willingness to assist in rectifying the issues. The customer will be given a time limit for making the needed corrections depending (maximum of 90 days) upon the seriousness of the cross-connections involved and upon the complexity and difficulty of correcting the problems.

C. Follow-up Visits and Re-inspections

Follow-up visits will be made as needed to assist the customer and to assure that satisfactory progress has been made. Such visits will continue until all corrective action has been completed to the satisfaction of the Director.

D. Installation of Backflow Prevention Devices:

Where the customer is asked to install a backflow prevention assembly, the customer will be supplied with a list of acceptable and approved assemblies. In addition, minimum acceptable installation criteria will be supplied. It will be pointed out that a unit cannot be accepted until the water system has verified that the installation fully meets the installation criteria and has been tested to verify that the assembly has a status of Passed. Such backflow prevention assemblies must be of a make, model, and orientation currently listed as acceptable by the both the City and Tennessee Department of Environment and Conservation.

E. Technical Assistance:

The customer will be urged to notify the water system when they are ready to begin installing either a reduced pressure or double check valve type backflow preventer assembly. The City's Codes Department, via the plumbing permit process, will inspect and approve the initial installation. The Codes Department may contact the Utility Program's Coordinator for technical assistance during this initial design.

V. Premises Requiring Reduced Pressure Principal Assemblies or Air Gap Separation

A. High Risk High Hazards

Establishments which pose significant risk of contamination or may create conditions which pose an extreme hazard of immediate concern (High Risk High Hazards), the cross-connection control inspector shall require immediate or a short amount of time (14 days maximum), depending on conditions, for corrective action to be taken. In such cases, if corrections have not been made within the time limits set forth, water service will be discontinued.

High Risk High Hazards require a reduced pressure principal (or detector) assembly. The following list includes establishments deemed high risk high hazard:

High Risk High Hazards:

1. Mortuaries, morgues, autopsy facilities
2. Hospitals, medical buildings, animal hospitals and control centers, doctor and dental offices
3. Sewage treatment facilities, water treatment, sewage and water treatment pump stations
4. Premises with auxiliary water supplies or industrial piping systems
5. Chemical plants (manufacturing, processing, compounding, or treatment)
6. Laboratories (industrial, commercial, medical research, school)
7. Packing and rendering houses
8. Manufacturing plants
9. Food and beverage processing plants
10. Automated car wash facilities
11. Extermination companies
12. Airports, railroads, bus terminals, piers, boat docks
13. Bulk distributors and users of pesticides, herbicides, liquid fertilizer, etc.
14. Metal plating, pickling, and anodizing operations
15. Greenhouses and nurseries
16. Commercial laundries and dry cleaners
17. Film Laboratories
18. Petroleum processes and storage plants
19. Restricted establishments
20. Schools and Educational Facilities
21. Animal feedlots, chicken houses, and CAFOs
22. Taxidermy facilities
23. Establishments which handle, process, or have extremely toxic or large amounts of toxic chemicals or use water of unknown or unsafe quality extensively.

B. High Hazard

In cases where there is less risk of contamination, or less likelihood of cross-connections contaminating the system, a time period of (90 days maximum) will be allowed for corrections. High Hazard is a cross-connection or potential cross-connection involving any substance that could, if introduced in the public water supply, cause death, illness, and spread disease. (See Appendix A of manual)

VI. Premises Allowing Double Check Valve Assemblies

Low Hazard

Low hazard is a cross-connection or potential cross-connection involving any substance that would not be a health hazard but would constitute a nuisance or be aesthetically objectionable if introduced into the public water supply. Low Hazards are protected by double check valve assemblies at minimum. Double check valve (and detector) assemblies used for main line protection are allowed only on Classes 1-3 fire protection systems.

VII. Inspection and Testing of Backflow Prevention Assemblies

A. Approval of New Installations

The City will not consider the installation of assemblies to be complete until:

1. The installation has been inspected, and approved by the Water Department based installation criteria; and
2. Assembly is tested initially and has a status of Passed.

