

Cross Connection Control Manual



PHILADELPHIA
WATER
— DEPARTMENT —

Standard Specifications
for Prevention of Water Contamination

DIRECTORY

PHILADELPHIA WATER DEPARTMENT

Backflow Protection requirements for Containment:

New name and address:

:

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1. INTRODUCTION

1.1 Purpose of Manual

This manual outlines the Philadelphia Water Department's ("PWD" or "Department") requirements and the responsibility of the customer regarding cross connection control and backflow protection. This manual presents general information and provides guidance for complying with the Department's Cross Connection Control Program. It does not cover every situation and piping configuration.

1.2 Cross Connection Control in the City of Philadelphia

Providing our customers with top quality drinking water is our highest priority and that is why PWD created the City's Cross Connection Control Program. There have been numerous reported cases around the country where backflow through cross connections has contaminated a potable supply with disease-causing agents, toxic chemicals and other hazardous substances. In order to prevent contamination resulting from backflow, PWD and the Department of Licenses + Inspections and the Department of Public Health, share responsibilities for cross connection control. Operational jurisdictions have traditionally been divided into two functional areas; containment and elimination.

Containment, which is the concern of PWD and this manual, is designed to prevent any contamination on the customer's premises from affecting other customers through the City's water supply. In effect, any contamination is "contained" within a facility and prevented from reaching the City main.

Elimination of all unprotected cross connections within a facility, for the protection of that facility and other facilities, is the concern of the Department of Public Health and the Department of Licenses and Inspections. These departments strive to eliminate all unprotected cross connections through permitting and inspections.

2.0 POLICY

The purpose of PWD's Cross Connection Control Program is to protect the City's Water distribution system. PWD must take precautionary measures to protect the City's water distribution system from hazards originating on the premises of its customers which may degrade the community's water. These measures are represented in the following policies:

2.1 All domestic service lines connected to a City main shall have either an air-gap separation or a PWD approved backflow prevention device consistent with the degree of hazard as defined by PWD (either a double check assembly or a reduced pressure assembly), installed by a City Certified Backflow Prevention Technician for Domestic Systems in accordance with this manual.

In addition, **all fire systems** connected to the City main shall have a PWD approved backflow prevention device (either a PWD approved double check assembly or a PWD approved reduced pressure assembly) on the lines leading to the fire systems installed by a City Certified Backflow Prevention Technician for Fire Suppression Systems in accordance with this manual.

2.2 The property owner shall provide for the regular testing of such backflow prevention devices or air-gap separations by a **City Certified Backflow Prevention Technician** for Domestic Systems or a City Certified Backflow Prevention Technician for Fire Suppression Systems, depending on the particular type of system, at least once a year, or whenever failure is suspected, in order to maintain them in an operating condition. The property owner shall also provide for the repair or replacement of such devices or air-gap separations by a **City Certified Backflow Prevention Technician**, for Domestic Systems or a City Certified Backflow Prevention Technician for Fire Suppression Systems, depending on the particular type of system, if they are not in working order. A record of such tests repairs and replacements shall be kept by the property owner for period of at least (3) years and be submitted to PWD's Industrial Waste and Backflow Compliance (IWBC) Unit.

2.3 Non-compliance with these requirements after due notification may result in discontinuation of water service. The customer may be required to reimburse PWD for all costs associated with such action. PWD may immediately terminate the water service to a facility if it is determined that a serious contamination potential exists.

3.0 AUTHORITY

3.1 *The Commonwealth of Pennsylvania*

Title 25 Pennsylvania Code, Section 109.709, states:

a. No person shall introduce contaminants into a public water supply through a service connection of a public water system.

(1) It shall be the responsibility of the customer to eliminate cross-connections or provide backflow devices to prevent contamination of the distribution system from both backsiphonage and backpressure. Individual backflow preventers shall be acceptable to the public water supplier.

(2) If the customer fails to comply with paragraph (1) within a reasonable period, the water supplier shall discontinue service after reasonable notice has been made to the customer.

b. At the direction of the DEP, the public water supplier shall develop and implement a comprehensive control program for the elimination of existing cross-connections or the effective containment of sources of contamination, and prevention of future cross-connections.

3.2 *The Philadelphia Water Department Regulations*

3.2.1 Backflow protection at connections to the City water mains

Philadelphia Water Department Regulation 403 states:

In order to protect the public water supply from potential cross connection and backflow hazards, any connection to the City main, including both domestic and fire service connections within a property and connections to City fire hydrants, shall be provided with adequate backflow protection by the property owner or the water user.

403.1 Requirements

(a) With the exception of single family residences and multi-family buildings with four (4) units or fewer, the requirements of this regulation shall generally apply to all water-using structures and systems, regardless of their sizes, plumbing types and water usage patterns. Where the Department has determined that backflow prevention measures are needed at any specific single family residence or multi-family building with four (4) units or fewer, this regulation shall also apply to those buildings. Backflow prevention measures include, but are not limited to, the following requirements:

(1) Any domestic and fire protection service line, including each line of a multiple service line to any property, shall be equipped with an approved backflow prevention device or an approved air-gap separation on each line. Backflow prevention devices or air-gap separations must be installed where designated by the Department at the sole expense of the property owner. Backflow prevention devices or air-gap separations must be from an approved Department list or otherwise approved by the Water Department. Installers must refer to the latest edition of the **Water Department Cross Connection Control Manual** for installation requirements and listings of approved backflow prevention devices. This manual is available upon request from the Department and the Department of Licenses and Inspection.

(2) All other connections to the City water main, including standpipes leading to elevated tanks, temporary ferrules and hose connections, shall be equipped with approved backflow prevention devices.

- (3) Only persons certified by the City's designated certification organizations shall install, test and service backflow prevention or air-gap separation devices. Installers are subject to all requirements of the Philadelphia City Code and regulations of the Department and the Department of Licenses and Inspection.
- (4) All required backflow prevention or air-gap separation devices shall be tested by certified persons at least once every twelve (12) months. Any newly installed backflow prevention or air-gap separation device shall be tested prior to the initiation of service. The property owner shall be responsible for arranging for testing and for all costs of testing and related maintenance. Test results shall be submitted to:

**The Philadelphia Water Department
Industrial Waste and Backflow Compliance (IWBC) Unit
9001 State Road
Philadelphia, PA 19107¹**

Property owners shall be responsible for maintaining records of such tests and related maintenance for a period of three (3) years. Backflow prevention and air-gap separation devices shall be maintained and kept in operating condition at all times. Backflow prevention and air-gap separation devices shall be tested whenever failure is suspected.

- (5) The service of water to any premises or at any connection may be shut off by the Department if it determined there is inadequate backflow protection at the service connection and/or any connection to the main, or a failure to maintain the backflow prevention or air-gap separation devices.

¹ This is current address for the Industrial Waste and Backflow Compliance Unit. This address differs from the address listed in the PWD Regulations, which requires updating.

4.0 CONTAINMENT REQUIREMENTS

This chapter describes PWD's backflow protection requirements for all newly constructed and existing facilities. In this manual, the term "backflow prevention assembly" refers to the body of the device and its attached shutoff valves and test cocks as a unit. Other commonly used cross connection control terms have been provided in a Glossary at the back of this manual.

4.1 Backflow Protection on the Domestic Service

- 4.1.1** In order to protect the City's water supply from contamination that originates within a customer's water system, it is the responsibility of the owner of a property to have a PWD approved backflow prevention assembly (Refer to City Approved Backflow Assembly Listing) consistent with the degree of hazard installed by a City Certified Backflow Prevention Technician for Domestic Systems on the outlet side of the meter on the domestic service line in accordance with Chapter 7 of this manual, or to have a PWD approved air-gap separation installed by a City Certified Backflow Prevention Technician for Domestic Systems on the domestic service line in accordance with Chapter 6 of this manual.
- 4.1.2** The **degree of hazard** is PWD's assessment of the potential harm that may result from potential cross connections within a water-using facility.
- 4.1.3** **High hazard** denotes a potential threat of a cross connection problem that is physical, chemical or biologically hazardous in nature. These pose a danger to the health and safety of the customer or the public.
- 4.1.4** **Low hazard** denotes a potential threat to the potability or physical properties of a potable water system which could cause aesthetic problems or have a detrimental effect but which would not constitute a hazard to the health of the customer or the general public.
- 4.1.5** A facility that has a **high hazard potential** or exhibits a **high potential for the occurrence of backflow** shall have an approved reduced pressure assembly (RP) or an approved air gap separation, which conforms to the City's cross connection requirements.
- 4.1.6** A facility that has a **low hazard potential** shall have an approved DC or RP which conforms to the City's cross connection requirements.
- 4.1.7** In order to provide guidance for designers of plumbing systems, PWD has developed a list of systems, plants and buildings for which the backflow prevention requirements have been predetermined (see Section 4.2) based upon the degree of hazard and potential for the occurrence of backflow. For cases which are not listed or where there are questions about installation requirements, the Department will provide a preliminary opinion on the specific containment requirements.

4.2 Facilities that require Backflow Protection on the Domestic Service

- 4.2.1 Listing of Facilities** - Table 1 on page 7 contains a list of plants or facilities where backflow protection is required on the domestic service line. The table identifies the required mechanical backflow prevention assemblies.
- 4.2.2** Backflow protection is required on the domestic service line for each of the plants, systems or buildings listed in Table 1. This requirement is based on the degree of hazard and potential for the occurrence of backflow. Every service line to the listed property shall be equipped with an approved backflow prevention assembly or an approved air-gap separation.
- 4.2.3** Single residences and multi-family buildings with four (4) units or fewer that maintain a potential cross connection (e.g. a built-in lawn sprinkler system, swimming pool or private well) shall have an approved reduced pressure assembly installed by a City Certified Backflow Prevention Technician for Domestic Systems.
- 4.2.4** For facilities other than those listed in Table 1, consult PWD for specific requirements.
- 4.2.5** PWD will evaluate the most serious potential hazard or a combination of hazards to determine the type of protection required in the case of facilities with multipurpose usage.
- 4.2.6** If the system is connected to a line or water system that is beyond the meter connection (i.e. a branch line off the domestic service line), backflow protection requirements come under the jurisdiction of the Department of Licenses and Inspection, and/or the Department of Public Health. In general, a DC is a minimum requirement.

4.3 Listing of Facilities that require Backflow Protection on the Domestic Service

TABLE 1. LISTING OF FACILITIES		DEVICE	TYPE
No	A. Plant or System	RP ¹	DC ²
1	Airport	x	
2	Automotive Paint Shop	x	
3	Automotive Plant	x	
4	Auxiliary Water system	x	
5	Beverage Plant / Brewery/ Distillery	x	
6	Campgrounds	x	
7	Cannery/ Packing / Reduction Plant	x	
8	Car Wash	x	
9	Chemical Plant	x	
10	Dairy and/ or Cold Storage Plant	x	
11	Dye Works	x	
12	Food Preparation Facility	x	
13	Gas Station	x	
14	Industrial Plant	x	
15	Irrigation System / Lawn Services	x	
16	Laundry Services	x	
17	Manufacturing / Processing Plant	x	
18	Metal Plating Plant	x	
19	Pest Control Products, Manufacturing / Sales	x	
20	Pet Services	x	
21	Petroleum / Gas, Processing / Storage Plant	x	
22	Photo / Film , Processing / Production	x	
23	Power / Steam Plant	x	
24	Public Swimming Pool	x	
25	Public Transportation Facility (Bus, Train Station,)	x	
26	Pulp and Paper Products Plant	x	
27	Wastewater Processing	x	
28	Water Front Facility & Industry	x	
	B. Building		
29	Apartment Building / Condo ³ , with a High Hazard potential ⁵ for backflow	x	
30	Apartment Building / Condo ³ , with a Low Hazard potential ⁴ for backflow		x
31	Auto Sales (no service)	x	
32	Auto Service / Repair / Dealership	x	
33	Barber /Beauty Salon, with a High Hazard potential ⁵ for backflow	x	
34	Barber /Beauty Salon, with a Low Hazard potential ⁴ for backflow		x
35	Church / Place of Worship	x	
36	Clinic / Doctor 's Office / Urgent Care	x	
37	Commercial Building, with a High Hazard potential ⁵ for Backflow	x	
38	Commercial Building, with a Low Hazard potential ⁴ for Backflow		x
39	Computer Sales / Service	x	
40	Food Service / Restaurant	x	
41	Hospital	x	
42	Hotel / Motel	x	
43	Laboratory	x	
44	Cemetery/ Funeral Home / Morgue / Mortuary	x	
45	Mixed Use building, with a High Hazard potential ⁵ for backflow	x	
46	Mixed Use building, with a Low Hazard potential ⁴ for backflow		x
47	Nursing Home	x	
48	Office Building with a High Hazard Potential ⁵ for backflow	x	
49	Office Building with a Low Hazard Potential ⁴ for backflow		x
50	Pet Services, Boarding and/or grooming	x	
51	Private home with dedicated fire service		x
52	Schools, Elementary / High	x	
53	Shopping Center / Mall / Strip	x	
54	Storage / Warehouse	x	
55	Unconfirmed	x	
56	University	x	
	C. Private Mains (See Appendix)		
57	Apartment Building / Condo ³ complex, with High Hazard potential ⁵ for backflow	x	
58	Apartment Building/ Condo ³ complex, with a Low Hazard potential ⁴ for backflow		x
59	Commercial Buildings Complex	x	
60	Industrial Complex	x	

61	Private Homes complex		x
62	Private Homes complex with high hazards	x	
	D. Fire System Description	RP¹	DC²
63	Fire system directly connected to City main (any type of building)	x	
64	Fire system with various chemical additives and/or auxiliary sources	x	
65	Fire connection on a metered domestic service		x
66	Fire connection on a metered domestic service with chemical additives and/or auxiliary sources	x	
67	RFSS with PWD determined backflow hazard		x
68	RFSS with PWD determined backflow hazard that includes chemical additives	x	

LEGEND:

- ¹ Reduced Pressure Assembly (RP)
- ² Double Check Assembly (DC).
- ³ Residence containing five or more housing units with a common water service line.
- ⁴ Facility that does not contain any of the high hazards listed below.
- ⁵ Facility that contains one or more of the high hazards listed below.

Examples of Systems with **high hazard** potential for the occurrence of backflow:

Sump systems, sewer ejecting or sewer connected systems, sewage pumping, swimming pools, wells, chilled-water, air conditioning systems equipped with cooling tower and circulation units, steam generation, boiler, built-in lawn sprinklers, heat exchanger or water treatment units (e.g. water softener). High-rise buildings (e.g., four floors or more), booster pumps, hydraulically operated equipment, water storage tanks, multi-purpose building (e.g. mall).

Residential Fire Sprinkler System (RFSS)

This system uses a single water service line from one ferrule connection to the water main to supply water to the domestic and sprinkler plumbing systems. The service line has a minimum size of ¾ - inch and a maximum size of 2-inch. Inside the building and after the meter, the water supply line may branch to separate sprinkler and domestic system lines (Branch System) or continue as one line that serves both the sprinkler and domestic water systems in a combined network system (Network System).

(Consult the L+I Code Bulletin 1001-R1 for details about RFSS installations).

4.4 Backflow Protection for Fire Protection Systems

4.4.1 Any fire sprinkler system, which is directly connected to the City main, shall be equipped with an approved DC assembly unless otherwise determined by PWD.

4.4.2 A fire protection service that contains private fire hydrants and that is metered shall be protected with an approved DC assembly unless otherwise determined by PWD.

4.4.3 Typical fire system containment drawings (A.7.1– A.7.5 in the Appendix) illustrate protection for different configurations. (*Note - These illustrations show typical layouts and do not supersede City Fire Code requirements. They MUST NOT be used for the installation of Fire Protection components*).

4.4.4 An approved RP assembly is required for sprinkler systems that constitute a significant backflow hazard or systems with a high potential for the occurrence of backflow. These include:

- Sprinkler systems which use foaming substances, antifreeze solutions or biostatic or chemical additives;
- Facilities which have auxiliary water sources (see Glossary) suitable for firefighting systems which are connected or available to the sprinkler systems.
- (Note: Facilities in which the fire Siamese connection is within 700 feet of a non-potable standing water source such as a pond, creek or river, must consult the Water Department regarding appropriate backflow protection.)

4.4.5 Limited area sprinkler systems serving fewer than twenty (20) sprinkler heads are permitted to be connected to the domestic service. Backflow protection will be consistent with the requirements for that domestic system. For details consult the current version of the *Philadelphia Fire Code*.

4.4.6 All new underground piping and lead-in connections on the inlet side of the listed backflow prevention device shall be cement lined ductile iron or copper pipe. Piping for the fire suppression system on the outlet side of the listed backflow prevention device may be of any material permitted by the appropriate installation standard referenced by the current version of the *Philadelphia Code*.

(Note: Consult the Philadelphia Fire Department for the usage of antifreeze or other chemical additives in wet systems and unheated rooms.)

4.5 Backflow Protection for Residential Fire Sprinkler System (RFSS) connections

Generally backflow preventers are not required in RFSS installations, unless required by PWD. However if the RFSS configuration necessitates the use of a backflow preventer a DC is required on the line leading to the sprinkler system. If chemical additives are present in the sprinkler system, an RP is required .

4.6 Backflow Protection for private mains

4.6.1 Separate domestic service and fire service lines

For new construction and the retrofit of service lines on existing systems, a containment device must be placed on the domestic service line just after the meter and on the fire service line as close to the City main as possible. For illustrations, see items A.6.1 and A.6.3 respectively in the Appendix.

4.6.2 Combined domestic and fire, service lines

For new construction and the retrofit of service lines on existing systems, a containment device must be placed on the common domestic and fire, service line just after the meter. For illustrations, see items A.6.2 and A.6.4 respectively in the Appendix.

5. APPROVED BACKFLOW PREVENTION ASSEMBLIES

All backflow prevention assemblies must be selected from the City's approved listing of Reduced Pressure (RP), Reduced Pressure Detector (RPD); Double Check (DC), and Double Check Detector (DCD) assemblies. This list is updated periodically with the modification, addition or deletion of backflow prevention assemblies. The approval process for these assemblies is based on the standards of the Foundation for Cross Connection Control and Hydraulic Research (FCCCHR) of the University of Southern California (USC). The current List of Approved Backflow Prevention Assemblies is separate from this manual and available on the Cross Connection Control Program webpage: www.phila.gov/water/cc.html

6. AIR-GAP SEPARATION (USING RECEIVING TANKS)

- 6.0.1** For a typical air gap separation installation, the receiving tank shall be installed within the building and on the domestic service line close to the meter. The supply line between the meter and the tank shall be permanently exposed for inspection purposes.
- 6.0.2** There shall be no outlet, tee, tap or connection of any kind to or from the supply pipe between the meter and the opening from which the water is discharged into the receiving tank.
- 6.0.3** The free flowing discharge point shall be located at a distance of not less than two times the diameter of the inlet pipe or one inch (whichever is greater) above the flood rim of the tank.
- 6.0.4** An air-gap separation must be installed by a City Certified Backflow Prevention Technician for Domestic Systems.

7. BACKFLOW PREVENTION ASSEMBLY INSTALLATION

Drawings in the Appendix illustrate the installation standards for air-gap separation, and mechanical backflow prevention devices. The same or similar methods as shown should be used. A City Certified Backflow Prevention Technician for Domestic Systems or a City Certified Backflow Prevention Technician for Fire Suppression Systems , depending on the type of system MUST do all work. (Note: See Chapter 9 for information on how to become a City Certified Backflow Prevention Technician)

- 7.0.1 Prior to the installation of any backflow prevention (bfp) assembly, except a replacement, the City Certified Backflow Prevention Technician for Domestic Systems or Fire Suppression Systems must apply for a permit and submit drawings to L+I offices for approval. Any alternate configurations must obtain written approval from the IWBC Unit of PWD.
- 7.0.2 Prior to the installation of any containment bfp assembly, the City Certified Backflow Prevention Technician for Domestic Systems or Fire Suppression Systems may need to caution the owners of certain facilities that the installation of a backflow prevention assembly may create a closed system, thereby creating the potential for thermal expansion pressure build-up.
- 7.0.3 Prior to installation, bfp assemblies **must** be selected from the current City-approved listing maintained by PWD. Any unapproved backflow prevention assembly on any water service line will be removed and replaced with a City approved assembly.
- 7.0.4 Prior to installation, the water line shall be thoroughly flushed to expel all debris. Debris lodging under one of the check valves of an RP is a common cause of malfunctioning.
- 7.0.5 No bfp assembly shall be installed creating a safety hazard (i.e. installed over an electrical panel, steam lines, boilers, or within a ceiling).

7.1 **General installation requirements**

All bfp assemblies shall be installed in a **HORIZONTAL ORIENTATION**, unless stated otherwise in the City's latest approved listing, and in accordance with the manufacturer's specifications and the following instructions:

- 7.1.1 The bfp assembly shall be maintained as a unit. The bfp assembly shall be equipped with proper shutoff valves, *attached to the device*, for maintenance and testing. Shutoff valves shall be of the types that are supplied by the same backflow preventer manufacturer or the type that are approved or manufactured to conform to standards set by USC. Approved assemblies will be shipped from the manufacturer with shutoff valves and test cocks. The assembly shall not be approved without proper shutoff valves and test cocks.
- 7.1.2 When a meter is not present, there shall be no outlet, tee, tap or connection of any kind on the supply pipe between the meter and the bfp assembly or between the connection to the water main and the bfp assembly. If a takeoff is necessary, it must be equipped with a **PWD approved bfp assembly**.
- 7.1.3 There shall be no tee, tap, or connection to any of the shutoff valves on a bfp assembly.
- 7.1.4 For domestic systems, when the bfp assembly is installed within the building on the service line, it shall be located after but close to the meter. If the meter is located outdoors, the bfp assembly must be within 100 ft. of pipe run of the meter. If the bfp assembly must be placed outdoors it shall be protected from freezing, flooding and vandalism. The assembly must be accessible for routine testing and maintenance.
- 7.1.5 For new fire systems the bfp assembly must be located as close to the water main as possible. The distance between the bfp assembly and the water main shall not exceed 100 ft. of pipe run . For existing fire systems, the bfp assembly must be as close as possible to the point of entry of the

service into the building.

7.1.6 In some facilities, bfp assemblies installed in parallel on a service line may be necessary to meet the needs of the facility:

- 1)** If a facility requires continuous uninterrupted service and it is not possible or practical to provide water service from two separate service lines into the premises, provisions must be made for the installation of two backflow prevention assemblies in parallel.
- 2)** Installing parallel assemblies may be required when the water service line to be protected is greater than 10" in diameter.
- 3)** If a parallel or by-pass installation is desired, both lines shall be equipped with two same-type backflow prevention assemblies. The combined hydraulic capacity of the parallel lines/devices shall be equal to or greater than that of the line that is being subdivided. Closed gate valves on the bypass do not constitute protection.

7.1.7 Where siting problems prevent installation as specified in Sections 7.1.2 - 7.1.6, PWD may approve an alternate installation provided that a written request is submitted to the IWBC Unit. All alternative installations must provide at least the same level of backflow protection as the standard installation.

7.2 *Specific installation requirements*

7.2.1 **Indoor Installations**

(a) A bfp assembly must be installed on the suction side of any booster pump and ahead of any storage tanks or other equipment that may be connected to the service line inside the building.

(b) There shall be no outlet, tee, tap or connection of any kind on the supply pipe between the meter and the bfp assembly or between the connection to the water main and the bfp assembly, when a meter is not present. If a takeoff is necessary, it must be equipped with **a PWD approved bfp assembly**.

