

**CITY OF RICHMOND, VIRGINIA
DEPARTMENT OF PUBLIC UTILITIES
CROSS CONNECTION CONTROL MANUAL**



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Note: It is the responsibility of the reader or user of this document to ensure that the excerpts referenced within this manual are the latest or most up-to-date.

PART I

INTRODUCTION

CROSS CONNECTION CONTROL AND BACKFLOW PREVENTION

INTRODUCTION

According to the Virginia Department of Health Waterworks Regulations (12 VAC 5-590-580), the City of Richmond must establish and enforce a program of cross connection control and backflow prevention to protect the City's water distribution system, and to ensure that the system's treated water is pure and safe for public consumption. Compliance with this requirement is a condition for the issuance and continued use of the Department's Waterworks Operation Permit (to treat raw water and distribute potable drinking water).

The purpose of the Cross Connection Control and Backflow Prevention Program (the Program) is to protect the City's drinking water system from any cross connections made to or backflow entering the water distribution system and to protect the public health.

The City of Richmond is responsible for providing potable water service to our customers in the City and surrounding municipalities. It is the City's Department of Public Utilities (DPU) obligation to insure the health, safety and welfare of our customers by making a continuous effort to provide quality services. The focus of this document is to assure protection of water quality throughout the water distribution system and to our customers.

DPU and the consumer have a shared responsibility for water quality. DPU's responsibility is for the distribution system and water service up to and through the water meter. The consumer's responsibility begins after the water meter and includes the service line and all the pipe, fittings and appliances beyond the meter. The City requires a service line backflow prevention device on each service line to facilities that have actual or potential uses other than domestic uses (cooking, drinking, bathing and toilet). DPU is responsible for determining when, where, and what type of backflow prevention must be installed on the service line, per the Waterworks Regulations (12 VAC 5-590-610).

To maintain water quality, DPU must identify potential cross connections and determine necessary protection measures. To aid in this, the Cross Connection Control and Backflow Prevention Program was adopted in 1984. This version of the Program manual and regulations is a revision to the 2015 manual and regulations. The Program identifies those activities which pose a threat to the public potable (drinking) water supply through cross connections and backflow and sets forth appropriate protective measures.

The purpose of the manual and regulations is to:

- Prevent backflow pollution or contamination of the water supply system by requiring the installation of an appropriate backflow prevention device or by backflow prevention by separation at the service connection,
- Explain the criteria by which the City will determine the Degree of Hazard,

- Define required backflow prevention assemblies or devices,
- Educate those who work with public water supplies, and
- Encourage consumers to actively support and implement cross connection control for the purpose of protecting the public water supply.

This manual is intended to address the requirements of the Owner (City of Richmond DPU) and the public water system. Additional requirements of the latest edition of the Plumbing Code must also be met.

If you have questions regarding the Cross Connection Control and Backflow Prevention Program, please contact the City's Cross Connection Control Specialist at (804) 646-8544, email at DPU.DevelopmentServices@RVA.gov or write to:

City of Richmond Department of Public Utilities Technical Services Division -
Cross Connection Control 400 Richmond Highway Richmond, VA 23224

PART II

DEFINITIONS

CROSS CONNECTION CONTROL AND BACKFLOW PREVENTION

DEFINITIONS

Air-Gap Separation

The term “Air-Gap Separation” shall mean the unobstructed physical separation through the free atmosphere between any pipe or faucet supplying water to a tank, plumbing fixture or other device. The physical separation shall be measured from the lowest opening of the pipe to the highest rim of the receptacle. An “approved air- gap separation” shall be a linear distance of at least two times the diameter of the supply pipe measured vertically above the rim of the vessel and the bottom of the discharge pipe. The minimum separation shall be two (2) inches in all cases.

ASSE

American Society of Sanitary Engineers

Atmospheric Vacuum Breaker

The term “Atmospheric vacuum breaker” (also known as the “non-pressure type vacuum breaker”) shall mean an assembly containing a float-check, a check to close the air inlet port. The flow of water into the body causes the float to close the air inlet port. When the flow of water stops the float falls and forms a check valve against backsiphonage and at the same time opens the air inlet port to allow air to enter and satisfy the vacuum. A shutoff immediately upstream may be an integral part of the assembly. An atmospheric vacuum breaker is designed to protect against a health hazard, (i.e. containment) under a back-siphonage condition only.

Auxiliary Water System

The term “auxiliary water system” shall mean any water system on or available to the premises other than the waterworks. These auxiliary water systems may include water from another owners’ waterworks or water from a source such as wells, lakes, or streams; or process fluids, or used water. They may be polluted or contaminated or objectionable, constitute a water source or system over which the owner does not have control.

Backflow

The term “backflow” shall mean the undesirable reversal of flow of water or mixtures of water and other liquids, gases or other substances into the distribution pipes of the potable supply of water from any source or sources.

Backflow Prevention Device – Approved

The term “backflow prevention device- approved” shall mean a device, method, or type of construction that has been investigated and approved by the Virginia Department of Health, Office of Drinking Water, and Division of Water Supply Engineering for the effective prevention of backflow into a potable system. In addition, the appropriate American Society of Sanitary Engineers (ASSE) standard is as follows:

BOCA International Plumbing Code

Table P-1505.11.1 - Air Gap Separation (A.G.)

ASSE-1013 - Reduced Pressure Zone Backflow Preventer (RPZ)

ASSE-1024 - Dual Check Valve Assembly Backflow Preventer (DCVA)

Backflow Prevention Device – Unapproved

The term “backflow prevention device-unapproved” shall mean an assembly that does not meet the requirements of the current ASSE standard and is therefore unacceptable for use in the City’s distribution system.

Backpressure

The term “backpressure” shall mean any elevation of pressure in the downstream piping system (by pump, elevation of piping, or steam and/or air pressure) above the supply pressure at the point of consideration which would cause or tend to cause a reversal of the normal flow of potable water leading to backsiphonage.

Backsiphonage

The term “backsiphonage” shall mean a form of backflow where water from a consumer’s water service line (after the meter) is pulled back into the supply system due a decrease in water pressure in the supply system.

By-Pass

The term “by-pass” shall mean any piping arrangement, connection, removable section, swivel, changeable device or other temporary or permanent devices through which or because of which a backflow prevention device could be circumvented and a backflow could occur.

CCCP

Cross Connection Control Program by the City of Richmond, Department of Public Utilities, Technical Services Division.

CCCS

Cross Connection Control Specialist – an employee of the City of Richmond, Department of Public Utilities, Technical Services Division.

Check Valve - Approved

The term “check valve- approved” shall mean a check valve that is drip tight in the normal direction of flow when the inlet pressure is at least one (1) psi and the outlet pressure is zero (0). The check valve shall permit no leakage in a direction reverse to the normal flow. The closure element (e.g. clapper, poppet or other design) shall be internally loaded to promote rapid and positive closure. An “approved check valve” is only one component of an approved backflow prevention device – i.e. pressure type, anti-siphon vacuum breaker, double check backflow prevention assembly, or reduced pressure backflow preventer.

Consumer

The term “consumer” shall mean the person who benefits from the water, wastewater, stormwater or gas service or any combination used or wasted on any premises within or without the corporate city limits, or means a customer.

Containment

The term “containment” shall mean that the appropriate type or method of backflow protection, commensurate with the degree of hazard of the consumer’s potable water system, is installed at the service connection. Therefore, any possible contamination of the water supply is contained within the consumer’s potable water system.

Contamination

The term “contamination” shall mean a degradation of the quality of the potable water by any solid, liquid, or gaseous compounds or mixtures which would create an actual or potential hazard to the public health, or would create an unacceptable, odor or color to potable water.

Customer

The term “customer” shall mean the person legally or equitably responsible for the payment of charges for stormwater, water, gas or wastewater service or any combination used or wasted on any premises within or without the corporate City limits.

Critical Level

The term “critical level” shall mean the minimum elevation (height) above the rim of a fixture or receptacle at which a vacuum breaker device may be installed.

Cross Connection

The term “cross connection” shall mean any unprotected actual or potential connection or structural arrangement between a public or a consumer’s potable water system and any other source or system through which it is possible to induce into any part of the potable system any used water, industrial fluid, gas, or substance other than the intended potable water with which the system is supplied.

Degree of Hazard

The term “degree of hazard” is used to refer to the potential risk to health and adverse effect upon the waterworks.

Detector Check

The term “detector check” shall mean a fire line water meter consisting of a single check valve assembly and a by-pass water meter and a single check. The meter shall register accurately for low rates of flow and shall show a registration for all rates of flow.

Double Check Valve Backflow Prevention Assembly (DCVA)

The term “double check valve backflow prevention assembly” (DCVA) shall mean an assembly composed of two (2) independently acting, approved check valves, including tightly closing shut-off valves located at each end of the assembly and fitted with properly located test cocks. This assembly shall be a low hazard device to only be used to protect against a non-health hazard (i.e. pollutant).

Enclosure

The term “enclosure” shall refer to the above ground structure that encloses a backflow prevention device to prevent freezing. Enclosures shall conform to the requirements of ASSE 1060.

Facility

The term “facility” shall refer to something designed, built, or installed to afford a specific convenience or service.

Health Agency

The term “Health Agency” shall mean the Virginia Department of Health, Office of Drinking Water, and Division of Water Supply Engineering.

Health Hazard

The term “health hazard” shall mean an actual or potential threat of contamination of a physical or toxic nature to the public potable water system or the consumer’s potable water system to such a degree or intensity that there would be a danger to health.

Industrial Fluids

The term “industrial fluids” shall mean any liquid or solution which may be chemically, biologically or otherwise contaminated or polluted which would constitute a health, pollution or system hazard if introduced into the waterworks. This includes, but is not limited to:

- Polluted or contaminated water;
- Process water;
- Used waters, originating from the waterworks which may have deteriorated in sanitary quality;
- Cooling water;
- Contaminated natural water taken from wells, lakes, streams, or irrigation systems,
- Chemicals in solution or suspension; and
- Oils, gases, acids, alkalis, and other liquid and gaseous fluid used in industrial or other processes or firefighting purposes.

Inlet

The term “inlet” shall mean the open end of the water supply pipe through which the water is discharged into a plumbing fixture.

Isolation Valve

The term “isolation valve” shall mean a type of valve used to stop or regulate fluid flow in a pipeline or system.

Main

The term “main” shall mean the pipe in a street extending parallel or nearly parallel to the line of property abutting thereon through which water is conveyed or distributed.

Multifamily

The term “multifamily” shall refer to housing where three or more separate housing units for residential (i.e. non-commercial) inhabitants are contained within one building or multiple buildings within one complex.

Non-Health Hazard

The term “non-health hazard” shall mean an actual or potential threat to the physical properties of the public or consumer’s potable water system or of a contamination which would have a protracted effect on the quality of the potable water system. A non-health hazard is one that, if introduced into the public potable water supply system, would be a nuisance to the customer but would not adversely affect human health.

Owner

The term “owner” shall mean an individual, group of individuals, partnership, firm, association, institution, corporation, Municipal Corporation or the Federal Government which supplies water to any person within the State from or by means of any waterworks.

Point of Connection (POC)

The term “point of connection” shall mean the terminal end of a water pipe where water is delivered for use. Examples of “point of connections” are faucets and hose bibs.

Point of Service (POS)

The term “point of service” shall mean the point where the public water utility’s responsibility ends and the customer’s private water system begins. This point shall be at the outlet side of the water meter, right-of-way, or public utility easement.

Potable Water

The term “potable water” shall mean water from any source which has been permitted by the Virginia Department of Health and approved for human consumption.

Premises

The term “premises” shall mean land, building or other structure and appurtenances thereto, in addition to the separate units of any building or other structure and appurtenances thereto, which is served by a gas or water meter or both and which is assigned a unique account number by the department of public utilities.

Program

The term “program” shall mean the Cross Connection Control and Backflow Prevention Program of the City of Richmond. The program includes all the rules and regulations of the DPU.

Reduced Pressure Zone Backflow Preventer (RPZ)

The term “reduced pressure zone backflow preventer” shall mean a device containing a minimum of two (2) independently acting check valves together with an automatically operated pressure differential relief valve located between the two (2) check valves. During normal flow and at the cessation of normal flow, the pressure between these two (2) check valves shall be less than the supply pressure. In case of leakage of either check valve, the differential relief valve, by discharging to the atmosphere, shall operate to maintain the pressure between the check valves at less than the supply pressure. The unit must include tightly closing shut-off valves located at each end of the device and each device shall be fitted with properly located test cocks. These devices must be the approved type. This device is designed to protect against health hazards.

Service Connection

The term “service connection” shall mean the terminal end point of the public potable water system where the DPU loses jurisdiction and sanitary control over the water at its point of delivery to the consumer’s water system. The terminal end point is normally the water meter.

Service Line Protection

The term “service line protection” shall mean the appropriate type or method of backflow protection installed at the service connection, commensurate with the degree of hazard of the consumer’s potable water system.

Water Service

The term “water service” shall mean the meter, facilities and equipment required to furnish water from the meter to the premises and the billing for services supplied through the meter to the consumer.

Water Service Connection

The term “water service connection” shall mean facilities and equipment in the street area between the water main and the property line used to supply water to any premises.

Water Supply

The term “water supply” shall mean any water that shall have been taken into waterworks from all wells, streams, springs, lakes and other bodies of water of surface waters (natural or impounded), and the tributaries thereto, and all impounded groundwater, but the term “water supply” shall not include any waters above the point of intake of such water works.

Water Supply – Auxiliary

The term “water supply auxiliary” shall mean any water supply on or available to the premises other than the owner’s approved public potable water supply. This auxiliary water may include water from another owner’s public potable water supply or any natural source such as a well, spring, river, stream, etc.

Water Supply – Unapproved

The term “water supply – unapproved” shall mean a water supply which has not been approved for human consumption by the Virginia Department of Health, Office of Drinking Water, Division of Water Supply Engineering.

Water System – Consumer’s Potable

The term “water system consumer’s potable” shall mean that portion of the privately owned water system lying between the point of delivery and point of use. This system will include all pipes conduits, tanks, receptacles, fixtures, equipment and appurtenances used to produce, convey, store or use potable water.

Water System – Public Potable

The term “water system Public potable” shall mean any public or privately owned water system operated as a public utility, under a valid health permit, to supply water for domestic purposes. This system will include all sources, facilities and appurtenances between the source and the point of delivery such as valves, pump, pipes, conduits, tanks, receptacles, fixtures, equipment and appurtenances used to produce, convey treat or store potable water for public consumption or use.

Waterworks

The term “waterworks” means a system that serves piped water for human consumption to at least 15 service connections or twenty-five (25) or more individuals for at least 60 days out of the year. "Waterworks" includes all structures, equipment and appurtenances used in the storage, collection, purification, treatment and distribution of pure water **except the piping and fixtures inside the building where such water is delivered.**

PART III

**ELEMENTS of the CROSS
CONNECTION CONTROL**

and

**BACKFLOW PREVENTION
PROGRAM**

CROSS CONNECTION CONTROL AND BACKFLOW PREVENTION

A. BASIC ELEMENTS of the PROGRAM

The purpose of the Cross Connection Control and Backflow Prevention Program is to protect the public water system. Basic elements of the Program include:

- Enforcing a service line protection program to protect the public water supply.
- Defining the personnel, equipment, supplies and organization to perform the functions of the Program.
- Assessing the need for and type of required control measures for existing and proposed connections to the City's water distribution system.
- Monitoring the Owner's testing to determine the operational effectiveness of devices installed on existing service connections to the City's water distribution system.
- Maintaining records for the program: inspections, devices installed, tests made, repairs made, non-compliant devices, etc.
- Reporting contamination or suspected contamination of the City's water distribution system to the Department of Public Utilities and taking enforcement action as deemed necessary and allowed by City Code to ensure public safety.
- Monitoring devices previously found to be non-compliant with the requirements of this Program and providing follow-up notification and enforcement action as deemed necessary and allowed by City Code to ensure public safety.

B. ADMINISTRATION

The City of Richmond, Department of Public Utilities, Technical Services Division - Cross Connection Control Specialist (CCCS) will be responsible for managing the City's Cross Connection Control and Backflow Prevention Program (the Program).

The City has State of Virginia certified personnel who will be responsible for specific aspects of the Program.

C. WATER SERVICE TERMINATION

As authorized by City Code Section 28-732, the Director of Public Utilities may terminate or prohibit, or otherwise control, water service to any Owner at a premises in the event the Director determines (i) that the Owner has failed to install any cross connection assembly, device or separation at the premises required pursuant to this Cross Connection Manual within a required deadline; (ii) that the Owner has failed to complete testing, inspection or overhauling of protection at the premises required pursuant to this Cross Connection Manual; (iii) that the Owner or the occupant of the premises otherwise has refused to comply with the requirements set forth in this Cross Connection Manual; or (iv) that such termination, prohibition, or abatement otherwise is necessary to protect the City's water distribution system.

If the Director determines to terminate, prohibit, or otherwise control water service to an Owner, or otherwise to a premises, the Director shall issue the Owner and, if different than the Owner, the water service customer, a Notice of Violation setting forth such determination, including the reasons for the determination; the planned date of termination, prohibition, or control of water service if the water service is to be terminated or controlled, and the required remedial action to obtain, maintain, or restore water service.

D. PROCEDURES/DEGREE OF HAZARD

1. The Degree of Hazard is the potential risk from a cross connection or backflow to cause health and adverse effects upon the waterworks.
2. The International Plumbing Code only recognizes backflow prevention devices for either "high" or "low" Degrees of Hazard. For "high" Degree of Hazard connections a reduced pressure zone (RPZ) backflow preventer is required.
3. The City of Richmond DPU does not inspect, test, or maintain point of connection (POC) backflow devices, the City assumes that at least one (1) POC device is malfunctioning. Therefore, all point of service (POS) connections within the City are considered "high" Degree of Hazard except for the following:
 - a) Single family residential connections and residential duplexes which have only domestic use services (cooking, drinking, bathing, and toilet) are considered Low Degree of Hazard and do not require a testable backflow prevention assembly. This does not include single family residential connections and residential duplexes which have auxiliary water systems, irrigation systems, fire sprinkler systems, are four stories or higher, or otherwise have other cross connections that are determined to have a "high" Degree of Hazard.

- b) Residential properties with three or more units are evaluated on an individual basis. Property owners with three or more residential units may submit for an evaluation of Degree of Hazard by completing the Cross Connection Backflow Prevention Hazard Evaluation Form and sending to DPU via email to DPU.DevelopmentServices@rva.gov. DPU will evaluate the requests for Degree of Hazard evaluation and respond within ten business days. Requests shall be based on the following criteria:
 - i. Residential Use
 - ii. Property is not owned by an LLC and not being operated as a business
 - iii. Building height is 3 stories or less (including basement)
 - iv. Property only contains domestic water use for (cooking, drinking, bathing, and toilet)
 - v. Property does not contain pools, hot tubs, irrigation systems, fire systems or other cross connections.

E. EXISTING CONNECTIONS ASSESSMENTS

Residential properties that are determined to have a “low” Degree of Hazard may periodically receive public education about the hazards associated with backflow prevention and cross connections. Public education will prompt consumer self-assessments and include causes of backflow; hazards and health effects of cross-connections and backflow; resources available to identify actual or potential cross-connections; safeguards to use to eliminate or control the hazards at the point of use; and sources for additional information.

Assessments may be performed by questionnaires, interviews or on-site assessments. Interviews may be conducted on-site or by telephone at the discretion of the CCCS.

- 1. Assessment by Questionnaire
 - Annual questionnaires may be sent to each Customer.
 - The results of the annual questionnaires will be reviewed by the CCCS. Based on the response to the questionnaires, cross connection control interviews will be scheduled and appropriate backflow prevention devices required to provide containment determined. No response to the questionnaire will prompt an on- site interview. Refusal of access for inspection or provision of pertinent information shall prompt the requirement to install a high hazard containment device. A high hazard device is required on all service containment except fire sprinkling which may require both.

2. Assessment By Interview

- Interviews will follow a prepared questionnaire to assess the need for cross connection control by containment.
- Available information about the premises to be surveyed will be gathered prior to the interview.
- The reasons for cross connection control and backflow prevention as well as the degree of hazard determined will be explained to the customer or the customer's representative.
- The questionnaire will cover the following topics:
 - Water uses after water enters the premises.
 - The current use of the facility.
 - Plans for future expansion and possible additional abatement.
 - Plans for any change in the use of the facility.
 - A list of all fixtures on the premises.
 - A list of all equipment used on the premises.
 - A list of any chemicals used on the premises.
 - Existing backflow prevention devices.
- All information will be recorded on the prepared questionnaire.
- Based on the information on the questionnaire an assessment of the Degrees of Hazard for the premises will be made.
- The results of the Interview, with the Degrees of Hazard assessment and recommendations for containment or isolation devices, will be submitted to the Department of Public Utilities Technical Services Division - Cross Connection Control Specialist (CCCS).

3. On-Site Assessments

- Based on the results of the questionnaire and/or the interview, an on-site inspection of the premises may be required. Facilities defined in Part IV, Paragraph A, will automatically require an on-site assessment and control device or air gap.
- Any Owner or Owner's representative that does not allow an on-site assessment shall be guilty of a misdemeanor pursuant to City Code Section 28-2 and shall be subject to a fine. Each refusal of an on-site assessment shall be a separate offense.
- On-Site assessments shall be made by personnel of the Technical Services Division - Cross Connection Control.