B. Routine Inspection and Testing of Assemblies

To assure that all assemblies are functioning properly, assemblies shall be tested within a 12 month period by backflow prevention assembly testers with a valid Certificate of Competency. In conjunction with testing the assembly, the water system representative or approved tester will investigate to determine:

1. That cross-connections, actual or potential, have not been added ahead of the protective assemblies,
2. The assembly meets all installation criteria; and
3. The assembly has not been bypassed or altered in some other way to compromise the backflow protection.

All reduced pressure and double check valve backflow prevention assemblies, including detector assemblies, utilized for the protection of the water system will be tested by a person possessing a valid Certificate of Competency from the State and approved by the water system in keeping with the following criteria:

1. Immediately following installation;
2. At least every 12 months;
3. Any time assemblies have been partially disassembled for cleaning and/or repair and;
4. Where there is indication that the unit may not be functioning properly (i.e. excessive or continuous discharges from relief valve, chatter, or vibration of internal parts).

C. Accepted Test Procedure

Tests of assemblies will be made using a 3 or 5 valve test kit that has valid annual certification in accordance to the latest approved testing procedure from the TDEC Division of Water Supply.

D. Official Tests

Only tests performed by persons possessing a valid Certificate of Competency will be considered official tests by the water system. All test reports submitted must be of the type approved by the Division of Water Supply. All parts of testing procedure are recorded accurately on the test report with a determination of status (Passed or Failed). Certificates of Competency are not transferrable.

E. Prior Arrangements for Testing

Prior arrangements will be made for a mutually agreeable time for testing the assemblies prior to performing the test. In all cases, the time which water service is interrupted will be held to a minimum in order to minimize the inconvenience to the customer. The customer, upon notification by the water system, has an obligation to work out a mutually agreeable time for testing assemblies within time allotted by the Department.

F. Repairs

Should a protective assembly be found defective or have a status of Failed, the Department will require the assembly to be repaired promptly with manufacturer's specified parts, in accordance to manufacturer's suggested procedure, and placed in proper operating condition within 14 days for high risk high hazards and within 90 days for low hazard areas. Following repairs, the assembly is to be tested again to verify that it is meeting performance standards and have a status of Passed. The owner will be held responsible for maintaining protective measures in a good state of repairs. The owner of an assembly needing repairs or maintenance will be permitted to do the work, if such owner is properly qualified or the owner may elect to secure the services of someone else experienced in the repair of the assemblies.

VIII. Parallel Units

The Department may require the installation of parallel assemblies if the customer cannot readily accommodate interruptions of water service for periodic testing and repairs of the assemblies or is unwilling to cooperate in scheduling a shutdown promptly for testing during normal hours worked by Department personnel.

IX. Records

Adequate records will be maintained as a part of the Department's permanent files to:

A. Document the overall effort of the Department to properly discharge its responsibility to see that each customer receives a safe water under all foreseeable circumstances;
B. Give a complete picture as to the current status and history of the individual premises regarding the potential for backflow, corrections made, etc.;
C. To support enforcement action, whenever necessary, to obtain backflow protection; and
D. Document that assemblies have been properly installed, maintained, and tested routinely.

Records to be maintained by Water System will include, but not necessarily be limited to the following;

A. Master List of all Establishments with assemblies used for premise isolation, including location, assembly used, make, model, size, serial number etc.;
B. Correspondence between water system and its customers
C. Copy of Approved Plan
D. Copy of Approved Ordinance
E. Test reports for each assembly
F. Copies of Certificates of Competency for each tester
G. Copies of test kit certifications
H. Site Inspection Reports
I. Backflow incident reports
J. Records on initial surveys, recommendations, follow-up, corrective action, routine re-inspections, etc.
K. A file system designed to call to the attention of the cross-connection control personnel when testing and re-inspections of premises are needed.
L. Public education pamphlets and information.

X. Backflow Contamination Procedures:

If contamination is caused by backflow, the City of Brentwood will take the following actions to protect the health of the customer:

A. Isolate the lines containing any contaminant from the distribution system;
B. Inform customers with contaminated lines not to consume or use the water;
C. Report contamination to the Nashville Field Office;
D. Determine and separate the cross-connection allowing the backflow and contamination;
E. Remove contamination from lines;
F. Test and ensure that lines meet Division of Water Supply regulations for safe water;
G. Return service to customers affected customers once water is safe;
H. Document the details of the incident including cause, isolation, and correction, and send report to Nashville Field Office;
I. Continue to survey and inspect system for similar situations that may allow backflow.