(c) When a bfp assembly is located inside a building, there must be a suitable means of address any discharge without creating a safety hazard or a nuisance problem. If an RP is to be installed, measures must be taken to provide drainage for the relief-valve port. An RP will spill or discharge water under some normal and most abnormal operating conditions. There must be a fixed air gap between the relief port and the drain.

(d) A bfp assembly must be installed at a minimum of 12 inches from the floor to the lowest part of the device; at a maximum of 5 feet from the floor to the highest part of the device and at a minimum of 12 inches from the nearest wall. See the Appendix for illustrations.

7.2.2 Outdoor Installations

(a) RP Installation

An RP must be installed above ground with a minimum 12" clearance (the distance between the ground level and the bottom of the assembly) so that it will not become submerged and can drain freely from the atmospheric port, (See Drawings A.4.7, A.4.8 and A.4.9 in the Appendix). An on-site constructed or pre-manufactured enclosure must be installed to provide additional protection against freezing and vandalism, (See Drawings A.5.1 and A.5.2 in the Appendix).

(b) DC Installation

A DC should be installed above ground, (See Drawings A.3.9, A.3.10 and A.3.11 in the Appendix). However, if a DC needs to be installed below ground level it must be located in a pit (vault) or chamber that is designed to prevent flooding, (See Drawing A.3.8). If the installation is made in a pit with a meter, the Designer shall follow PWD's Meter Installation Standards which are separate from this manual and available from the Meter Shop.

All bfp assembly installations in pits or chambers must adhere to the following provisions:

- (i) There shall be no outlet, tee, tap or connection of any kind to or from the supply line between the meter and the bfp assembly or between the water main and the assembly when a meter is not present.
- (ii) The assembly shall be protected against freezing and must be accessible for routine testing and maintenance.
- (iii) If a drain in the pit or chamber is absolutely necessary there shall be no connection between the drain and a sewer or appurtenance that permits the passage of polluted water into the pit or chamber.
- (iv) The pit shall be maintained free of standing water so the DC is not submerged.

8. BACKFLOW PREVENTION ASSEMBLY TESTING AND MAINTENANCE

All containment backflow prevention assemblies shall be tested and maintained to ensure continued reliability.

8.1 Backflow Prevention Assembly Testing in Philadelphia

8.1.1

Only a City Certified Backflow Prevention Technician for Domestic Systems shall perform testing of a backflow prevention assembly on a domestic service. Only a City Certified Backflow Prevention Technician for Fire Suppression Systems shall perform testing of a backflow prevention assembly on a fire service. (Note: See Chapter 9 for information on how to become a City Certified Backflow Prevention Technician.) These certified individuals are trained and competent in this specialized area. An updated listing of the City certified technicians is available on the Department's webpage: www.phila.gov/water/ccp.html

8.1.2

Tests of every backflow prevention assembly shall be conducted immediately upon installation, immediately after each repair and annually thereafter.

8.1.3

For each backflow prevention assembly test, the respective City Certified Backflow Prevention Technician must document the testing of each assembly, providing pertinent test data and any repairs that were made, on a Backflow Prevention Assembly Test and Maintenance Record (Form 79-770). City Certified Backflow Prevention Technicians must sign the completed Backflow Prevention Assembly Test and Maintenance Record and send it to the IWBC Unit within 48 hours of completion.

8.1.4

All assemblies failing to meet the PWD's performance standards (see Testing Procedures Section 8.1.6) shall be repaired or replaced and retested within fourteen (14) days from the initial test.

8.1.5

Test kits used to test backflow prevention assemblies shall be calibrated annually. Calibration information must be included on all test reports.

8.1.6

Acceptable test procedures for backflow assemblies include:

- Mid-West Instruments Bulletin Nos., 835, 845-5, 847-5RP2013.
- ASSE series 1000 Test Procedure Nos., 1013, 1015, 1020, 1047, 1048, 1056.
- NEWWA Test Procedures.

Procedures are also acceptable from Test Kit manufacturers including:

- Apollo/Conbraco, Barton/Cameron, Duke (Bravo), Dwyer Instruments, Febco, Gage-It, King, Watts and Wilkins.

8.2 Backflow Prevention Assembly Maintenance

8.2.1 Maintenance of Backflow Prevention Assemblies on Domestic Systems

- All maintenance on a backflow assembly on a domestic service must be performed by a City Certified Backflow Prevention Technician for Domestic Systems or by a trained backflow technician working under the supervision of a City Certified Backflow Prevention Technician for Domestic Systems. (Note: See Chapter 9 for information on how to become a City Certified Backflow Prevention Technician for Domestic Systems)
- All containment backflow prevention assemblies on domestic services shall be maintained to ensure continued reliability.
- City Certified Backflow Prevention Technicians for Domestic Systems must document any repairs made to the backflow prevention assemblies on the Backflow Prevention Assembly Test and Maintenance Record (Form 79-770). The City Certified Backflow Prevention Technician must sign the completed Backflow Prevention Assembly Test and Maintenance Record and send it to the IWBC Unit within 72 hours of completion.

8.2.2 Maintenance of Backflow Prevention Assemblies on Fire Systems

- All maintenance on a backflow prevention assembly on a fire service must be performed by a City Certified Backflow Prevention Technician for Fire Suppression Systems or by a trained backflow technician working under the supervision of a City Certified Backflow Prevention Technician for Fire Suppression Systems. (Note: See Chapter 9 for information on how to become a City Certified Backflow Prevention Technician)
- All containment backflow prevention assemblies on domestic services shall be maintained to ensure continued reliability.
- City Certified Backflow Prevention Technicians for Fire Suppression Systems must document any repairs made to the backflow prevention assemblies on the Backflow Prevention Assembly Test and Maintenance Record (Form 79-770). The City Certified Backflow Prevention Technician must sign the completed Backflow Prevention Assembly Test and Maintenance Record and send it to the IWBC Unit within 72 hours of completion.

9. CITY CERTIFIED BACKFLOW PREVENTION TECHNICIAN

All work – installation, testing, repair and maintenance – on backflow prevention assemblies on a domestic service line must be performed by a City Certified Backflow Prevention Technician for Domestic Systems. All work – installation, testing, repair and maintenance – on backflow prevention assemblies on a fire service line must be performed by a City Certified Backflow Prevention Technician for Fire Suppression Systems.

9.1 How to become a City Certified Backflow Prevention Technician

9.1.1 What is a City Certified Backflow Prevention Technician?

A City-licensed Registered Master Plumber (RMP) or Fire Suppression Contractor (FSC) who is certified for installation, servicing and testing of backflow prevention devices, and is registered with PWD's IWBC Unit.

9.1.2 What are the types of City Certified Backflow Prevention Technicians?

There are two (2) types of technicians:

City Certified Backflow Prevention Technician for Domestic Systems

City Certified Backflow Prevention Technician for Fire Suppression Systems

9.1.3 Requirements for City Backflow Prevention Technician Certification

- **9.1.3.1 Requirements to become a City Certified Backflow Prevention Technician for Domestic Systems:**
 - Must have a license as a Registered Master Plumber (RMP) issued by the Department of Licenses & Inspections.
 - Must successfully complete a four (4) day training by NEWWA or ASSE (testing is part of the training)
 - Must register by submitting Certified Backflow Assembly Technician Registration Form (CR100) to the IWBC Unit (see website and submission information below).

- **9.1.3.2 Requirements to become a City Certified Backflow Prevention Technician for Fire Suppression Systems:**
 - Must have a license as a Fire Suppression Systems Contractor (FSC) issued by the Department of Licenses & Inspections and possess a Department of Licenses & Inspections Fire Suppression Systems Cert I, II or III.
 - Must successfully complete a four (4) day training by NEWWA or ASSE (testing is part of the training)
 - Must register by submitting Certified Backflow Assembly Technician Registration Form (CR100) to the IWBC Unit (see website and submission information below).below

9.1.4. Where to get the CR-100 Form?

Go to <http://www.phila.gov/water/ccf.html> and click on “Backflow Prevention Forms”

9.1.5 Where to submit the CR-100 Form?

E-mail to: ccc.bls@phila.gov Fax to: (215) 333-9453

Mail to: Backflow Compliance
IWBC Unit
Baxter Water Treatment Plant
9001 State Road,
Philadelphia, PA 19107

9.2 Backflow prevention licensing and training

9.2.1 Master Plumber and Fire Suppression System Licenses

To obtain licenses visit the Department of Licenses & Inspection in person or online.

Address for Department of Licenses & Inspection

Municipal Services Building - Public Service Concourse
1401 John F. Kennedy Boulevard
Philadelphia, PA 19102

9.2.2 Backflow Prevention Training

PWD recognizes the following two agencies:

New England Water Works Association (NEWWA)
Philadelphia training location available
For questions call: (508) 893-7979
<http://www.newwa.org>

American Society of Sanitary Engineering (ASSE)
Philadelphia training locations available
For questions call: (708) 479-6139
<http://www.asse-plumbing.org/>

9.3 City Certified Backflow Prevention Technician Responsibilities in Philadelphia

1. **OBTAIN PERMIT**

Complete Permit Form CP-100 for the installation of any new backflow assembly. A device installed without a permit will be considered unauthorized.

2. **INSTALLATION**

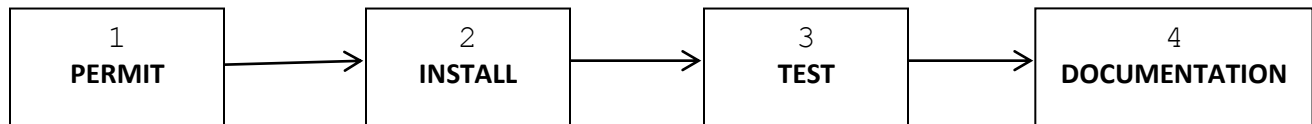
Carry out work in accordance with the Installation Requirements in Chapter 7.

3. **TESTING**

Select from the list of acceptable procedures shown in Section 8.4.5 above and use as guidance for carrying out backflow assembly testing. Any replacement parts must be equal in quality to the parts originally supplied by the manufacturer.

4. **DOCUMENTATION**

Complete and sign Form 79-770 and send the original of the test form to the IWBC Unit within 48 hours of completion of the work. Send a copy of the completed test form to the customer.



APPENDIX

Drawings of typical backflow protection installations

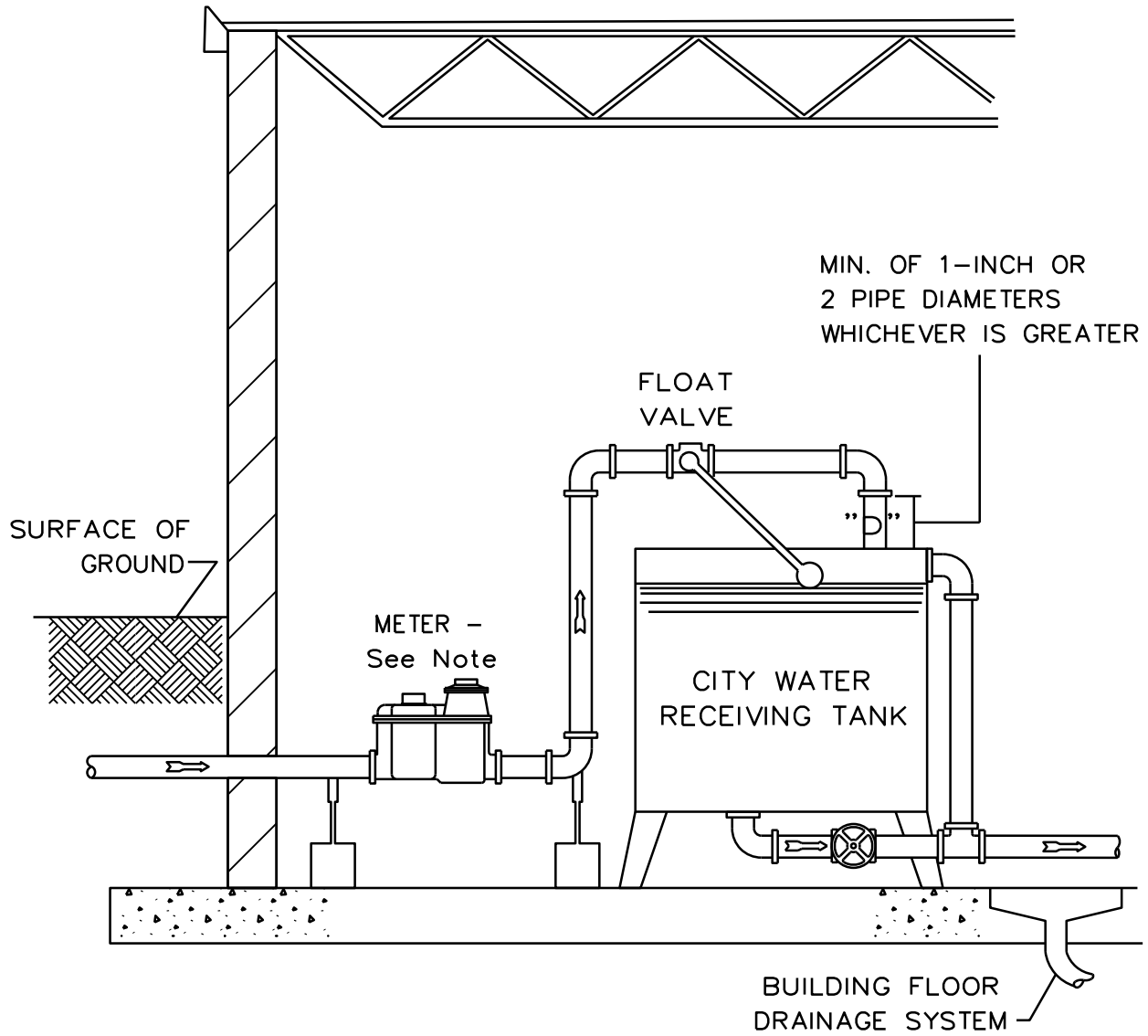
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GENERAL NOTES FOR BACKFLOW ASSEMBLY INSTALLATION

- 1) Backflow prevention assemblies shall generally be located within the building, after but close to the water meter. In certain instances the device may be installed at an alternate location such as in an outdoor enclosure or in an outdoor enclosure or in an underground vault. An outdoor RP must always be installed above ground, whereas a DC may be installed below ground level in a vault designed to prevent flooding.
- 2) All backflow prevention assemblies when located outdoors above ground must be adequately protected from freezing, flooding and vandalism. Also, there must be adequate access provided for testing and maintenance.
outdoor enclosure or in an underground vault. An outdoor RP must always be installed above ground, whereas a DC may be installed below ground level in a vault designed to prevent flooding.
- 3) Backflow prevention assemblies shall be installed in the horizontal position only, unless the assemblies are approved for vertical installation as per the listing of Approved Backflow Prevention Assemblies.
- 4) Backflow prevention assemblies shall be equipped with approved shutoff valves attached to the device. The use of unapproved shutoff valves is not permitted. Also, the installation of a strainer before the device is strongly recommended to minimize mechanical damage.
- 5) When parallel or bypass installation of backflow assemblies is necessary, both lines shall be equipped with similar types of assemblies.
- 6) For the design and installation requirements of meter pits to house backflow assemblies when placed below ground outdoors, refer to the Philadelphia's Water Meter Pit Standards which is separate from this manual. The Meter Division can be contacted at the address shown in the Contact page at the beginning of this manual.

GENERAL NOTES



TYPICAL BUILDING SECTION

NOTE:

This does NOT represent actual meter installation. Refer to latest Philadelphia Water, Meter Installation standards.

INDOOR INSTALLATION



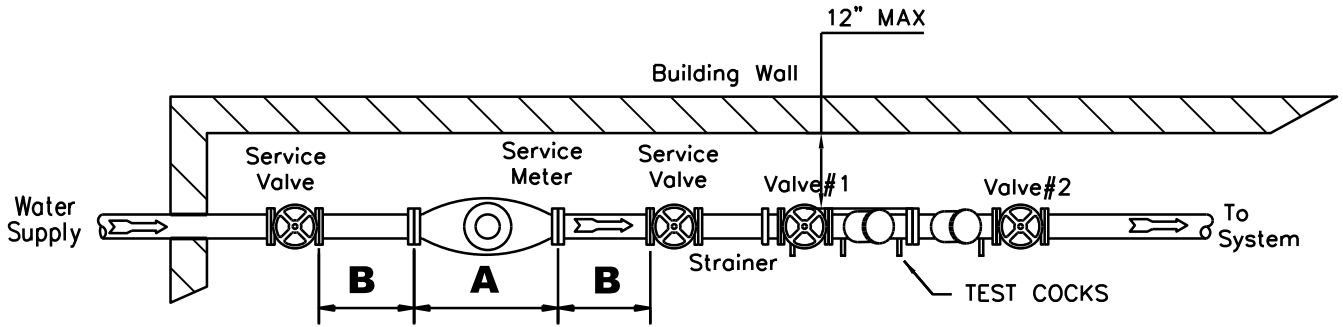
AIR-GAP SEPARATION

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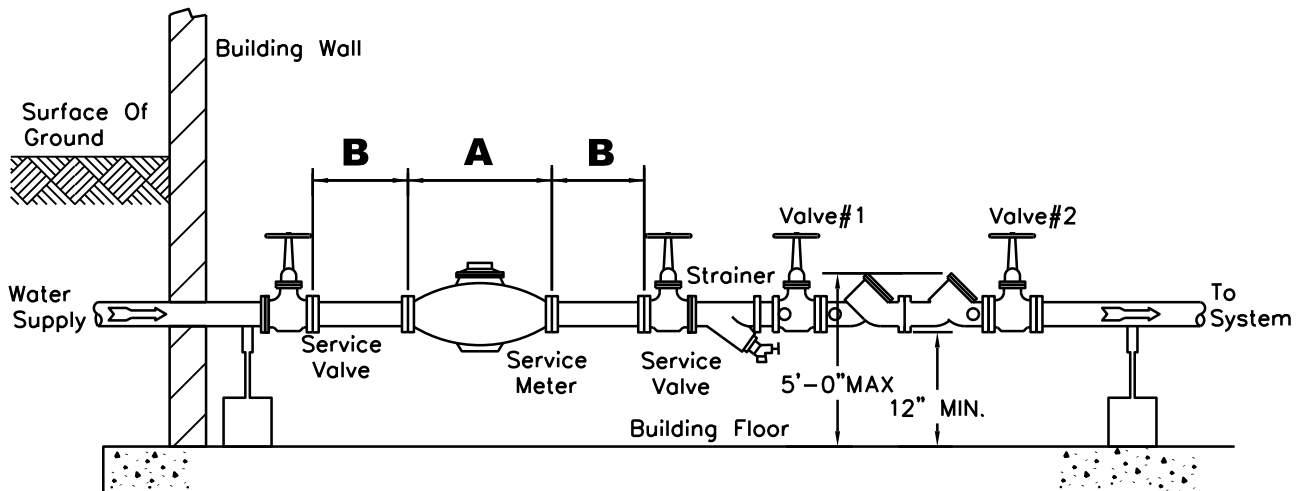
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Plan View



Elevation View

DIMENSION	PIPE SIZE	
		1½"
A	1'-1"	1'-5"
B	1'-0"	1'-4"

NOTE:

Backflow Preventers to be set a minimum of 12 inches from the floor to the lowest part of the device; a maximum of 5 feet from the floor to the top of the device and a minimum of 12 inches from any wall.

FOR N.R.S. OR O.S.& Y.
RESILIENT SEATED VALVE TYPES

INDOOR INSTALLATION
(Pipe sizes less than 3")



DC INSTALLATION

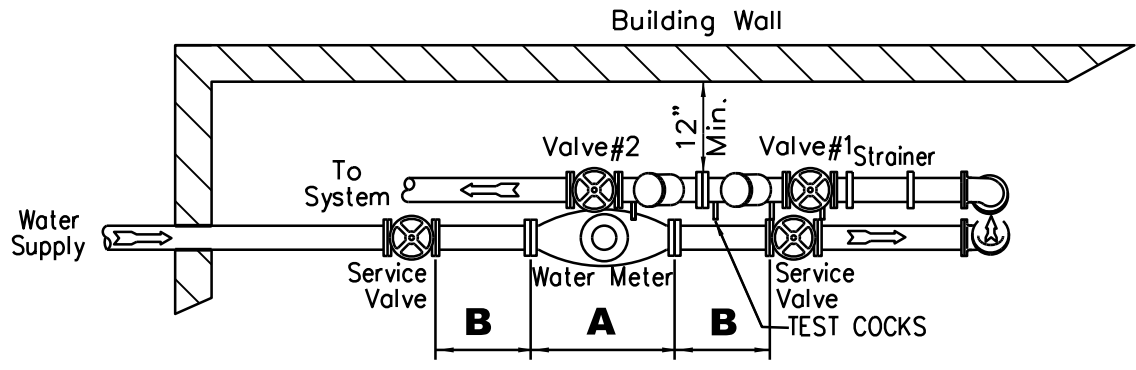
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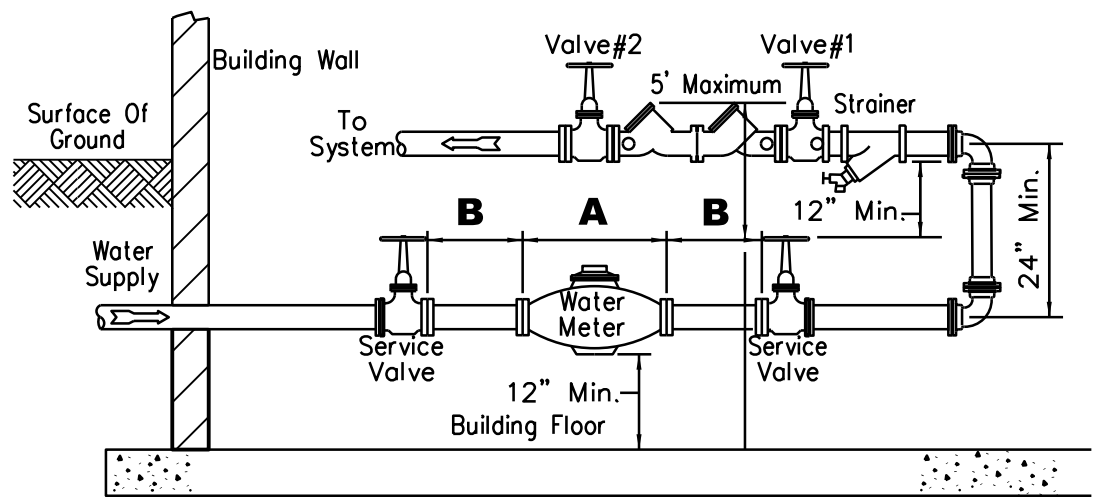
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Plan View



Elevation View

DIMENSION	PIPE SIZE	
		1 1/2"
A	1'-1"	1'-5"
B	1'-0"	1'-4"

NOTE:

Backflow Preventers to be set a minimum of 12 inches from the floor to the lowest part of the device; a maximum of 5 feet from the floor to the top of the device and a minimum of 12 inches from any wall.