4. Customer Notification

- The CCCS will notify the Customer in writing as to the required location of any assembly or device; type of assembly or device, including applicable American Society of Sanitary Engineering (ASSE) standards; installation requirements; and the deadline for completing the installation (usually 30 days and in accordance with the manufacturer's requirements).
- If the Customer is not the Owner, meaning the person who has legal or equitable title to the premises, the Owner shall be notified by the CCCS in writing of the required location of any assembly or device; type of assembly or device, including applicable American Society of Sanitary Engineering (ASSE) standards; installation requirements; and the deadline for completing the installation, usually 30 days, and installed in accordance with the manufacturer's requirements.
- If the Owner fails to install any required assembly, device or separation within the deadline or fails to complete testing, inspection or overhauling as required, a Notice of Violation may be prepared in accordance with City Code Sections 28-356 & 28-398 and may include a notification of termination of water service as allowed by City Code Section 28-241 unless the compliance is obtained within a satisfactory timeframe as established by DPU.

F. NEW OR MODIFIED CONNECTIONS ASSESSMENTS

1. New Premises

- All new use or modified use applications shall be reviewed by the CCCS for cross connection control requirements prior to issuance of a building permit.
- The location of any backflow prevention device shall be shown on the site plan.
- Existing plumbing from the building to the connection and/or water meter must be shown. Proposed plumbing from the building to the water connection must also be shown.
- When the site plan reflects the installation of a backflow prevention device, such devices shall be of the approved type, tested by a recognized testing laboratory or agency, approved by the CCCS. The criteria for approved backflow prevention devices are included in Part VII of this document.
- Detailed drawings of the backflow prevention device installation shall be submitted for review. Submitted detailed drawings shall include type, manufacturer, model, size, clearance from wall, distance to floor or pad, distance to ceiling, distance from walls, isolation valves, pad, enclosure and distance to drains.
- The CCCS shall review the plans and advise whether they are approved or disapproved. Disapproved site plans shall be revised and resubmitted for additional review.
- If a fire system is proposed, show proposed connection to the City's main, the proposed City meter vault location and the location of the backflow prevention device (including type of device, clearances and type of freeze proof enclosure where applicable).
- If an underground irrigation system is proposed, the site plan must show the proposed water line tie-in and the proposed location of an approved backflow prevention device at the service connection.

- If changes are made to the water system during construction, modified plans shall be submitted to the CCCS for review. Disapproved plans shall be revised and resubmitted for additional review. The meter will be withheld until the modified plans are approved.
 - Required assemblies, devices or separations shall be operational prior to issuance of a Certificate of Occupancy. The initial testing of the devices will be performed by a state certified backflow prevention device tester at the Customer's expense. The results of the test shall be submitted to the CCCS. If the backflow assembly fails inspection or testing, the meter will be withheld until backflow assembly is approved or passes testing.
 - A follow up inspection of all premises, except residential, may be performed by the CCCS within 30 days of occupancy.
 - The Building Inspection Department will coordinate cross connection control requirements at new construction, properties where building usage has changed, properties where booster or fire pumps are used and all other incidences where plumbing modifications occur with the CCCS.
2. Existing Premises with Modified Water Supplies
- Existing premises requesting a new service connection or reconnection to the waterworks (modified service) must be assessed by an on-site interview for cross connection hazards and the appropriate device installed, inspected and operational prior to making the service connection.
 - The owner shall submit plans for the new service connection in accordance with Section 1.
 - Existing premises with individual water supplies (i.e. an auxiliary water system) may, upon approval of the DPU, maintain the water supply on the premises if a separation from the consumer's water supply system is provided and maintained and access is granted for inspections. A written request must be made and the City Building Official must concur.

G. INSPECTION PROGRAM

1. The CCCS shall inspect and approve service line protection when required to ensure protection measures, including installation location, have been taken.
2. CCCS inspections will be scheduled in priority according to known Degree of Hazard associated with the consumer being served. Services with a "high" Degree of Hazard will be surveyed first. Others shall come in order.
3. Residential customers shall be informed of potential cross connections in and around the home through educational brochures and other information sent periodically in conjunction with the billing cycle.
4. Annual assessments by questionnaires shall be conducted and results filed or

acted upon as appropriate.

H. TESTING and MAINTENANCE of BACKFLOW PREVENTION DEVICES

1. The Customer shall ensure that all backflow prevention devices shall be inspected and tested annually by a state certified backflow prevention device tester at the Customer's expense. The results of the testing shall be submitted to the CCCS.
2. Testing procedure shall be in accordance with the manufacturer's instructions and approved by the CCCS.
3. Backflow prevention devices that fail inspection or testing, or both, shall be overhauled or replaced at the Customer's expense. The service connection will be closed, or a tested temporary backflow prevention device installed, until the failed backflow prevention device has been overhauled or replaced. After overhauling, the backflow prevention device shall be tested.
4. Backflow prevention device overhaul intervals shall not exceed the manufacturer's recommendation. If the overhaul interval has been exceeded the backflow prevention device will be considered failed.
5. Test reports shall be submitted to the CCCS. The CCCS will review and track the testing reports.
6. Customer shall replace containment devices as recommended by the manufacturer.

I. BACKFLOW PREVENTION DEVICE TESTER

1. The backflow prevention device tester is responsible for making competent inspections and for repairing or overhauling backflow prevention assemblies, devices and making reports of such repairs to the consumer's water supply owner on forms approved by the DPU. The backflow prevention device tester must be state certified.
2. A backflow prevention device tester shall be certified by a Commonwealth of Virginia tradesman certification program (identified by Virginia Department of Professional and Occupational Regulation (DPOR) as backflow prevention device workers) and shall have an active status. The backflow prevention device tester shall maintain their certification per the rules and regulations of the DPOR.
3. The tester shall include the list of materials or replacement parts used and insure that parts used in the repair of the backflow prevention assembly or device meet the manufacturer's recommendations.
4. The tester shall not change the design or operational characteristics of an assembly or device or separation during repair or maintenance without prior written approval of the water service owner and the DPU.

5. The tester shall be equipped with and be competent in the use of all the necessary tools, gauges, manometers and other equipment necessary to properly test, repair and maintain backflow prevention assemblies and devices.
6. Cost for testing and repair of backflow prevention devices shall be paid for by the owner.

J. RECORDS MAINTENANCE PROGRAM

1. An up-to-date listing of all Customers shall be maintained by the CCCS. The list will contain:
 - Customer of premises
 - Tenant
 - Name of premises
 - Service address
 - Phone Number
 - Contact person
 - Number of service connections
 - Size of service connection
 - Annual Testing Report
2. An up-to-date listing of Customers who have cross connection control assemblies and devices (including pressure sensing devices) or separations (including separations from auxiliary or non-potable water systems and air gaps) installed shall be maintained by the CCCS. The list will contain:
 - Customer of premises
 - Tenant
 - Name of premises
 - Service address
 - Phone Number
 - Contact person
 - Locations of assemblies, devices or separations
 - Device manufacturer
 - Device model number
 - Device serial number
 - Device size
 - Device ASSE number
 - Cross Connection or pressure sensing device tested annually
 - Pressure sensing device manufacturer
 - Pressure sensing device model number
 - Pressure sensing device serial number
 - Pressure sensing device pressure setpoint
 - Type of separation
 - air gap
 - physical disconnection

- Separation verified annually
 - Type of protection
 - Service line containment device
 - Access for inspection (granted) (denied) (not necessary)
3. Questionnaires, cross connection control interview reports and testing reports shall be maintained by the CCCS for ten (10) years. The reports will contain:
- Listings as noted in Paragraph J, Sections 1 & 2.
 - An assessment of:
 - Degree of Hazard
 - Appropriateness of assembly, device or separation
 - Installation acceptable
 - General condition of assembly, device or separation
 - Repair / replacement recommendations
 - New / additional abatement or control recommendations
 - Any indication of thermal expansion problems
 - Site Assessment Survey form (see Part VI)
 - Line pressure
 - Results of testing
 - Test method used
 - Date, license number and signature of device tester
 - Master plumber license number and signature of device installer
 - If repairs were made, the test report will contain:
 - Which parts replaced
 - Replacements parts used
 - Probable cause of test failure
 - Preventative measures taken
 - Backflow Assembly Test Report form (see Part VI)
 - Brief explanation of causes of backflow and control measures. These causes may include, but will not be limited to:
 - Spring, hot tub, cistern or swimming pool connected to the house plumbing system
 - Water softeners improperly connected
 - Individual wells, springs or cisterns on the property
 - Pressure booster pumps
 - Water storage tanks
 - Water treatment systems
 - Outside hose bibs used in conjunction with:
 - ❖ Chemical sprayers
 - ❖ Jet spray washers
 - ❖ Swimming pools, hot tubs, saunas, etc.
 - ❖ Lawn sprinkler or irrigation systems
 - Photographic developing

- Utility sinks with hoses extending below the sink rim
- Animal watering troughs
- Existing cross connection control assemblies, devices or separations:
 - Working properly
 - Leaking, noisy
 - Any modifications or repairs made
 - Date of last test
 - Any problems with hot water tank relief valve or faucet washers not lasting very long
- Also included with the questionnaire should be:
 - Educational material
 - Who to contact for additional information
 - Who to contact if contamination is ever suspected
 - A deadline to respond to the questionnaire
- See Part VI for the Questionnaire Forms (residential) (Commercial)
- 4. Residential containment double check valve assembly device (ASSE #1024) overhaul or replacement reports shall be maintained by the CCCS for ten (10) years. The report will contain:
 - Listings as noted in Paragraph J, Sections 1 & 2.
 - Overhaul/replacement action
 - Date of action

K. REPORTING CONTAMINATION or SUSPECTED CONTAMINATION

1. The water supply system owner, Local Building Official, device tester or any other person shall immediately report contamination or the suspicion of contamination to DPU at the following number as well as all other applicable City or State offices and departments:
 - DPU General – (804) 646-8544 Cross Connection – (804) 646-8510
 - Virginia Department of Health, Office of Drinking Water, East Central Field Office [ECFO], telephone – (804) 674-2880
 - Local Health Department, Environmental Health Divisions (804) 205- 3912
2. The City's Cross Connection Control Specialist [CCCS] supervises daily operations of cross connections staff and monitors, evaluates, and generates operational policies and procedures. This position also explains, reviews, and enforces codes, laws and ordinances governing potable water distribution systems, investigates complaints and conducts inspections, prepares reports, issues violation notices, prepares related correspondence and inspects establishments to verify compliance with City codes for cross connection control and water backflow prevention.

3. The City of Richmond Water Plant, with assistance from the CCCS, will be responsible for investigating reports of contamination or suspected contamination and will be responsible for notifying the appropriate Virginia Department of Health, Office of Drinking Water, ECFO. A written report will be submitted by the 10th day of the month following the month during which backflow occurred, addressing the incident, its causes, affects and preventative or control measures taken.

L. THERMAL EXPANSION

Customers should be advised (by the Plumbing Inspector) 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 water supply system owner and at the expense of the water supply system owner.

M. BACKFLOW PREVENTION DEVICE INSTALLER QUALIFICATIONS

1. If the contract amount is over \$1,000, backflow prevention devices shall be installed by a licensed plumbing contractor. If the contract amount is under \$1,000, backflow prevention devices may be installed by a State licensed Master Plumber. Backflow prevention devices installed as part of a fire sprinkler system may be installed by an employee of a licensed fire sprinkler contractor who holds a National Institute for Certification in Engineering Technologies (NICET) Level 3 certification.
2. A plumbing permit issued through the City's Bureau of Permits must be obtained to install a backflow device.

N. REFERENCES – Latest Edition of Each Shall Apply

1. Virginia Cross Connection Control Association – Recommended Best Practice
2. The latest edition of the Code as approved by the City of Richmond
3. EPA Cross Connection Control Manual
4. Virginia Waterworks Regulations
5. The American Society of Sanitary Engineers (ASSE) shall be the governing testing agency.
6. Installation guidelines published by the manufacturer of the backflow device being installed.

7. AWWA M14 – Recommended Practice for Backflow Prevention and Cross Connection Control.
8. International Plumbing Code

PART IV

REQUIRED INSTALLATION

**CROSS CONNECTION CONTROL
AND
BACKFLOW PREVENTION**

**INSTALLATIONS REQUIRING BACKFLOW
PREVENTION DEVICES**

A. GENERAL

An approved backflow prevention device that complies with the Uniform Statewide Building Code shall be installed in accordance with applicable references on each service connection to a consumer's water system serving, but not necessarily limited to, the following types of facilities:

1. Hospitals, mortuaries, clinics, veterinary establishments, nursing homes, and medical buildings
2. Laboratories
3. Piers, docks, and 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. Buildings with commercial, industrial, or institutional occupants served through a master meter
12. Water loading facilities
13. Slaughter houses and poultry processing plants
14. Farms where 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-product plants and printing plants
18. Pesticide or exterminating companies and their vehicles with storage or mixing tanks
19. Facilities that blend, store, package, transport, or treat chemicals, and their related vehicles
20. Schools or colleges with laboratory facilities
21. High-rise buildings (four or more stories)
22. Multi-use commercial, office or warehouse facilities
23. Other specified by the Owner or the department when reasonable cause can be shown for a potential backflow or cross connection hazard

In addition, cross connection control devices will be required in each of the following situations:

- Premises having complicated plumbing or restrictive security which make it impractical to determine whether or not a cross connection exists.
- Premises with a history of cross connections being established or reestablished.
- Premises having fire protection systems utilizing a combination of sprinklers, fire loops, storage tanks, pumps, antifreeze protection, or auxiliary water sources including Siamese connections.
- Other premises specified by the division or the owner where cause can be shown that a potential cross connection hazard not listed above exists.

TABLE 4.1
CROSS CONNECTIONS, HAZARDS FOUND, RECOMMENDED
TYPE OF
PROTECTION

Facility	Hazards Found	Type of Protection
A. Hospitals, Mortuaries, clinics, veterinary clinics, nursing homes, medical buildings, laboratories	Bedpan washers, flush valve toilets, autoclaves, specimen tanks, aspirators, lab equipment, autopsy and mortuary equipment, etc.	Air gap separation or RPZ backflow device on the service connection
B. Restaurants	Cookers, tanks, cleaning chemicals and equipment, etc.	Air gap separation or RPZ backflow device on the service connection
C. Piers, docks, waterfront buildings	Auxiliary water, raw water connections, steam boilers, mud pumps, oil and gas tanks, reservoirs, etc.	Air gap separation or RPZ backflow device on the service connection
D. Sewage treatment plants, Sewage and storm water Pumping stations	Sewage pumps, sewage sump ejectors, laboratories, chemical storage, etc.	Air gap separation or RPZ backflow device on the service connection
E. Food, beverage processing plants	Cookers, autoclaves, tanks, fill lines, steam connected facilities, chemicals, cleaning equipment, etc.	Air gap separation or RPZ backflow device on the service connection.
F. Chemical plants, dyeing plants pharmaceutical plants	Chemical tanks, vessels, fill lines, industrial fluid lines, storage reservoirs, fire foam equipment, etc	Air gap separation or RPZ backflow device on the service connection
G. Metal plating industries	Industrial fluid lines, metals in solutions, cyanic, cleaning equipment, tanks, vessels, reservoirs, etc.	Air gap separation or RPZ backflow device on the service connection
H. Petroleum, natural gas processing or storage plants	Steam boilers, mud pumps, tanks vessels, industrial fluid lines, fire foam equipment, etc.	Air gap separation or RPZ backflow device on the service connection

TABLE 4.1 (cont.)

**CROSS CONNECTIONS, HAZARDS FOUND, RECOMMENDED
TYPE OF PROTECTION**

Facility	Hazard Found	Type of Protection
I. Radioactive materials processing plants or nuclear reactors	Chemical tanks, autoclaves, cleaning equipment, fire foam equipment, chemicals, metals in solution, etc.	Air gap separation or RPZ backflow device on the service connection
J. Car washes and commercial laundries	Soap, wax aspirating equipment, reclaimed water lines, fill and feed lines, etc.	Air gap separation or RPZ backflow device on the service connection
K. Lawn sprinkler systems	Submerged outlets, chemicals, pumps, stagnant or polluted ground water, etc.	An RPZ device on lines that are connected with chemicals. A PVB device on wet systems must be 1' above highest head.
L. Fire service systems	Sprinkler systems, foam systems, tank, auxiliary water, anti-freeze, chemicals, pumps, pumper connection, etc.	Air gap separation or RPZ backflow device on the service connection
M. Slaughter or poultry processing plants	Industrial fluid lines, cleaning, bleaching, chemicals, wastes, etc	Air gap separation or RPZ backflow device on the service connection
N. Farms where water is used for other than household purposes	Chemical fertilizer, biological Contaminants, storage tanks, pumps, etc,	Air gap separation or RPZ backflow device on the service connection
O. Commercial greenhouses	Chemical fertilizer, aspirating equipment, sprinkler lines, tanks, vessels, pumps, etc,	Air gap separation or RPZ backflow device on the service connection
P. Health clubs with swimming pools, therapeutic baths, hot tubs or saunas	Chemicals, pumps, flush valve toilets, cooling towers, soap, fill lines, steam boilers, etc.	Air gap separation or RPZ backflow device on the service connection
S. Schools and colleges	Biological labs, flush valve toilets, specimen tanks, reservoirs, cooling towers, autopsy and morgue equipment, etc.	Air gap separation or RPZ backflow device on the service connection
T. High-rise buildings (4 or more stories)	Multiple services, change of Occupancy, flush valve toilets, pumps, cooling towers, steam boilers, etc.	Air gap separation or RPZ backflow device on the service connection
U. Multi-use commercial, office	Multiple services, change of occupancy, internal looping of lines, industrial fluid lines, etc	Air gap separation or RPZ backflow device on the service connection

TABLE 4.2**DETERMINATION OF DEGREE OF HAZARD**

Table 630.1	
DETERMINATION OF DEGREE OF HAZARD	
Cross-connections that meet or may meet the following condition shall be rated at the corresponding degree of hazard.	
High Hazard	Low Hazard
The contaminant would be toxic, poisonous, noxious, unhealthy, or of unknown quality.	The contaminant would only degrade the quality of the water aesthetically or impair the usefulness of the water.
A health hazard would exist.	A health hazard would not exist.
The contaminant would disrupt the service of piped water for human consumption.	The contaminant would not disrupt service of piped water for human consumption.
Backflow would be by either backpressure or backsiphonage.	Backflow would occur by backsiphonage.
Examples: lawn irrigation systems, fire sprinkler systems with chemical additives or antifreeze, sewage, used water, non-potable water, auxiliary water systems, and mixtures of water and other liquids, gases, or other chemicals.	Examples: food residuals, coffee machines, non-carbonated beverage dispensers, and residential fire sprinkler systems constructed of materials designed for potable water flow.

A. TYPICAL BACKFLOW PREVENTION DEVICE INSTALLATION

Once a Degree of Hazard has been determined and properly classified, remedial steps shall be taken to correct the condition or an approved backflow prevention device shall be installed.

1. The criteria for approved backflow prevention devices can be found in Part VII.
2. The DPU will be responsible for determining which type backflow prevention device is required. The Customer shall be responsible for installing the backflow prevention device in accordance with the manual and ordinance.
3. Installations shall be in accordance with the drawing details in Part VIII.
4. An air gap separation or an approved Reduced Pressure Zone (RPZ) backflow prevention device shall be installed where contamination hazards are found or where the potential exists. Examples of such facilities would be those facilities listed in Table 4.1.

NOTE: air gap separation and reduced pressure principle backflow prevention device will protect against backpressure, but vacuum breakers will not. Air gaps give the highest degree of protection and shall be used whenever practical to do so in high hazard situations subject to back pressure.

5. In the City of Richmond, the only application is a fire suppression system. Fire suppression systems that are “high hazard” shall have an RPZ backflow prevention device installed. For detailed information on “high hazard” fire suppression systems see Part V – Fire Sprinkler System Requirements.
6. RPZ backflow prevention devices shall also be installed on lawn/irrigation sprinkler systems. If the sprinkler system has a booster pump, a low pressure regulator or cut-off device shall be installed to prevent the inlet pressure from dropping below 20 psi [12 VAC 5-590-610(d)].
7. Trucks using portable hydrant meters shall be equipped with an approved air gap or provide an approved RPZ backflow prevention device on the fill line. See Drawing TANKTRK in Part VIII.
8. Barometric loops are not an acceptable cross connection control device.
9. No devices shall be installed in pits except as specifically approved by the DPU in cases of unique circumstances.
10. If the contract amount is over \$1,000, backflow prevention devices shall be installed by a licensed plumbing contractor. If the contract amount is under \$1,000, backflow prevention devices may be installed by a State licensed Master Plumber. Backflow prevention devices installed as part of a fire sprinkler system may be installed by an employee of a licensed fire sprinkler contractor who holds a National Institute for Certification in Engineering Technologies (NICET) Level 3 certification.
11. High rise buildings (4 or more stories) with an in-line system booster pump shall have a low pressure regulator or cut-off device shall be installed to prevent the inlet pressure from dropping below 20 psi [12 VAC 5-590-610(d)].

PART V

**FIRE SPRINKLER SYSTEM
REQUIREMENTS**

**CROSS CONNECTION CONTROL
AND
BACKFLOW PREVENTION**

FIRE SPRINKLER SYSTEM REQUIREMENTS

A. DEGREE OF HAZARD

1. Fire Sprinkler Systems, because of their varying Degree of Hazard, must be evaluated by the Department of Public Utilities, Technical Services Division – Cross Connection Control Specialist (CCCS). All fire sprinkler systems shall have a detector check meter or isolation valve and a backflow preventer as set forth in Sections 2 & 3.

2. Low Degree of Hazard fire sprinkler system services will be equipped with a City approved detector check meter or isolation valve and Reduced Pressure Zone (RPZ) backflow preventer. A “low” Degree of Hazard fire service connection is:

Example of a “low” Degree of Hazard fire service connection are:

- A standard Siamese fire department connection.
- A plain dry risersystem.
- A wet system without additives or compressed air.

