SECTION 02519
BACKFLOW/CROSS CONNECTION

I. GENERAL REQUIREMENTS

A. In accordance with the Tennessee Code Annotated, and Knoxville Utilities Board (KUB) Rules and Regulations, no person shall cause a cross-connection or inter-connection to be made, or allow one to exist for any purpose whatsoever unless the construction and operation of the same have been approved by the OWNER (KUB).

B. Protective devices are required to:

1. Protect the OWNER's water system from contamination.

2. Eliminate or control existing or potential cross connections between potable and non-potable water systems.

3. Protect the occupants or users of the water supply within the customers' premises in certain situations from in-house contamination.

C. Protective devices will be required when the nature of use of the water supplied to a premise by the OWNER is such that it is deemed:

1. Impractical to provide an effective air gap separation.

2. That the property owner and/or occupant cannot or will not demonstrate to the OWNER that the water use and protective features of the plumbing are such that they pose no threat to the safety or potability of the water supply.

3. That the nature and mode of operations within a facility are such that frequent plumbing changes are made.

4. There is likelihood that protective measures may be subverted, altered, or disconnected (portable or temporary meters).

5. A type of facility requiring protection as listed by the Tennessee Department of Environment and Conservation (TDEC) and/or the Environmental Protection Agency (EPA).

6. To come into contact with chemicals or remain stagnant within the water line. Use of secondary meters to supply fire suppression systems, irrigation systems, pools, fountains, and hot tubs.

D. Dual devices installed in parallel are required where continuous, uninterrupted service is required and there is no auxiliary service line. Refusal to install two parallel devices shall constitute agreement by the property owner or occupant that the water service may be interrupted as necessary to test the device.

E. Area Plumbing Inspectors' Offices may require a plumbing permit and inspection for the installation of backflow prevention devices (BFD). The City or County office should be contacted to determine their requirements prior to installing a BFD. If a permit and inspection is not required by the City or County, then the property owner or occupant must call the OWNER at (865) 594-8333 to schedule an inspection after the device is installed.

II. DEFINITIONS

A. Cross-Connection: Any physical connection whereby the public water supply is connected with any other water supply system, whether public or private, either inside or outside of any public building or buildings, in such a manner that a flow of water into the public water supply is possible either through the manipulation of valves, ineffective check or back pressure valves, or because of any other arrangement.

B. Inter-Connection: Any system of piping or other arrangement whereby the public water supply is connected directly with a sewer, drain, conduit, pool, storage reservoir or other device which does or may contain sewage or other waste, or liquid which would be capable of importing contamination to the public water supply.

C. OWNER: Knoxville Utilities Board (KUB), the owner of the public water supply.

III. ACRONYMS

BFD – backflow device

DC – Double Check Valve Assembly

DWS – Division of Water Supply

EPA – Environmental Protection Agency

gpm – gallons per minute

KUB – Knoxville Utilities Board

psi – pounds per square inch

RPZ – Reduced Pressure Zone

TDEC – Tennessee Department of Environment and Conservation

IV. MATERIALS - RPZ

A. A reduced pressure zone (RPZ) BFD is required for protection of the water distribution system. Only RPZ's listed in the "Approved Backflow Prevention

Assemblies" listing available through TDEC Division of Water Supply (DWS) shall be installed on the OWNER's water system. (The only exception is on non-chemical fire suppression systems, where a DC may be used instead of an RPZ. See Section VI. Materials – DC for non-chemical fire suppression systems.)

B. BFD should be of sufficient size to deliver the same gallons per minute (gpm) capacity as the water meter supplying the premises when it is installed in the main line.

C. The RPZ device must contain two spring loaded, resilient seat check valves and be equipped with a relief valve mechanism between the two check valves that ensures the pressure in the zone is always at least 2 psi lower than the inlet pressure.

D. Devices ¾" through 2" shall have bronze bodies and 2-1/2" through 10" shall have fusion epoxy coated bodies rated at a minimum175 pounds working pressure and water temperature 32 to 140 degrees Fahrenheit. Contact KUB for questions regarding operating pressure before installation. Some locations may require a minimum of 250 pounds working pressure.

E. The RPZ device must be installed with either a bronze or inside and out coated fusion epoxy strainer, complete with a blow down.

F. The device must be installed between two tight-closing resilient seated, inside and outside coated fusion epoxy gate valves, or full port ball valves.

G. Test cocks must be of bronze, stainless steel, or polymer construction. They must also be resilient seated, have full port characteristic, and be located as follows:

1. On the upstream side of the #1 shut off valve.
2. Between the #1 shut off valve and the #1 check valve.
3. Between the check valves.
4. Between the #2 check valve and the #2 shut off valve.