FOR N.R.S. OR O.S.& Y.
RESILIENT SEATED VALVE TYPES

ALTERNATE INDOOR INSTALLATION
(Pipe sizes less than 3")

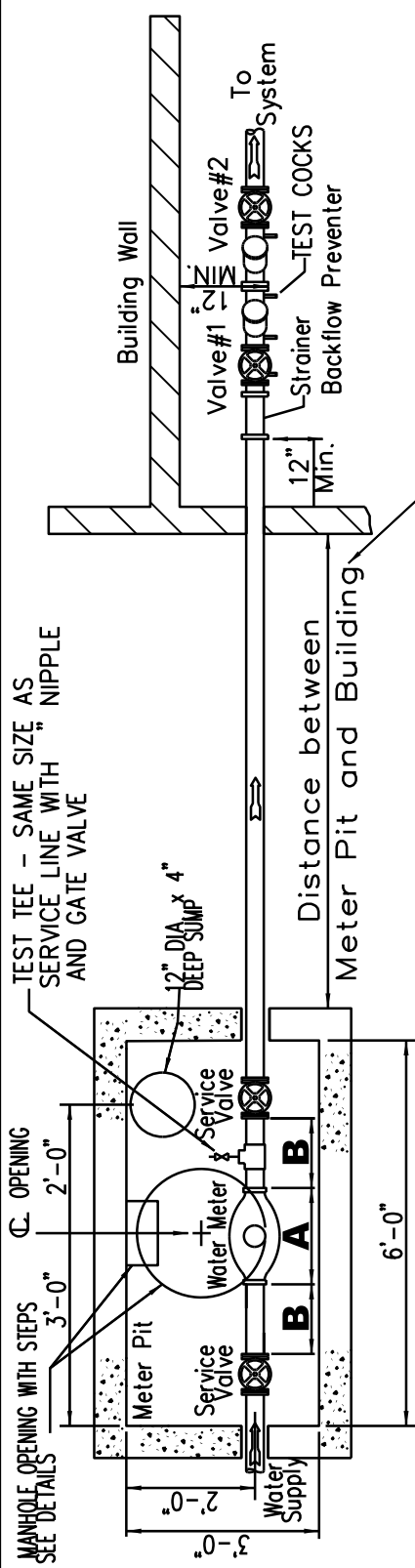


DC INSTALLATION

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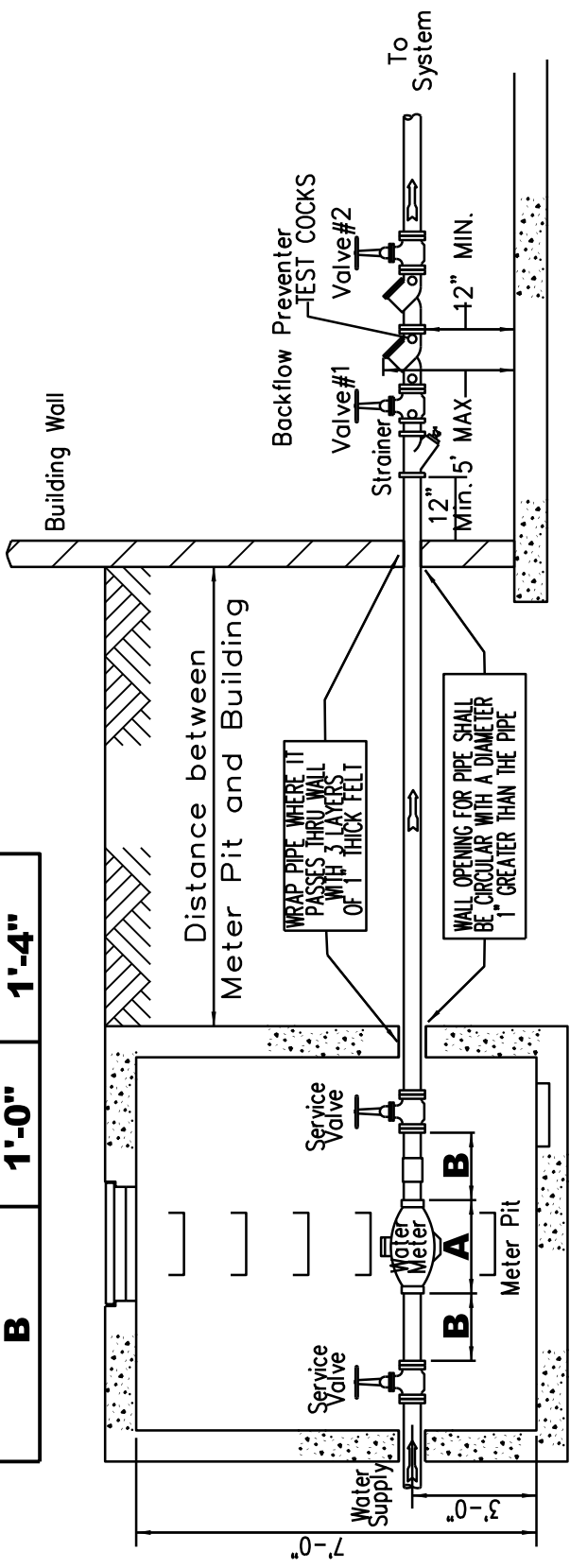
Elevation View



Plan View

NOTE: This distance must be approved by the Backflow Compliance Unit.

	PIPE SIZE	
DIMENSION	1 1/2"	2"
	A	1'-5"
B	1'-0"	1'-4"



FOR N.R.S. OR O.S.& Y.
RESILIENT SEATED VALVE TYPES

ALTERNATE INDOOR INSTALLATION (2)
(Pipe sizes less than 3")

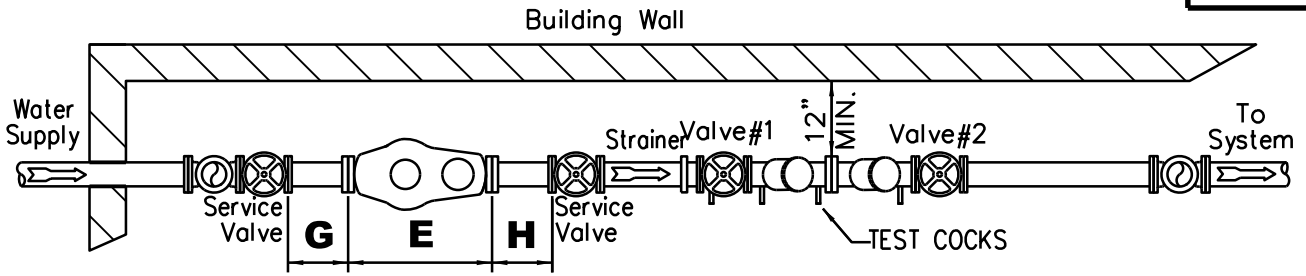


DC INSTALLATION

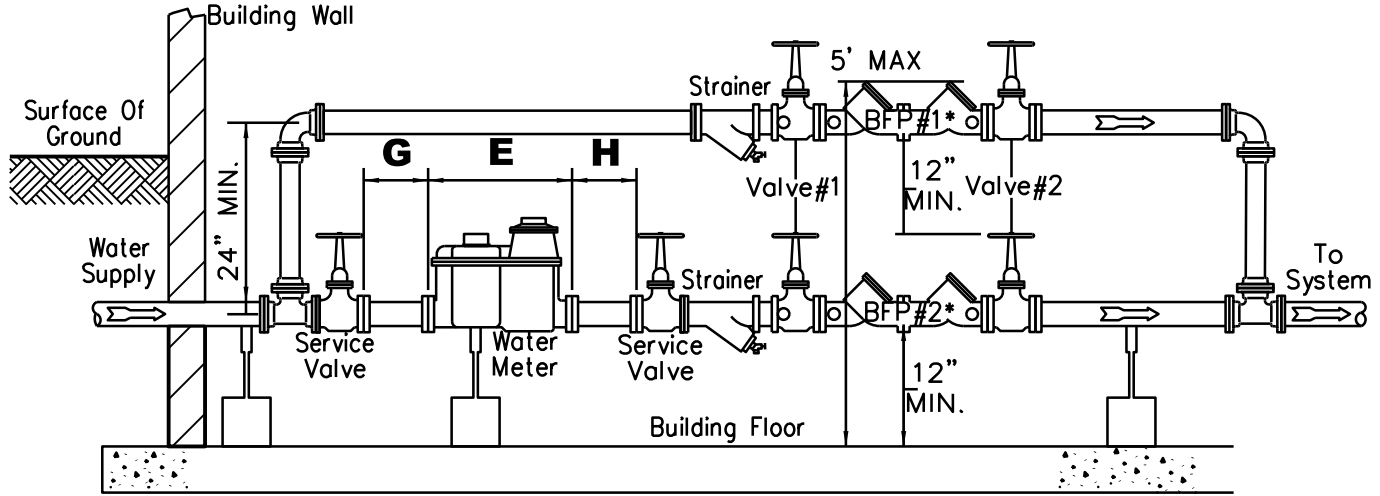
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Plan View



Elevation View

DIMENSION	PIPE SIZE				
	3"	4"	6"	8"	10"
E	2'-0"	2'-5"	3'-1"	4'-5"	5'-8 ³ / ₄ "
G	1'-6"	2'-0"	2'-6"	3'-6"	2'-6"
H	1'-0"	1'-6"	1'-6"	2'-0"	2'-6"

NOTE:

Backflow Preventers to be set a minimum of 12 inches from the floor to the lowest part of the device; a maximum of 5 feet from the floor to the top of the device and a minimum of 12 inches from any wall.

FOR N.R.S. OR O.S.& Y.
RESILIENT SEATED VALVE TYPES

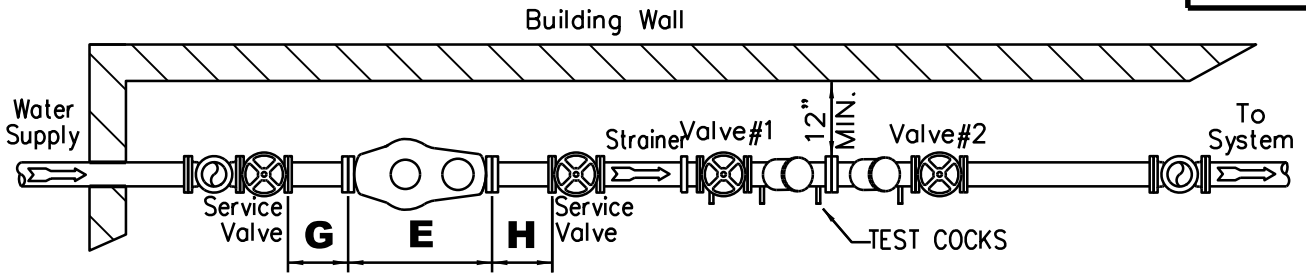
INDOOR INSTALLATION
(Pipe sizes 3" or greater)



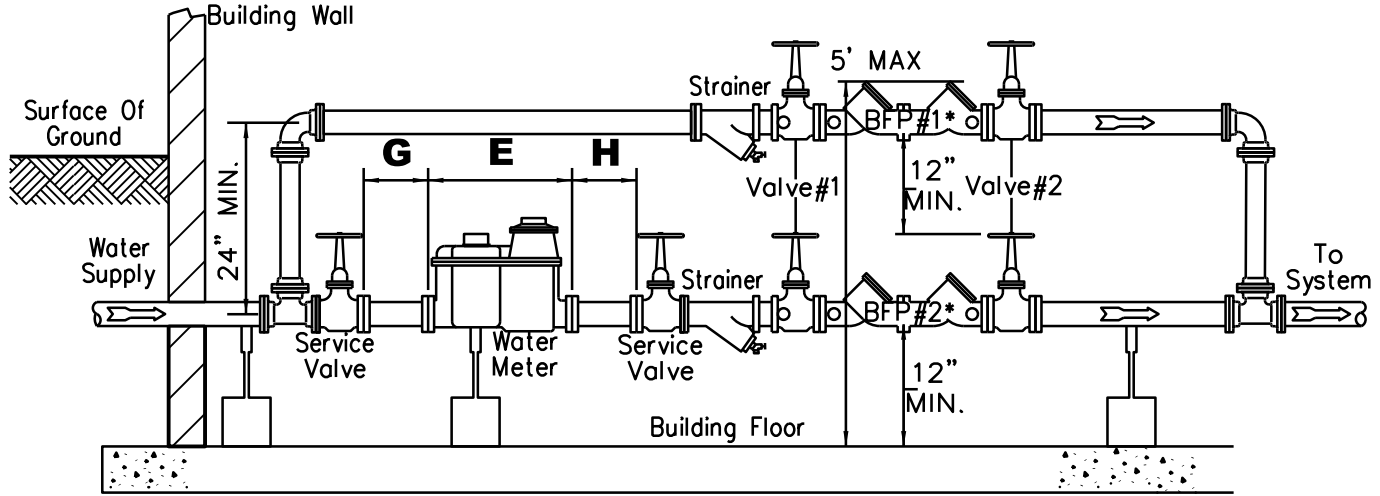
DC INSTALLATION

(DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLY)

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Plan View



Elevation View

NOTE: This alternate installation requires prior approval from the Meter Division.

DIMENSION	PIPE SIZE				
	3"	4"	6"	8"	10"
E	2'-0"	2'-5"	3'-1"	4'-5"	5'-8 ³ / ₄ "
G	1'-6"	2'-0"	2'-6"	3'-6"	2'-6"
H	1'-0"	1'-6"	1'-6"	2'-0"	2'-6"

NOTE:

Backflow Preventers to be set a minimum of 12 inches from the floor to the lowest part of the device; a maximum of 5 feet from the floor to the top of the device and a minimum of 12 inches from any wall.

FOR N.R.S. OR O.S. & Y.
RESILIENT SEATED VALVE TYPES

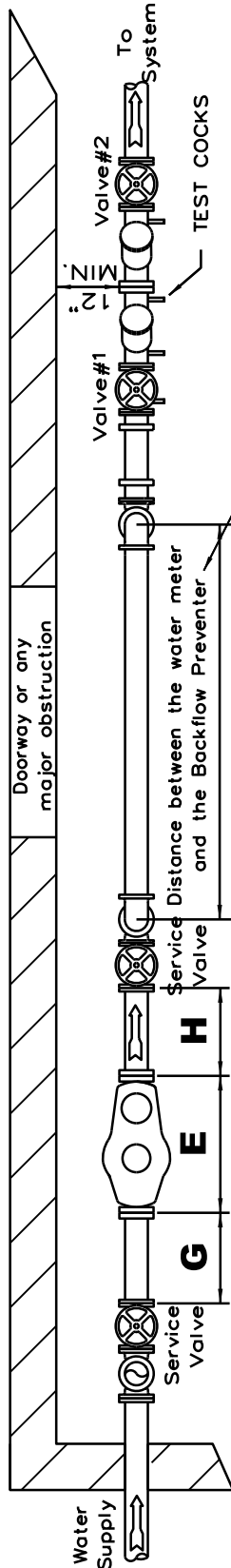
ALTERNATE INDOOR INSTALLATION (1)
(Pipe sizes 3" or greater)



DC INSTALLATION

(DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLY)

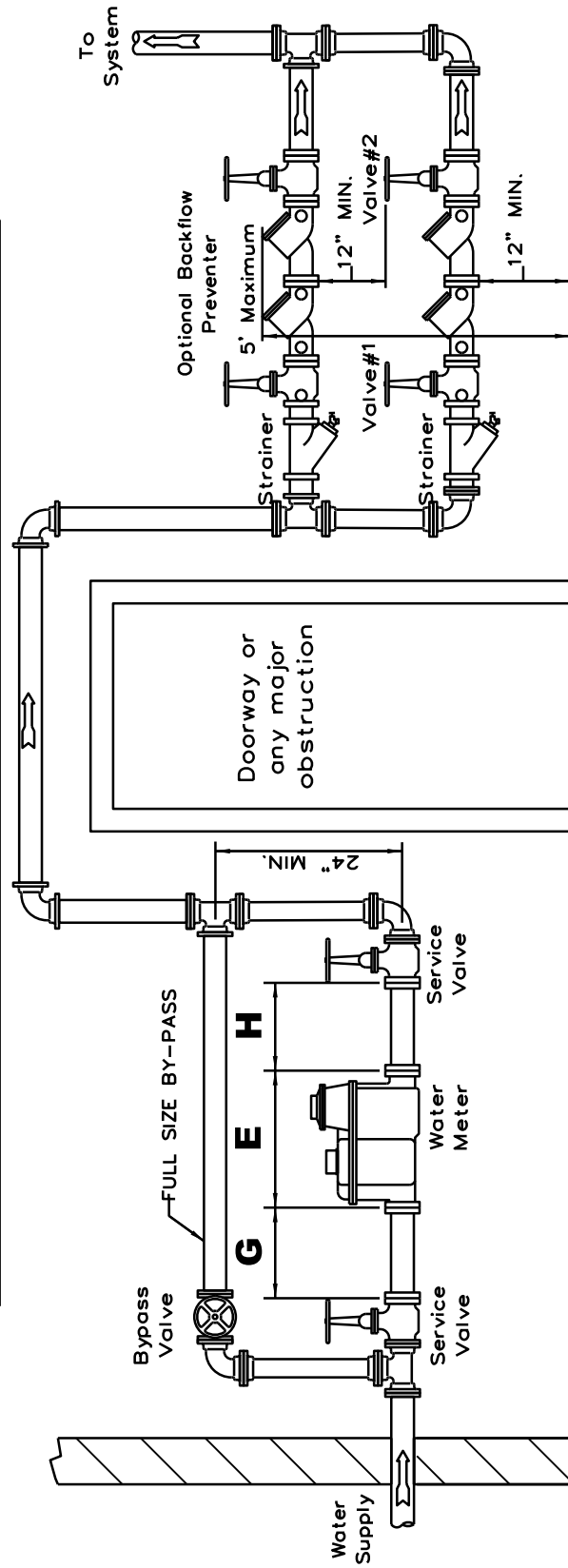
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NOTE: This distance must be approved by the Backflow Compliance Unit.

Plan View

DIMENSION	PIPE SIZE			
	3"	4"	6"	8"
E	2'-0"	2'-5"	3'-1"	4'-5"
G	1'-6"	2'-0"	2'-6"	3'-6"
H	1'-0"	1'-6"	1'-6"	2'-0"
				10"
				5'-8 ³ / ₄ "
				2'-6"
				2'-6"



Elevation View

FOR N.R.S. OR O.S.& Y.
RESILIENT SEATED VALVE TYPES

ALTERNATE INDOOR INSTALLATION (2)
(Pipe sizes 3" or greater)

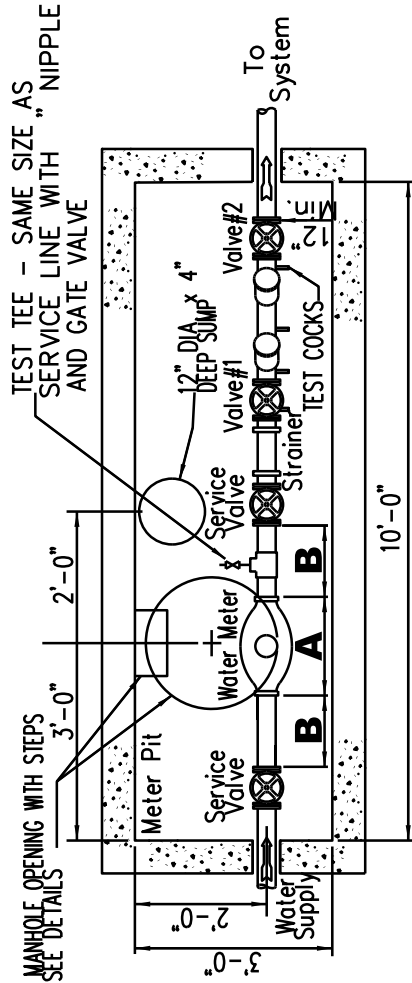


DC INSTALLATION

(DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLY)

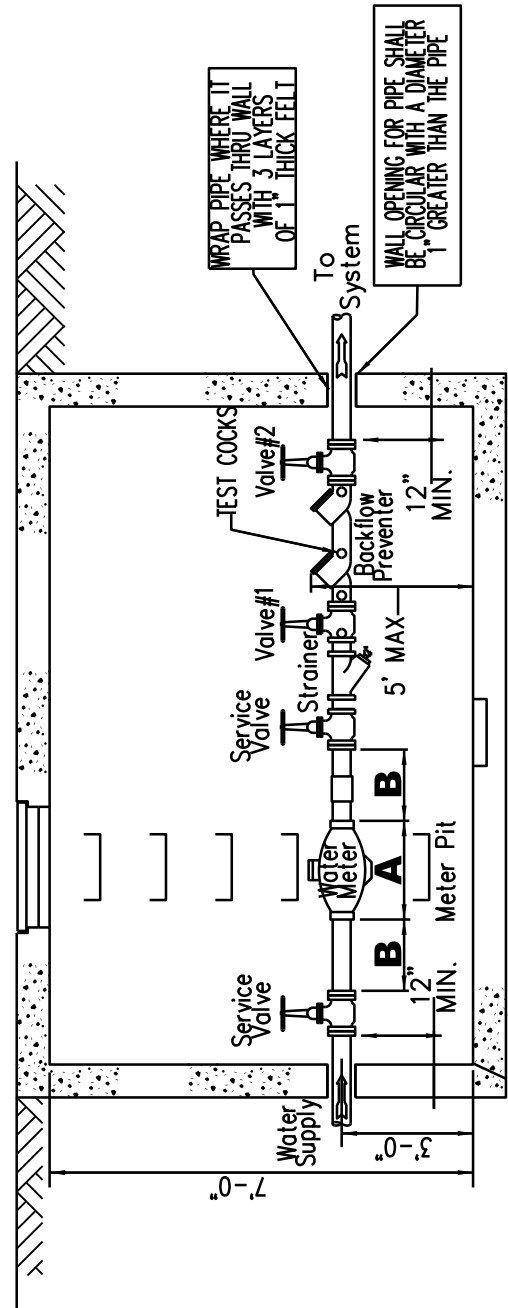
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Plan View

DIMENSION	PIPE SIZE
A	1 1/2" 2"
B	1'-1" 1'-5"
B	1'-0" 1'-4"



Elevation View

NOTE:

Backflow Preventers to be set a minimum of 12 inches from the floor to the lowest part of the device; a maximum of 5 feet from the floor to the top of the device and a minimum of 12 inches from any wall.