XI. Modifications to Plan

This plan may be modified from time to time to meet the needs of the utility and to meet the State's requirements. The plan and ordinance will be reviewed by the water system every five (5) years to determine if the existing plan meets requirements set forth by the Division of Water Supply and that it promotes an ongoing program. The Director shall have the authority to modify this policy documents as required and shall advise the Nashville Field Office of any changes to this plan for their review and comments.

INSTALLATION CRITERIA
FOR
REDUCED PRESSURE PRINCIPLE AND DOUBLE CHECK VALVE BACKFLOW PREVENTION ASSEMBLIES

A. The RP assemblies should never be subject to flooding and therefore should:

1. Never be located in a pit or other area subject to flooding;

2. Avoid piped drains for enclosures housing the units. Provision should be made for discharging water (maximum design discharge) directly through the wall of the enclosure housing the unit at a slightly higher elevation than surrounding ground level or maximum flood level.

3. The lowest part of the relief valve discharge port should be a minimum of 12 inches above either:

    1. The ground

    2. Top of the opening(s) in enclosure wall

    3. Maximum flood level

    Whichever is highest, in order to prevent any part of the assembly from becoming submerged.

B. All new backflow prevention assemblies being installed in Tennessee for the protection of a public water system should be included on the latest listing of "Approved Backflow Prevention Assemblies" maintained by the Division of Water Supply.

C. The assemblies should be installed where the units can be easily tested and repaired.

1. Installation of assemblies 2" and less must have a minimum of six inch clearance from all walls. Assemblies over 2" must be a minimum of twelve inches from all walls.

2. Assemblies installed in stationery enclosures should have at least a 2 ft. clearance on each side of the assembly to facilitate testing and servicing. Adequate drainage must be provided.

3. Assemblies should not be installed higher than 5 ft. from the floor/ground to the center line of the assembly unless safe permanent access is provided for testing and servicing

D. The pipelines should be thoroughly flushed to remove foreign material and debris. A strainer should be added on the inlet side of the assembly before installation except for fire protection service lines.

E. Installation of backflow prevention assemblies will not allow any unprotected or uninspected connections in front of the backflow prevention assembly.

F. Backflow preventers should be installed with unions and isolation valves on both ends of the assembly to allow removal of the assembly for repair or replacement.

G. Provisions should be made to protect the assemblies from freezing. Insulating materials should not restrict the relief valve discharge or accessibility to test cocks or name plate of the unit. All enclosures should be designed to provide for adequate draining for the relief valve.

H. The relief valve of an RP should never be plugged, restricted, or solidly piped to a drain, ditch or pump. Rigidly secured air-gap funnels may be used to direct discharges away from the unit provided an approved air-gap separation is provided at the relief valve discharge and again at the discharge end of the drainpipe. An adequate area drain is recommended to handle the maximum relief valve flow to prevent flooding.

I. The test cocks, valve stems, or name plates should not be painted and their accessibility, operation of legibility should not be hampered nor the relief valve discharge passage be restricted by insulation or other coverings.

J. The assemblies should be installed in an approved position as listed in the Latest Approved List and special supports added if needed.

K. For applications where water temperatures exceed 110°F (43°C) only approved hot water devices are to be used.

L. Prior to completing the installation, temperature pressure relief valves on heating vessels should be properly installed and in good working condition. If needed, thermal expansion tanks should be installed.

M. No unprotected bypasses or connections are made between the assembly and meter.

Existing assemblies not meeting the minimum requirements above, with the exception of being installed in an area that may allow flooding of the assembly, may be allowed variances by the water system. However, no variance may be allowed that will compromise the protection of the assembly or that will allow contaminants in the distribution system. All variances should be documented and kept on file for the life of the assembly. Please review the document entitled: *Approved Backflow Prevention Assemblies.*

APPENDIX A

TYPICAL CROSS CONNECTION HAZARDS

Actual or potential cross connection hazards may be present within almost every water using premises. To better understand and become aware of these hazards, the following examples are provided.