3. High Degree of Hazard fire sprinkler system services will be equipped with a City approved detector check meter or isolation valve and Reduced Pressure Zone (RPZ) backflow preventer. A “high” Degree of Hazard fire service connection is:

- A system with pumper connections where corrosion inhibitors or other chemicals are added,
- All foamite plant installations,
- A system where an unapproved water supply is permanently connected to a fire hydrant,
- A system in which antifreeze is used,
- Auxiliary watersupplies,
- A system with storagetanks,
- A “dry” system with compressed air.
- Complex fire systems where the City cannot verify the installation.
- Existing systems where the City cannot verify the installation.
- A service connection that combines the domestic and fire services into a single pipe.

4. The RPZ backflow preventer will be installed as near to the property line as possible (See Standard Drawings FIRE-A and HI-HAZ). Maintenance responsibility of DPU will end immediately preceding the inlet gate valve of the assembly.

B. PLAN REVIEW AND APPROVAL

1. The CCCS will perform plan review of the proposed water line extension up to the first approved gate valve located on the inlet side of the RPZ and the plan review of the assembly as it relates to the backflow device, etc. For fire service laterals, a gate valve shall be installed on the tee at the main. In all cases the engineer shall provide details illustrating what type of anchoring will be used on the inlet side of the assembly, so that the approved valve (inlet side) of the RPZ will not blow off when the RPZ is removed.
2. The CCCS will review the plan for the location of the backflow prevention device at such time as a utilities plan is submitted to DPU. Separate plans for the location of the backflow prevention device shall be submitted to the CCCS.
3. An auxiliary mechanical permit issued by the Building Inspector's Office, along with four (4) sets of plans, is required for the work from the vault to the building and shall be applied for by the installing contractor from the Building Inspector's Office and plans submitted to and reviewed by the Fire Department.

C. DESIGN

1. The backflow device shall be located at or as near to the property line as possible as shown on the standard drawings, and out of the main flow of traffic.
 - The vault location will be reviewed by the CCCS for optimum placement. The review of the site plan will not be a detailed review of the water and sewer design when it involves the relocation and/or extension of the City's system. However, the site plan must reflect the approved water and sewer design and show the exact location of the existing facilities. Therefore, it is important that the Engineer submit utilities plans directly to the DPU at the same time or as near that time to avoid unnecessary delays in the approval of the site plan and release of the building permit.
 - Installation of RPZ other than at the property line must be approved by the CCCS.
2. The backflow device shall be designed and constructed in accordance with the City's Standard Details.
3. Under any circumstances where a Siamese connection is required, it will be installed on the outlet side of the RPZ.
4. Upon making application for water service, applicants who wish to separate their fire line service must have this reflected on the Site Plan and the Utility Plan (the Engineer is required to submit for review and approval a separate Utility Plan to

the DPU) indicating the service size required for the fire demand, the size water meter and the service size required for the domestic use. The applicant must indicate clearly on the water meter sizing form the desire to separate the fire service, otherwise, the water meter and appurtenances will be installed without regard to the fire service and the applicant will be subject to additional expense to correct the installation.

5. The installation of 2-inch and smaller fire line and water meter service line and box must comply with the requirements in this paragraph and the applicable details in Part VIII – Standard Drawings.
6. Where an applicant cannot accomplish combining the fire/domestic services and/or a separate fire line is needed where a water meter service already exists, all service line backflow prevention work must be performed in accordance with the device installer qualifications in Part III, Paragraph M.
7. Fire systems with an in-line system booster pump shall have a low pressure regulator or cut-off device shall be installed to prevent the inlet pressure from dropping below 20 psi [12 VAC 5-590-610(d)].

PART VI

STANDARD FORMS & LETTERS

Backflow Preventer (Annual) Request Form

Customer Name:
Mailing Address:
City, State & Zip

Account #:
Serial #:
Meter #:

Service Address:
Device:
Test Due Date:

Dear Customer,

The City or Richmond Department of Public Utilities is writing to remind you that the back flow prevention device(s) installed on your water service(s) as indicated above must be tested within one year of installation and then on an annual basis. According to our records it is time for the annual testing of the device(s) at the above referenced service address. The annual test is required by both the City and the Virginia Department of Health and is the responsibility of the owner or occupant. {12 VAC 5-590-600}

A successful test of the device(s) must be completed by a Virginia State Certified Backflow Prevention Device Tester possessing a valid certification. You can find Certified Testers online at the (DPOR) Department of Professional and Occupational Regulations website at <https://www.dpor.virginia.gov> [search for Backflow Testers].

A Certified Backflow Prevention Device Tester must complete the enclosed back flow assembly test report and mail the completed form to the return address shown on the form within forty-five (45) calendar days of the noted "Test Due" date shown on this letter. The form can also be sent as a pdf to re-dpudevelop@richmondgov.com or faxed to 804-646-3438.

If your records indicate that the referenced device has recently been successfully tested and you believe that testing at this time is not warranted, please submit a copy of the most current backflow assembly test report.

Feel free to contact me if you have any questions/concerns about this matter.

Lawrence Williams
Utilities Tech Cross Connection Supervisor
City of Richmond
Dept. Of Public Utilities
Phone: (804) 646-8510
Cell: (804) 337-8436
Email: Lawrence.Williams@rva.gov

Backflow Preventer (Compliance) Request Form

Customer Name:
Mailing Address:
City, State & Zip

Account #:
Serial #:
Meter #:

Service Address:
Device:
Test Due Date:

Dear Customer,

To date, the City of Richmond Department of Public Utilities has not received a copy of your annual test report showing the proper functioning of the backflow device(s) located on your water service(s) at the above reference address. This annual test is required by both the City and the Virginia Department of Health, and is the responsibility of the owner or occupant. (12 VAC 5-90-600)

In order to avoid possible disconnection of water service to your property, or other connective measures please mail or fax a copy of a test report prepared by a Certified Tester, that exhibits compliance with the testing specifications, to the following address within (15) days of the date of this letter.

If your records indicate that the device has recently been successfully tested and you believe that testing at this time is not warranted, please submit a copy of the most current backflow assembly test report.

Feel free to contact me if you have any questions/concerns about this matter.

Lawrence Williams
Utilities Tech Cross Connection Supervisor
City of Richmond
Dept. of Public Utilities
Phone: 804-646-8510
Cell: 804-337-8436
Email: Lawrence.Williams@rva.gov

Backflow Preventer (Failed) Request Form

Customer Name:
Mailing Address:
City, State & Zip

Account #:
Serial #:
Meter #:

Service Address:
Device:
Test Due Date:

Dear Customer,

The City of Richmond Department of Public Utilities is sending you this notice to inform you that, per information furnished to our office, your Backflow Preventer Device at the above address has failed the testing specifications required by the City's Cross Connection Control Program and Virginia Department of Health regulations. (12VAC 5-590-600)

In order to avoid possible disconnection of water service to your property, or other connective measures please mail or fax a copy of a test report prepared by a Certified Tester, that exhibits compliance with the testing specifications, to the following address within forty-five (45) days of the date of this letter.

If your records indicate that the device has recently been successfully tested and you believe that testing at this time is not warranted, please submit a copy of the most current backflow assembly test report.

Feel free to contact me if you have any questions/concerns about this matter.

Lawrence Williams
Utilities Tech Cross Connection Supervisor
City of Richmond
Dept. of Public Utilities
Phone: (804) 646-8510
Cell: (804) 337-8436
Email: Lawrence.Williams@rva.gov

Backflow Preventer (Need for install) Request Form

Customer Name:
Mailing Address:
City, State & Zip

Account #:
Serial #:
Meter #:

Service Address:
Device:
Test Due Date:

Dear Customer,

The City of Richmond Department of Public Utilities has identified the need for the installation of a Backflow Prevention Device on the domestic, fire, or irrigation water service at the above service address pursuant to the City's Cross Connection Control Program and Virginia Department of Health regulations {12 VAC 5-590-600}. In order to avoid disconnection of water service please arrange to have a Backflow Preventer Device properly installed on the water service at your property as soon as possible.

A successful test of the device(s) must be completed by a Virginia State Certified Backflow Prevention Device Tester possessing a valid certification. You can find Certified Testers online under (DPOR) Department of Professional and Occupational Regulations website at <https://www.dpor.virginia.gov> [search for Backflow Testers].

Please have your Certified Tester complete the enclosed back flow assembly test report and mail the completed form to the return address shown on the form within Forty-five (45) calendar days of the "Test Due" date shown on this letter. You can fax or email your completed form.
(Fax 804-646-3438 or email as a pdf to dpudevelop@richmondgov.com.)

If a device has been installed and successfully tested, Please submit a copy of the most current Backflow Test Report.

Feel free to contact me if you have any questions/concerns about this matter.

Lawrence Williams
Utilities Tech Cross Connection Supervisor
City of Richmond
Dept. of Public Utilities
Phone: (804) 646-8510
Cell: (804) 337-8436
Email: Lawrence.Williams@rva.gov



DEPARTMENT OF PUBLIC UTILITIES

BACKFLOW ASSEMBLY TEST REPORT

Premise Address: _____

Mailing Address: _____

Location of Device: _____

Manufacturer: _____ Model #: _____ Serial #: _____ Size: _____

1. Date of Test: _____
2. Time of Test: _____
3. Line Pressure at time of Test: _____
4. New Device ☐ Existing Device ☐ Replaced ☐ Repaired ☐
5. Remarks: _____

Device Type: ☐ RPZ ☐ DC			
Containment Type: Backflow preventer is located between the water meter and first branch Yes ☐ No ☐			
Water Service Type: Domestic ☐ Fire-Line ☐ Irrigation ☐			
Check Valve No.1	Check Valve No.2	Differential Pressure Relief Valve	Pressure Vacuum Breaker
☐ Leaked ☐ Closed Tight	☐ Leaked ☐ Closed Tight	Opened At _____ psi ☐ Did Not Open	Air Inlet Opened At _____ psi ☐ Did Not Open
Drop Across CV #1 _____ psi	Drop Across CV #2 _____ psi		Check Valve _____ psi ☐ Leaked

Condition of No. 2 Control Valve: ☐ Closed Tight ☐ Leaking

Remarks: _____

I hereby certify that the data in this report is accurate and reflects the proper operation of the unit and I certify that the testing was done under the latest ASSE 5000 test procedures.

Date: _____ Time: _____ Tester Certification: _____

Signature of Tester: _____ ☐ Passed ☐ Failed

Name of Tester (print): _____

Company Name: _____

Company Email & Telephone: _____

Gauge Manufacturer: _____ Model #: _____

Serial #: _____ Calibration Date: _____



DEPARTMENT OF PUBLIC UTILITIES

PORTABLE WATER METER APPLICATION

This section to be completed by customer

Company Name: _____ Date: _____

Applicants Name: _____ ☐ Contractor ☐ Owner ☐ Resident
☐ Company Representative

Billing Address: _____

VA DPOR Contractors License #: _____

Telephone Number: (____) _____ Estimated duration of use: _____

Project Name: _____ Meter Location: _____

(Within City Limits)

Will water be returned to sewer system? ☐ Yes ☐ No Wastewater Permit Number: _____

Will water be used for drinking? ☐ Yes ☐ No

Use of Meter (check one) *Possible Wastewater Discharge #High Hazard Air Gap Required

☐ Construction* ☐ General Industrial Use*# ☐ Chemical Application#

☐ Irrigation/Landscape# ☐ Professional Cleaning Service*# ☐ Application of Substance#

☐ Ground Remediation# ☐ Other (explain): _____

DPU USE ONLY

METER ISSUED:

Deposit Required: \$ _____ Receipt No: _____ Date: _____

Cross Connection Control Specialist Comments: _____

Mtr#: _____ Manuf: _____ Mtr Size: 1 1/2" Mtr Reading: _____

Backflow Preventer Serial # _____ Size: 1"

Spanner Issued: ☐ Yes ☐ No Meter Supt Iss: ☐ Yes ☐ No CMS Initials: _____ Date: _____

Wastewater to be Charged: ☐ Yes ☐ No ECO Initials: _____

Environmental Compliance Officer Comments: _____

Account No: _____ Service No: _____ New Service Initials: _____

METER RETURNED:

Date of Return: _____ Reason Returned: _____

Spanner Ret: ☐ Yes ☐ No Mtr Supt Ret: ☐ Yes ☐ No *Mtr Damaged: ☐ Yes ☐ No Repair Fee: ☐ Yes ☐ No

*If Meter or Backflow is damaged charges will be billed if applicable.

REISSUE NEW METER:

New Mtr#: _____ Manuf: _____ Mtr Size: 1 1/2" Mtr Reading: _____

Backflow Preventer Serial # _____ Size: 1"

Spanner Issued: ☐ Yes ☐ No Meter Spt Iss: ☐ Yes ☐ No CMS Initials: _____ Date: _____

New Premise No.: _____ New Svc Initials: _____ Date: _____



DEPARTMENT OF PUBLIC UTILITIES

PORTABLE WATER METER APPLICATION

PLEASE READ BEFORE SIGNING:

Portable water meters are meters that can be attached to a fire hydrant in order to obtain water service when service lines are not available and a regular water meter cannot be used. THESE METERS MUST BE USED ONLY IN THE CITY OF RICHMOND AND ON HYDRANTS OWNED BY THE CITY OF RICHMOND. THEY CANNOT BE USED AS A PERMANENT METER. Any violation of use will result in a fine of \$100.

- **Charges:** I understand that I am responsible for a water establishment fee, charges for all water used and associated fees as outlined below. I may also be subject to wastewater charges based on my use.
- **Deposits:** I hereby agree to pay the City of Richmond a deposit of \$500 per meter. I understand that the entire deposit is refundable after the final bill has been paid and the meter returned undamaged or may be applied to the final bill after the meter is returned and the remaining balance refunded.
- **Damage to the Meter/Backflow Preventer and/or Meter Support:** I understand I am responsible for all fees for repairs and damages to the meter, backflow preventer, meter support and spanner, and it is my responsibility to return the meter if it malfunctions.
- **Meter Readings:** I agree to bring the meter to the Commercial Meter Shop, at 400 Richmond Highway, to be read by the 2nd business day of the month for the first month's billing.
- **Late Penalties:** I understand that failure to bring in the meter the first month for reading by the 2nd business day of the first month will result in a late penalty charge of \$20.00 per day until the meter is brought in.
- **Testing of the Meter:** I understand that failure to bring in the meter to be tested quarterly (every 3 months) by the 4th business day of the applicable month will be a violation of this agreement and may result in retrieval of the meter.
- **Delinquent Accounts:** Payments are due by the due date shown on the bill. A late charge of 0.83% will be applied to any unpaid balance. Future applications for portable meters will be denied until charges are paid in full. I further understand that balances over 60 days may result in retrieval of the meter.
- **Contacts:**
 - Contact Special Billing Office at (804)646-5270 for questions concerning your bill.
 - Contact Commercial Meter Shop at (804)646-8460 for questions concerning the meter or its usage.
 - Contact Cross Connection Specialist at (804)646-8502 for questions concerning the backflow.
- **Installing the meter:** See attached instructions. If you have any problems, contact the Commercial Meter Shop at the number provided above.

Acknowledgement

Applicants be aware when utilizing Portable Meters that an approved Backflow Prevention Device must be installed to protect consumer's water system where health, pollution, or system hazard to the Water Works exists. Applicants must acknowledge and comply with the Virginia Department of Health Waterworks Regulations, Article 3 (12VAC-590) , Cross Connection Control and Backflow Protection in Waterworks, which governs the required conditions and regulatory requirements for issuance and continued use of devices to prevent hazardous conditions caused by cross contamination of The City of Richmond's Public Water Distribution System.

I have received all equipment and hereby have read and understand the policies and procedures above as they apply to Portable Meters and their use within the City of Richmond. I also understand that failure to comply may result in legal action. In addition, all information that was provided by me on this form is accurate and current.

Printed Name: _____ Position: _____

Signature: _____ Date: _____

cc: Customer
DPU Cross Connection Specialist
Special Billing Office
Commercial Meter Shop
Environmental Compliance



DEPARTMENT OF PUBLIC UTILITIES

BACKFLOW PREVENTION AND CROSS CONNECTION CONTROL INSPECTION REPORT

Date: _____ Time: _____
Name of Business: _____
Address: _____
Name of Contact Person: _____ Telephone: (____) _____
Type of Use: Industrial ☐ Commercial ☐ Governmental ☐ Other ☐
Comments: _____
Location of Backflow Device: _____
Size of Device: _____ inch Fireline ☐ Domestic ☐
Type of Device: _____
Plans Reviewed: Yes ☐ No ☐
Comments: _____

Backflow preventers cannot be installed in un-excavated areas, concealed areas, areas that are subject to flooding because of lack of drainage, or any other conditions or areas where it presents a safety hazard such as areas subject to shorting of electrical systems (such as basements)

Summary:

Type of device required for contaminant: RPZ ☐ DCV ☐ None ☐

Containment device is required to be installed complete and approved within 60 days of first (1st) inspection.

Freeze Protection Provided Yes ☐ No ☐

Adequate spacing provided around unit for testing and servicing (18 inches) Yes ☐ No ☐

Minimum clearance from floor/grade provided (12" min.\30"max.) Yes ☐ No ☐

Pressure Vacuum Breaker a minimum of 12" above highest point of water in system Yes ☐ No ☐

*Reduced Pressure Principal Backflow Device shall not be installed in pits or areas subject to flooding

Installation Inspection Approved Yes ☐ No ☐

If no, reason _____

Signed: _____

Telephone: (804) 646-_____

cc: Inspection File
DPU - Gas & Water – Water Maintenance
DPU – New Services Division
DCD – Plumbing Permits

DEPARTMENT OF PUBLIC UTILITIES CROSS CONNECTION CONTROL QUESTIONNAIRE

Customer Name: **(PLEASE PRINT LEGIBLY)** _____

Date: _____

DPU Water Service Account Number: _____

Service Address: _____

Proposed Business Name: _____

Water Service Type: **(PLEASE CHECK ONE)** Apartment Complex or Duplex **(Total # of Units)** _____ Mobile

Home park (Total # of Trailers) _____ Commercial _____ Industrial _____ Govt. or School _____

Temporary Bldg./Construction _____ Multi-Story Bldg. (How Many Stories?) _____

YARD IRRIGATION / SPRINKLER SERVICES

In-Ground Irrigation System: _____ Spigot/Faucet & Garden Hose Use Only: _____ **PLEASE CHECK ONE**

Type of Heads: Pop-Up _____ Shrub _____ Soaker _____ Other _____ Will your irrigation system be designed to add fertilizer, weed control, or other additives by using pressure, injection or aspiration methods either manually or automatically? Yes _____ No _____ Will your irrigation system need or use a booster pump? Yes _____ No _____

Will this water meter used to fill a Swimming Pool, Hot Tub or Spa? Yes _____ No _____

COMMERCIAL OR INDUSTRIAL SERVICES

Type of business: medical, restaurant, catering, video rental/sales, auto-detail shop, clothing, office, commercial, industrial, gas station, Laundromat, grocery/deli, dry cleaners, sweet shop, other: (Please define business:) _____

Water will be used for: cooking/drinking _____ boilers _____ chillers _____ cooling tower _____ equipment _____

What Type? Please Define: _____

Are cooling inhibitors, chemical treatments or other additives used in processing; boilers; chillers; or cooling towers? Yes _____ No _____ Does your water service use pressure water? Yes _____ No _____

FIRE SPRINKLER SERVICES

PLEASE ANSWER "YES" OR "NO" TO ALL BLANKS (as appropriate)

Is your proposed fire sprinkler system a wet system or a dry system? _____ Is it used to supply private fire hydrants or a wall-mounted fire hose cabinet only? _____ Will your fire sprinkler system contain/use anti-freeze or foaming agents? _____ Will your fire sprinkler system use a booster or jockey pump? _____ If

there is any other type of fire sprinkler system that is not listed above, please describe: _____

(NEXT PAGE)

TO BE SIGNED BY PERSON MAKING APPLICATION FOR WATER SERVICE

I hereby certify that all information furnished is complete and correct. I further acknowledge that incomplete or incorrect information may result in an additional or different requirement insofar as Backflow Prevention Assemblies at the water service connection are concerned.

Applicant Name: **(Please Print Legibly):** _____

Applicant Signature:

Date: Telephone Number (W) (H) (Fax)

(Pager) (Mobile)

Cross Connection Control Questionnaire to be submitted to DPU with Water Service Application

CUSTOMER NOTICE

In order that we may accurately determine the proper, **IF ANY**, Backflow Prevention Assembly required for your service, please complete this form and return it to DPU at your earliest possible convenience. **FAILURE TO COMPLY WILL RESULT IN A DELAY IN THE INSTALLATION OF YOUR WATER SERVICE.**

DPU USE ONLY

- Air Gap
- Reduced Pressure Zone Principle Assembly
- Double Check Valve Assembly
- Vacuum Breaker
- No Backflow Preventer Required

DPU Reviewer's Signature:

Date:

Additional Notes:

THE DEPARTMENT OF PUBIC UTILITIES
Technical Services Division - Cross Connection Control
400 Richmond Highway, Richmond, Virginia 23224

Phone (804) 646-8544 Fax (804) 646-3438



DEPARTMENT OF PUBLIC UTILITIES

CROSS CONNECTION BACKFLOW PREVENTION HAZARD EVALUATION FORM

This form is to be completed by property owners who have received a letter from DPU to provide information on their existing cross connection control device on their property's water service line(s), and are requesting a review of the property to see if the property's hazard determination can be evaluated on an individual basis. If approved, the hazard evaluation is valid until modifications are made to the property plumbing and water service. Submit the form to DPU.DevelopmentServices@rva.gov. DPU will respond with a request to inspect the property, request for more information, approval, or denial within 10 business days.