FOR N.R.S. OR O.S. & Y.
RESILIENT SEATED VALVE TYPES

OUTDOOR INSTALLATION
(Pipe sizes less than 3")



DC INSTALLATION

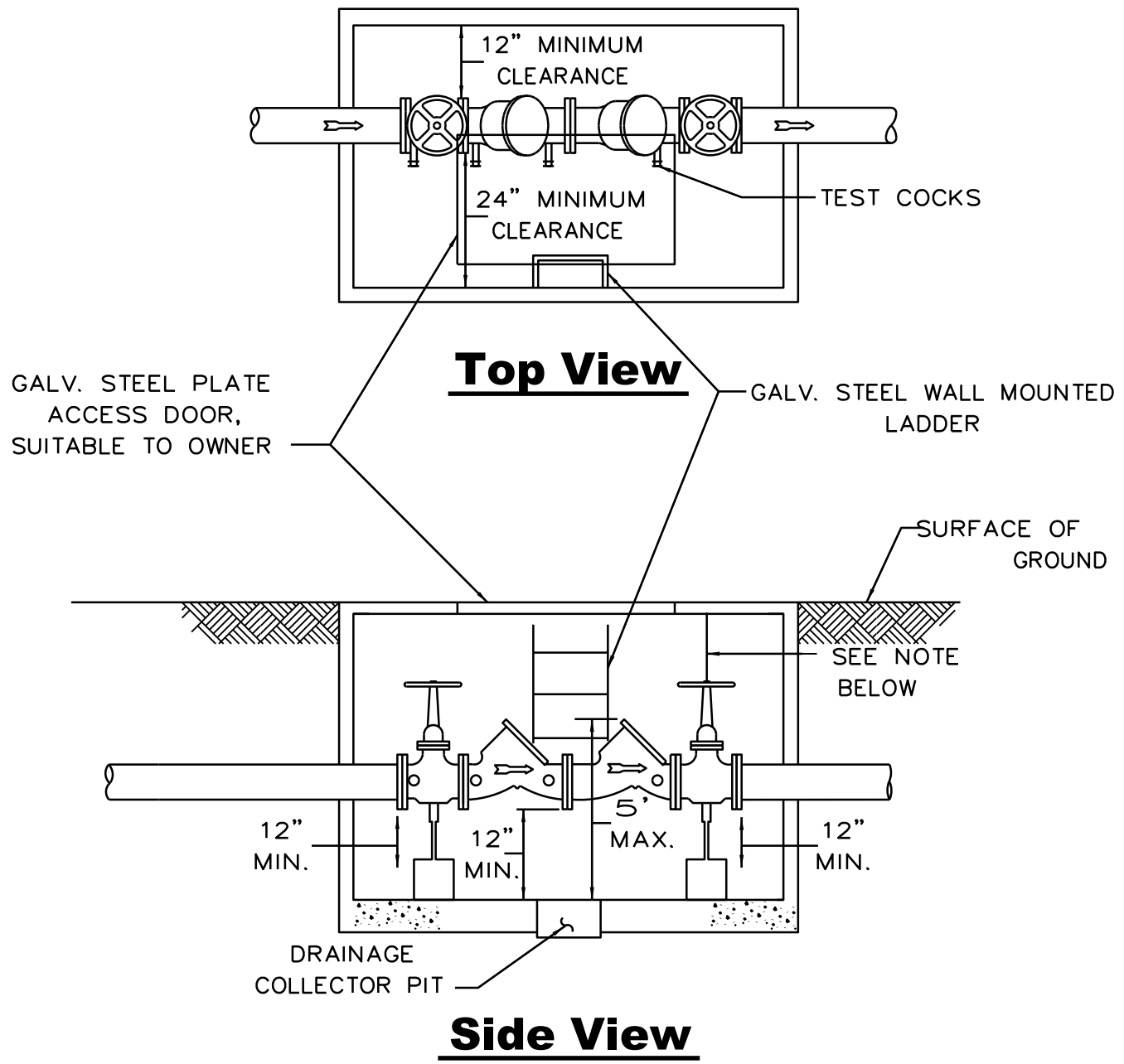
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NOTE: VALVE HEADROOM REQUIREMENTS:
 N.R.S. - 12" MIN. TO TOP OF WHEEL.
 O.S. & Y. - 3" MIN. TO TOP OF FULLY EXTENDED STEM.

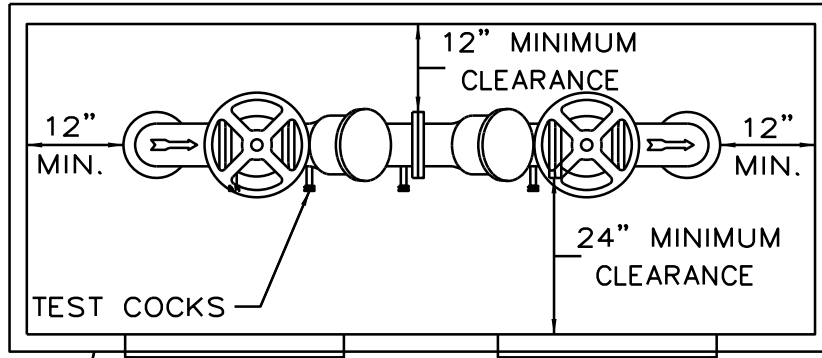
FOR N.R.S. OR O.S. & Y.
 RESILIENT SEATED VALVE TYPES

OUTDOOR INSTALLATION
 BELOW GROUND

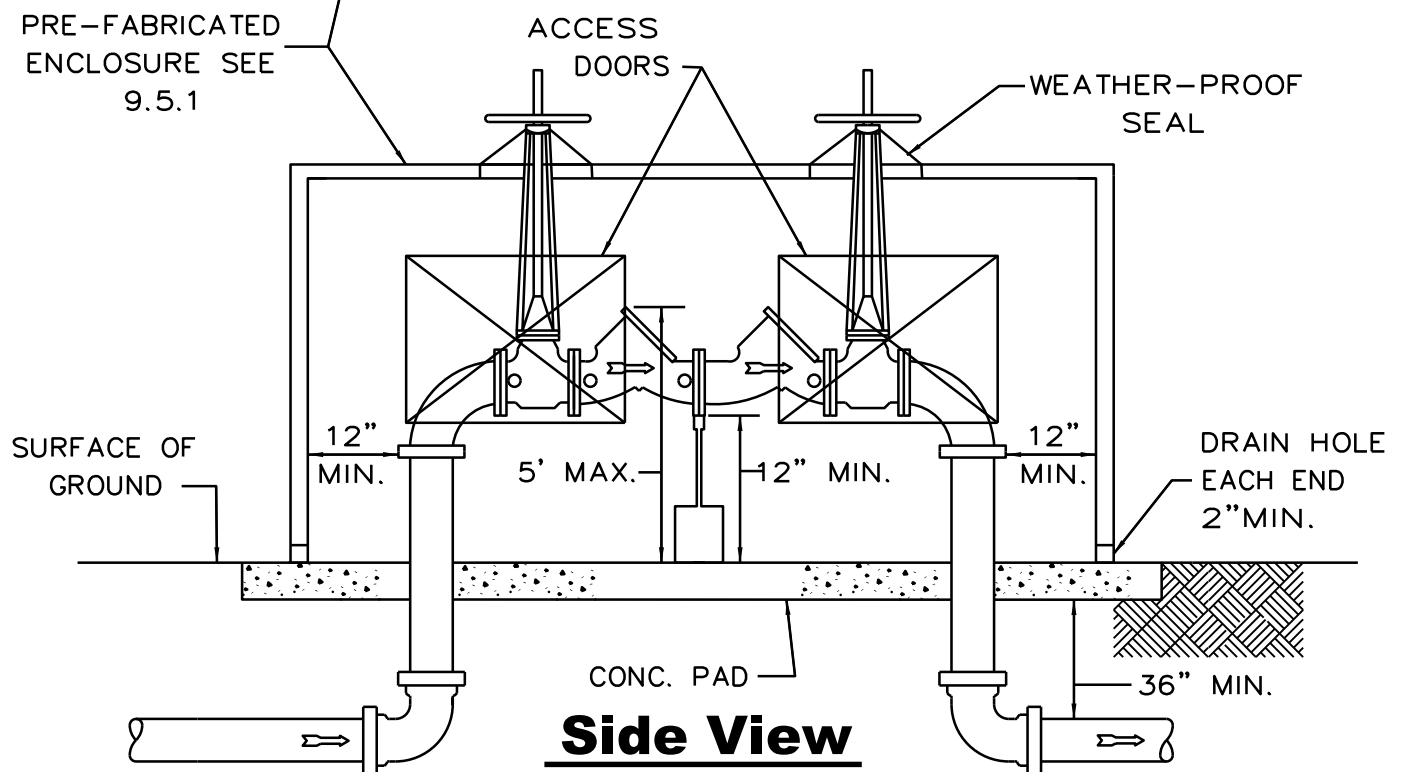


DC INSTALLATION
 (DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLY)

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Top View



Side View

MINIMUM SIDEWALL CLEARANCE REQUIRED ONLY IF THE ENCLOSURE IS DESIGNED FOR PERSONNEL ENTRY, OTHERWISE, ENCLOSURE SHALL HAVE ACCESS DOORS FOR ROUTINE TESTING AND A REMOVABLE COVER AS SHOWN ABOVE.

FOR O.S.& Y. RESILIENT SEATED VALVE TYPES

OUTDOOR INSTALLATION (1) ABOVE GROUND



DC INSTALLATION

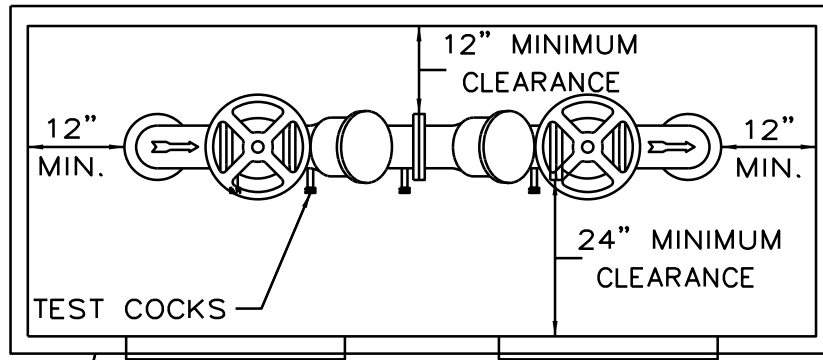
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DATE: Jan. 2016

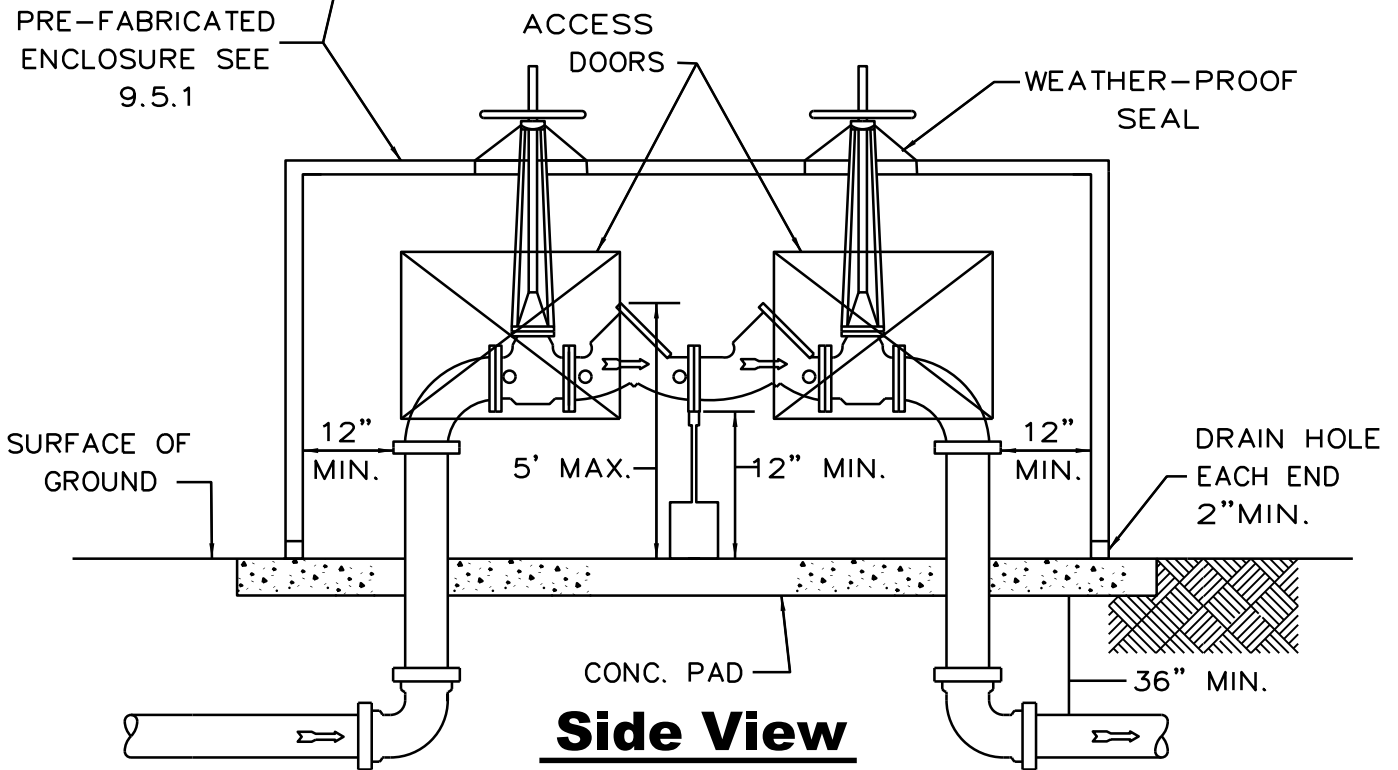
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Top View

PRE-FABRICATED ENCLOSURE SEE 9.5.1



Side View

MINIMUM SIDEWALL CLEARANCE REQUIRED ONLY IF THE ENCLOSURE IS DESIGNED FOR PERSONNEL ENTRY, OTHERWISE, ENCLOSURE SHALL HAVE ACCESS DOORS FOR ROUTINE TESTING AND A REMOVABLE COVER AS SHOWN ABOVE.

FOR N.R.S. RESILIENT SEATED VALVE TYPES

OUTDOOR INSTALLATION (2) ABOVE GROUND



DC INSTALLATION

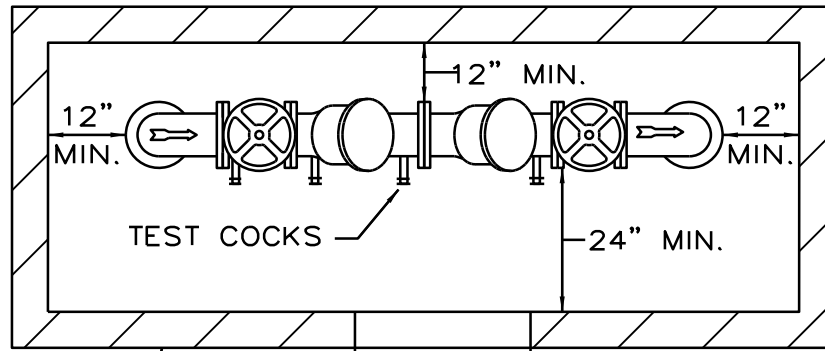
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DATE: Jan. 2016

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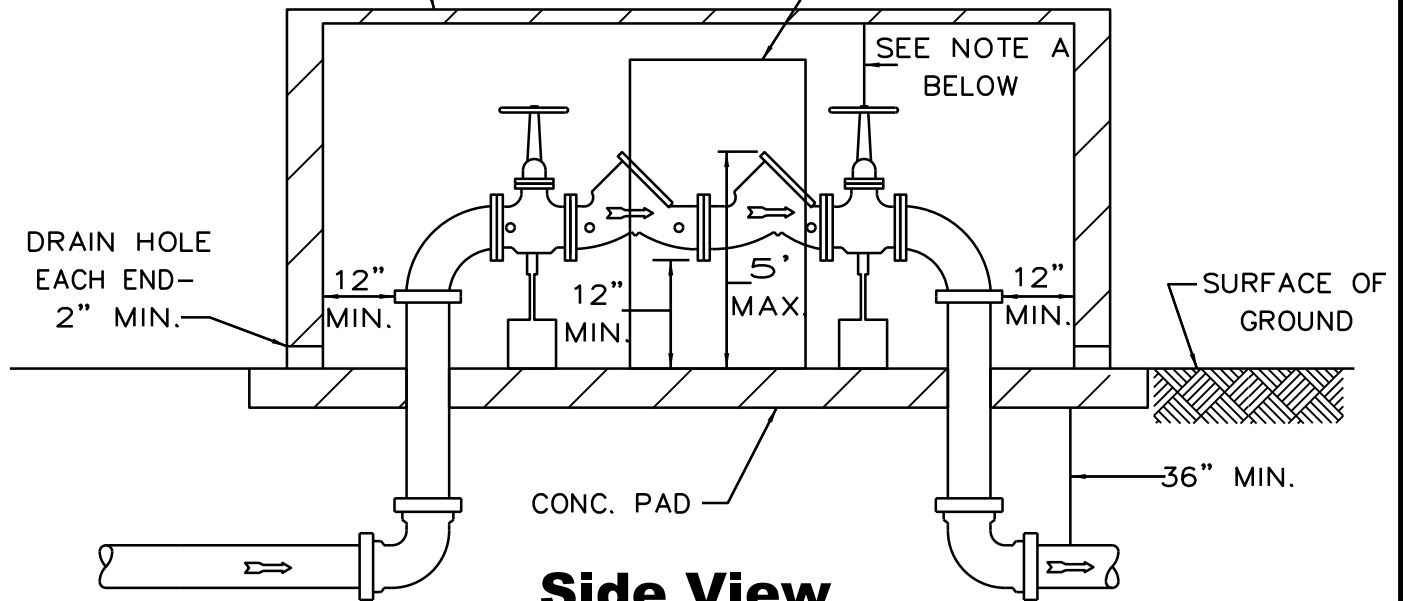
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Top View

PRECAST OR
CAST-IN-PLACE
CONCRETE ENCLOSURE
SEE 9.5.2

STEEL ACCESS DOOR
SUITABLE TO OWNER



Side View

NOTE: VALVE HEADROOM REQUIREMENTS:
N.R.S. - 12" MIN. TO TOP OF WHEEL.
O.S. & Y. - 3" MIN. TO TOP OF
FULLY EXTENDED STEM.

FOR N.R.S. RESILIENT OR O.S. & Y.
RESILIENT SEATED VALVE TYPES

OUTDOOR INSTALLATION (3)
ABOVE GROUND



DC INSTALLATION

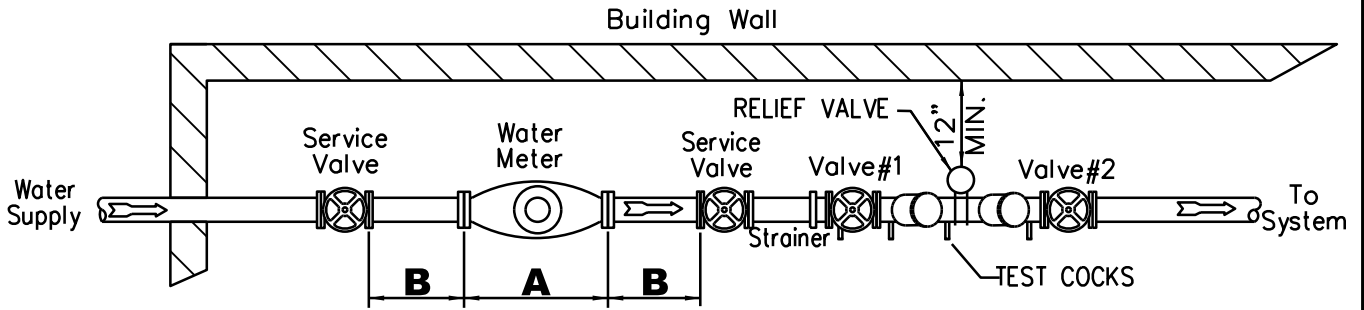
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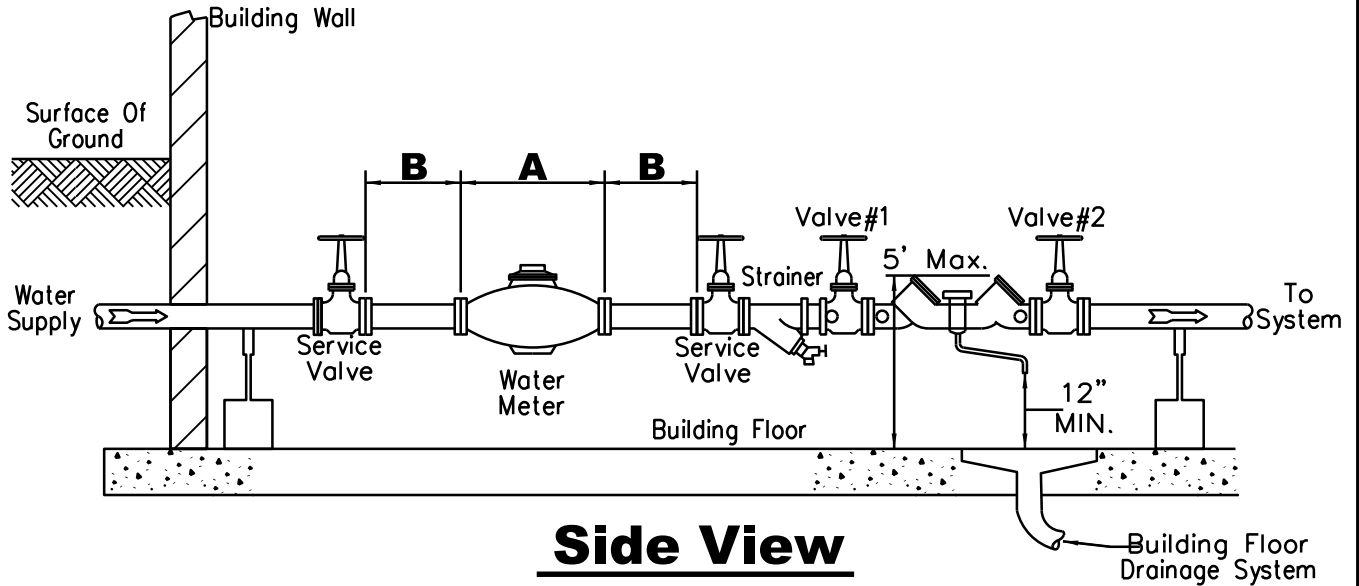
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Top View



Side View

DIMENSION	PIPE SIZE	
	1 1/2"	2"
A	1'-1 1/2"	1'-5"
B	1'-0"	1'-4"

NOTE:

Backflow Preventers to be set a minimum of 12 inches from the floor to the lowest part of the device; a maximum of 5 feet from the floor to the top of the device and a minimum of 12 inches from any wall.