A. Common Facilities and Systems Likely to have Cross Connection Hazards:

1. Auxiliary Water Systems
   Any premises or facility with an alternate water supply on or available to the premises. Water stored in reservoirs that are not properly protected or circulated is considered an auxiliary supply.

2. Food Processing
   Pressure cookers, autoclaves, retorts, and other steam connected facilities.

3. Cooling Systems Single Pass
   Compressors, heat exchangers, air-conditioning equipment, and other water-cooled equipment that may be connected to the sewer.

4. Farming Operations
   Poultry houses, chicken houses with automatic proportioning pumps or feeder barrels for supplying water with live virus or other medication, livestock watering troughs with below the rim filling outlet, diluting and mixing of pesticides and insecticides, mixing and spray equipment, greenhouses, dilution of liquid fertilizers, dairies, unprotected hose bibbs.

5. Fire Protection Systems
   Piping systems and storage reservoirs that may be treated for prevention of scale formation, corrosion, algae, or slime.

   Piping systems that contain non-potable plumbing materials.

   Booster pumps without suction pressure sustaining valves or low suction pressure cutoff switches.

   Sprinkler systems filled with antifreeze solutions and/or piping systems filled with chemical compounds used in fighting fires.

   Fire systems with an auxiliary source of supply or which are located within 1700 ft. of streams, lakes, ponds, reservoirs, or other non-potable waters that could be utilized in emergencies.

6. Film Processing
   Automatic film processing machines, tanks, vats, and other facilities used in processing film.

7. Hydraulic Test Facilities
   Hydraulic test equipment using pumps, rams, pressure cylinders, or other hydraulic principles, which may force liquids back into the public water system.

   Piping systems, tanks, and other equipment where the public water system pressure is used directly and which may be subject to backpressure.

8. Industrial Piping Systems
   Industrial piping systems containing chemicals, gases, cutting or hydraulic fluids, coolants, antifreeze, hydrocarbon products, glycerin, paraffin, caustic or acid solutions and other substances.

9. Industrial Systems – Chemical Contamination
   Tanks, can and bottle washing machines, and piping systems where caustics, acids detergents, and other compounds are used in cleaning, sterilizing, and flushing.

10. Residential or Commercial lawn irrigation systems.
    Irrigation systems equipped with pumps, injectors, pressurized tanks, or other facilities for injecting agricultural chemicals, such as, fungicides, pesticides, herbicides, and other toxic or objectionable substances, require immediate protection.

11. Laundry and Dyeing Facilities
    Laundry machines having under rim or bottom inlets, dry cleaning equipment, solvent reclaim facilities.

    Wash water storage tanks equipped with re-circulating pumps.

    Dye vats in which toxic chemicals and dyes are used.

    Shrinking, bluing, and dyeing machines directly connected to re-circulating systems.

    Boilers, steam lines, and heat exchangers.

12. Paper Processing
    Pulp, bleaching, dyeing, and processing facilities that may be contaminated with toxic chemicals.

13. Petroleum Processing
    Steam boilers, steam lines, mud pumps and mud tanks, oil well casing used for dampening gas pressures, dehydration tanks, oil and gas tanks in which hydraulic

pressures are used to raise oil and gas levels, gas and oil lines used for testing, excavating, and slugging.

14. Plating Facilities
    Plating facilities using highly toxic cyanides, heavy metals, such as, copper, cadmium, chrome, acids, and caustic solutions.

    Plating solution filtering equipment with pumps and circulating lines.

    Tanks, vats, or other vessels used in painting, descaling, anodizing, cleaning, stripping, oxidizing, etching, pickling, dipping, and rinsing operations and lines used for transferring fluids.

15. Storage Tanks, Cooling Towers, and Circulating Systems
    Storage tanks, cooling towers, reservoirs, and circulatory systems contaminated with bird droppings, algae, slimes, or with water treatment compounds, such as copper, chromate, phenols, and mercury.

16. Sewerage Systems
    Cross connections to sewage pumps for priming, water seal lubrication, cleaning, flushing, or unclogging.

    Water-operated sewage pump ejectors.

    Sewer lines used for disposing of filter or softener backwash, water from cooling systems, or for providing a quick drain for building lines and lines used for flushing or blowing out obstructions in sewer lines.