Property Address: _____

I, _____ (Property Owner) for the above address, certify that the information contained in Section 1 of this form is true and accurate as it relates to the above address.

Property Owner Signature: _____

Date: _____

Section 1: Property Owner Certifications (check one if all sub bullets are true)

☐ My property is a duplex AND:

1. I certify that the property is residential; and
2. I certify that the property contains 2 units only; and
3. I certify that the property is NOT owned by an LLC and is NOT being operated as a business.

☐ My property contains 3 or more units AND:

1. I certify that the property is residential; and
2. I certify that the property is NOT owned by an LLC and is NOT being operated as a business; and
3. I certify that the property is less than 4 stories (including the basement); and
4. I certify that the property only contains domestic use services (cooking, drinking, bathing and toilet); and
5. I certify that the property does not contain pools, hot tubs, irrigation systems, fire systems, or other cross connections.

Section 2: City of Richmond Verification

- ☐ Confirmed ownership and residential status in Accessor's Office database.
- ☐ Confirmed ownership is NOT an LLC or business in Accessor's Office database.
- ☐ For properties that contain 3 or more units: confirmed 3 stories or less through visual inspection. Confirmed lack of pool through visual inspection.
- ☐ For properties that contain 3 or more units, performed a visual exterior inspection and reviewed past permitting documentation to verify only domestic water uses are present.

Name of City Verifier: _____

Date of Final Determination: _____

Final Determination: ☐ Service connection determined Low Hazard ☐ Service connection remains classified High Hazard

SITE ASSESSMENT SURVEY FORM

**CITY OF RICHMOND
INDUSTRIAL WASTE PRETREATMENT PROGRAM
DEPARTMENT OF PUBLIC UTILITIES
400 Richmond Highway
Richmond, Virginia 23224**

BUSINESS NAME: _____ **ACCOUNT NUMBER:** _____
SERVICE ADDRESS: _____ **SIC CODE #:** _____
 _____ (Standard Industrial Classification)
MAILING ADDRESS: _____ **SIC CODE/TITLE/DESCRIPTION/GROUP:** _____

 _____ (City/County) _____ (State) **PHONE NUMBER:** () _____

CERTIFICATION STATEMENT

I CERTIFY THAT THE INFORMATION PROVIDED IS TRUE AND REPRESENTS, TO THE BEST OF MY KNOWLEDGE, THE INFORMATION REQUESTED. I ALSO ACKNOWLEDGE THAT I AM THE MOST QUALIFIED PERSON ON SITE TO ASSESS THE OPERATIONS OF THIS BUSINESS.

SIGNATURE_____
TITLE_____
COMPANY NAME_____
DATE

PRINT OR TYPE NAME: _____

QUESTIONS	YES	NO
1. Does the facility utilize the City of Richmond's Sanitary Sewer System? If YES, Please answer the following: _____ (Circle which used) Average Estimated Daily Wastewater Discharged _____ Gallons/CCF per Day (You may write in the CCF total from your most recent water bill in lieu of gallons per day) Total Number of Employees _____		
2. Are hauled waste services utilized at any time of the year? If YES, please check all that apply: Septic Tank Grease Trap Grit Trap Oil/Water Separator Other: (describe) _____		
3. Is this facility located in a strip mall or other multi-unit building?		
4. Does your business discharge, or have potential to discharge, a waste product to the sewer system <i>OTHER THAN</i> normal sanitary wastewater?		

1. Provide a brief description of the business(es) at this address. Also, list any operations or processes which may be associated with this address.

2. Please list all chemicals and raw materials that are used/stored at the site: (Attach a list if necessary)

Name of Chemical/Raw Material	Quantity Stored Onsite	Common Use for Chemical at Site

3. Please check all that apply to the site.

☐	Aluminum Forming	☐	Funeral Activities	☐	Paving and Roofing
☐	Asbestos Manufacturing	☐	Glass Manufacturing	☐	Petroleum Refining
☐	Battery Manufacturing	☐	Industrial Launderer	☐	Pesticide Manufacturing
☐	Builder's Paper and Board Mills	☐	Ink Formulating	☐	Pesticide Formulating & Packaging
☐	Carbon Black Manufacturing	☐	Inorganic Chemicals	☐	Pharmaceuticals
☐	Centralized Waste Treatment	☐	Iron & Steel	☐	Photographic Processes
☐	Coal Mining	☐	Leather Tanning & Finishing	☐	Porcelain Enameling Pulp,
☐	Coastal Oil & Gas	☐	Machinery Manufacturing	☐	Paper & Paperboard
☐	Coil Coating	☐	Metal Finishing	☐	Rubber Manufacturing
☐	Can Making	☐	Metal Molding & Casting	☐	Soap & Detergent Manufacturing
☐	Copper Forming	☐	Nonferrous Metals Forming	☐	Steam Electric
☐	Electrical & Electronic Comp.	☐	Nonferrous Metals Manufacturing	☐	Timber Products
☐	Electroplating	☐	Onshore/Stripper Oil and Gas	☐	Textiles
☐	Ferroalloy Manufacturing	☐	Organic Chemicals & Plastics	☐	Vehicle Washing
☐	Fertilizer Manufacturing	☐	Paint Formulating	☐	
NATURE OF BUSINESS					
☐	Manufacturing/Process	☐	Warehouse/Wholesale Distribution	☐	Packaging/Repackaging
☐	Service Related	☐	Offices Only	☐	Retail

PART VII

**CRITERIA FOR APPROVED
BACKFLOW PREVENTION DEVICES**

**CROSS CONNECTION CONTROL
AND
BACKFLOW PREVENTION**

APPROVED BACKFLOW PREVENTION DEVICES

A. APPROVED BACKFLOW PREVENTION DEVICES

1. Double Check Valve Assemblies (DCVA) devices shall meet the requirements of ASSE 5000 or the latest edition.
2. Reduced Pressure Zone (RPZ) devices shall meet the requirements of ASSE 5000 or the latest edition.

B. BACKFLOW PREVENTION DEVICE SPECIFICATIONS

1. Flow Characteristics and Pressure Loss Requirements
 - For each size of backflow prevention assembly at any flow rate up to and including the rated flow, the maximum pressure loss shall not exceed the values given in Tables 7.1 for Reduced Pressure Zone (RPZ) Assemblies and Double Check Valve assemblies (DCVA).
2. Standard Sizes
 - In this specification the following standard sizes have been adopted for backflow prevention assemblies: 1/4, 3/8, 1/2, 5/8 x 3/4, 1, 1 1/4, 1 1/2, 2, 2 1/2, 3, 4, 6, 8, 10, 12, 14 and 16 inches.
 - All assemblies designed and constructed in sizes other than those aforementioned shall be given separate consideration.
 - Inlet and outlet of the assembly shall be threaded in accordance with ANSI/ASME B1.20.1 for taper pipe connections; or ANSI B16.24 for bronze flanges; or ANSI B16.1 for iron flanges; or ANSI/AWWA C660 for grooved and shoulder joints.
3. Markings
 - Size, models and serial number markings on backflow prevention assemblies for sizes 5/8 x 3/4-inch through 16-inch shall be with letters or numbers at least 1/4 inch in height. Backflow assemblies sized 1/4, 3/8, 1/2–inch, the size, model and serial number markings shall be with letters or numbers at least 1/8-inch in height. All markings shall be easily read and shall be stamped or cast on the body; or stamped, engraved or etched on a

TABLE 7.1⁺

RATED FLOW AND MAXIMUM ALLOWABLE PRESSURE LOSS FOR VARIOUS SIZES OF BACKFLOW PREVENTION ASSEMBLIES							
				MAXIMUM ALLOWABLE PRESSURE LOSS			
SIZE OF ASSEMBLY		RATED FLOW		REDUCED PRESSURE ZONE ASSEMBLY		DOUBLE CHECK VALVE ASSEMBLY	
(1)		(2)		(3)		(4)	
(inches)	(mm)	(gpm)	(L/s)	(psi)	(KPa)	(psi)	(KPa)
¼	6	1 *	0.06	24	165.4	10	68.9
3/8	9	3 *	0.19	22	151.6	10	68.9
½	12	7.5 *	0.39	22	151.6	10	68.9
5/8 x ¾	16 x 20	20	1.3	20	137.8	10	68.9
¾	20	30	1.9	20	137.8	10	68.9
1	25	50	3.1	18	124.1	10	68.9
1 ¼	31	75 **	4.7	18	124.1	10	68.9
1 ½	38	100	6.3	16	110.3	10	68.9
2	50	160	10.1	16	110.3	10	68.9
2 ½	63	225 **	14.2	16	110.3	10	68.9
3	75	320	20.2	15	103.4	10	68.9
4	100	500	31.6	14	96.5	10	68.9
6	150	1000	63.1	14	96.5	10	68.9
8	200	1600	101.0	14	96.5	10	68.9
10	254	2300	145.1	14	96.5	10	68.9
12	305	3000	189.3	13	89.6	10	68.9
14	355	3700	233.5	13	89.6	10	68.9
16	406	4400	277.6	13	89.6	10	68.9
* - Extrapolated							
** - Interpolated							
*** - ¾" Ø Inlet and Outlet Connections							

Note: The pressure losses as shown in Columns (3) and (4) represent the maximum permissible pressure loss at any flow rate up to and including the rated flow shown in Column (2).

+ - Table 10-1, Manual of Cross-Connection Control, 9th Edition, Foundation for Cross-Connection Control and Hydraulic Research, USC

durable nameplate permanently attached to the body of the assembly and shall be located either: a) on both sides of the body or b) on a top surface of the body. Nameplates shall be either brass or stainless steel and affixed with stainless steel escutcheon pins. In attaching a nameplate or stamping data in the metal of the assembly, caution shall be exercised so as not to produce an area of stress concentration.

- Markings shall be permanent and not easily defaced.
- All markings shall be in English units (i.e. – psi, °F, inches). Metric equivalents (i.e. – Kpa, °C, MM) shall be permitted in addition to the English units at the manufacturer’s discretion.

4. Hydrostatic Test – Structural Integrity

- All assemblies shall be pressure tested according to their designed operating pressure for use on cold water service (maximum 110 °F). Normal testing shall be accomplished at a minimum of 150 psi line pressure. The hydrostatic test pressure shall be twice the maximum rated working pressure of the assembly.
- The entire assembly shall be subjected to the hydrostatic test both in the normal direction of flow and in the reverse direction of flow of all closed barriers with the opposite side of the barrier open to the atmosphere. There shall be no leakage across any barrier. The hydrostatic test pressure shall be maintained for a minimum of ten (10) minutes.
- No damage or permanent deformation of any parts of the assembly, or impairment of operation shall occur under the full hydrostatic test pressure.

5. All assemblies which consist of independent units assembled for the purpose of preventing backflow shall comply with the material, the operational and the specifications as required for backflow assemblies. In order to ensure proper installations, all backflow prevention assemblies shall be delivered for installation completely assembled by the original manufacturer with all components as approved. Resilient seated shut-off valves and test cocks are considered integral parts of the assembly.

6. A backflow prevention assembly shall be designed so that each principle component (i.e. – check valve if a separate body and the differential pressure relief valve) of the assembly shall be permitted to be removed and reinstalled individually from the line.

7. A backflow prevention assembly shall be provided with one or more openings through which the internal parts may be removed, repaired or inspected without having to remove the body of the assembly from the line.

8. Interdependence of Components

- In the DCVA there shall be no mechanical linkage between the two (2) check valves. Each check valve shall be free to operate independently through its entire movement. The movement of either the first or second check valve through its full limit of travel shall not affect the operations of the other check valve.
 - In the RPZ Assembly each of the check valves shall likewise be free of any mechanical linkage and shall be free to operate independently through its entire movement. The relief valve shall be mechanically independent of both check valves yet hydraulically dependent upon the pressure differential across the first check valve. The movement of both the first or second check valves and the relief valve through their full limits of travel shall not affect the operations of the other check valve.
9. The differential pressure relief valve of a RPPA shall be located so that its valve seat(s) and port(s) to the atmosphere are below the lowest point of the first check valve so as to preclude backsiphonage.
10. Materials to be used in construction of the body and cover(s) shall be either valve bronze which conforms to ASTM Designation: B61 or B62 or B584 UNS number C84400; or ductile iron which conforms to ASTM Designation A536, Grade 65-45-12; or stainless steel which conforms to ASTM Designation: A276 or A296 or Schedule 40 steel pipe and flanges – suitably protected against corrosion; or engineered plastic.
11. Seat Rings shall be constructed of valve bronze which conforms to ASTM Designation: B61 or B62 or B584 UNS number C84400; or stainless steel which conforms to ASTM Designation: A276; or engineered plastic.
12. The clapper, poppet or similar check valve shall be constructed of valve bronze which conforms to ASTM Designation: B61 or B62 or B584 UNS number C84400; or stainless steel which conforms to ASTM Designation: A276; or engineered plastic.
13. Elastomer Disc(s)
- The check valve elastomer disc shall be composed of molded natural rubber or a synthetic elastomer. It must be of even thickness, smooth-faced and with a shore “A” hardness (ASTM D224086 Rubber Property – Durometer hardness) of between 35 and 45 inclusive.
 - The differential pressure relief valve elastomer disc(s) shall be composed of molded natural rubber or a synthetic elastomer. It must be of even thickness, smooth-faced and with a shore “A” hardness (ASTM D224086 Rubber Property – Durometer hardness) of between 55 and 65 inclusive.

- The air inlet valve elastomer disc(s) shall be composed of molded natural rubber or a synthetic elastomer. It must be of even thickness, smooth-faced and with a shore “A” hardness (ASTM D224086 Rubber Property – Durometer hardness) of between 65 and 75 inclusive.
- 14. Swing arms shall be made of valve bronze which conforms to ASTM Designation: B61 or B62 or B584 UNS number C84400; or stainless steel which conforms to ASTM Designation: A276; or engineered plastic.
- 15. Bushing shall have corrosion resistance at least equal to ASTM Designation B584 UNS number C84400.
- 16. Counterbalances shall be weighted with a corrosion resistant material and/or protected from corrosion with a suitable protective coating in accordance with Section 19.
- 17. All springs shall be made of either stainless steel which conforms to ASTM Designation: A313; or of phosphor bronze which conforms to ASTM Designation: B159, UNS number C52100 or C52400 or equal.
- 18. Diaphragm material shall be made of a natural rubber, synthetic rubber or thermoplastic elastomer.
- 19. Protective Coatings
 - All ferrous bodies and parts shall be coated with a holiday-free polymerized coating per AWWA C550.
 - The protective coating shall be composed of material deemed acceptable in the Food and Drug Administration Document, Title 21 of the Federal Regulations on Food Additives, Sec. 175.300, entitled “Resinous and Polymeric Coatings”.
- 20. Test Cocks
 - Test cocks are required on backflow assemblies so that the assembly may be tested in situ. Test cocks shall be resilient seated and have full flow characteristics.
 - Materials used in construction of the body and internal wetted components of test cocks shall be either valve bronze which conforms to ASTM Designation: B61 or B62 or B584 UNS number C84400; or stainless steel which conforms to ASTM Designation: A276; or suitable engineered plastic
 - In ball valves, the solid ball shall be stainless steel which conforms to ASTM Designation: A276; or hard chromium plated brass per Federal Specification QQ-C-320B – Chromium Plating (Electrodeposited).

- In plug valves, the plug shall be valve bronze which conforms to ASTM Designation: B61 or B62 or B584 UNS number C84400; or stainless steel which conforms to ASTM Designation: A276; or hard chromium plated brass per Federal Specification QQ-C-320B – Chromium Plating (Electrodeposited).
- Material to be used for the resilient seals shall be of a suitable elastomer or polymer and capable of withstanding the action of line fluids and operation under long term service at rated conditions.

21. Shut-off Valves

- Shut-off valves on backflow prevention devices are required so that the assemblies may be tested and/or maintained periodically. The shut-off valves shall be resilient seated and shall have a full flow characteristics.
- Materials to be used in the construction of the body of shut-off valves shall be either valve bronze which conforms to ASTM Designation: B61 or B62 or B584 UNS number C84400; or ductile iron which conforms to ASTM Designation A536, Grade 65-45-12; or stainless steel which conforms to ASTM Designation: A276 or A296 or Schedule 40 steel pipe and flanges – suitably protected against corrosion; or engineered plastic.
- Materials used in construction of the internal wetted components shall be either valve bronze which conforms to ASTM Designation: B61 or B62 or B584 UNS number C84400; or stainless steel which conforms to ASTM Designation: A276; or suitable engineered plastic.
- In ball valves, the solid ball shall be stainless steel which conforms to ASTM Designation: A276; or hard chromium plated brass per Federal Specification QQ-C-320B – Chromium Plating (Electrodeposited).
- In plug valves, the plug shall be valve bronze which conforms to ASTM Designation: B61 or B62 or B584 UNS number C84400; or stainless steel which conforms to ASTM Designation: A276; or hard chromium plated brass per Federal Specification QQ-C-320B – Chromium Plating (Electrodeposited).
- In gate valves, the gate shall either valve bronze which conforms to ASTM Designation: B61 or B62 or B584 UNS number C84400; or ductile iron which conforms to ASTM Designation A536, Grade 65-45-12; or stainless steel which conforms to ASTM Designation: A276 or A296.
- Material to be used for the resilient seals shall be of a suitable elastomer or polymer and capable of withstanding the action of line fluids and operation under long term service at rated conditions.

22. Lubricants shall be suitable for lubricating parts for assembly purposes only. The lubricant shall be non-toxic, shall not support the growth of bacteria, and shall have no deteriorating effects on any component. Manufacturer must supply documentation stating that lubricant is suitable for contact with potable water.

PART VIII

STANDARD DRAWINGS

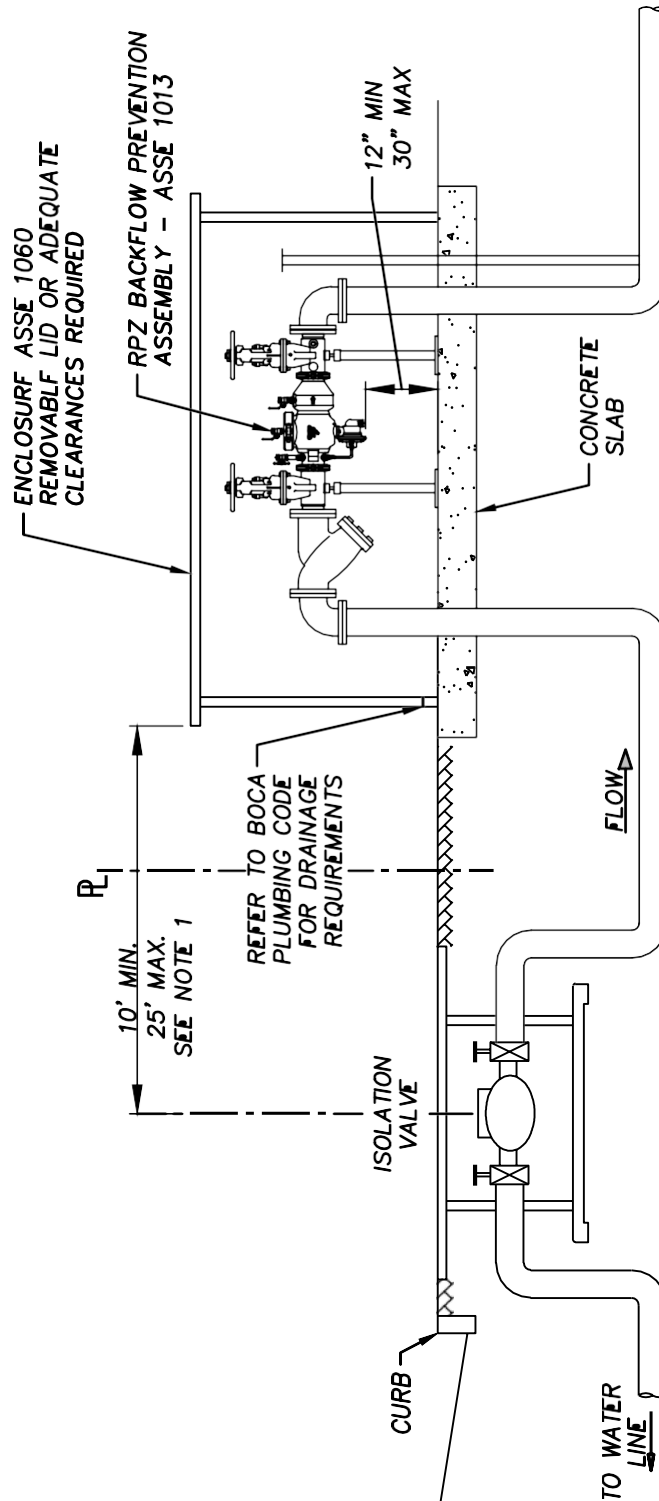
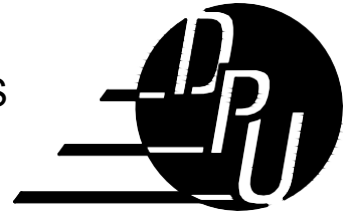
STANDARD DRAWINGS *

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* Drawings are subject to change. Check with the DPU CCCS for most recent drawings.



CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES



NOTES:
1. LONGER DISTANCES MAY BE ALLOWED WITH APPROVAL BY THE CITY.