FOR N.R.S. RESILIENT OR O.S. & Y.
RESILIENT SEATED VALVE TYPES

INDOOR INSTALLATION
(Pipe sizes less than 3")



RP INSTALLATION

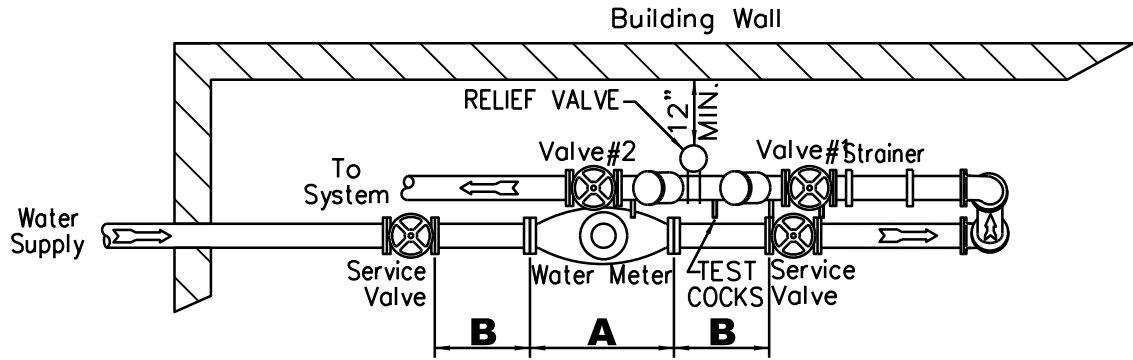
(REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY)

DRAWN BY: KC

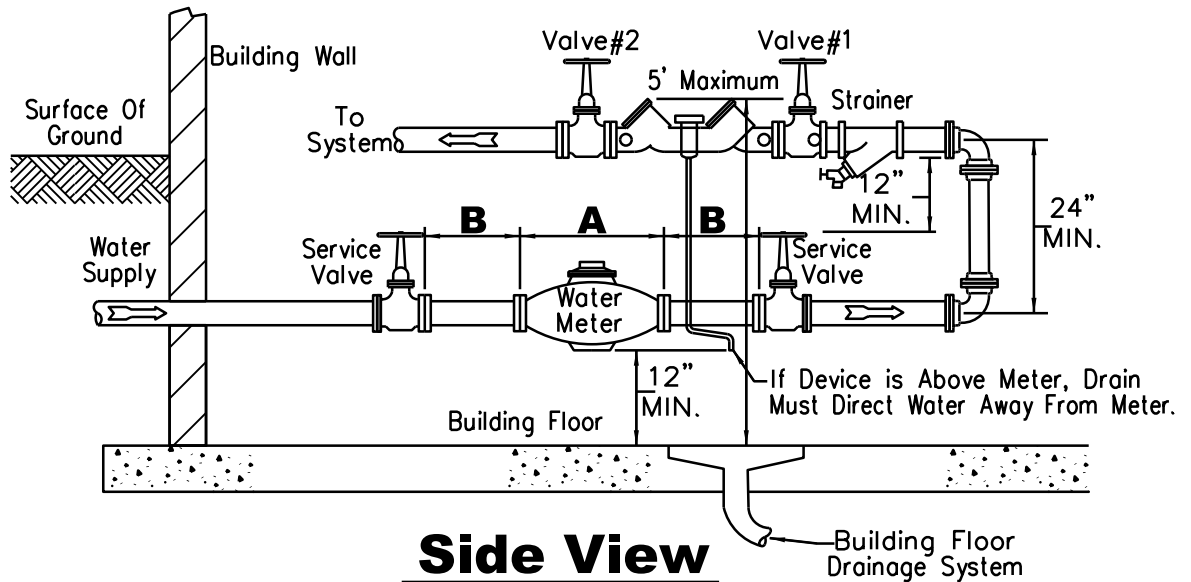
DATE: Jan. 2016

CHECKED BY: PBS

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Top View



Side View

DIMENSION	PIPE SIZE	
	1 1/2"	2"
A	1'-1"	1'-5"
B	1'-0"	1'-4"

NOTE:

Backflow Preventers to be set a minimum of 12 inches from the floor to the lowest part of the device; a maximum of 5 feet from the floor to the top of the device and a minimum of 12 inches from any wall.

FOR N.R.S. RESILIENT OR O.S. & Y. RESILIENT SEATED VALVE TYPES

ALTERNATE INDOOR INSTALLATION (1)
(Pipe sizes 3" or greater)



RP INSTALLATION

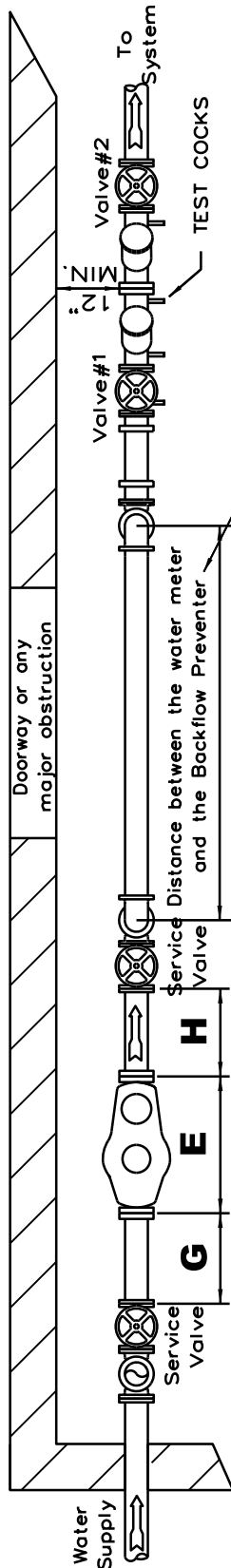
(REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY)

DRAWN BY: KC

DATE: Jan. 2016

CHECKED BY: PBS

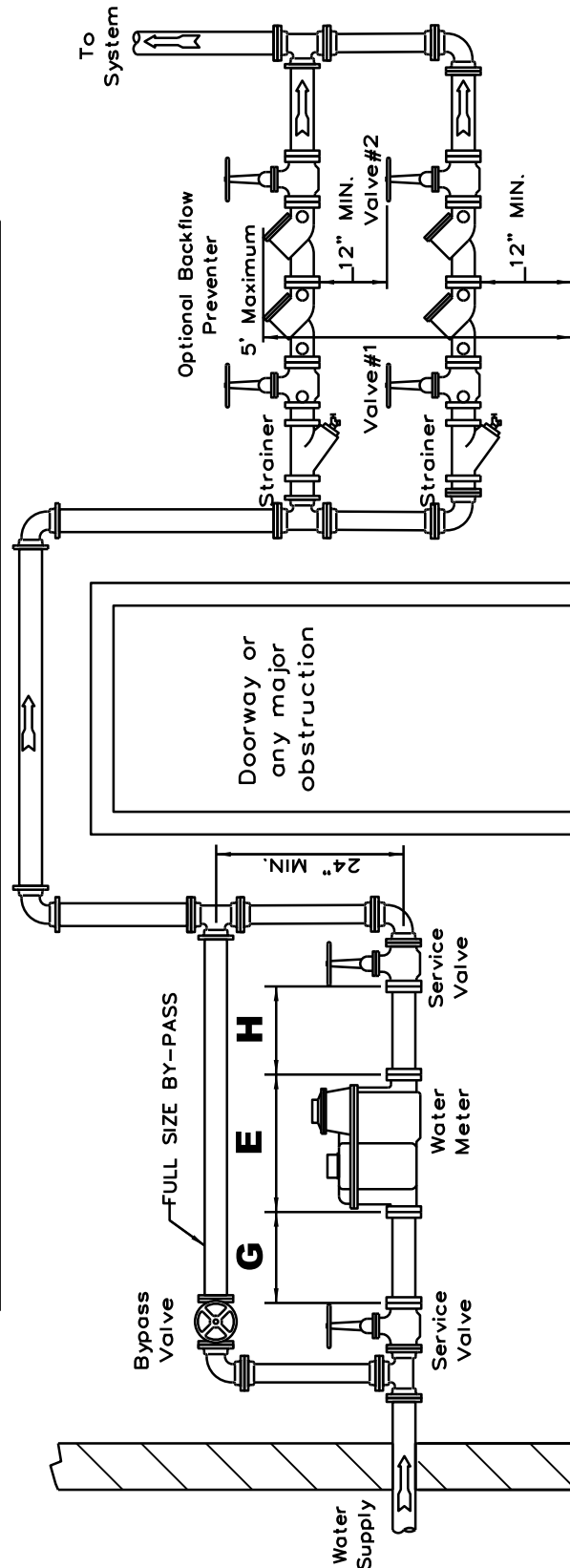
PAGE NO. A-15 OF 33



NOTE: This distance must be approved by the Backflow Compliance Unit.

Plan View

DIMENSION	PIPE SIZE			
	3"	4"	6"	8"
E	2'-0"	2'-5"	3'-1"	4'-5"
G	1'-6"	2'-0"	2'-6"	3'-6"
H	1'-0"	1'-6"	1'-6"	2'-0"
				2'-6"



Elevation View

FOR N.R.S. OR O.S.& Y.
RESILIENT SEATED VALVE TYPES

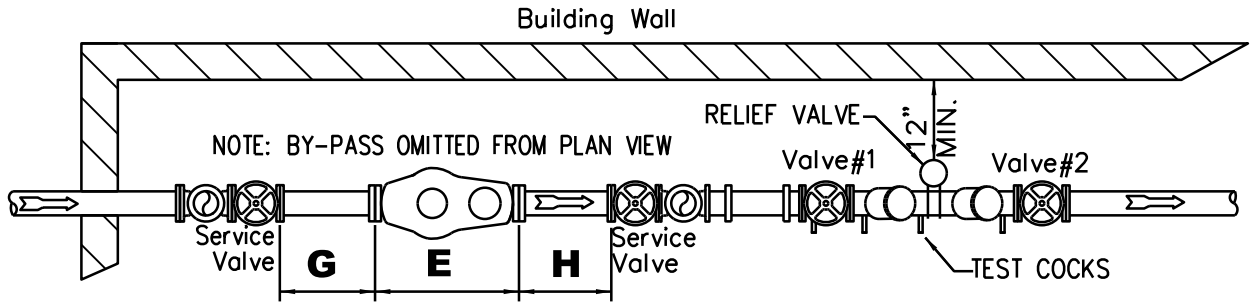
ALTERNATE INDOOR INSTALLATION (1)
(Pipe sizes 3" or greater)



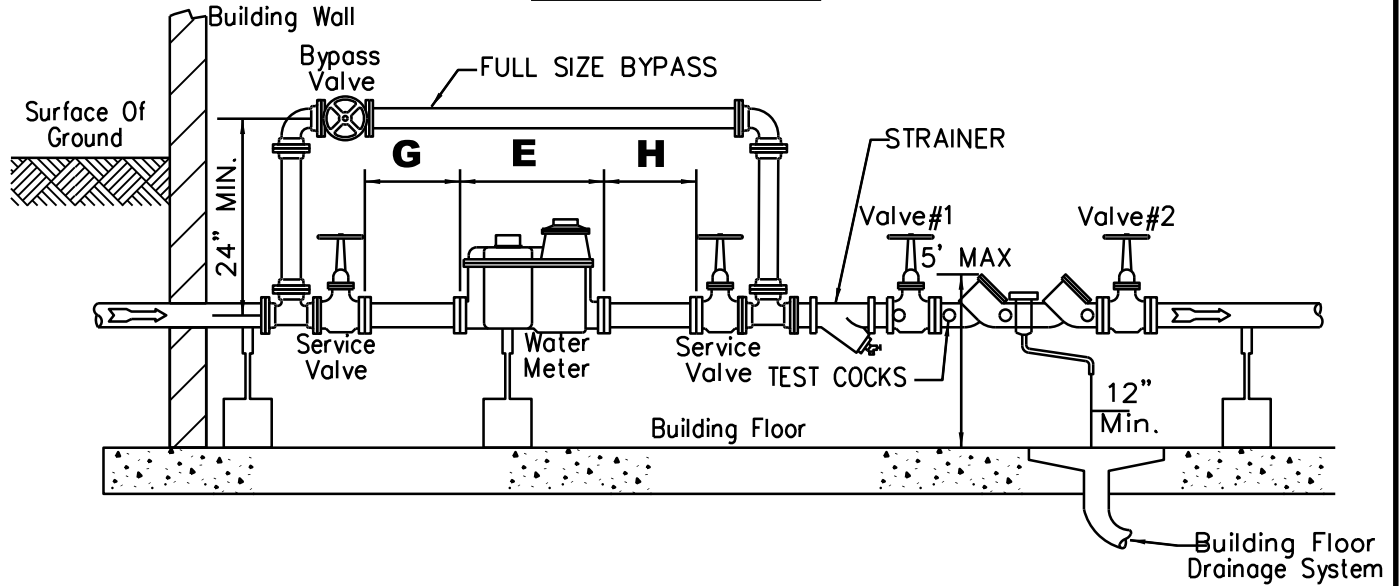
RP INSTALLATION

(REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY)

DRAWN BY: KC	DATE: Jan. 2016
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Top View



Side View

DIMENSION	PIPE SIZE				
	3"	4"	6"	8"	10"
E	2'-0"	2'-5"	3'-1"	4'-5"	5'-8"
G	1'-6"	2'-0"	2'-6"	3'-6"	2'-6"
H	1'-0"	1'-6"	1'-6"	2'-0"	2'-6"

NOTE:

Backflow Preventers to be set a minimum of 12 inches from the floor to the lowest part of the device; a maximum of 5 feet from the floor to the top of the device and a minimum of 12 inches from any wall.

FOR N.R.S. RESILIENT OR O.S. & Y.
RESILIENT SEATED VALVE TYPES

INDOOR INSTALLATION
(Pipe sizes 3" or greater)



RP INSTALLATION

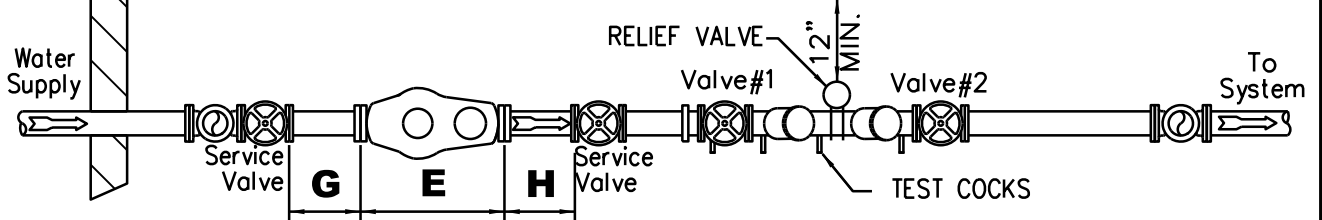
(REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY)

DRAWN BY: KC

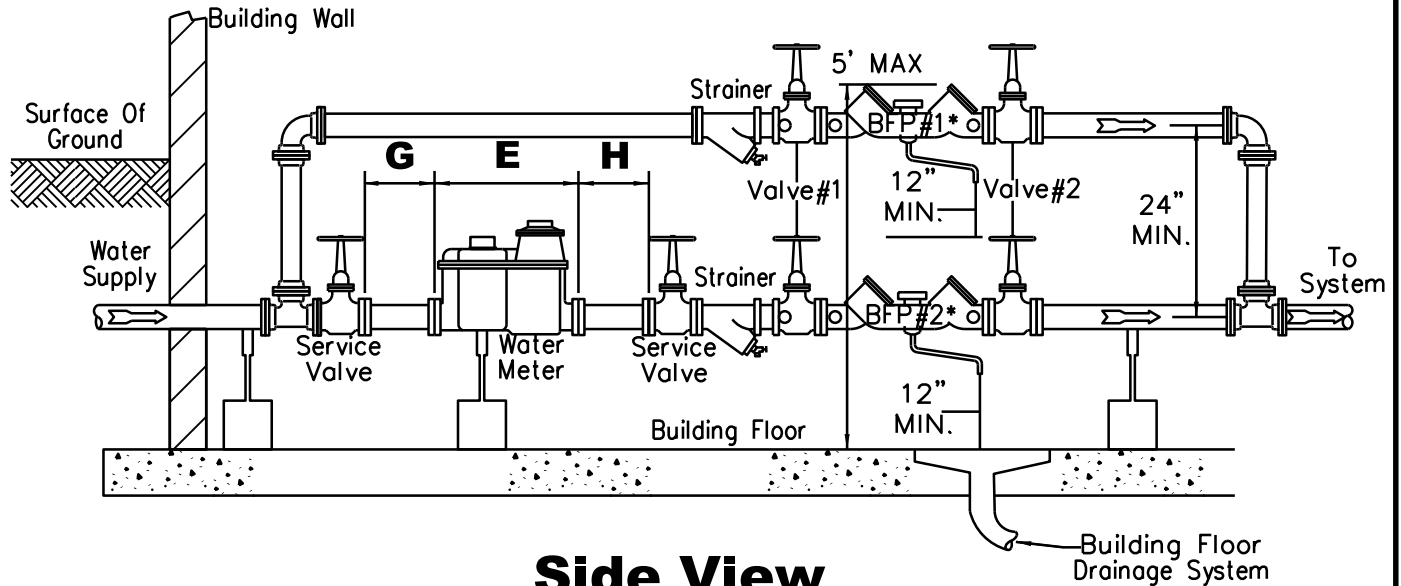
DATE: Jan. 2016

CHECKED BY: PBS

PAGE NO. A-17 OF 33



Top View



Side View

NOTE: This alternate Installation requires prior approval from the Meter Division.

DIMENSION	PIPE SIZE				
	3"	4"	6"	8"	10"
E	2'-0"	2'-5"	3'-1"	4'-5"	5'-8 ³ / ₄ "
G	1'-6"	2'-0"	2'-6"	3'-6"	2'-6"
H	1'-0"	1'-6"	1'-6"	2'-0"	2'-6"

NOTE:

Backflow Preventers to be set a minimum of 12 inches from the floor to the lowest part of the device; a maximum of 5 feet from the floor to the top of the device and a minimum of 12 inches from any wall.

FOR N.R.S. RESILIENT OR O.S. & Y.
RESILIENT SEATED VALVE TYPES

ALTERNATE INDOOR INSTALLATION (1)
(Pipe sizes 3" or greater)



RP INSTALLATION

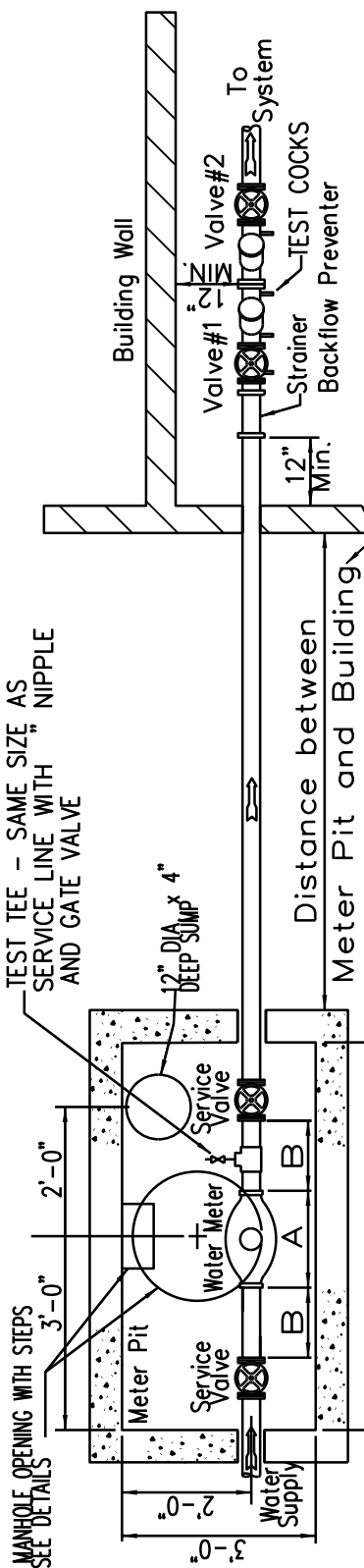
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DRAWN BY: KC

DATE: Jan. 2016

CHECKED BY: PBS

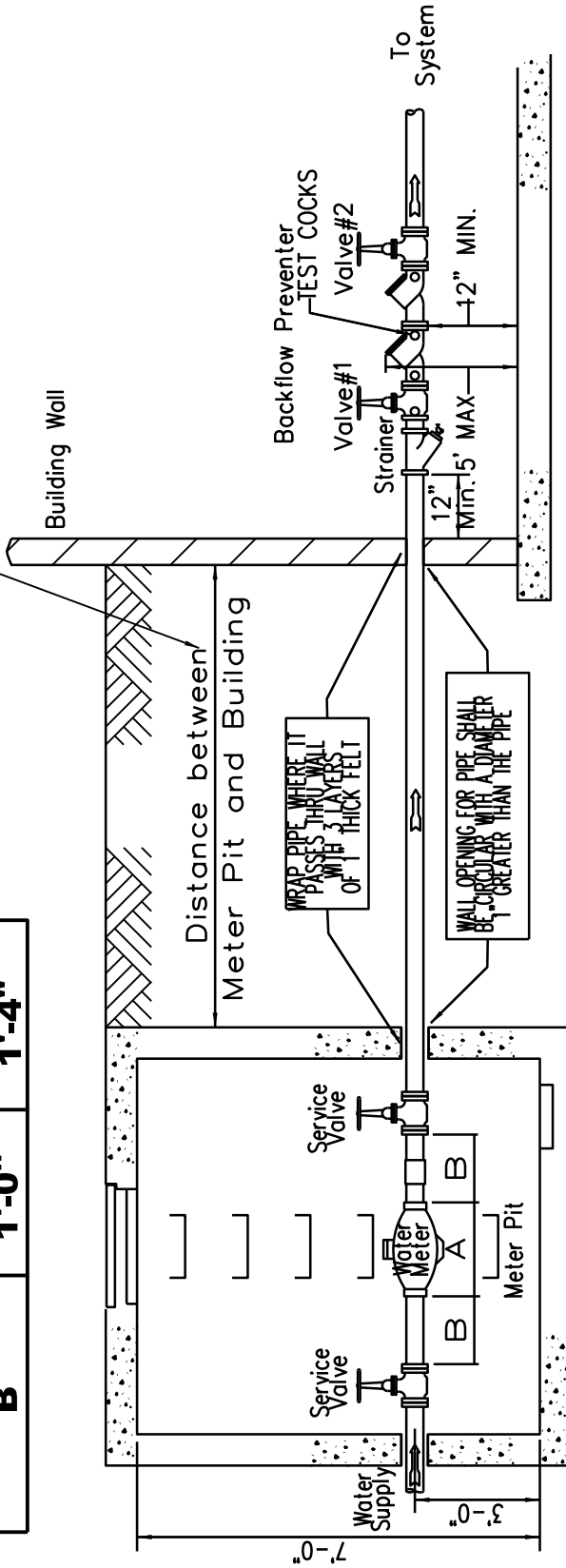
PAGE NO. A-18 OF 33



Plan View

NOTE: This distance must be approved by the Backflow Compliance Unit.