Note: See Figures 1-02519-a through 3-02519-c for test cock locations.

V. INSTALLATION - RPZ

A. RPZ's shall be installed in a location such that:

1. The master valve (if installed) is located after the backflow.
2. The device is located before the first use of water.
3. The device is not installed in a way that allows it to be bypassed.
4. The device can be easily accessed for testing on an annual basis and repaired as needed.

5. The device is installed with at least 12" between the ground, floor, or mulch and the bottom of the BFD.
6. The device is installed at least 6" away from walls for BFDs size 2" and under and at least 12" away from walls for BFDs over 2".
7. The device is not installed below ground or inside a pit.
8. The device is not exposed to grit, sticky, corrosive, or abrasive substances.
9. The device is protected from mechanical abuse, freezing, and flooding.
10. The device is adequately supported to prevent the unit from sagging. Special supports are needed for units in the 4" to 10" size range.

B. The water line shall be thoroughly flushed to expel all debris prior to installation of the BFD. Debris lodging under check valves is one of the most common reasons of device failure.

C. RPZ devices shall be installed in accordance with installation drawings of these specifications (See Figure 1-02519-a, Figure 2-02519-b, and Figure 3-02519-c) and according to manufacturers' instructions. Any variations in these drawings must have prior approval of the OWNER.

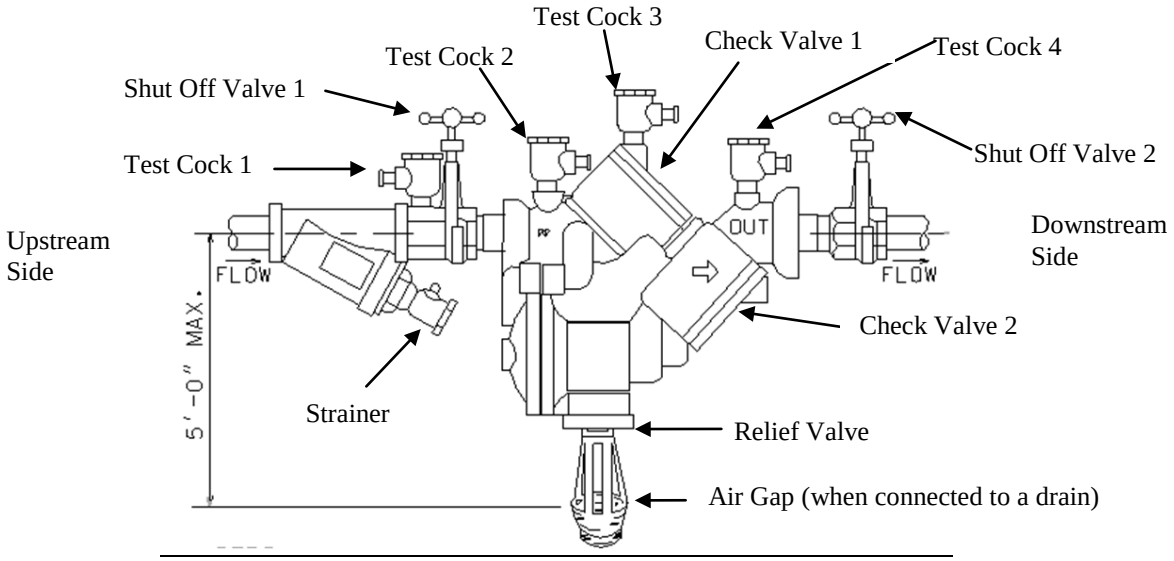

Figure 1-02519-a (RPZ, Size ¾" to 2" BFD)

Notes: The device must be installed:

- With a strainer (only on commercial properties),
- Above ground level,
- With suitable air gap between relief valve discharge port and ground level or flood level (12" minimum, 5' maximum),
- With a minimum of 6" clearance from all walls, and
- With adequate support to prevent the unit from sagging.