17. Steam Generation Facilities
    Steam generating facilities and lines which may be contaminated with boiler compounds, heat exchangers, single wall steam heated water heating equipment.

18. Hospital-Medical Facilities
    Unprotected connections to bedpan washers, hydrotherapy tubs, toilets, urinals, autopsy and mortuary equipment, aspirators, x-ray and photo processing equipment, vacuum pump seals.

    Unprotected connections to laboratory equipment which may be chemically or bacteriologically contaminated, such as, steam sterilizes, autoclaves, specimen tanks, and pipette washers.

B. Equipment posing significant risk of creating cross-connections.

Establishments with equipment list will normally require premise isolation with a Reduced Pressure Principle Assembly or Double Check Valve Assembly depending on hazard unless otherwise found to have an appropriate air gap.

Many devices or equipment below may be designed and constructed with approved air gaps that would adequately protect the water system. However, the Utility Program's Coordinator should consider and make judgments on the amount risk that the establishment poses to the distribution and not solely on the presence or absence of the devices, situations, or equipment listed below.

The following is an incomplete list of equipment normally requiring backflow prevention assemblies, it is to be noted that any connection with piping, equipment, or devices that contain or may contain substances that are pollutants or contaminants will require premises isolation.

Air-conditioning systems (using water for processing)
Aspirators
Air lines
Autoclaves and sterilizers
Auxiliary systems
Baptismal tanks
Bathtubs (Hard Piped)
Bedpan washers
Bidets
Booster pumps
Brine tanks, softeners
Boilers
Car wash equipment
Chemical feeders
Chillers
Chlorination equipment
Commercial cookers
Compressors
Cooling towers
Culture vats
Cuspidor, dental
Developing equipment
Display fountains
Drinking fountains
Ejectors, steam or water
Extractors
Fire protection systems, standpipes, sprinkler systems and drain lines
Fish tanks, ponds
Floor drains
Food mixing tanks
Frost-free hydrants, and fountains
Garbage grinders (commercial)
Garbage can washers
Heat exchangers
Humidity controls
Hydraulic equipment

Hydraulic insecticide or fertilizer applicators
Hydraulic lifts
Irrigation systems, lawn sprinklers
Laboratory equipment
Laundry equipment
Lawn sprinklers
Liquid handling systems
Lubrication, pump bearings
Medical equipment
Pest control equipment
Photo laboratory sinks
Pressure cookers
Process water circulation systems
Pump, priming systems
Sewer flush tanks
Shampoo sinks, basins
Sinks, slop sinks, mop sinks
Soda fountains
Solar water and space heating equipment
Steam boilers
Steam tables
Stop and waste vales
Swimming pools, ponds, fountains
Therapeutic tanks, spas, and hot tubs
Urinals (siphon set blowout)
Vacuum systems (water operated with water seals)
Water troughs
Water-using mechanical equipment
Water Jacketed tanks, vats, cookers

C. <u>Premises, facilities or establishments that pose a significant risk of cross-connection</u> –

Reduced Pressure Backflow Prevention Assemblies are required for premises isolation for the following establishments:

Agricultural processing facilities
Aircraft and missile plants
Amusement parks
Animal hospitals and clinics
Automotive plants
Auxiliary water systems
Autopsy facilities
Beverage bottling plants
Breweries
Buildings (multistory) – hotels, apartment houses, public and private buildings, or structures having unprotected cross connections

Campgrounds
Canneries
Car washes
Chemical plants – manufacturing, processing, compounding, treatment, packing, storage
Chemically contaminated water systems
Civil works
Clinics
Cold storage plants
Dairies, creameries
Dry cleaners
Dental buildings
Dye works
Extermination Companies
Fertilizer plants
Fertilizer (liquid) and spray distributors
Film laboratories
Fire sprinkler systems
Funeral homes
Hospitals
Laboratories
Laundries and dye works
Lawn irrigation systems
Medical buildings
Metal manufacturing, cleaning, processing, and fabricating plant
Mortuaries
Morgues
Motion picture studio
Nursing home or convalescent homes
Greenhouses, plant nurseries
Oil and gas production, storage, or transmission facilities
Oil refineries
Packing houses
Paper and paper product plants
Plating plants
Power plants
Private wells
Radioactive materials or substances
Reduction plants
Restricted, classified, or other closed facilities
Rubber plants
Sand and gravel plants
Schools and colleges
Sewage pumping stations
Storm water pumping stations
Hard plumbed swimming pools, ponds, and fountains
Tanneries of all kinds