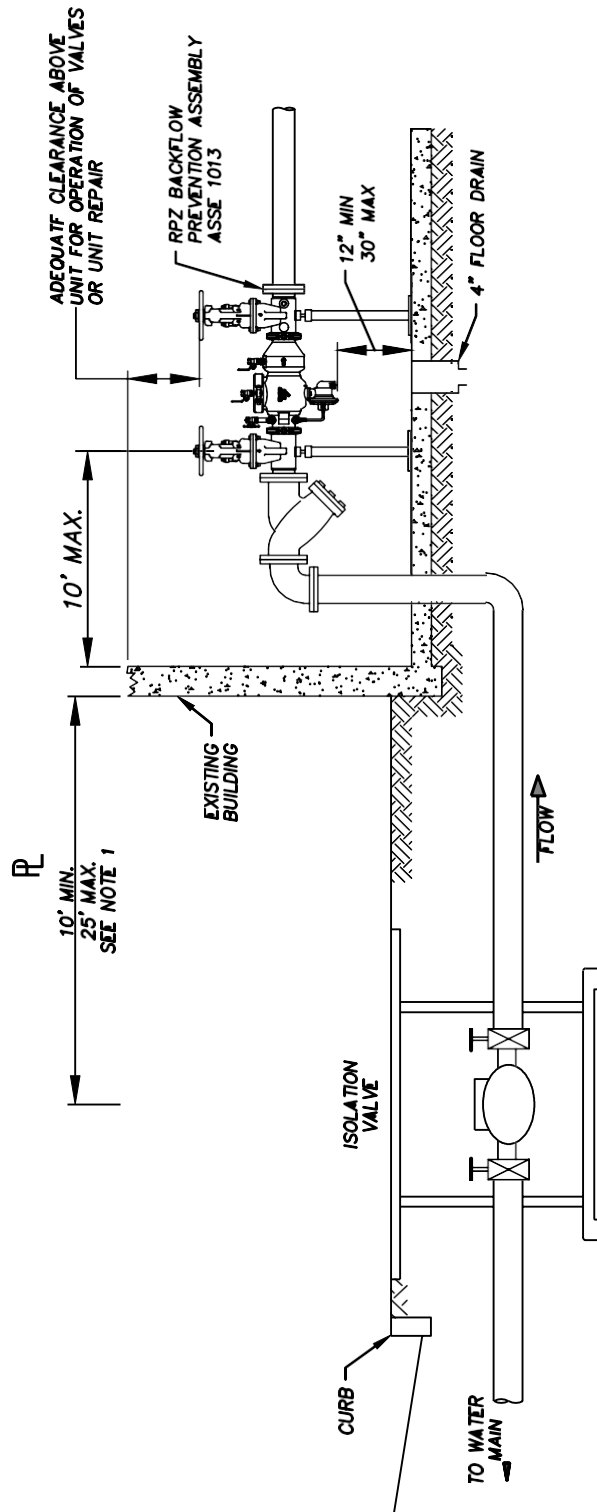
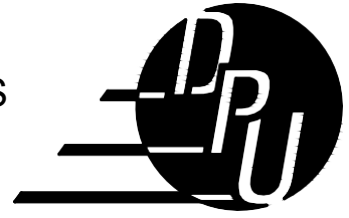
DATE
APR. 2006
REVISIONS
JAN. 2025

LOW HAZARD FIRE SYSTEM -
ENCLOSURE INSTALLATION

DWG. NO.
M-12.1



CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES



NOTE:
LONGER DISTANCES MAY BE ALLOWED WITH APPROVAL
BY THE CITY. LENGTHS GREATER THAN 25' SHALL BE
CONCRETE ENCASED TO PREVENT CONNECTIONS.

ALTERNATE INSIDE INSTALLATION*

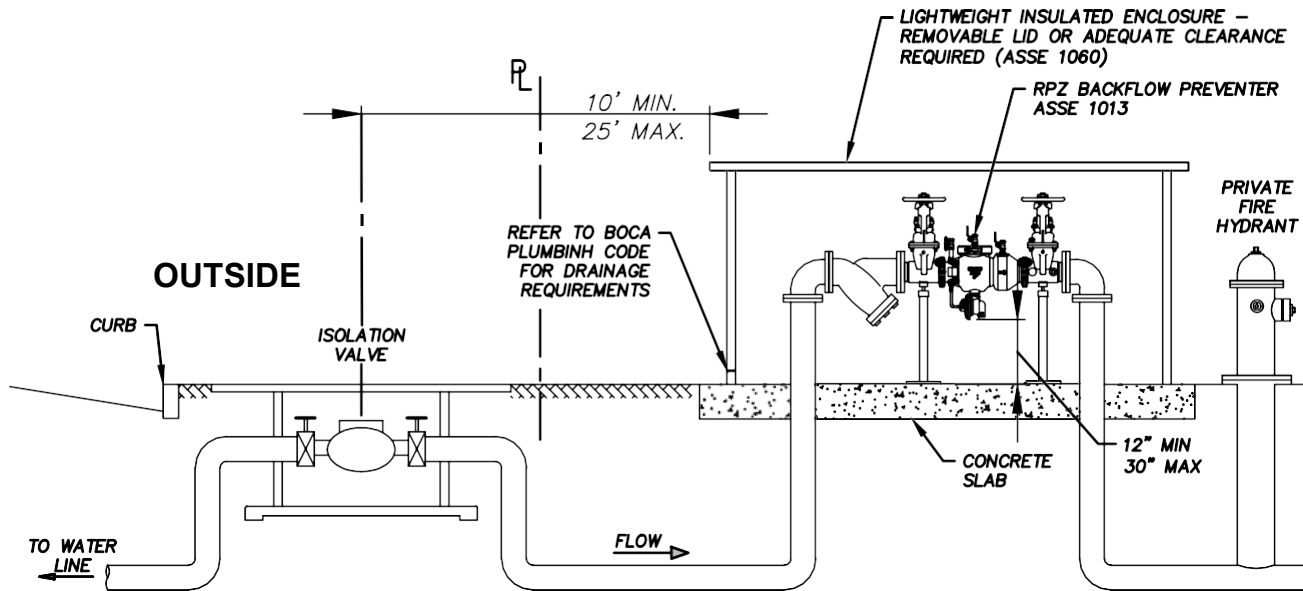
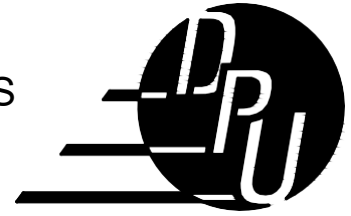
DATE
APR. 2006
REVISIONS
JAN. 2025

LOW HAZARD FIRE SYSTEM -
BUILDING INSTALLATION

DWG. NO.
M-12.2



CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES



TYPICAL INSTALLATION

WITH A
BACKFLOW

A SYSTEM WITH PUMPER CONNECTIONS WHERE CORROSION INHIBITORS OR OTHER CHEMICALS ARE ADDED.

ALL FOAMITE PLANT INSTALLATIONS.

A SYSTEM WHERE AN UNAPPROVED WATER SUPPLY IS PERMANENTLY CONNECTED TO A PRIVATE FIRE HYDRANT.

A SYSTEM IN WHICH ANTIFREEZE IS USED.

AUXILIARY WATER SUPPLIES.

A SYSTEM WITH STORAGE TANKS.

7. A "DRY" SYSTEM WITH COMPRESSED AIR.

COMPLEX FIRE SYSTEMS WHICH THE CITY CANNOT VERIFY THE INSTALLATION.

EXISTING SYSTEMS WHERE THE CITY CANNOT VERIFY THE INSTALLATION.

FIRE SYSTEMS WITH PRIVATE FIRE HYDRANTS.

SYSTEMS WITH A BOOSTER PUMP INCLUDED.

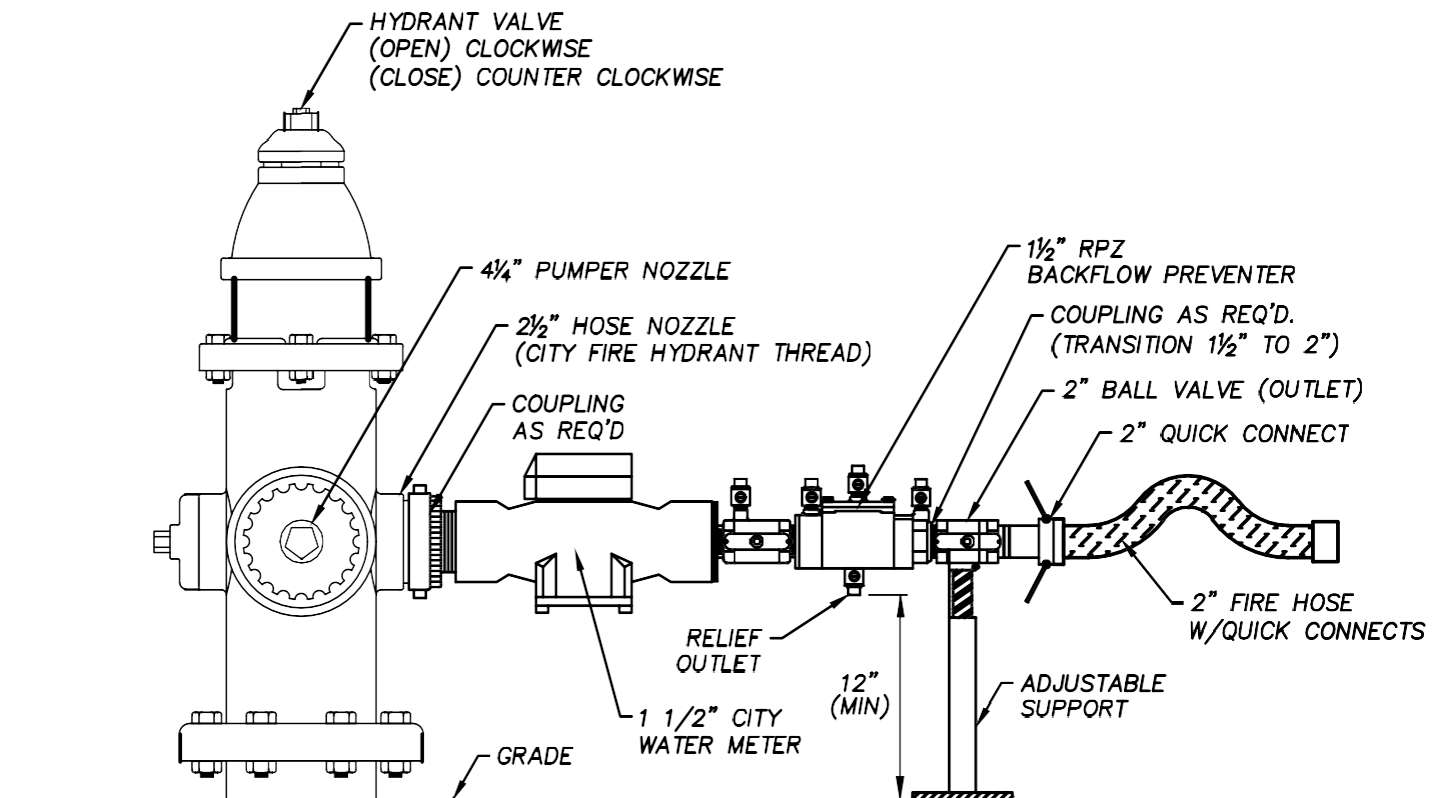
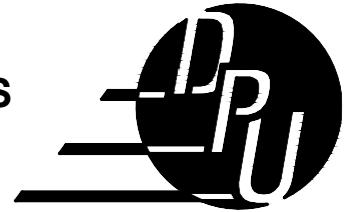
OTHER CONDITIONS AS DETERMINED BY THE DPU.

A

DATE APR. 2006	HIGH HAZARD FIRE SYSTEM	DWG. NO.
REV. S. ONS		M-12.3
JAN. 2025		



**CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES**



PORTABLE/TEMPORARY METER – TYPICAL AT EXISTING HYDRANT

NOTES:

1. CONTACT THE CITY OF RICHMOND CROSS CONNECTION CONTROL SPECIALIST AT (804) 646-3026 FOR AN APPLICATION, FEES, AND INFORMATION REGARDING THE USE OF THE ASSEMBLY.
2. THE BACKFLOW DEVICE IS REQUIRED TO BE TESTED AT THE TIME OF INSTALLATION.
3. DPU RECOMMENDS THE USE OF BARRICADES TO SAFEGUARD THE ASSEMBLY WHILE IN USE.
4. DO NOT OPEN THE HYDRANT INTO A STREET WHEN THE TEMPERATURE IS BELOW 32°.
5. DO NOT STAND IN FRONT OF THE ASSEMBLY WHEN OPENING THE HYDRANT VALVE.
6. DO NOT SIT ON THE ASSEMBLY.
7. DO NOT USE A DAMAGED OR DEFECTIVE ASSEMBLY.
8. DO NOT DISCONNECT OR REMOVE THE METER FROM THE BACKFLOW DEVICE.

INSTALLATION INSTRUCTIONS:

1. REMOVE THE 2 1/2 inch HOSE NOZZLE CAP FROM THE HYDRANT USING A SPANNER WRENCH.
2. USING A SPANNER WRENCH CHECK THE REMAINING 2 1/2 inch & 4 1/4 inch CAPS TO ENSURE THEY ARE TIGHT. THE CAPS SHOULD BE SNUG, DO NOT OVER TIGHTEN.
3. USING A SPANNER WRENCH TURN THE HYDRANT VALVE SLOWLY IN A CLOCKWISE DIRECTION TO FLUSH THE HYDRANT. ONCE CLEAR WATER IS FLOWING FROM THE HYDRANT, SLOWLY TURN THE HYDRANT VALVE IN A COUNTER CLOCKWISE DIRECTION TO CLOSE THE HYDRANT.
4. INSTALL THE HYDRANT ASSEMBLY ON THE 2 1/2 inch HOSE NOZZLE BY TURNING THE CONNECTOR NUT CLOCKWISE UNTIL SNUG.
5. ENSURE THE OUTLET BALL VALVE IS IN THE CLOSED POSITION.
6. SLOWLY TURN HYDRANT VALVE CLOCKWISE UNTIL FULLY OPEN. WHEN READY FOR USE, OPEN THE OUTLET BALL VALVE ON THE DISCHARGE SIDE OF THE BACKFLOW DEVICE.

REVISION
JAN 2025

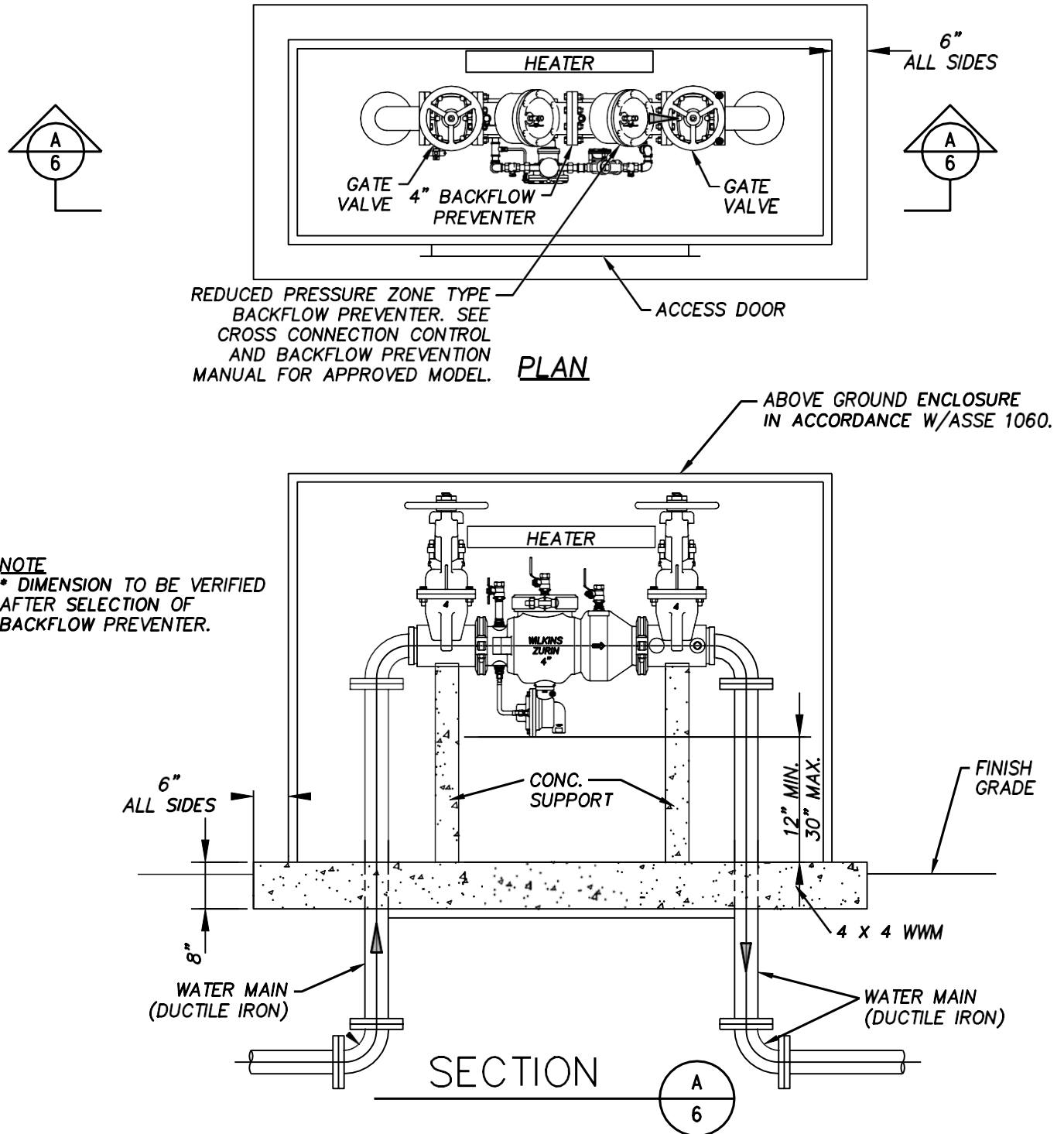
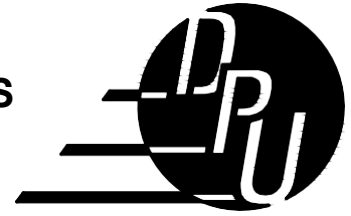
**PORTABLE/TEMPORARY METER -
TYPICAL ASSEMBLY AT EXISTING
HYDRANT**

DPU DWG. NO.

W-8



**CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES**



REVISION
JAN 2025

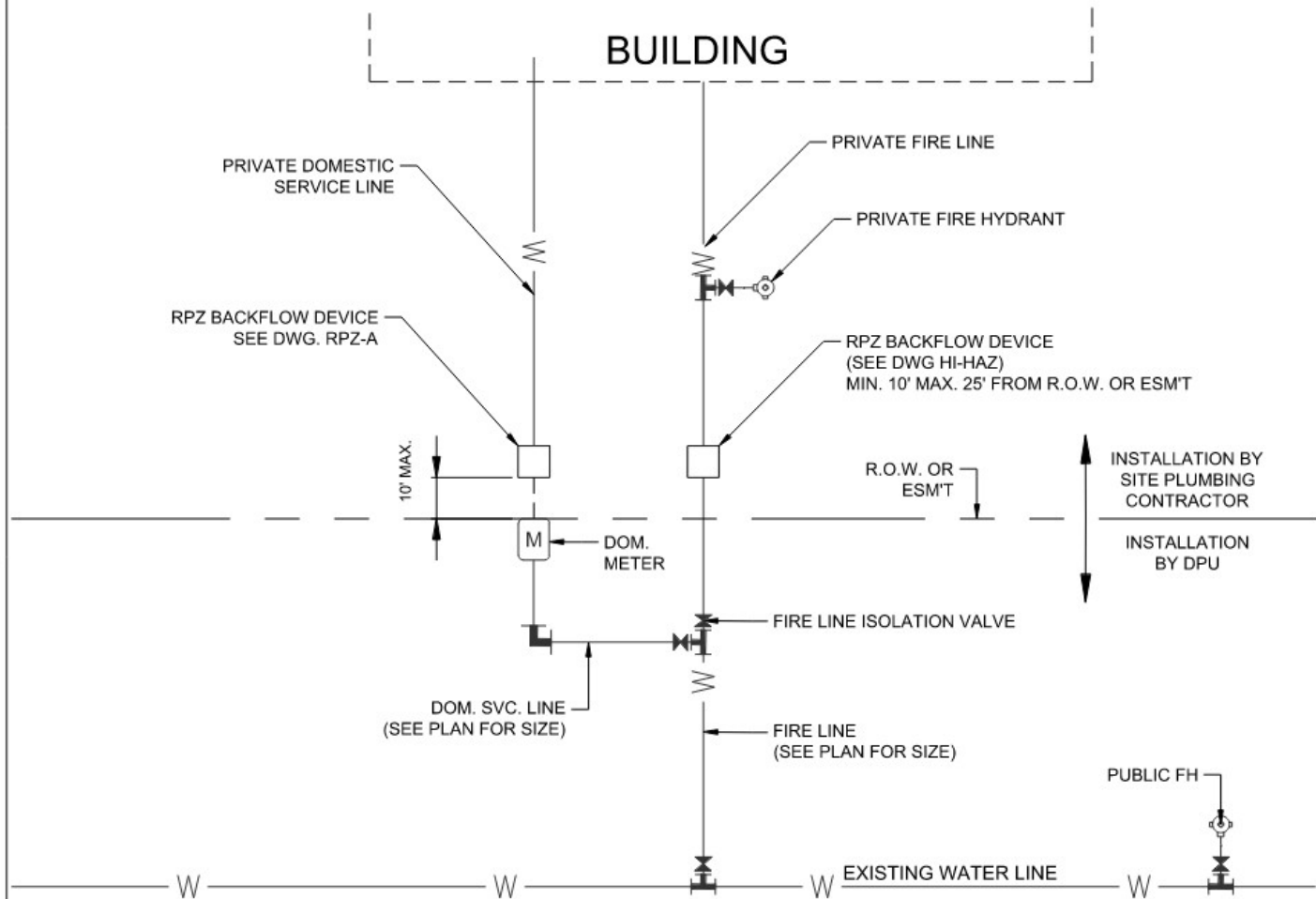
ENCLOSURE DETAIL

DPU DWG. NO.