	PIPE SIZE	
DIMENSION	1 1/2"	2"
	1'-1"	1'-5"
A	1'-0"	1'-4"
B		



Elevation View

FOR N.R.S. OR O.S.& Y.
RESILIENT SEATED VALVE TYPES

ALTERNATE INDOOR INSTALLATION (2)
(Pipe sizes 3" or greater)

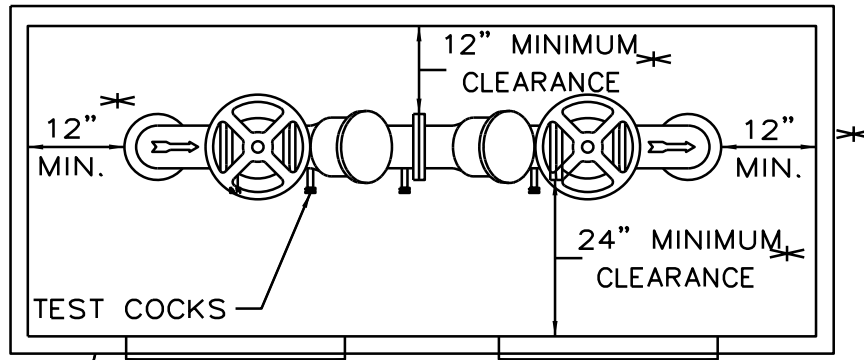


RP INSTALLATION

(REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY)

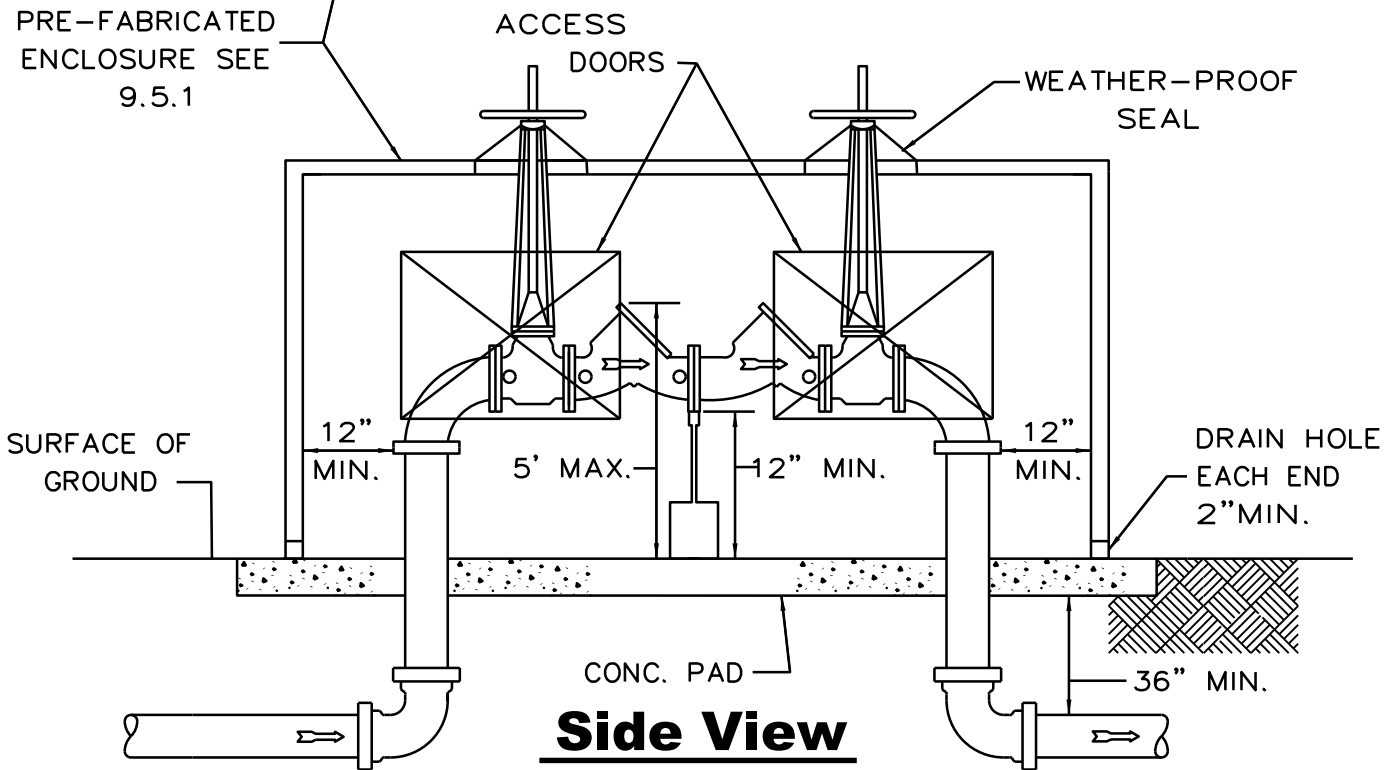
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CHECKED BY: PBS

DATE: Jan. 2016
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Top View

PRE-FABRICATED ENCLOSURE SEE 9.5.1



Side View

MINIMUM SIDEWALL CLEARANCE REQUIRED ONLY IF THE ENCLOSURE IS DESIGNED FOR PERSONNEL ENTRY, OTHERWISE, ENCLOSURE SHALL HAVE ACCESS DOORS FOR ROUTINE TESTING AND A REMOVABLE COVER AS SHOWN ABOVE.

FOR O.S.& Y.
RESILIENT SEATED VALVES

OUTDOOR INSTALLATION (1)
ABOVE GROUND ONLY



RP INSTALLATION

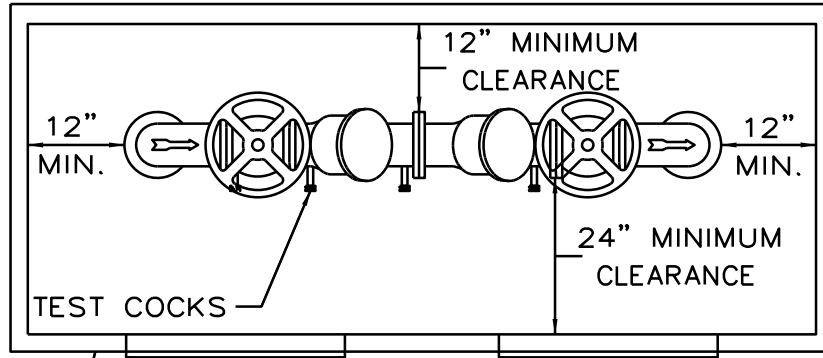
(REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY)

DRAWN BY: KC

DATE: Jan. 2016

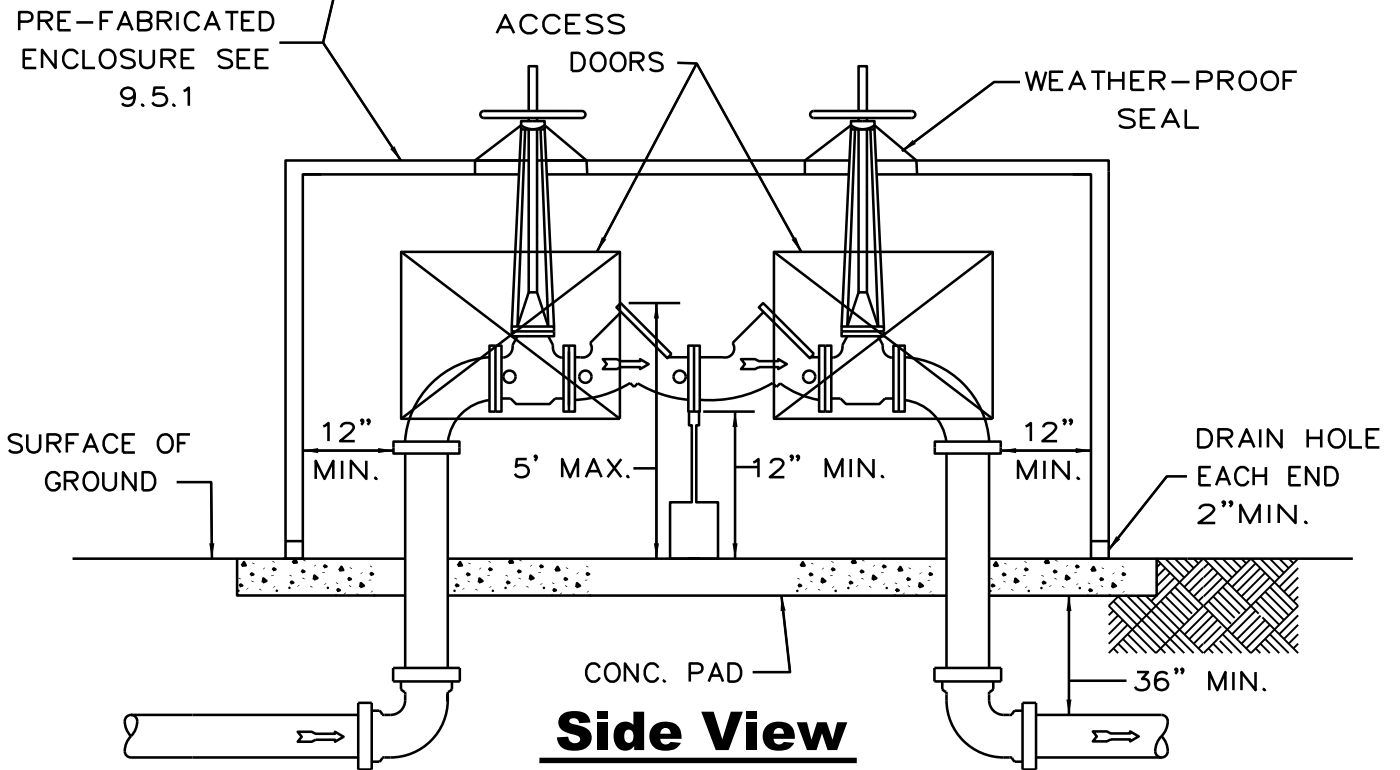
CHECKED BY: PBS

PAGE NO. A-20 OF 33



Top View

PRE-FABRICATED ENCLOSURE SEE 9.5.1



Side View

MINIMUM SIDEWALL CLEARANCE REQUIRED ONLY IF THE ENCLOSURE IS DESIGNED FOR PERSONNEL ENTRY, OTHERWISE, ENCLOSURE SHALL HAVE ACCESS DOORS FOR ROUTINE TESTING AND A REMOVABLE COVER AS SHOWN ABOVE.

FOR N.R.S.
RESILIENT SEATED VALVES

OUTDOOR INSTALLATION (2)
ABOVE GROUND ONLY



RP INSTALLATION

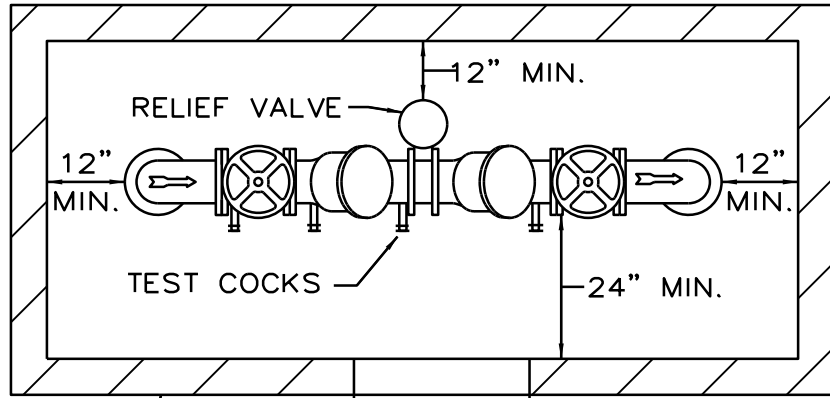
(REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY)

DRAWN BY: KC

DATE: Jan. 2016

CHECKED BY: PBS

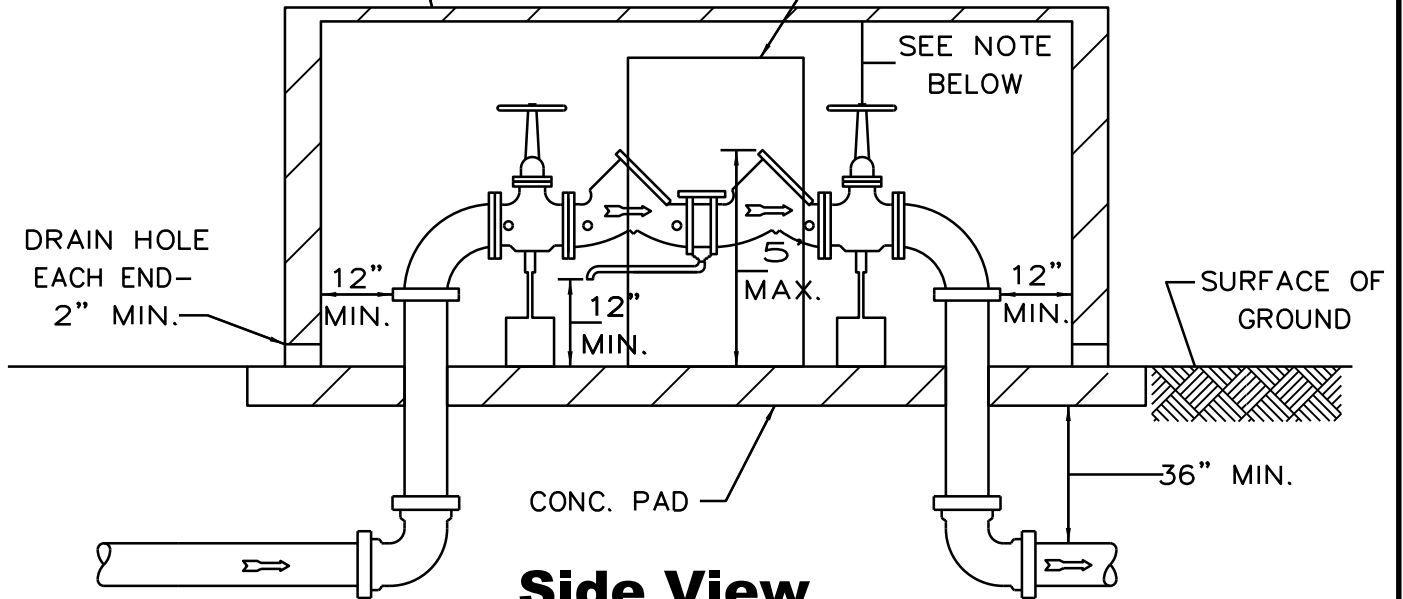
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Top View

PRECAST OR
CAST-IN-PLACE
CONCRETE ENCLOSURE
9.5.2

STEEL ACCESS DOOR
SUITABLE TO OWNER



Side View

MINIMUM SIDEWALL CLEARANCE REQUIRED ONLY IF THE ENCLOSURE IS DESIGNED FOR PERSONNEL ENTRY, OTHERWISE, ENCLOSURE SHALL HAVE ACCESS DOORS FOR ROUTINE TESTING AND A REMOVABLE COVER AS SHOWN ABOVE.

FOR N.R.S. OR O.S. & Y.
RESILIENT SEATED VALVES

OUTDOOR INSTALLATION (2)
ABOVE GROUND ONLY



RP INSTALLATION

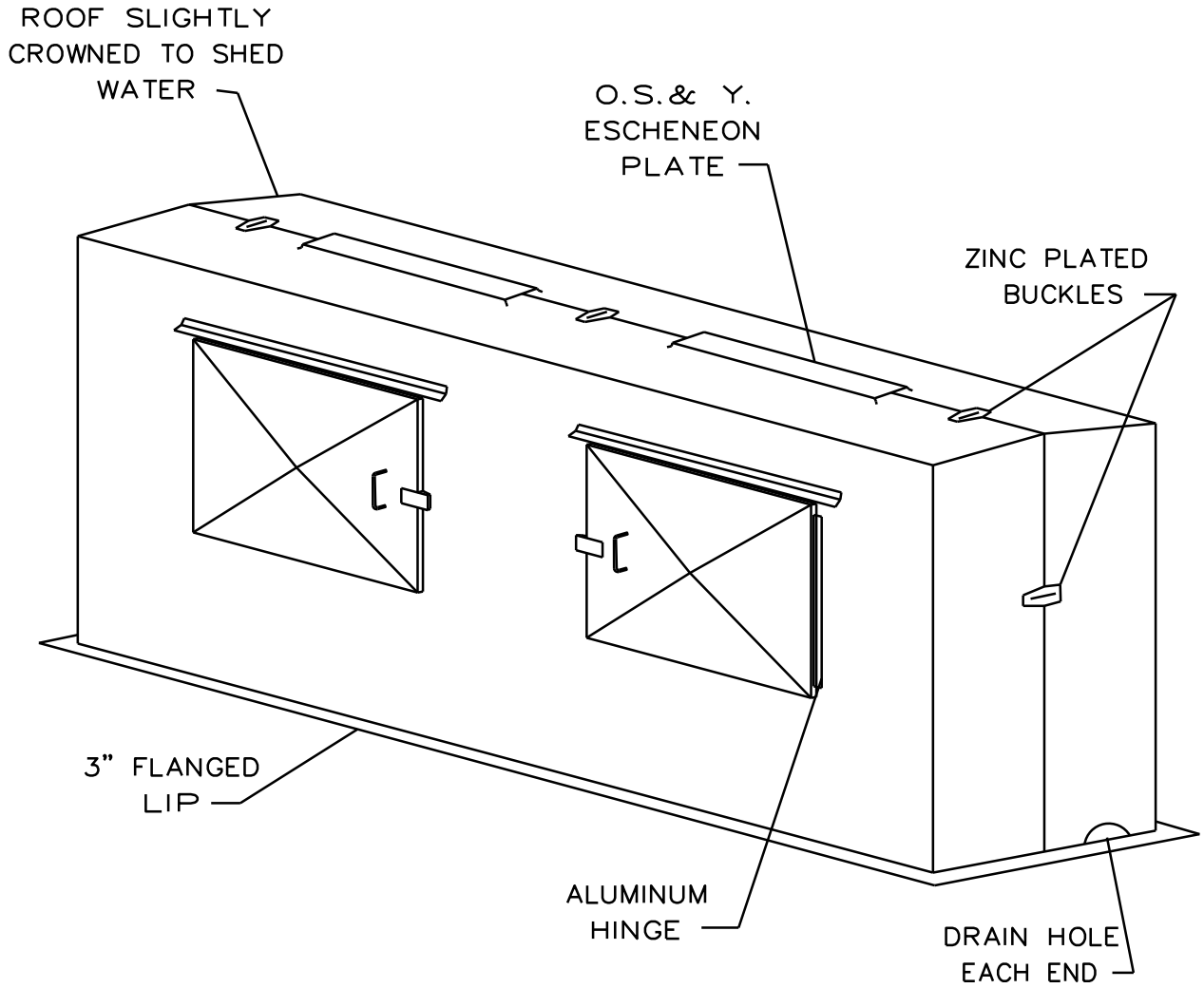
(REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY)

DRAWN BY: KC

DATE: Jan. 2016

CHECKED BY: PBS

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A pre-fabricated enclosure that provides access for routine testing and maintenance as well as protection against freezing and vandalism.

OUTDOOR INSTALLATION
ABOVE GROUND ENCLOSURE (1)



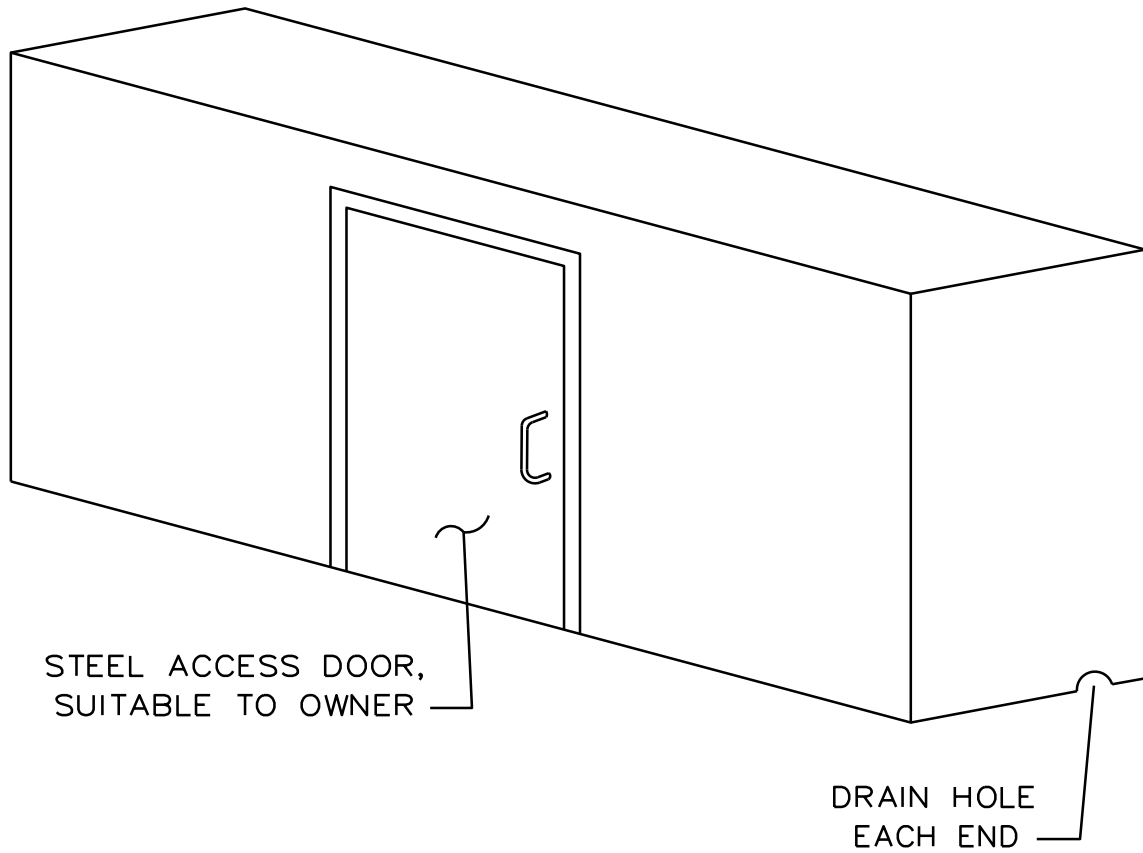
EXAMPLE OF COMMERCIALY AVAILABLE PRE-FABRICATED ENCLOSURE

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DATE: Jan. 2016

CHECKED BY: PBS

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A pre-fabricated enclosure that provides access for routine testing and maintenance as well as protection against freezing and vandalism.

OUTDOOR INSTALLATION
ABOVE GROUND ENCLOSURE (2)



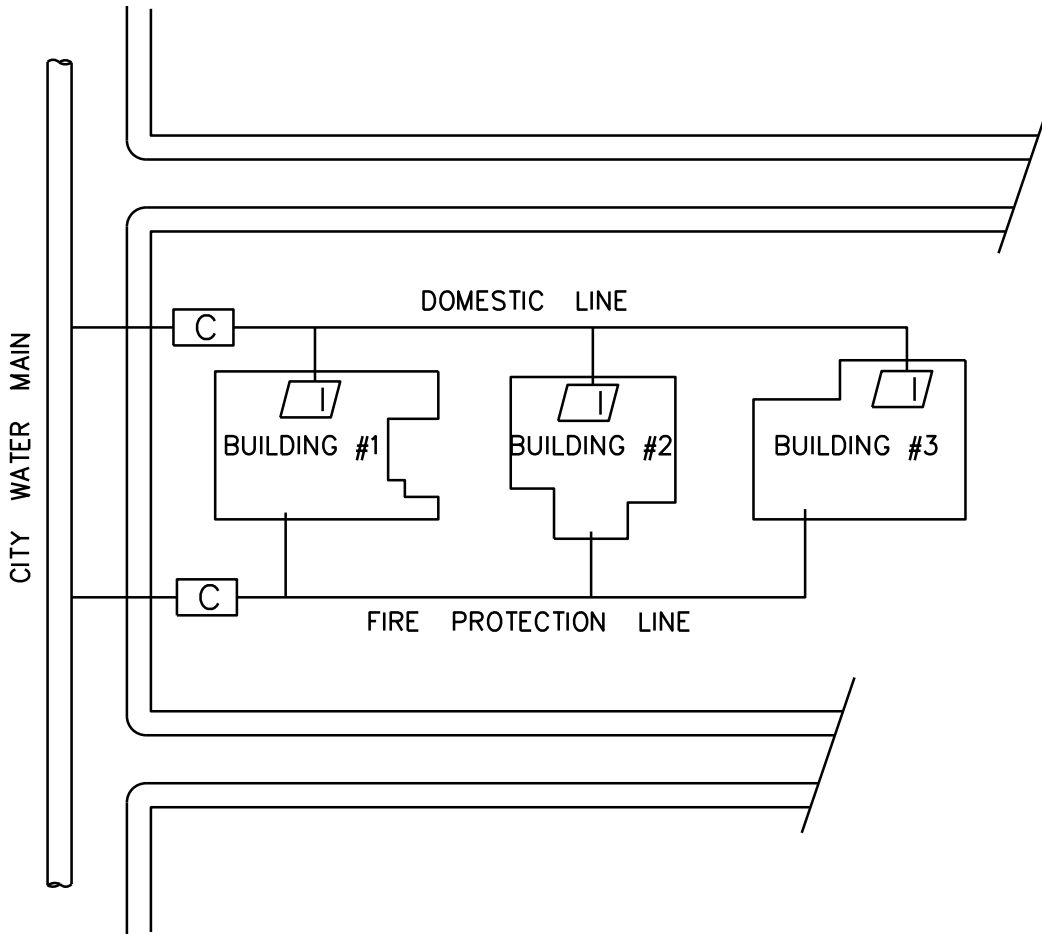
**EXAMPLE OF PRE-CAST AND
CAST-IN-PLACE CONCRETE ENCLOSURE**

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LEGEND:

[C] Containment Backflow Prevention Device at the water main.