Therapeutic tanks, spas, and hot tubs
Vegetable and food processing facilities
Waterfront facilities and industries
Water treatment plants
Wastewater treatment plants
Water using recreational facilities (swimming pools, water slides)

D. **Other Factors to Consider:**

1. The degree of hazard involved.

2. The likelihood of frequent and/or unapproved plumbing changes.

3. The probability of frequent modification of water using equipment.

4. The complexity of the internal piping system.

5. The difficulty in making frequent inspections to verify that the internal protection provided is being adequately maintained.

6. The likelihood of protective assemblies being rendered ineffective.

7. The ease of access to premises.

8. The time necessary to inspect all water outlets not protected by a backflow prevention assembly.

9. The time needed to inspect the facility at least annually to determine if new cross connections have been created.

State Guidance for Approved Backflow Prevention Assemblies

All assemblies used to protect the public water supply, must be approved by the Division of Water Supply. New installation and replacement assemblies required by a public water system must be included on the latest listing of the Approved List maintained by the Division of Water Supply. A backflow prevention device will qualify as an assembly if it is consistent with the following definitions:

DOUBLE CHECK-DETECTOR CHECK VALVE ASSEMBLY (DCDA)
A specially designed unit composed of a line size approved double check valve assembly with a specific bypass line equipped with a small water meter and a ¾ inch approved double check valve assembly. The meter shall register accurately for only very low rates of flow and shall show a registration for all rates of flow. The meter will detect small leakage or theft of water for unmetered fire lines. This assembly is designed for fire service lines and is recommended for unmetered fire lines. This assembly is designed to protect against a *low hazard or pollutant.*

DOUBLE CHECK VALVE ASSEMBLY (DCVA)
An assembly composed of two independently acting, approved check valves, including tightly closing shutoff valves located at each end of the assembly and fitted with properly located test cocks. This assembly is designed to protect against a *low hazard or pollutant.*

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY (RPBP)
An assembly containing two independently acting approved check valves together with a hydraulically operating, mechanically independent pressure differential relief valve located between the check valves and at the same time below the first check valve. The unit shall include properly located test cocks and tightly closing shutoff valves at each end of the assembly. This assembly is designed to protect against a *health hazard (i.e. contaminant).*

REDUCED PRESSURE PRINCIPLE-DETECTOR BACKFLOW PREVENTION ASSEMBLY (RPDA)
A specially designed assembly composed of a line-size approved pressure principle backflow prevention assembly with a bypass containing a specific water meter and an approved reduced pressure principle backflow prevention assembly. The meter shall register accurately for only very low rates of flow up to 3 gpm and shall show a registration for all rates of flow. This assembly shall be used to protect against a non-health hazard or a health hazard. The RPDA is primarily used on fire sprinkler systems. This assembly is designed to protect against a *health hazard (i.e. contaminant).*

The following assemblies will meet recommendations and requirement for protection of the water system:

1. **Reduced Pressure Principle Assembly**
2. **Reduced Pressure Principle Detector Assembly**
3. **Double Check Valve Assembly***
4. **Double Check Valve Detector Assembly***

* Double Check Valve Assemblies and Double Check Valve Detector Assemblies are permissible on non-chemical fire lines Class 1-3 only.

Atmospheric Vacuum Breakers, Pressure Vacuum Breakers, and Spill-Resistant Pressure Vacuum Breakers are not approved by the Division of Water Supply for premise isolation.

Existing Assemblies not on Approved List

The City of Brentwood will only accept those devices on the Division of Water Supply Approved List. No exceptions are allowed on Brentwood Water Services system.

State Guidance for Backflow Prevention Assembly Performance Evaluations

Performance evaluations are needed to demonstrate that all parts of the assemblies are performing as designed and as approved.

1. Performance evaluations must be performed on every assembly at least annually.

2. Each backflow prevention assembly must be deemed **Passed** to remain approved and acceptable protection for the public water system.