W-44



CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES



NOTES:

1. ALL FIRE LINES MUST HAVE AT LEAST 3 FEET OF COVER OVER THE PIPE.
2. ALL PRIVATE HYDRANTS ON PROPERTY SHALL BE LOCATED AFTER RPZ BACKFLOW DEVICE AND SHALL BE PAINTED RED.

DATE
APR. 2006

REVISIONS
AUGUST 2026

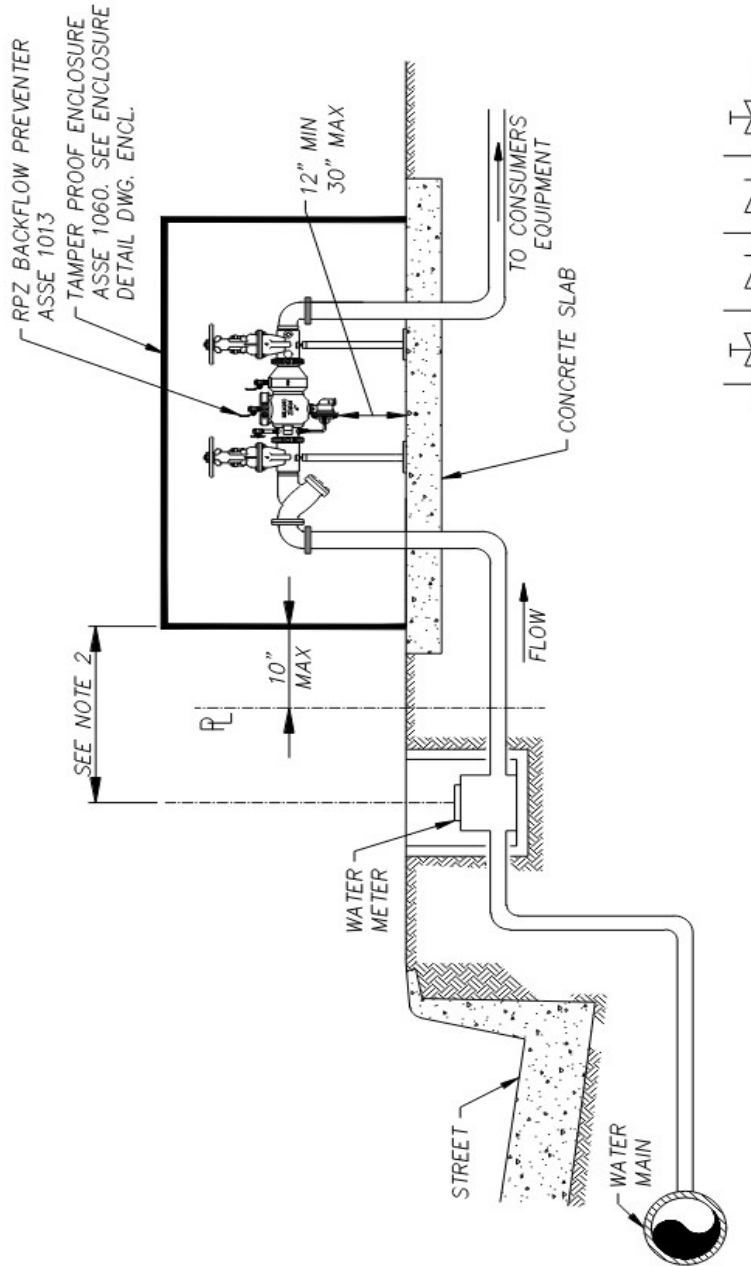
TYPICAL DOMESTIC & FIRE SERVICE
CONFIGURATION

DWG. NO.

W-45.1



**CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES**



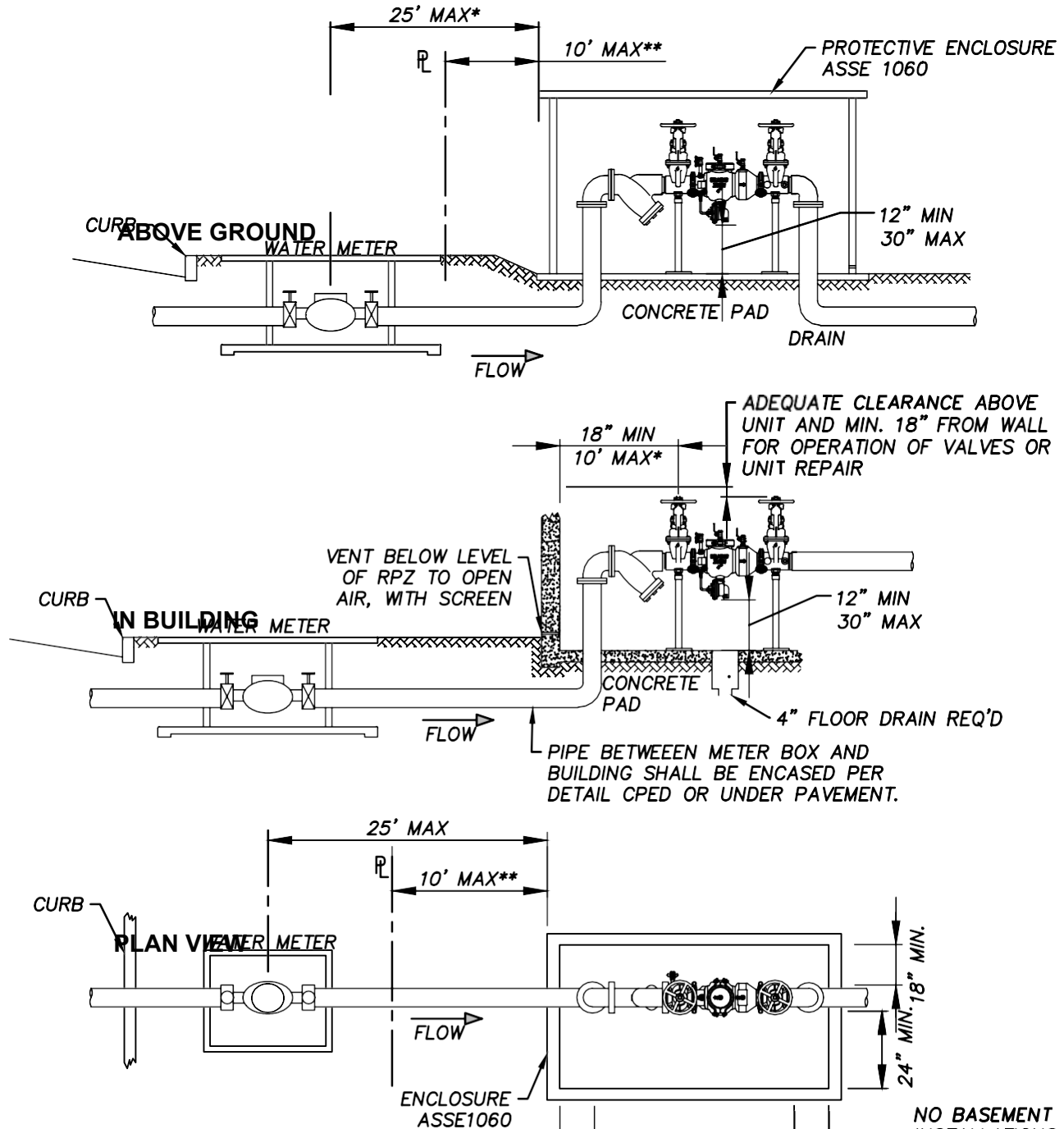
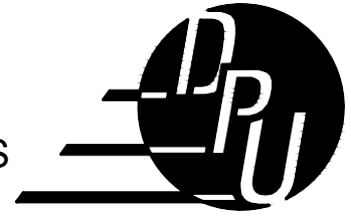
- NOTES:**
1. RESILIENT SEATED SHUT-OFF VALVES AND TESTCOCKS ARE REQUIRED.
 2. NO CONNECTIONS SHALL BE ALLOWED BETWEEN METER AND BACKFLOW PREVENTER.

NOTE: THE MECHANICAL BACKFLOW PREVENTION ASSEMBLY SHALL BE INSTALLED SUBJECT TO THE APPROVAL OF THE CITY OF RICHMOND DPU. ANY DEVIATION FROM THE METHODS DESCRIBED ABOVE MUST RECEIVE APPROVAL PRIOR TO INSTALLATION. ALL MECHANICAL BACKFLOW PREVENTION ASSEMBLIES APPROVED BY THE CITY OF RICHMOND DPU FOR INSTALLATION AT THE SERVICE CONNECTION SHALL BE IN ACCORDANCE WITH THE CROSS CONNECTION CONTROL AND BACKFLOW PREVENTION PROGRAM.

DATE APR. 2006	DOMESTIC BACKFLOW PREVENTION ASSEMBLY	DPU DWG. NO.
REVISIONS AUG 2025		W-54



CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES



**IF DISTANCE IS GREATER THAN 10', THEN
PIPE SHALL BE PROTECTED FROM
CONNECTION IN A MANNER APPROVED
BY THE CITY CCCS. SEE DWG. CPED.

NO BASEMENT
INSTALLATIONS
ALLOWED

*MUST HAVE CITY
APPROVAL PRIOR TO
INSTALLATION

DATE
APRIL 2006
REVISIONS
JAN. 2025

DOMESTIC REDUCED PRESSURE ZONE
ASSEMBLIES - ALTERNATE INSTALLATIONS*

DWG. NO.

W-56



**CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES**

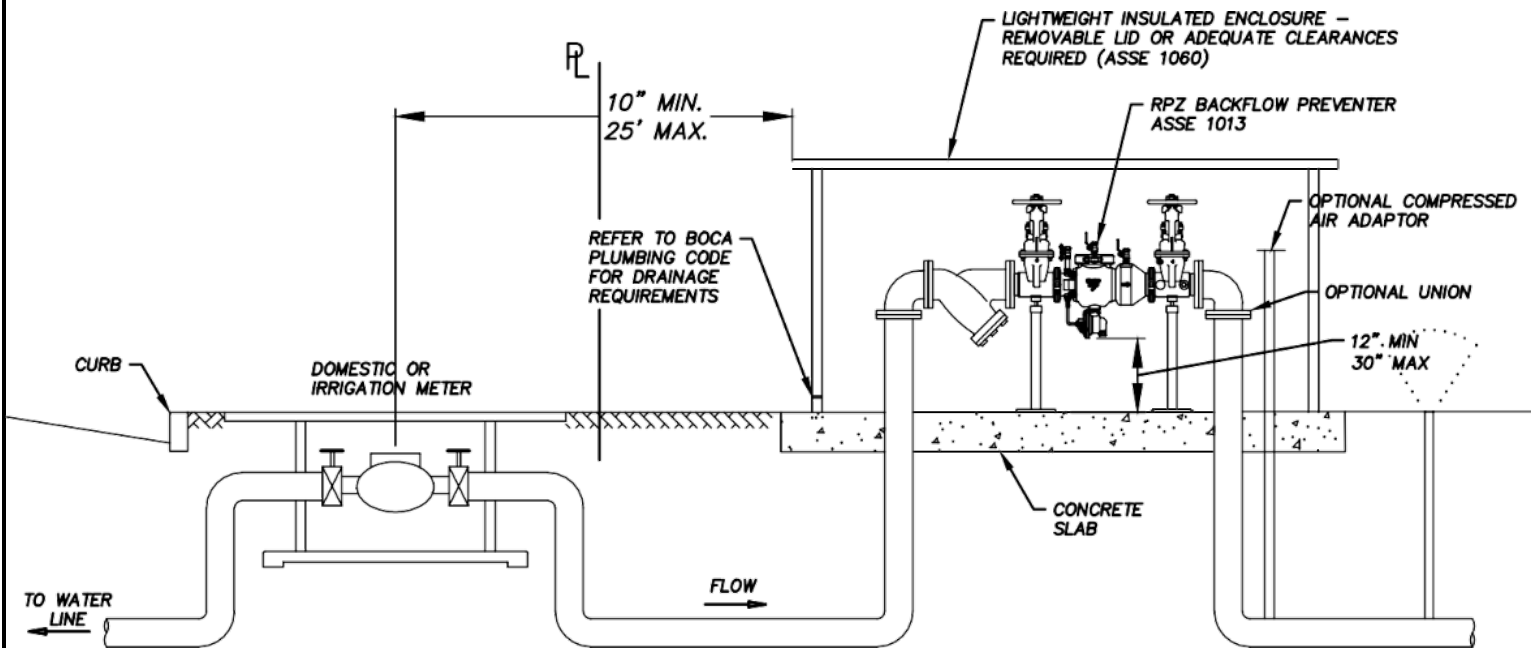
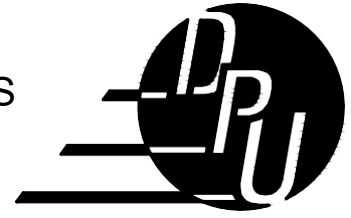


1. REFER TO ALL APPLICABLE CODES AND MANUALS DURING DESIGN.
2. THE BFP ASSEMBLY'S SHUT OFF VALVES SHALL BE APPROVED BY THE MANUFACTURER FOR THAT BFP ASSEMBLY.
3. APPLY FOR A PLUMBING PERMIT FROM THE BUILDING INSPECTIONS OFFICE. THE LINK TO THE PERMITS AND INSPECTIONS OFFICE PERMIT PORTAL CAN BE FOUND HERE:
[HTTPS://RVA.GOV/PLANNING-DEVELOPMENT-REVIEW/ONLINE-PERMIT-PORTAL](https://rva.gov/planning-development-review/online-permit-portal)
4. INSTALL PIPING AND BACKFLOW PREVENTER, INCLUDING TEST COCK ADAPTERS (4)STRAIGHT HOSE ADAPTER FITTINGS, 1/4" S.A.E., 45° FLARE TUBE X 1/4" NPT, FOR CONNECTION TO TEST DEVICE, BACKFLOW PREVENTION DEVICES WILL BE INSTALLED OUTSIDE (OR INSIDE OF A BUILDING WITH APPROVAL OF THE CROSS CONNECTION CONTROL SPECIALIST). REFER TO PLANS FOR TYPICAL INSTALLATION DETAILS. NO TAP-INS WILL BE PERMITTED FOR ANY PURPOSE UPSTREAM OF THE BACKFLOW PREVENTION DEVICE.
5. CALL THE CROSS CONNECTION CONTROL SPECIALIST FOR INSPECTION OF THE BACKFLOW PREVENTER. CONTACT: LONDELL SHELTON P:(804)432-8311
E:LONDELL.SHELTON@RVA.GOV OR ALEX BROADDUS P:(804)658-8661
E:ALEXANDER.BROADDUS@RVA.GOV.
6. CALL PLUMBING INSPECTOR FOR INSPECTION OF ALL PIPING AND PLUMBING WORK DOWNSTREAM OF THE METER. CALL MECHANICAL INSPECTOR FOR INSPECTION OF ALL WORK DOWNSTREAM OF THE DETECTOR CHECK/ISOLATION VALVE.

DATE APR. 2006	TYPICAL BACKFLOW ASSEMBLY INSTALLATION PROCEDURES	DPU DWG. NO.
REVISIONS AUGUST 2026		W-57



CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES



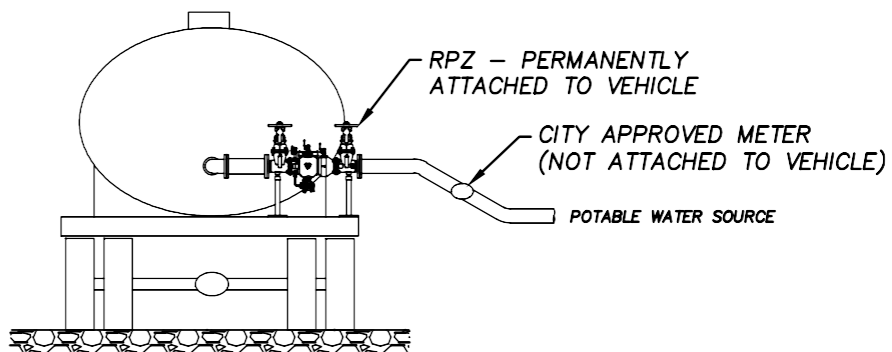
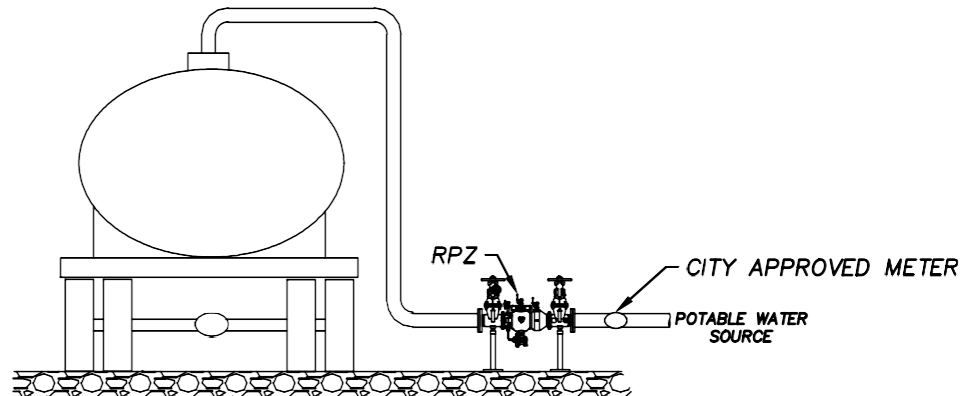
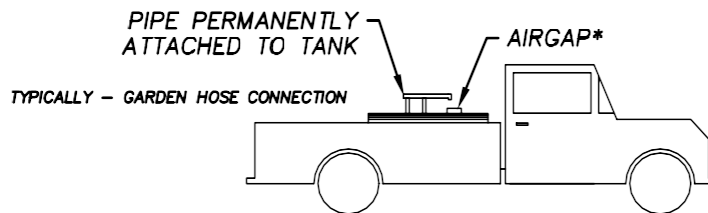
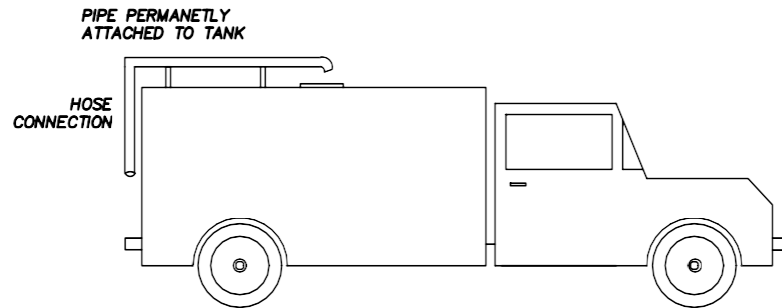
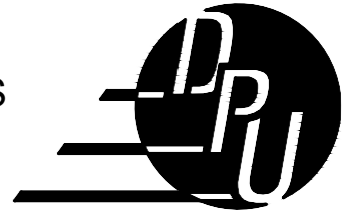
DATE
APR. 2006
REV.S.ONS
JAN. 2025

IRRIGATION SYSTEM WITH BACKFLOW
PREVENTION & METER

DWG. NO.
W-58



CITY OF RICHMOND DEPARTMENT OF PUBLIC UTILITIES



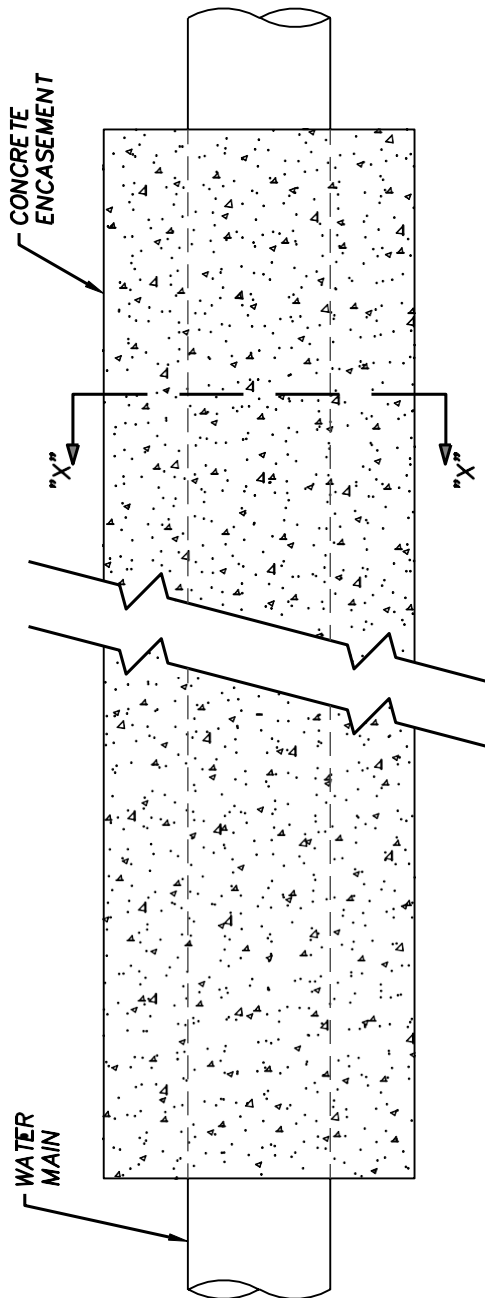
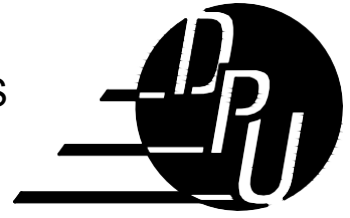
*-SEE DEFINITIONS FOR
MIN. AIR GAP SEPARATION

PROPER METHODS OF FILLING PORTABLE
SPRAY AND CLEANING EQUIPMENT

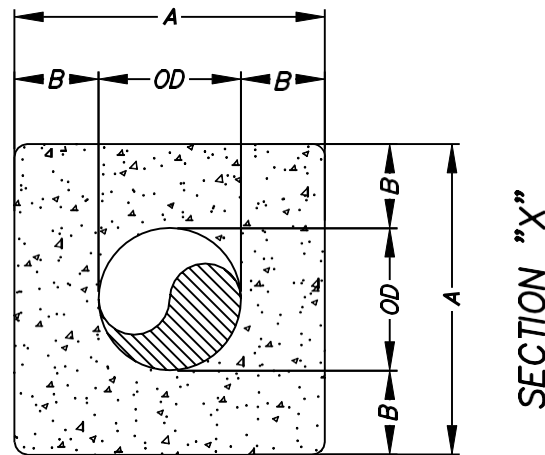
DATE APR. 2006	METHODS OF FILLING TANKER TRUCKS	DWG. NO.
REVISIONS JAN. 2025		W-59



CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES



PROFILE



SECTION "X"

OD = PIPE OUTSIDE DIA.