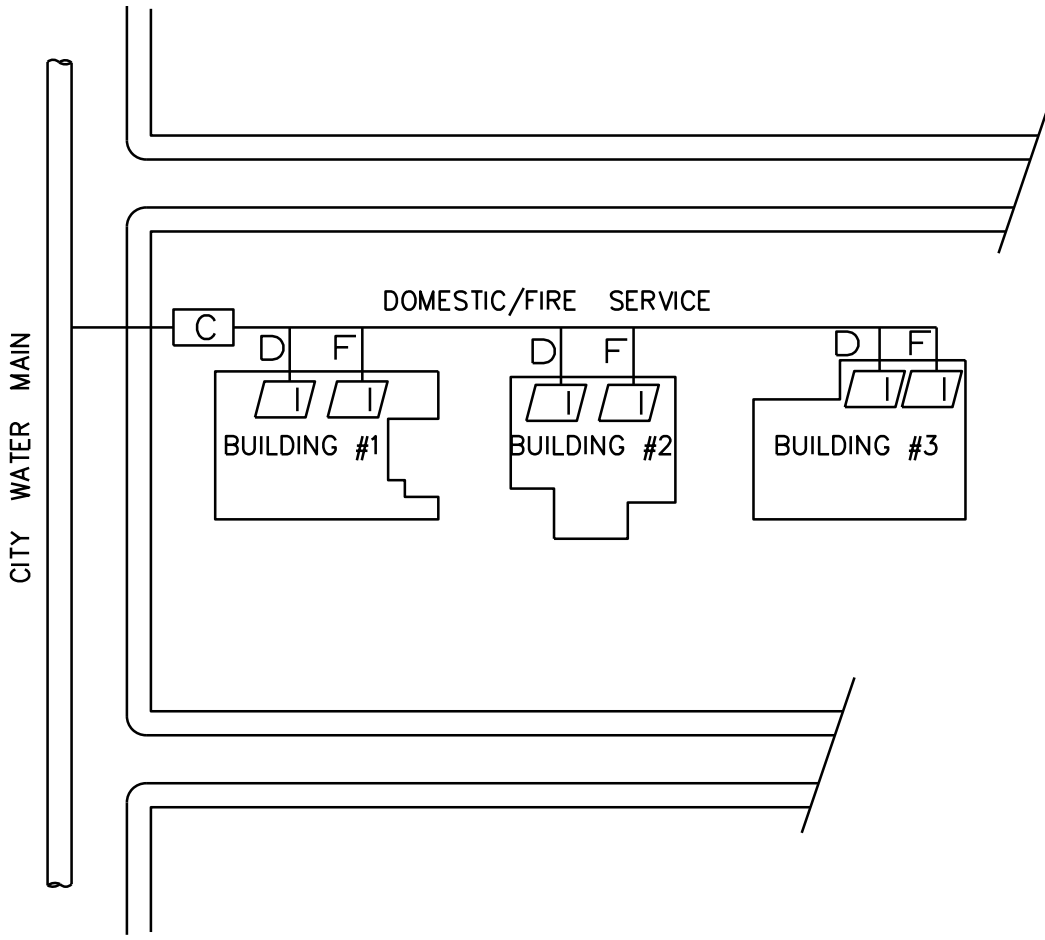
[I] Isolation Backflow Prevention Device on the branch line
 (as per the requirements of the Department of Licenses and Inspections and/or the Department of Public Health).

BACKFLOW PROTECTION FOR
 SEPARTE DOMESTIC/FIRE
 SERVICES ON PRIVATE MAINS



PRIVATE MAIN (NEW CONSTRUCTION)

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LEGEND:

[C] Containment Backflow Prevention Device at the water main.

[I] Isolation Backflow Prevention Device on the branch line
 (as per the requirements of the Department of Licenses and Inspections and/or the Department of Public Health).

D – Domestic Service branch line

F – Fire Service branch line

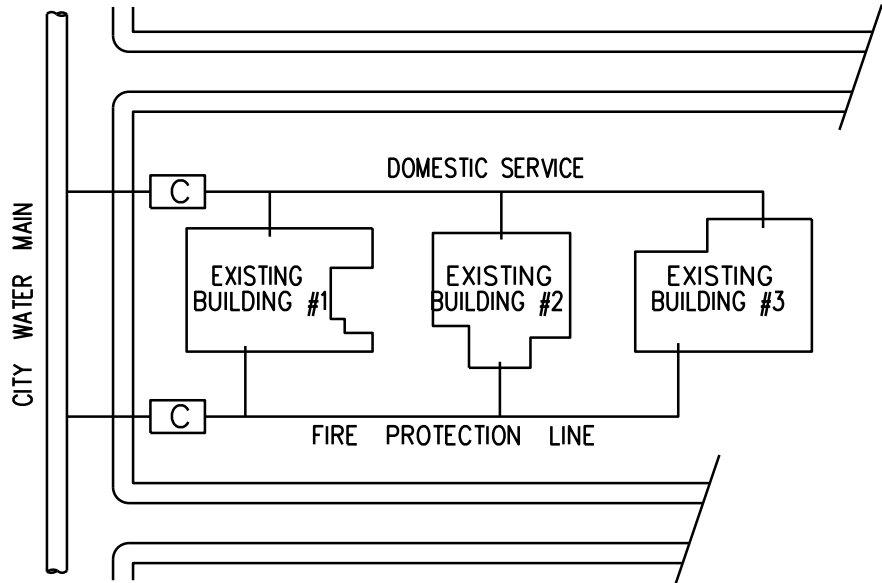
BACKFLOW PROTECTION FOR
 COMBINED DOMESTIC/FIRE
 SERVICES ON PRIVATE MAINS



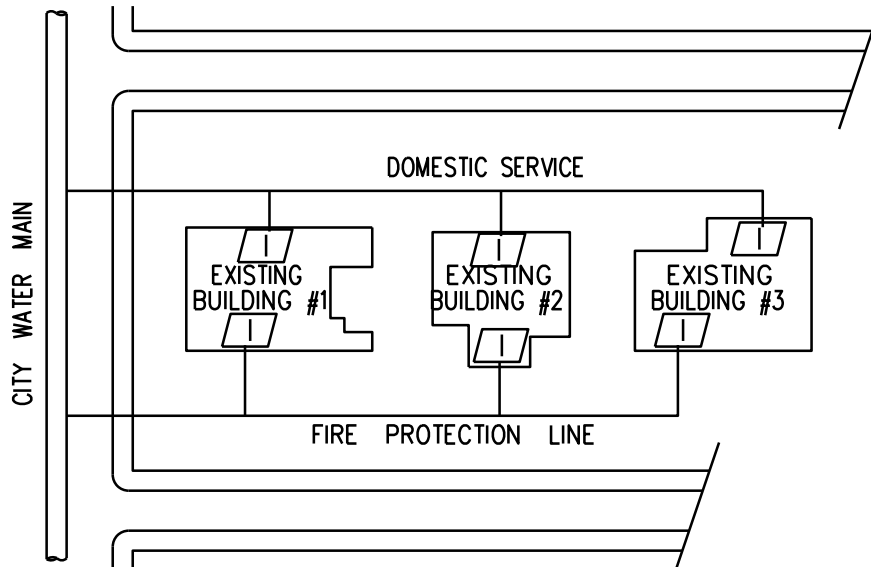
PRIVATE MAIN (NEW CONSTRUCTION)

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Example (A)
(Preferred)



Example (B)
(Alternate)



- (A) A containment device shall be installed on the common Domestic line and the common Fire Protection line close to the City water main.
- (B) If site problems prevent installation using the preferred layout shown in Example (A), **the Backflow Compliance Unit must be consulted before using any alternate layout, such as the one one shown in Example (B).**

LEGEND:

- [C] Containment Backflow Prevention device at the Water Main
- [I] Internal Backflow Prevention device branch line to each building

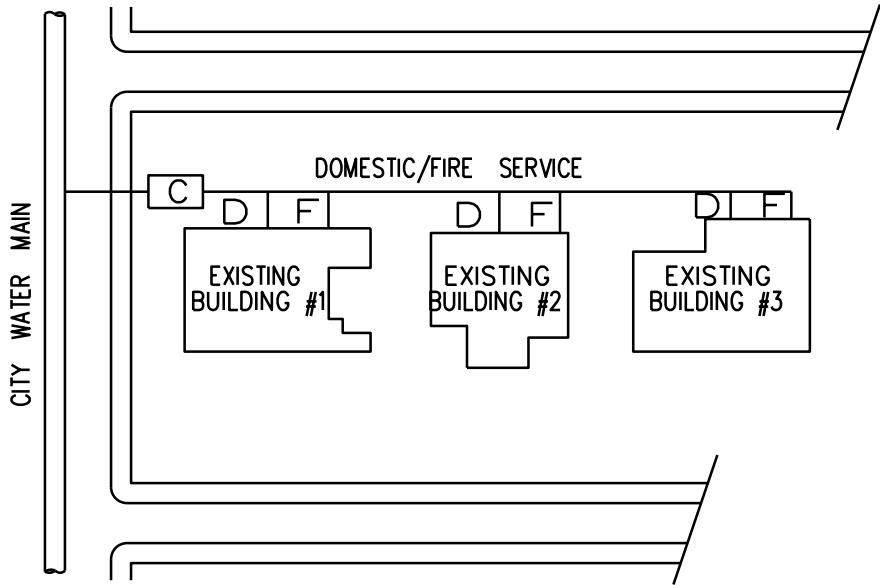
**RETRO-FITTING EXISTING SEPARATE
DOMESTIC SERVICES AND FIRE SERVICES FOR BACKFLOW
PROTECTION ON PRIVATE MAINS**



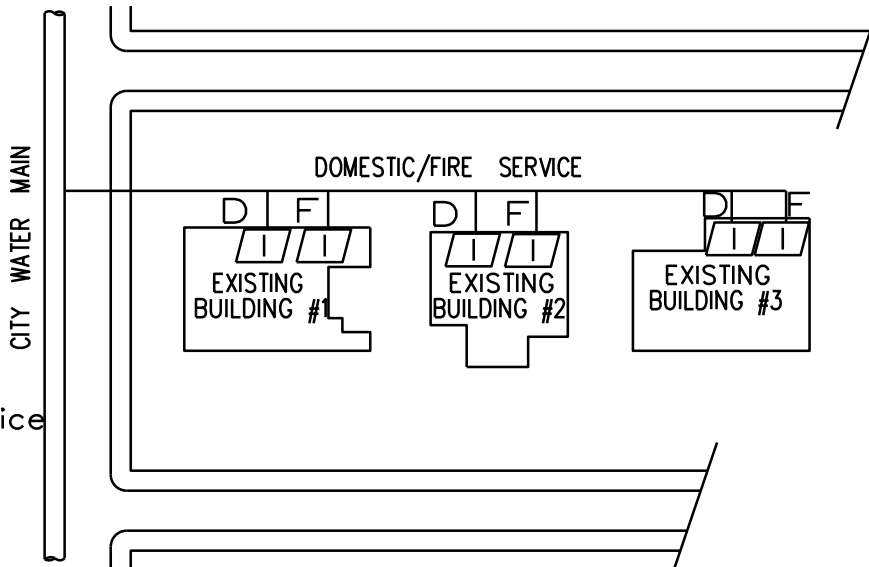
PRIVATE MAIN (RETROFIT 1)

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Example (A)
(Preferred)



Example (B)
(Alternate)



D – Domestic Service branch line
F – Fire Service branch line

- (A) A containment device shall be installed on the common Domestic & Fire Protection line close to the City water main.
- (B) If site problems prevent installation using the preferred layout shown in Example (A), **the Backflow Compliance Unit must be consulted before using any alternate layout, such as the one shown shown in Example (B).**

LEGEND:

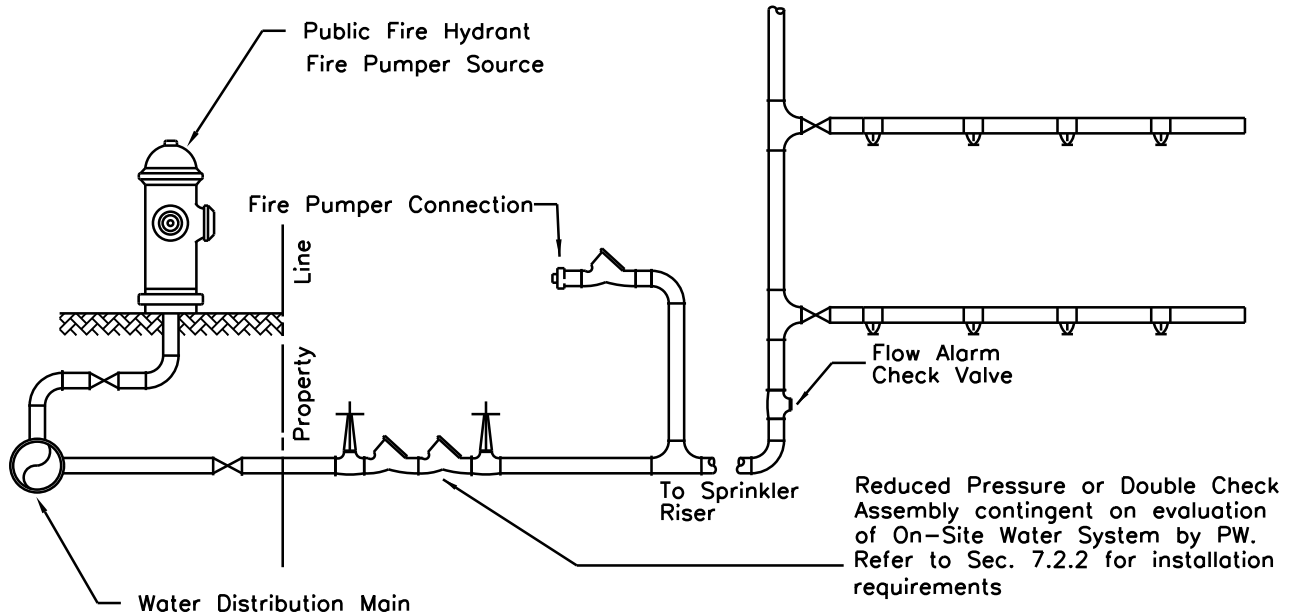
- [C] Containment Backflow Prevention device at the Water Main.
- [I] Internal Backflow Prevention device on branch lines to each building

**RETRO-FITTING EXISTING COMBINED
DOMESTIC & FIRE SERVICES FOR BACKFLOW
PROTECTION ON PRIVATE MAINS**



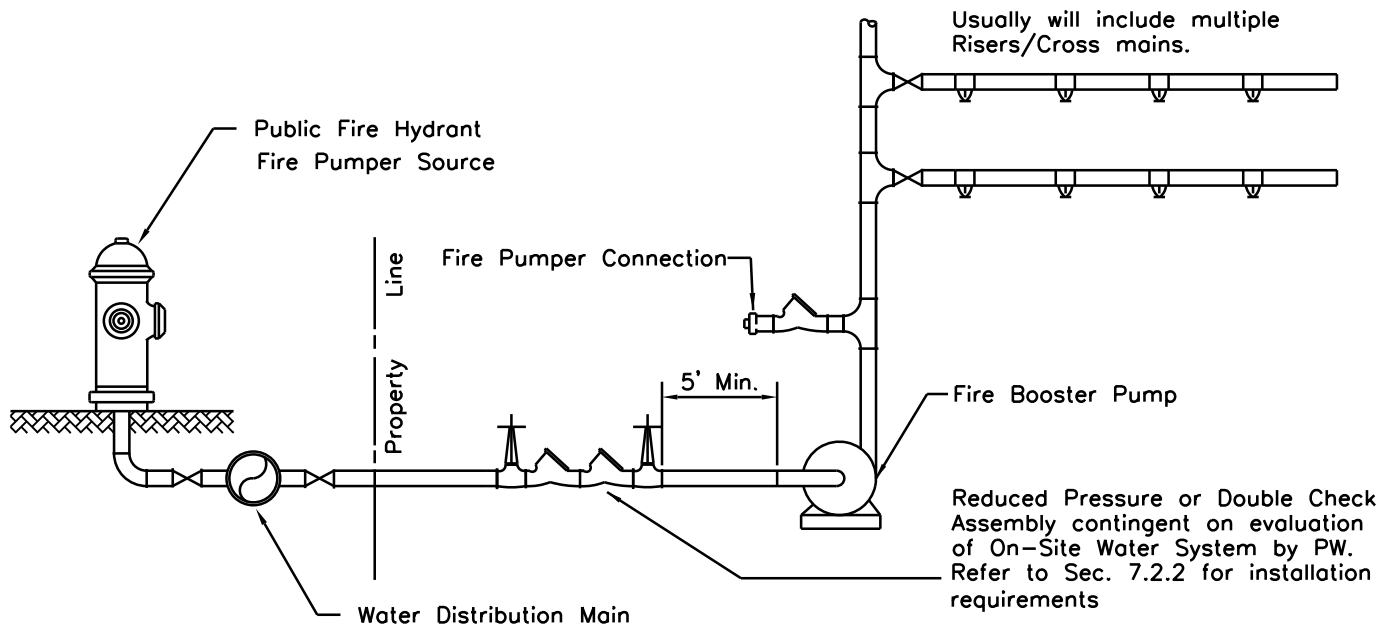
PRIVATE MAIN (RETROFIT 2)

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Typical Backflow Protection on a Fire System with only a direct connection to the water main.

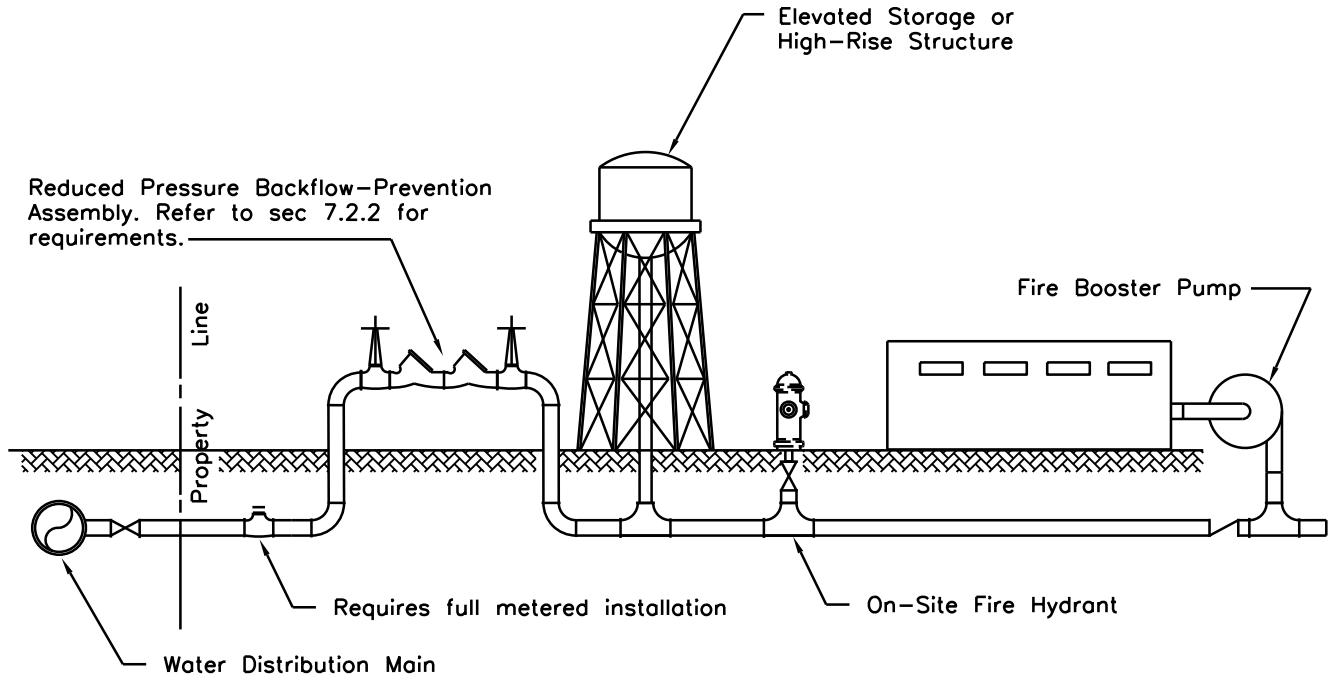
Illustration No.1



Typical Backflow Protection on a direct connection Fire System with booster pump.

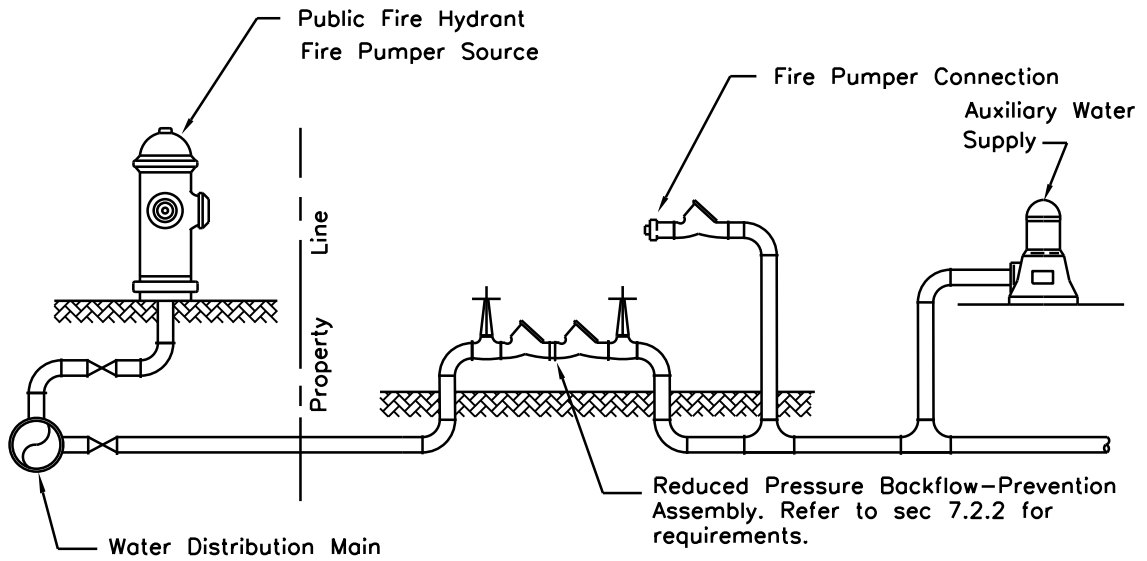
Illustration No.2

These illustrations MUST NOT be used for the installation of Fire Protection Components, refer to City Fire Code for details.