   Passed: The status of a backflow prevention assembly determined by a performance evaluation in which the assembly meets all minimum standards set forth by the approved testing procedure.

   Reduced Pressure Principle Assembly:
   a. Relief Valve must be have an opening point of 2.0 psi or greater
   b. Backpressure on Check Valve #2 must hold tight.
   c. Static Pressure Drop across Check Valve #1 must be 3.0 psi or greater than relief valve opening point.
   d. Shutoff Valve #2 must hold tight.
   e. Static Pressure Drop across Check Valve #2 must be 1.0 psi or greater.

   Double Check Valve Assembly:
   a. Static Pressure Drop across Check Valve #1 must be 1.0 psi or greater.
   b. Backpressure on Check Valve #2 must hold tight.
   c. Shutoff Valve #2 must hold tight.
   d. Static Pressure Drop across Check Valve #2 must be 1.0 psi or greater.

3. The Backflow Prevention Assembly Tester must have, at minimum, a valid Certificate of Competency in Testing and Evaluation Backflow Prevention Assemblies and a valid test kit certification by a manufacturer-approved entity.

4. Backflow Prevention Assembly Testers must test and evaluate according to the latest Division of Water Supply's approved procedures.

5. Test kits must be certified annually and the water provider and tester must show proof of certification from manufacturer-approved entities.

6. Proof of annual test kit certification and Certificate of Competency must be current and kept on file for each tester by water provider for five years.

7. Test reports must be completely and accurately documented and the appropriate evaluation determined from testing procedure.

8. All correspondence and documentation pertaining to each backflow prevention assembly will be kept on file by the water provider for at least five years. This includes, but not limited to, test reports, repair reports and installation records.

9. Each location requiring an assembly will have a documented backflow prevention assembly, if the assembly at the address cannot be identified or is not the correct assembly, the water provider will be notified.

10. Every assembly must pass each part of the Performance Evaluation. If any test does not meet the minimum requirements set forth in the testing procedure, the assembly is deemed **Failed**. If conditions around the assembly do not allow the assembly to be tested, the assembly fails the assembly performance evaluation. (Examples would include assembly is submerged, test cocks missing or plugged, relief valve continually discharging)

    Failed: The status of a backflow prevention assembly determined by a performance evaluation based on the failure to meet all minimum standards set forth by the approved testing procedure.

11. Assemblies must be tested when installed and after every repair. Backflow prevention assemblies on lawn irrigation systems must be tested when assemblies are placed in service. If lawn irrigation backflow assemblies are taken out of service to winterize the system, upon startup of the system, the assemblies must be retested.

State Guidance for
Certificate of Competency for Testing and Evaluating Backflow Prevention Assemblies

The information listed below is guidance concerning Certificate of Competencies:

- Anyone testing backflow prevention assemblies for the purposes outlined in the water system's Cross-Connection Control Ordinance or Ordinance must have a **valid** Certificate of Competency in Testing and Evaluation of Backflow Prevention Assemblies issued by the Division of Water Supply.

- A valid certificate is defined as a Certificate (Basic or Renewal) issued by the state of Tennessee that has not surpassed the three-year time limit from issuance. After certificates have been granted by the State of Tennessee, a Certificate No. is assigned to the applicant. Certificates are valid for three (3) years after certificates are granted. All Certificates are no longer valid, if the Renewal Certificate is not attained within three (3) years from the date the certificate was issued. A 1 year grace period is allowed to attend the renewal class however, the person must not be allowed to test after the 3 year expiration.

- The applicant must complete and satisfy all requirements set forth by the Division of Water Supply to attain and renew the Certificate of Competency.

- Applicant must successfully complete a State-approved Basic Cross-Connection Control training session, written exam, and practical exam to attain an initial Certificate of Competency. The student must successfully complete a State-approved Renewal Cross-Connection Control training session and practical exam to renew the Certificate of Competency.

- Certificate of Competency must be valid in order to perform assembly evaluations.

- In order to renew the Certificate of Competency, a Renewal Course and Exam must be taken within three years after the issuance date to remain valid.

- If the Certificate of Competency is not renewed three years after issuance, the certificate is no longer valid, but does not expire.