A = OD + 2(B)

B = 4" FOR PIPES ≤ 8"
6" FOR PIPES > 8"

BPD MUST BE APPROVED
FOR VERTICAL INSTALLATION

DATE
APR. 2006
REVISIONS
JAN. 2025

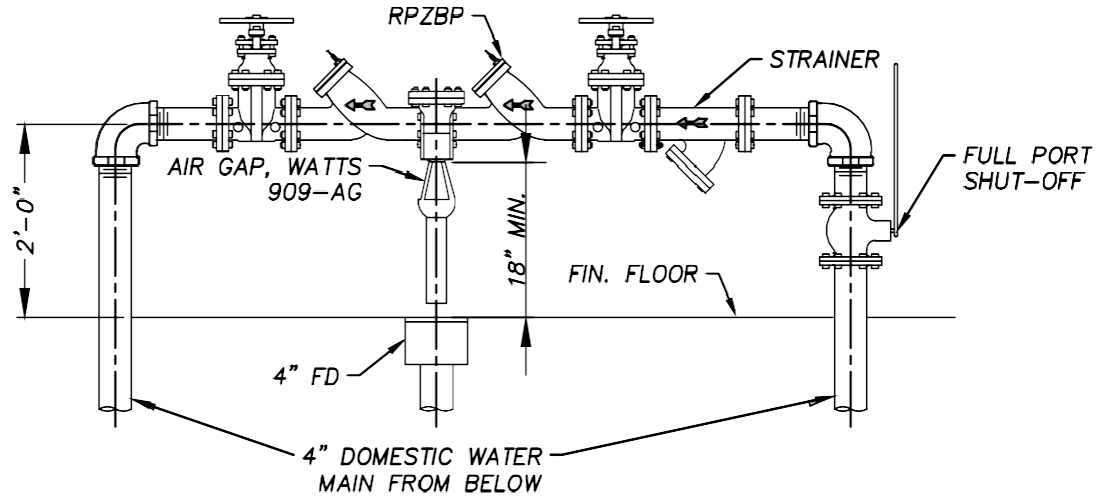
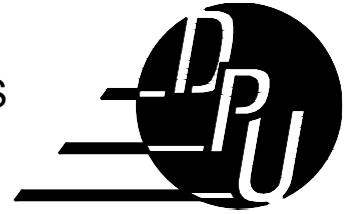
CONCRETE PIPE ENCASEMENT DETAIL

DWG. NO.

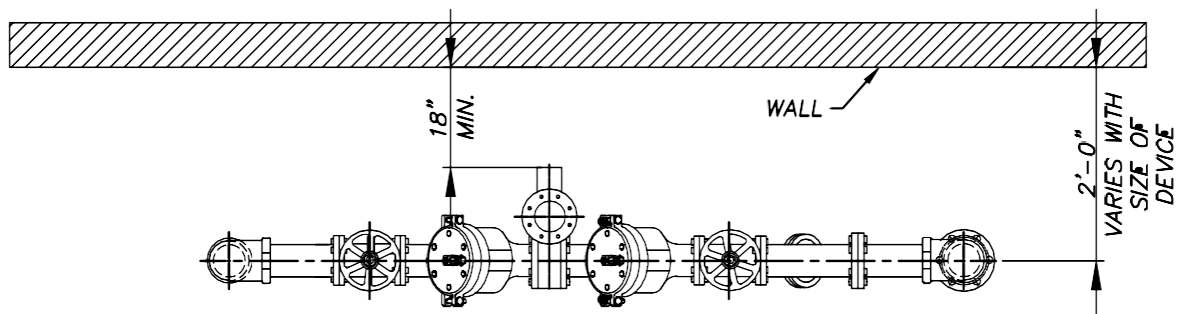
W-60



CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES



PROFILE



PLAN

SCALE: 1" = 2'-0"
(1ST ANGLE PROJ.)

DATE APR. 2006	BACKFLOW PREVENTER DETAIL	DWG. NO.
REVISIONS JAN. 2025		W-61

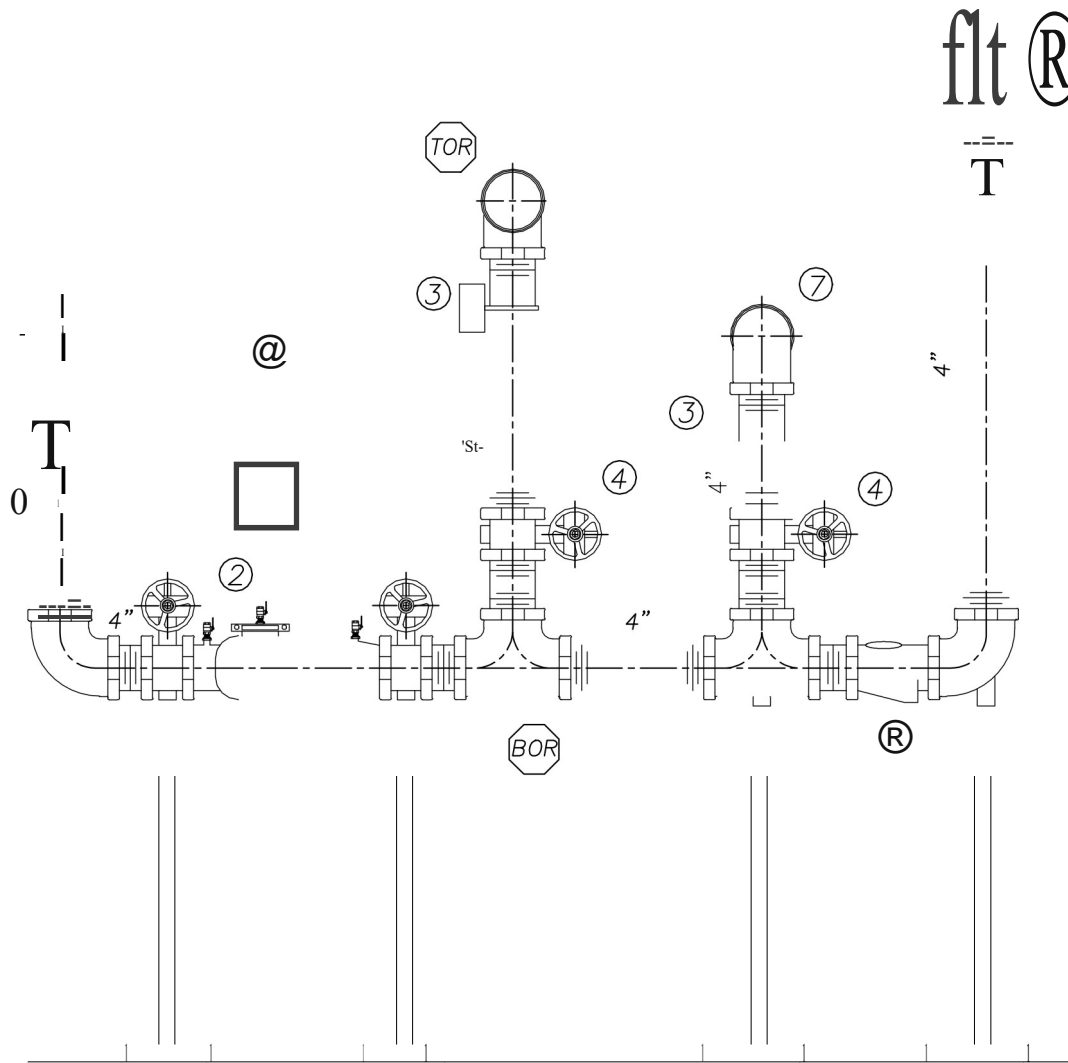
EXAMPLES OF SUBMITTAL DRAWINGS *

Examples are meant to show the quality of drawings to be submitted; type of backflow preventer/device, pipe sizes, valving, drainage, piping layout and dimensions specific the project being considered.

RISER2

VERTICAL ASSEMBLY DETAIL (GARAGE)

**CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES**



SPRINKLER RISER MATERIAL LIST

1. 4" FROM CITY SUPPLY
2. 4" AMES 200 COLT SERIES W/ BUTTERFLY VALVES
3. 4" FLOW SWITCH
4. 4" BUTTERFLY VALVE W/T.S.
5. SPARE HEAD CABINET
6. 4" GRV CHECK VALVE
7. 4" TO SISTERS HOUSE SPRINKLER SYSTEM (UNDERGROUND)
8. 4" OUT TO FOG

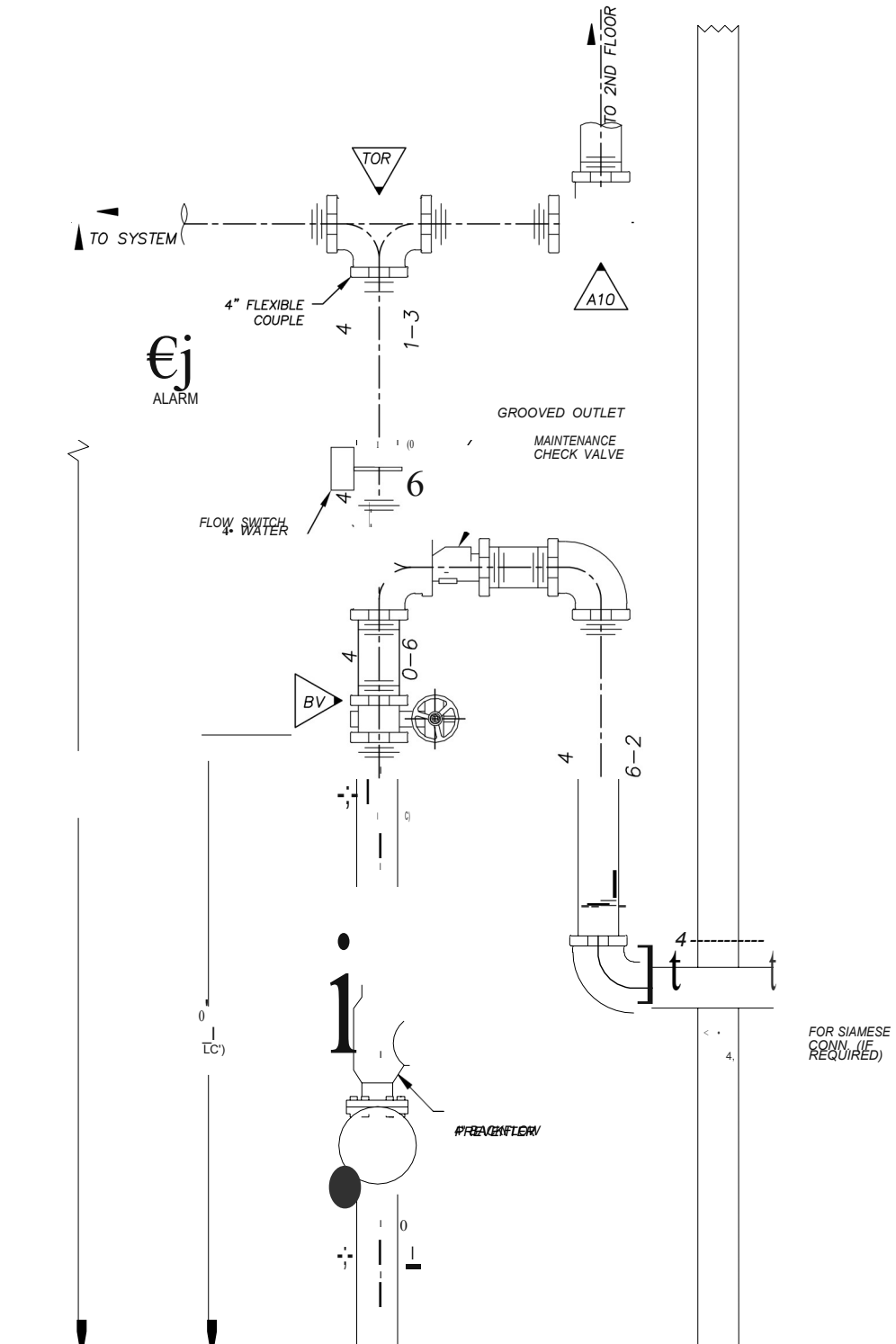
BPD MUST BE APPROVED
FOR VERTICAL INSTALLATION

DATE
APR. 2006
REVISIONS
JAN. 2025

SPRINKLER RISER DETAIL

DWG. NO.
RISER3

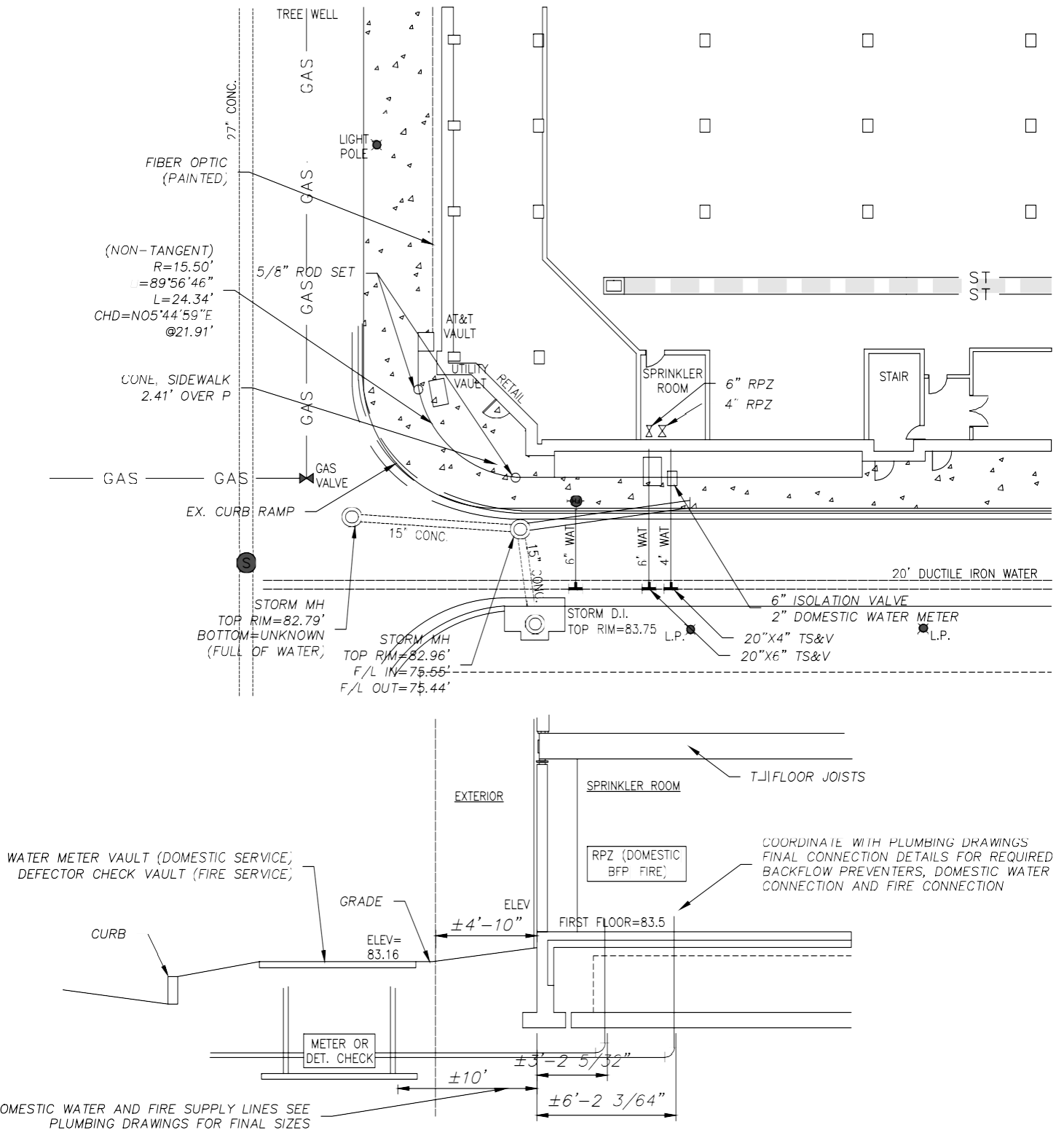
CITY OF RICHMOND DEPARTMENT OF PUBLIC UTILITIES



BPD MUST BE APPROVED
FOR VERTICAL INSTALLATION

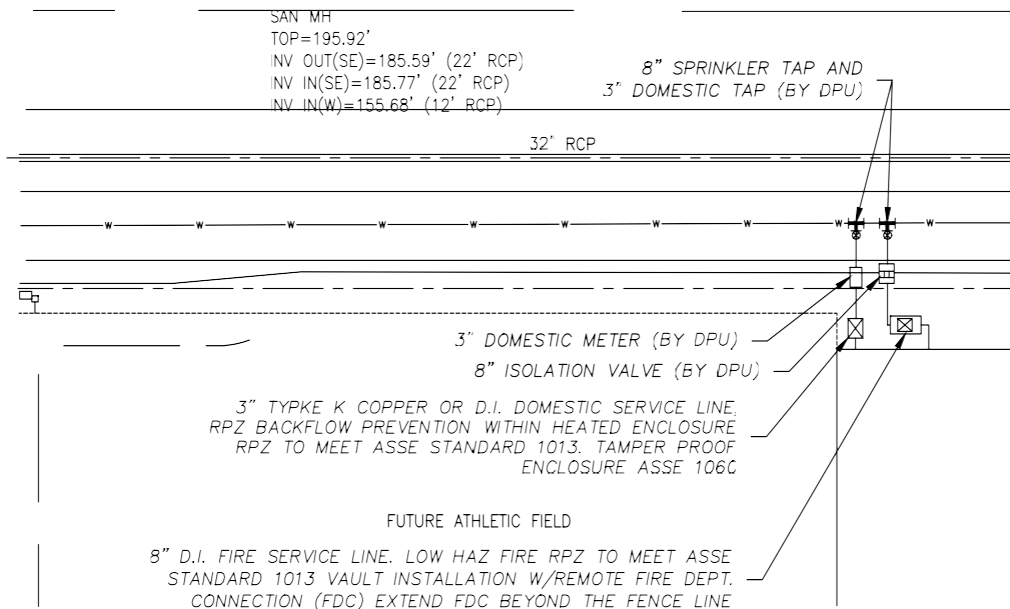
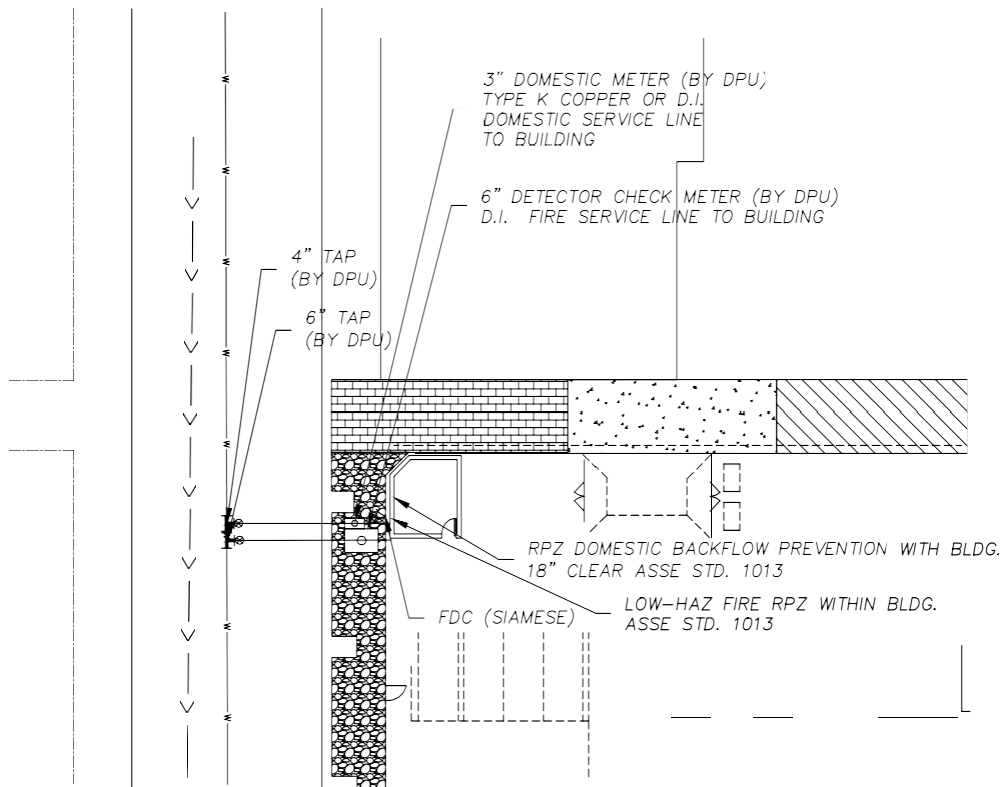
DATE APR. 2006	VERTICAL ASSEMBLY DETAIL (WET)	DWG. NO. RISER
REVISIONS JAN. 2025		

CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES



DATE APR. 2006	CROSS CONNECTION CONTROL 1	DWG. NO.
REVISIONS JAN. 2025		CCC 1

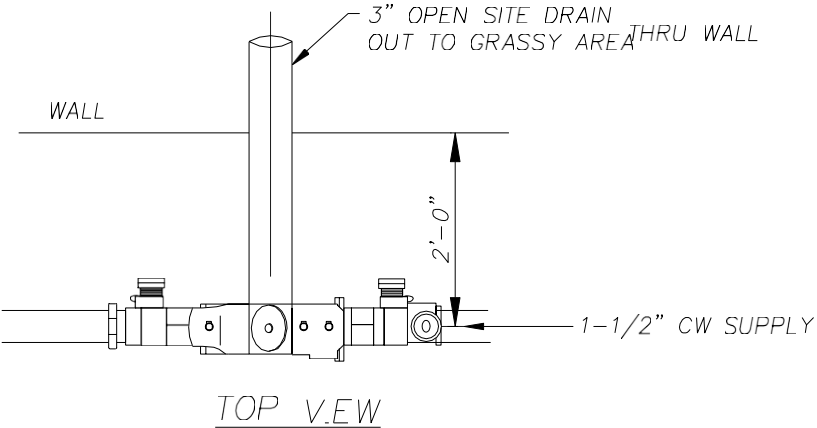
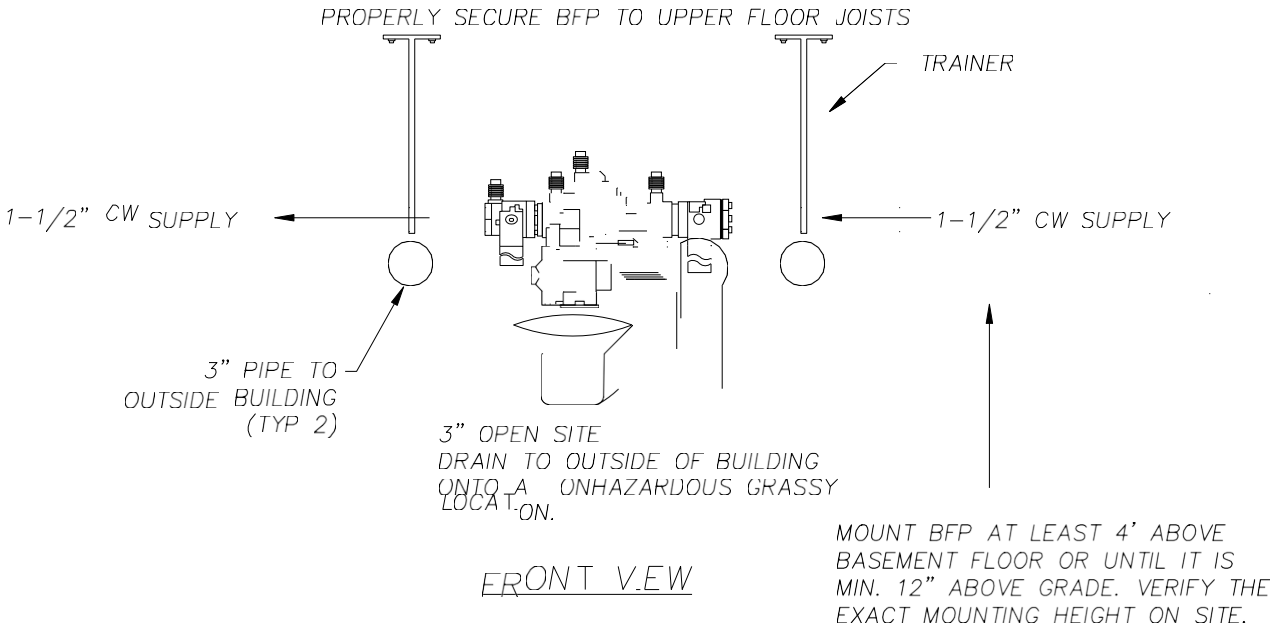
CITY OF RICHMOND DEPARTMENT OF PUBLIC UTILITIES



DATE APR. 2006	CROSS CONNECTION CONTROL 2	DWG. NO.
REVISIONS JAN. 2025		CCC 2

CITY OF RICHMOND

DEPARTMENT OF PUBLIC UTILITIES



DATE APR. 2006	BACKFLOW PREVENTOR DETAIL (BASEMENT)	DWG. NO.
REVISIONS JAN. 2025		BASEMENT

PART IX

APPENDICIES

APPENDIX A

CROSS CONNECTION CONTROL
and
BACKFLOW PREVENTION
ORDINANCE & CODE

**AN
ORDINANCE
NO. 84-261-234**

ADOPTED OCT. 22,
1984

To amend the Richmond City Code of 1975, as amended, by adding in Chapter 31, Water, Gas and Sewers, Article III, Service Connections. Pipes, and Meters, Generally, Division 1, Generally, a new section numbered Section 31 – 34.10, concerning protection of the City’s water distribution system from a cross connection in any connection made to the water distribution system.

• **Sec. 28-732. - Prevention of cross connection or backflow.**

(a) The following words, terms and phrases, when used in this section, shall have the meanings ascribed to them in this subsection, except where the context clearly indicates a different meaning:

Backflow means the flow of water or other liquids, materials or substances into the pipes or into other facilities of the City's water distribution system from any source other than the City's normal sources of water, meeting standards for use and consumption of water, or from any alternate source of water meeting such standards which might be utilized by the City for the purpose of supplying water to the customers served by the water distribution system of the City.

Cross connection means any connection or structural arrangement, direct or indirect, to the City's water distribution system whereby a backflow can occur.

(b) To protect and ensure that the water distribution system of the City is pure and safe for public consumption as mandated by applicable State law and regulations, if any service connection for the supply of water to property from the water distribution system of the City may cause or result in a cross connection to the City's water distribution system, the Director is authorized to require the abatement or control of such cross connection or possible cross connection in accordance with regulations to be promulgated by the Director authorized in this section.

(c) The Director shall promulgate rules and regulations pursuant to [Section 28-26](#) in order to prevent and control cross connection and backflow. Such rules and regulations shall be consistent with applicable State law and regulations and may provide for the termination of water service where necessary to protect the health of the citizens or where an owner or occupant of premises refuses to comply with the regulations.

(Code 1993, § 29-66; Code 2004, § 106-347; Code 2015, § 28-398)

APPENDIX B

REFERENCES

REFERENCES

1. AWWA – Cross Connection Control Manual
2. Cross Connection Manual – U.S. Environmental Protection Agency
3. City of Richmond Department of Public Utilities – Water and Sewer Specifications
4. Virginia Department of Health / State Water Works Regulations
5. The Code of the City of Richmond, Virginia
6. The American Society of Sanitary Engineers
7. Uniform Statewide Building Code
8. BOCA International Plumbing Code

APPENDIX C

VIRGINIA DEPARTMENT OF HEALTH WATERWORKS REGULATIONS

PART II ARTICLE 4 CROSS CONNECTION CONTROL AND BACKFLOW PREVENTION IN WATERWORKS

12VAC5-590-580. General requirements for cross-connection control and backflow prevention.

A. Every owner shall establish and enforce a cross-connection control program (CCCP) in accordance with 12VAC5-590-360. The goal of the CCCP is to prevent the intrusion of contamination into the distribution system via cross-connections and backflow. The owner shall document the CCCP activities in a cross-connection control plan and submit the written document to the department for review and approval.

B. No owner shall install, maintain, or allow a service connection to any premises where cross-connections to a waterworks or a consumer's water system exist, unless the owner and department ensure the cross-connections are adequately safeguarded.

C. No owner shall install, maintain, or allow any connection whereby water from an auxiliary water system may enter a waterworks or consumer's water system, unless the owner and department approve the auxiliary water system, the method of connection, and use of such system].

D. The owner, in accordance with 12VAC5-590-510 C, shall maintain acceptable working pressures in the distribution system to reduce the potential for backflow to occur.

Statutory Authority

§§ 32.1-12 and 32.1-170 of the Code of Virginia.

Historical Notes

Derived from VR355-18-006.01 § 2.25, eff. August 1, 1991; amended, Virginia Register Volume 9, Issue 17, eff. June 23, 1993; Volume 37, Issue 20, eff. June 23, 2021.12

12VAC5-590-590. (Repealed.)

Historical Notes

Derived from VR355-18-006.02 § 2.26, eff. June 23, 1993; repealed, Virginia Register Volume 37, Issue 20, eff. June 23, 2021.

12VAC5-590-600. Cross-connection control program responsibilities.

A. The owner shall establish and implement a CCCP consistent with the extent of the distribution system and the consumers served by the waterworks. The owner shall review the CCCP and written cross-connection control plan not less than every five years and update it as necessary to satisfy the requirements of this chapter. The owner shall submit updates to the department to obtain approval. The department may review the plan upon request. This program shall include at least one designated individual assigned by the owner. Requirements for this position shall include training and experience in cross-connection control programs.

B. The CCCP shall not be in conflict with the USBC and applicable building code regulations, including 13VAC5-63 or subsequent regulations promulgated by the Board of Housing and Community Development.

C. The CCCP shall ensure complete assessments of every consumer's water system and shall determine both the degree of hazard and the appropriateness of existing safeguards to prevent contamination from cross-connections and backflow.

D. The CCCP shall ensure testing, maintenance, and repairs of all backflow prevention assemblies, backflow elimination methods, and backflow prevention devices required and installed pursuant to 12VAC5-590-610.

E. 13VAC5-63-530, which incorporates the International Property Maintenance Code into the USBC, requires testing of RPZ assemblies, double check valve assemblies, double check detector backflow assemblies, and pressure vacuum breaker assemblies after initial installation, immediately after repairs or relocation, and annually thereafter. The CCCP shall establish procedures for completing and monitoring operational tests, or other evaluation procedures as appropriate, at least annually, and after installation, relocation, or repairs, for testable backflow prevention assemblies, devices, and methods that provide containment. The CCCP may include a public education program to:

1. Prompt consumer self-assessments, increase the awareness of cross-connections, and inform the consumer of the public health hazards of backflow.
2. The public education program, if provided as part of the CCCP, shall include, at a minimum, the following:
 - a. Causes of backflow;
 - b. Hazards and health effects of cross-connections and backflow;
 - c. Resources available to identify actual or potential cross-connections;
 - d. Safeguards to use to eliminate or control the hazards at the point of use; and
 - e. Sources for additional information.

F. The CCCP shall provide a method to discontinue or refuse water service to the consumer to ensure that the waterworks is adequately protected from cross-connections and backflow if any of the following conditions occur:

1. The consumer does not install, test and maintain a required backflow prevention assembly or backflow elimination method in accordance with the applicable sections of this chapter;
2. The consumer allows a required backflow prevention assembly or backflow elimination method to become inoperable or the consumer removes or bypasses it; or
3. The owner knows an unprotected or inadequately protected cross-connection exists on the

premises and determines that there is inadequate backflow prevention at the service connection.

G. In the event of backflow of contaminants into the waterworks, the owner shall promptly take or cause corrective action to confine and eliminate the contamination. The owner shall report the event to the department within one business day in the most expeditious manner. The owner shall submit a written report by the 10th day of the month following the month during which backflow occurred addressing the incident, its causes and effects, and safeguards required or other action taken.

H. The owner shall maintain an inventory and records of testing, repairs, and maintenance of all backflow prevention assemblies, backflow elimination methods, and backflow prevention devices required and installed under 12VAC5-590-610 C. In the case of single-family residences subject to 12VAC5-590-610 C 5, the owner may determine whether or not to maintain an inventory or records. The department recommends the owner follow best practices identified in the AWWA Manual of Water Supply Practices M14 and the EPA Cross-Connection Control Manual.

I. The owner shall maintain an inventory and records of testing, repairs, and maintenance of all backflow prevention assemblies, backflow elimination methods, and backflow prevention devices required and installed under 12VAC5-590-610 E.

J. The owner shall maintain records related to the CCCP implementation, and any other records the department requires in accordance with 12VAC5-590-550.

Statutory Authority

§§ 32.1-12 and 32.1-170 of the Code of Virginia.

Historical Notes

Derived from VR355-18-006.03 § 2.27, eff. August 1, 1991; amended, Virginia Register Volume 9, Issue 17, eff. June 23, 1993; Volume 37, Issue 20, eff. June 23, 2021.

12VAC5-590-610. Containment of backflow.

A. The owner shall ensure installation of backflow prevention assemblies or backflow elimination methods (i) at the service connection or (ii) downstream of the service connection but before any unprotected takeoffs.

B. Where the consumer's water system is not intricate or complex and where actual or potential cross-connection hazards can be eliminated or controlled, instead of containment, the owner may allow consumers to use point-of-use isolation protection by application of appropriate backflow prevention assemblies, backflow prevention devices, or backflow elimination methods complying with the USBC.

C. A backflow prevention assembly or backflow elimination method shall be installed where the following conditions exist:

1. A substance is handled in such a manner as to create an actual or potential hazard to a waterworks (this shall include premises having sources or systems containing process fluids or waters originating from a waterworks which are no longer under the control of the owner);
2. There exists internal cross-connections that, in the judgment of the owner or the department, may not be easily correctable or have intricate or complex plumbing arrangements that make it impracticable to determine whether or not cross-connections exist;
3. There are security requirements or other prohibitions or restrictions that prevent the assessment of all potential cross-connections that may impair the quality of the water delivered;
4. There is a repeated history of cross-connections being established or reestablished;
5. There are fire protection systems, lawn sprinkler systems, or irrigation systems;
6. The owner or department can show that a potential cross-connection hazard exists.

D. The owner shall ensure that consumers equip premises having booster pumps or fire pumps connected to the waterworks with control devices to prevent a reduction of pump suction line pressure to less than 20 psig.

E. A backflow prevention assembly or backflow elimination method shall be installed at consumer water systems serving the following types of facilities, including:

1. Hospitals, mortuaries, clinics, veterinary establishments, nursing homes, and medical buildings;
2. Laboratories;
3. Piers, docks, and 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. Buildings with commercial, industrial, or institutional occupants served through a master meter;

12. Water loading facilities;
13. Slaughter houses and poultry processing plants;
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-product plants and printing plants;
18. Pesticide or exterminating companies and their vehicles with storage or mixing tanks;
19. Facilities that blend, store, package, transport, or treat chemicals, and their related vehicles;
20. Schools or colleges with laboratory facilities;
21. Highrise buildings (four or more stories);
22. Multiuse commercial, office or warehouse facilities; and
23. Others specified by the owner or the department when reasonable cause can be shown for a potential backflow or cross-connection hazard.

F. All temporary or emergency service connections shall be protected where reasonable cause can be shown for a potential backflow or cross-connection hazard. Backflow prevention assemblies or backflow elimination methods used shall be appropriately certified or approved to match the requirements of this section.

Statutory Authority

§§ 32.1-12 and 32.1-170 of the Code of Virginia.

Historical Notes

Derived from VR355-18-006.04 § 2.28, eff. August 1, 1991; amended, Virginia Register Volume 9, Issue 17, eff. June 23, 1993; Volume 37, Issue 20, eff. June 23, 2021.

12VAC5-590-620. (Repealed.)

Historical Notes

Derived from VR355-18-006.05 § 2.29, eff. August 1, 1991; amended, Virginia Register Volume 9, Issue 17, eff. June 23, 1993; repealed, Virginia Register Volume 37, Issue 20, eff. June 23, 2021.

12VAC5-590-630. Backflow prevention assemblies, devices, and backflow elimination methods for containment.

A. Any backflow prevention assembly or backflow elimination method or backflow prevention device shall be of the approved type and shall comply with the USBC.

B. General safeguards

1. The backflow prevention assembly or backflow elimination method or backflow elimination device used shall depend on the degree of hazard that exists or may exist. The safeguard shall ensure maintenance of the distribution system water quality and its usefulness.

2. The degree of hazard, either high or low, is based on (i) the nature of the contaminant; (ii) the potential of the health hazard; (iii) the potential method of backflow (either by backpressure or by backsiphonage); and (iv) the potential effect on waterworks structures, equipment, and appurtenances used in the storage, collection, purification, treatment, and distribution of potable water. Table 630.1 shall be used as a guide to determine the degree of hazard for any situation.

Table 630.1	
DETERMINATION OF DEGREE OF HAZARD	
Cross-connections that meet or may meet the following condition shall be rated at the corresponding degree of hazard.	
High Hazard	Low Hazard
The contaminant would be toxic, poisonous, noxious, unhealthy, or of unknown quality.	The contaminant would only degrade the quality of the water aesthetically or impair the usefulness of the water.
A health hazard would exist.	A health hazard would not exist.
The contaminant would disrupt the service of piped water for human consumption.	The contaminant would not disrupt service of piped water for human consumption.
Backflow would be by either backpressure or backsiphonage.	Backflow would occur by backsiphonage.
Examples: lawn irrigation systems, fire sprinkler systems with chemical additives or antifreeze, sewage, used water, non-potable water, auxiliary water systems, and mixtures of water and other liquids, gases, or other chemicals.	Examples: food residuals, coffee machines, non-carbonated beverage dispensers, and residential fire sprinkler systems constructed of materials designed for potable water flow.

3. The USBC and the manufacturer's specifications shall be used to determine the appropriateness of the backflow prevention assembly or backflow prevention device application for containment.

C. Owners shall not allow the installation of backflow prevention devices or backflow prevention assemblies with openings, outlets, or vents that are designed to operate or open during backflow prevention:

1. In areas subject to flooding or in pits;
2. In areas with atmospheric conditions that represent a contamination threat to the potable water supply; and
3. In such a manner as to be able to be bypassed.

D. Starting January 1, 2023, persons testing and repairing backflow prevention assemblies and backflow prevention devices shall be certified by a Commonwealth of Virginia tradesman certification program (identified by DPOR as backflow prevention device workers). Until January 1, 2023, persons testing and repairing backflow prevention assemblies and backflow prevention devices shall be qualified to perform such work as demonstrated by possessing a certification or license from a local or state agency having legal authority or shall possess a certificate of completion of applicable vocational training acceptable to the owner.

Statutory Authority

§§ 32.1-12 and 32.1-170 of the Code of Virginia.

Historical Notes

Derived from VR355-18-006.06 § 2.30, eff. August 1, 1991; amended, Virginia Register Volume 9, Issue 17, eff. June 23, 1993; Volume 31, Issue 1, eff. October 10, 2014; Volume 37, Issue 20, eff. June 23, 2021.

APPENDIX D

CHECK LIST

**CITY OF RICHMOND
DEPARTMENT OF PUBLIC UTILITIES
REVIEW CHECKLIST FOR BACKFLOW
PREVENTER INSTALLATION**

PROJECT TITLE

1. Site Plan showing:
 - a. Location and size of water service(s).
 - b. Location and size of fire service(s) (where applicable).
 - c. Location and size of irrigation system service(s) (where applicable).
 - c. Proposed location of domestic service backflow prevention device(s).
 - d. Proposed location of fire service detector check meter(s) and backflow prevention device(s) (where applicable).
 - e. Proposed location of irrigation system exclusion meter(s) and backflow prevention device(s) (where applicable).
2. Virginia Registered Engineer's stamp and signature.
3. Site Plan on 24" x 36" paper.
4. Plan Cover Sheet with project vicinity map.
5. Owner/Developer name and address on plans.
6. Detailed installation drawing(s) of each backflow prevention device to be installed.
 - a. Type, manufacturer, model and size of backflow prevention device(s).
 - b. Clearance(s) between backflow prevention device and wall.
 - c. Clearance(s) between backflow prevention device and floor and ceiling (where applicable).
 - d. Clearance(s) between backflow prevention device and any walls in front or behind (where applicable).
 - e. Type, manufacturer, model and size of enclosure(s).
 - f. List of the materials and approximate quantities to be used for each of the backflow preventions.

7. Water System designed to provide adequate domestic service and fire protection to Owner's property. ____-inch diameter line required to adequately serve this project in accordance with the City standards.
8. Overall water plan submitted for phased projects.
 - a. Future locations of domestic, fire and irrigation system services shown on overall water plan (where applicable).
 - b. Future locations for domestic, fire and irrigation system backflow prevention devices shown on overall water plan (where applicable).
9. Any and all existing connections to property are shown on plans.
10. This project has been designed in accordance with the latest version of the City of Richmond DPU Standards and State regulations (whichever is more restrictive).
11. This project has been designed in accordance with the latest version of the City of Richmond DPU Cross Connection Control and Backflow Prevention Manual.
12. All proposed service lines connect to existing facilities that have previously accepted by the City for operations and maintenance.

I hereby certify that I have complied with the above and do hereby submit these plans for approval.

Signature - Engineer

License Number

Name – Typed or Printed

Date

City of Richmond, Virginia

Department of Public Utilities

Rules and Regulations

Cross Connection Control Manual

This Cross Connection Control Manual shall become effective _____ as Department of Public Utilities rules and regulations, and at that time shall supersede, (i) in its entirety, the City of Richmond Department of Public Utilities "Cross-Connection Control Manual" as adopted by the Director of Public Utilities effective - _____; and (ii) to the extent necessary, any and all other conflicting City of Richmond Department of Public Utilities manuals, rules, regulations, policies, and guidelines.

Approved: _____
Anthony "Scott" Morris, Director of Public Utilities, City of Richmond

Date: _____