Typical Backflow Protection On A Fire System Relying On Elevated Storage And/Or Pumping System

Illustration No.3

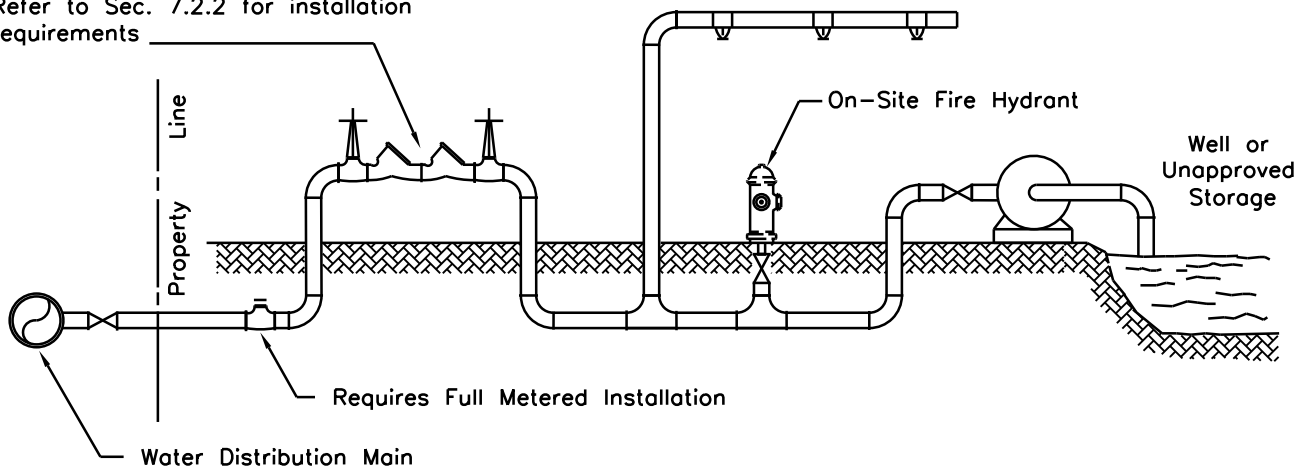


Typical Backflow Protection On A Fire System with an auxiliary water supply either on or available to the premises.

Illustration No.4

These illustrations MUST NOT be used for the installation of Fire Protection Components, refer to City Fire Code for details.

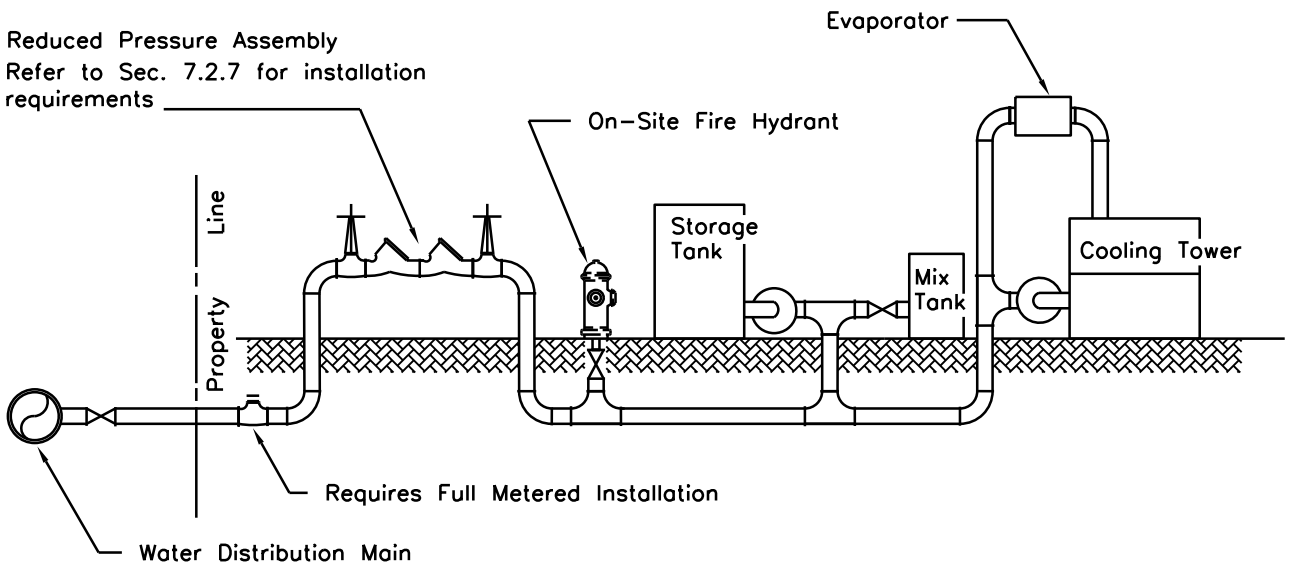
Reduced Pressure Assembly
Refer to Sec. 7.2.2 for installation requirements



Typical Backflow Protection On A Fire System With An Unapproved Secondary Source

Illustration No.5

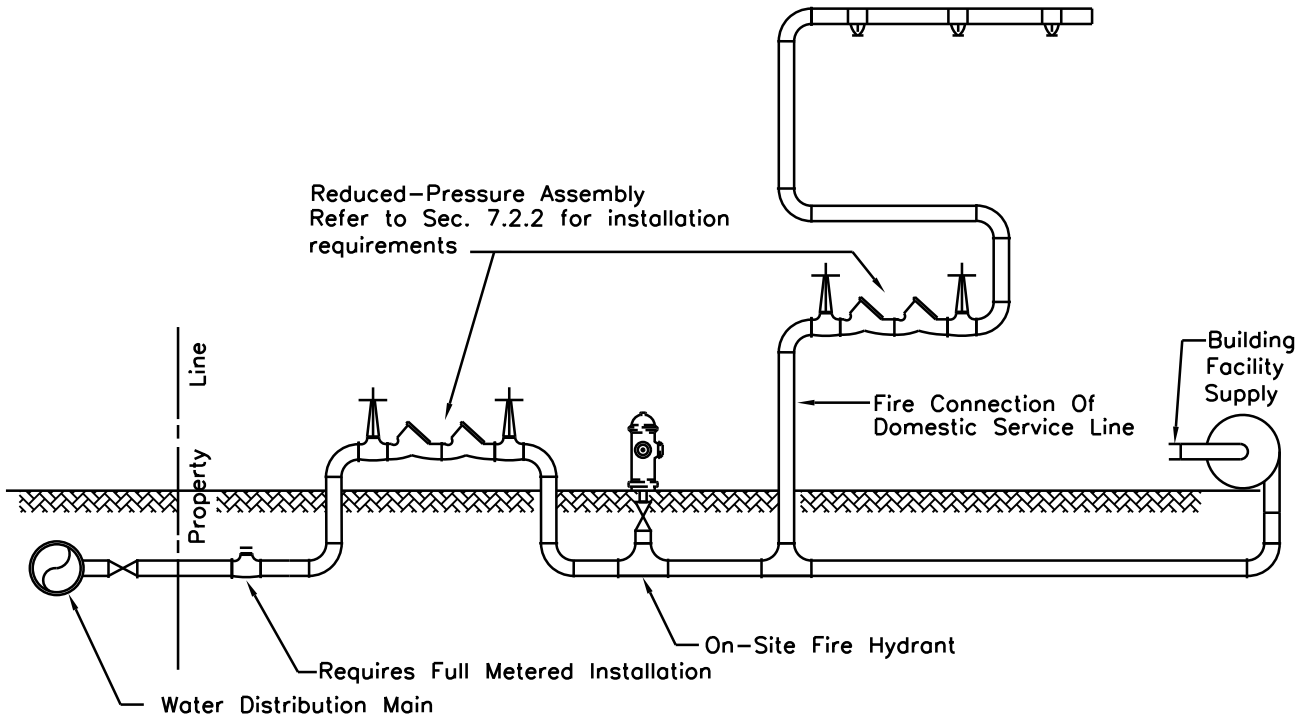
Reduced Pressure Assembly
Refer to Sec. 7.2.7 for installation requirements



Typical Backflow Protection On A Combined Fire And Industrial Water System Supplied From The City Service Water Main

Illustration No.6

These illustrations MUST NOT be used for the installation of Fire Protection Components, refer to City Fire Code for details.



Typical Backflow Protection On A Fire System with the fire service connection supplied from the domestic service line.

Illustration No.7

These illustrations MUST NOT be used for the installation of Fire Protection Components, refer to City Fire Code for details.

CC941.DWG



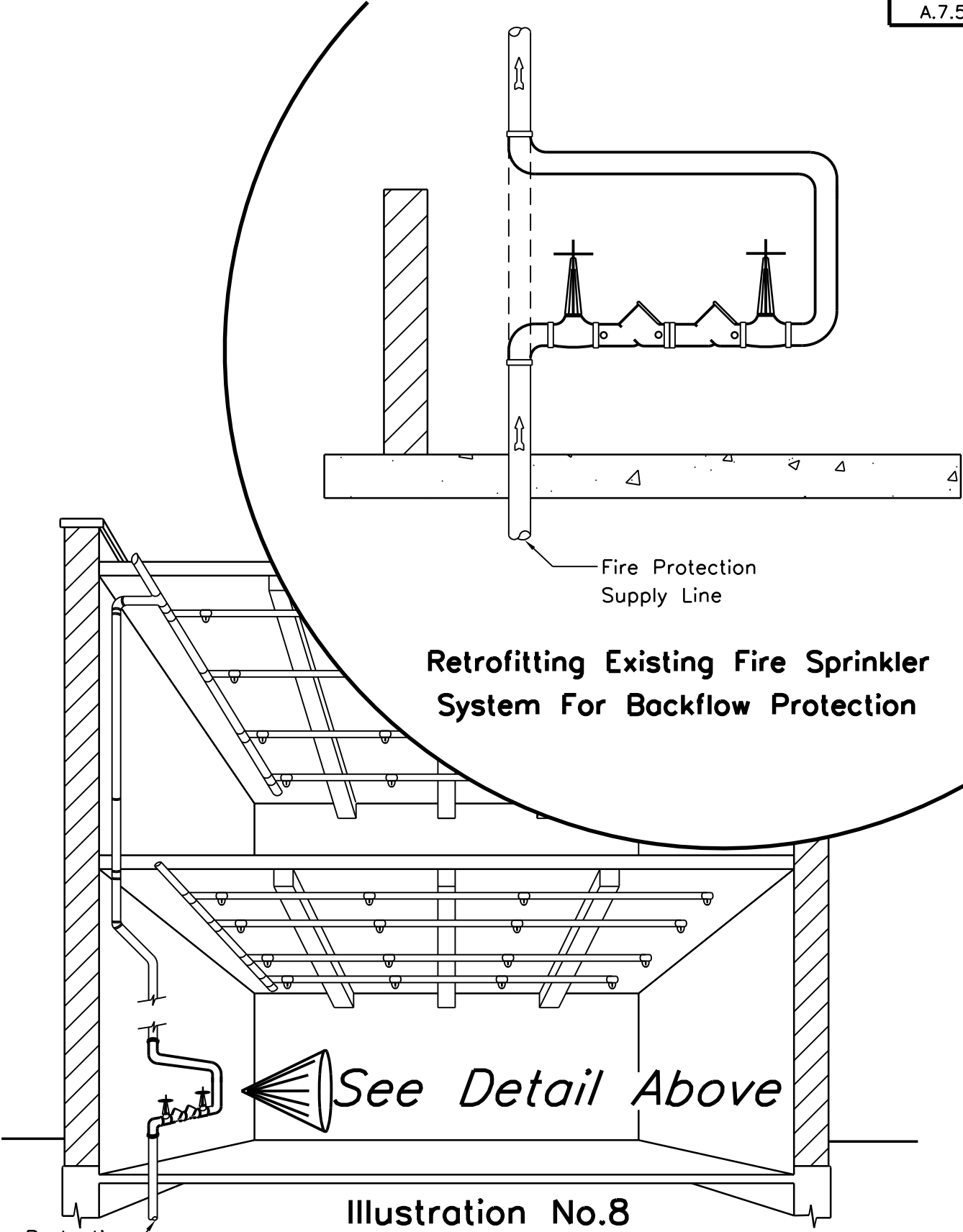
FIRE SYSTEMS CONTAINMENT (7)

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Retrofitting Existing Fire Sprinkler System For Backflow Protection

Illustration No.8

Fire Protection Supply Line

These illustrations MUST NOT be used for the installation of Fire Protection Components, refer to City Fire Code for details.



FIRE SYSTEMS CONTAINMENT (8)

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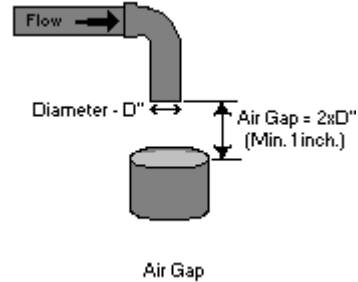
CC941.DWG

GLOSSARY

DEFINITIONS OF COMMONLY USED BACKFLOW PREVENTION TERMS

Air-Gap Separation

Unobstructed physical separations between the free-flowing discharge end of a potable supply pipeline and an open or non-pressurized receiving vessel. The distance between the bottom of the feed line and top rim of the vessel (vertically measured) shall be at least double the diameter ($2xD$) of the supply pipe. In no case shall the air-gap be less than one (1) inch.



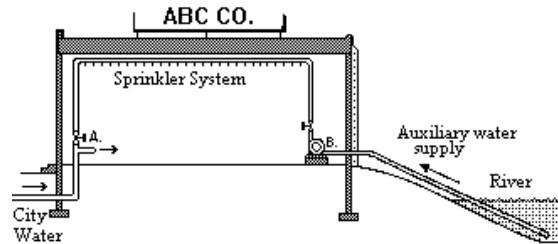
Atmospheric Vacuum Breaker (AVB)

The AVB is typically used in the supply lines to slop sinks. This assembly contains a float-check, a check seat and an 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. An AVB is designed to protect against backsiphonage conditions only. **Therefore, an AVB shall not be used for containment backflow protection.**

Auxiliary Water Supply (System)

Any water supply that does not contain City drinking water or is deemed to be non-potable. There are three categories of auxiliary systems:

- A water system in which City water is stored, transmitted or utilized for other than a potable purpose (e.g., a high pressure fire system, an industrial process, a fire sprinkler system, cooling towers or swimming pools) and is open to contamination or deterioration, thus making it non-potable.
- A water system in which City water is further treated with chemicals or by other means.
- A water system in which water is derived from natural sources such as a well, river or pond.



Backflow

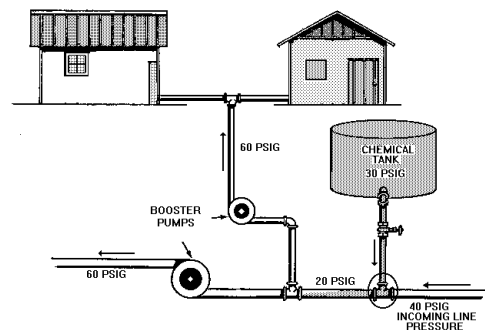
The flow of water or other liquids, mixtures, gases, or other undesirable substances through a cross connection into the distribution pipes of a potable water supply from any source(s) other than its intended source. Backflow usually occur under two hydraulic conditions: (1) back pressure or (2) a reduced or negative supply pressure below atmospheric pressure (backsiphonage).

Backflow Prevention Assembly

This is a backflow prevention device complete with its test cocks and shutoff valves.

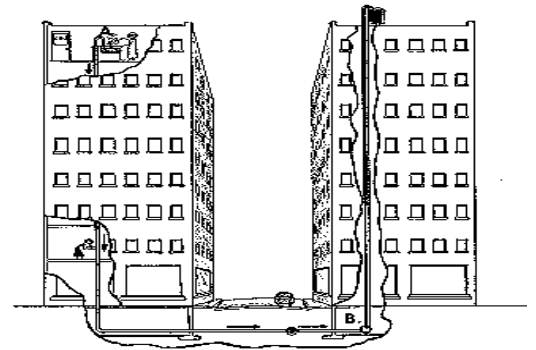
Backpressure

Elevated pressure in the downstream piping system caused by pumping, elevation head, steam pressure or air pressure that exceeds the pressure in the supply piping.



Backsiphonage

Is the flowing back of non-potable water from a plumbing fixture or vessel into the drinking water supply due to a negative pressure within the connected drinking water supply system.

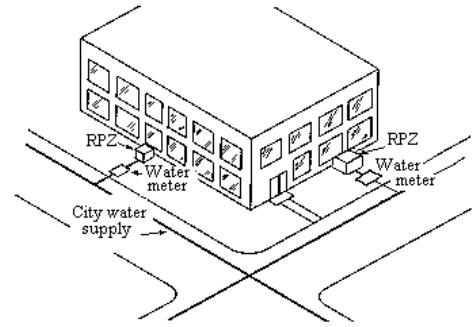


City Certified Backflow Prevention Technician

A City-licensed tradesperson who is **certified** for installation, servicing and testing of backflow prevention devices. (See Chapter 9)

Containment

A strategic approach of applying backflow protection on the service line to a facility, wherein contaminated water is **contained within the facility** and prevented from affecting other services connected to the same City water main.



Containment backflow prevention

The installation of an approved backflow prevention assembly at the water meter on a domestic line and just beyond the connection to the public water main on a fire protection line.

Contamination

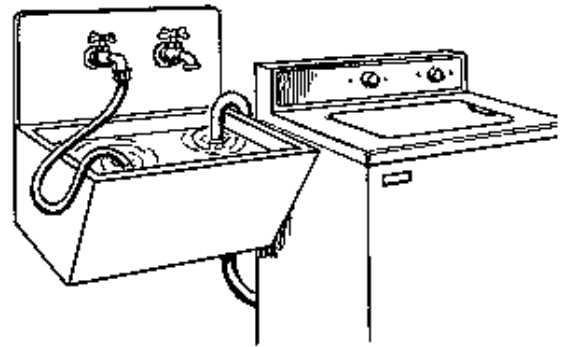
This is an impairment of potable water by the introduction or admission of any foreign substance that degrades the water quality and has the potential to create a health hazard.

Contaminant

Any substance which when introduced into the potable water system, constitutes a direct threat to life or health of a human, if the substance is ingested or comes in contact with the skin.

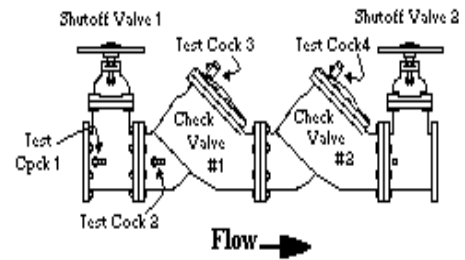
Cross Connection

Any physical connection or arrangement of pipes that allows the conveyances between potable and non-potable or questionable water sources. Water may flow from one system to the other such that the potable water may become contaminated by the questionable source. Hose connections, bypass arrangements, jumper connections, removal sections, or changeover assemblies or any other temporary or permanent connecting arrangements through which backflow may occur are considered to be cross connections. The direction of flow depends on the pressure differential between the two systems.



Double Check Assembly (DC)

One of the types of backflow prevention assemblies that comprise two independently acting check valves in series along with tightly closing shutoff valves attached at each end of the device and fitted with test cocks. A DC is used against backpressure and backsiphonage. In general, a double check valve assembly installation is used in minimum hazard systems.



Double Check Detector Assembly (DCD) and (DCD-II)

An assembly that includes a mainline DC and a bypass arrangement attached from upstream of the first check valve to downstream of the second check valve. The bypass arrangement includes a specific DC along with a specific water meter. In this assembly all flows of 2 gallons per minute (gpm) or less flow exclusively through the bypass and register accurately on the meter. Above 2 gpm, water will flow through the mainline assembly and the bypass. The DCD-II is a modification of the DCD with the bypass arrangement now across the second check valve. These assemblies which are generally used in medium hazard systems, are designed for fire sprinkler systems where there is a need to detect unauthorized use of water or leaks in the system.

Isolation

An approach of applying backflow protection to the piping within the owners' premises, wherein any hazard is **isolated to a particular location** to protect the remainder of the owner's potable water system from contamination.

Isolation backflow prevention

The installation of an approved backflow assembly on a process or system within a facility, or on the branch line of a private main serving a facility. The requirements for this type of protection typically are provided by the Departments of Public Health (DPH) and Licenses and Inspection (L&I).

Pollutant

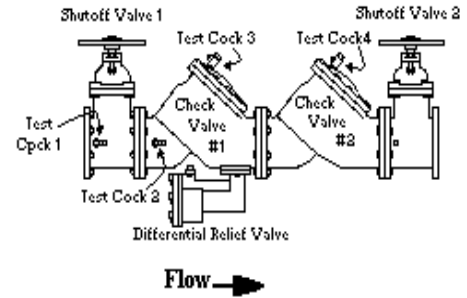
Any substance which may affect the color, taste or odor of the potable water, but which does not pose a direct threat to human health if there is exposure to or consumption of the water.

Pressure Vacuum Breaker (PVB)

This assembly contains an independently operating, internally loaded check valve and an independently operating, loaded air inlet valve located on the discharge side of the check valve. This assembly is equipped with test cocks and shutoff valves attached at each end of the assembly. This assembly is designed to protect against backsiphonage only. **The PVB shall not be used for containment backflow protection.**

Reduced Pressure Assembly (RP)

A type of backflow prevention assembly, which contains two independently acting check valves in series and a hydraulically operated, mechanically independent, pressure differential relief zone located between the check valves. The relief valve will empty the chamber between check valve one and check valve two if the pressure difference across the check valves is less than two PSI (2 psi). The assembly includes test cocks and a tightly closing shutoff valve at each end. This assembly is effective against backflow caused by backpressure and backsiphonage. An RP is normally used in high hazard systems.



Reduced Pressure Detector Assembly (RPD) and (RPD-II)

The RPD assembly includes a mainline RP and a bypass arrangement attached from upstream of the first check valve to downstream of the second check valve. The bypass arrangement includes a specific RP along with a specific water meter. In this assembly all flows of 2 gallons per minute (gpm) or less, flow exclusively through the bypass and register accurately on the meter. Above 2 gpm, water will flow through both the mainline assembly and the bypass. The RPD –II is a modification of the RPD now with the bypass across the second check valve. These assemblies which are used in high hazard systems, are designed for fire sprinkler systems where there is a need to detect unauthorized use of water or leaks in the system.

Residential Fire Sprinkler System (RFSS)

The RFSS is a multipurpose water service connection that is designed according to the NFPA 13D Standard or the IRC Section 2904 prescriptive requirements and consists of a single water supply line from a ferrule connection at the water main. This connection shall be used to supply both domestic service and fire service water to the residential building. The minimum size is 3/4-inch piping and the maximum size is 2-inch. The piping within the building can be configured as either a Network System or a Branch System, as described in the PWD Regulations Section 404.0 - Residential Fire Sprinkler Systems. This applies to water services for fire sprinkler systems in R-3 Residential Occupancy Classifications of three stories or less and residential buildings constructed under the International Residential Code.

PHILADELPHIA WATER — DEPARTMENT —

Cross Connection Control Guidelines- Issued 1978

Cross Connection Control Manual, 1st Edition - Issued 1988

Cross Connection Control Manual, 2nd Edition- Issued 1992

Cross Connection Control Manual, 3rd Edition - Issued 1994

Cross Connection Control Manual, 4th Edition - Issued 1998

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Cross Connection Control Manual, 7th Edition - Issued 2017