- A one year grace period to renew the Certificate of Competency is allowed once the three year time limit has passed.

- The City of Brentwood will not accept a test report from a tester whose certificate is in the grace period or has expired.

- If the tester does not renew during the one year grace period, the certificate expires and the tester must take the Basic Course and Basic Exam in order to attain the Certificate of Competency.

- The Certificate of Competency is not transferable and no one may work "under" the certificate.

- A Plumber Certificate in Testing and Evaluating Backflow Prevention Devices issued by Division of Water Supply cannot be substituted and will not be accepted in place of the Certificate of Competency.

- Certificates of Competency in Testing and Evaluation of Backflow Prevention Assemblies from other states or entities will only be accepted if approved by the Division of Water Supply. No entities or states presently have an approved Certificate of Competency.

State Guidance Concerning Lawn Irrigation Systems

Lawn irrigation systems, both commercial and residential, are recognized by the State of Tennessee, Division of Water Supply as an actual and potential cross-connection to a public water system. The contact between the sprinkler heads and the soil or submergence of sprinkler heads allows a connection between the potable water system and water of unknown or unsafe quality.

Soil and standing water in contact with the sprinkler heads poses a significant risk of containing E.coli, Cryptosporidium, Giardia, other pathogens, and hazardous chemicals used for lawn care. Many lawn irrigation system use toxic chemicals injected in the piping to fertilize and eliminate undesired plants.

Required Protection for Lawn Irrigation Systems by Public Water Systems:

- For public water systems to protect their distribution lines, lawn irrigation systems are protected by a **Reduced Pressure Principle Assembly** or **Reduced Pressure Principle Detector Assembly**.

- Double Check Valves cannot be used for premise isolation on lawn irrigation systems. Double Check Valves may be used for non-health hazards only. Water which contains or may contain pathogens or harmful chemicals is considered a health hazard and must be protected by a **Reduced Pressure Principle Assembly** or **Reduced Pressure Principle Detector Assembly** only.

- Pressure vacuum breakers, Spill-resistant vacuum breaker, and atmospheric vacuum breakers may not be used to protect the public water system's main-line piping or distribution system. These devices are point-of-use devices and may not be used for premise isolation.

- Assemblies must be tested annually.

- Assemblies on lawn irrigation systems must be tested during the start-up period (typical maximum time limit is within 90 days). Annual testing just prior to winterization or seasonal shutdown is not acceptable. Testing may also be initially staggered in order to reduce problems with scheduling tests.

Backflow Incident Report Form

Reporting Agency: _____ Report Date: _____

Reported By: _____ Title: _____

Mail Address: _____ City: _____

State: _____ Zip Code: _____ Telephone: _____

Date of Incident: _____ Time of Occurrence: _____

General Location (Street, etc.): _____

Backflow Originated From:

Name of Premises: _____

Street Address: _____ City: _____

Contact Person: _____ Telephone: _____

Type of Business: _____

Description of Contaminants:
(Attach Chemical Analysis or MSDS if available)

_____

_____

Distribution of Contaminants:

Contained within customer's premises: Yes: _____ No: _____

Number of persons affected: _____

Effect of Contamination:

Illness Reported: _____

Physical irritation reported: _____

_____

Cross-Connection Source of Contaminant (boiler, chemical pump, irrigation system, etc.):

_____

_____

Cause of Backflow (main break, fire flow, etc.):

_____

_____

Corrective Action Taken to Restore Water Quality (main flushing, disinfection, etc.):

_____

_____

Corrective Action Ordered to Eliminate or Protect from Cross Connection (type of backflow preventer, location, etc.)

_____

_____

Previous Cross-Connection Survey of Premises:

Date: _____ By: _____

Types of Backflow Preventer Isolating Premises:

RPBA: _____ RPDA: _____ DCVA: _____ DCDA: _____

Air Gap: _____ None: _____ Other Type: _____

Date of Latest Test of Assembly: _____

_____

Notification of Division of Water Supply:

Date: _____ Time: _____ Person Notified: _____

Attach sheets with additional information, sketches, and/or media information, and mail to Local Environmental Field Office

CROSS CONNECTION CONTROL ORDINANCE – November, 2008