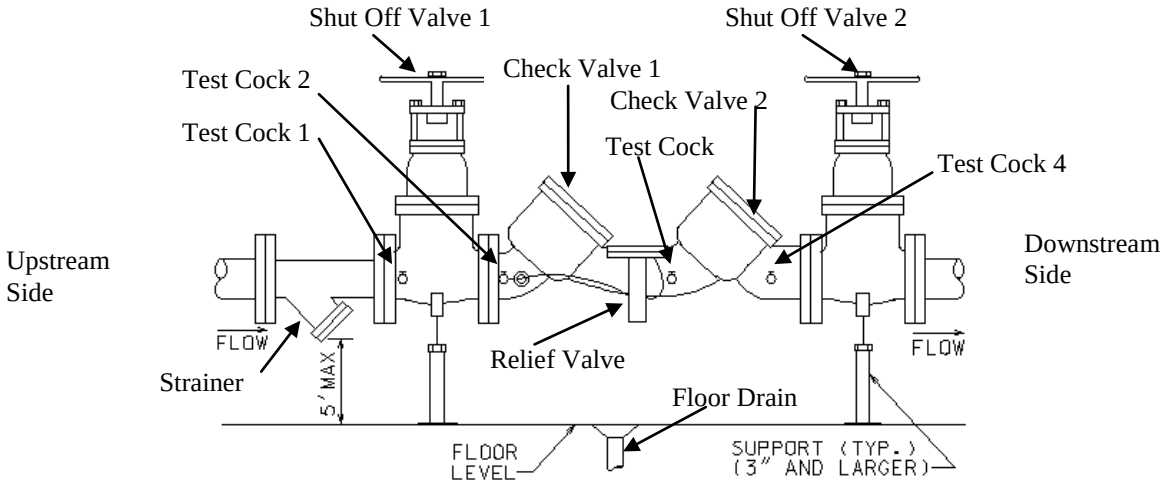

Figure 2-02519-b (RPZ, **Indoor** Installation, Size 2 ½" - 10" BFD)

Notes: The device must be installed:

- With a strainer (only on commercial properties),
- Above ground level,
- With suitable air gap between relief valve discharge port and ground level or flood level (12" minimum, 5' maximum),
- With a minimum of 12" clearance from all walls, and
- With adequate support to prevent the unit from sagging.

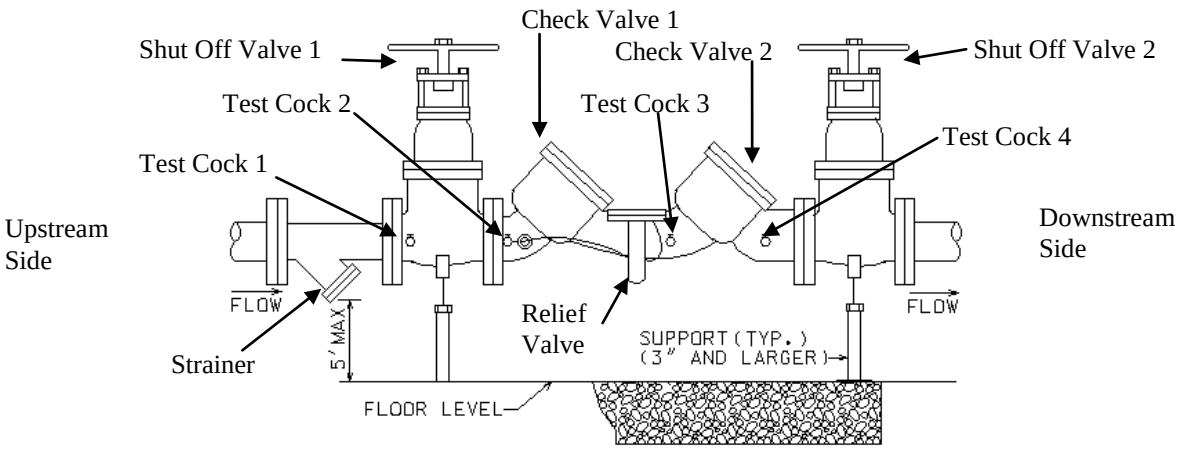

Figure 3-02519-c (RPZ, **Outdoor** Installation, Size 2 ½" - 10" BFD)

Notes: The device must be installed:

- With a strainer (only on commercial properties),
- Above ground level,
- With suitable air gap between relief valve discharge port and ground level or flood level (12" minimum, 5' maximum),
- With a minimum of 12" clearance from all walls, and
- With adequate support to prevent sagging.

D. Cross Connection Protection Requirement

The TDEC DWS determines the types of facilities requiring cross connection protection. A current list of these facilities may be obtained by contacting the OWNER. This list is also available at www.KUB.org under the Cross Connection webpage.

E. Existing Facilities:

After a complete premise inspection by the OWNER, a formal written notice advising of RPZ BFD requirements will be issued to the property owner or occupant of an establishment or premise.

VI. MATERIALS - DC

A. Double check (DC) BFDs are required for protection of the water distribution system on non-chemical fire lines only. A DC does not provide the same degree of protection as the RPZ. Only DC's listed in the "Approved Backflow Prevention Assemblies" listing maintained by TDEC DWS shall be installed on the OWNER's water system.

B. The DC device must have two internally loaded, independently acting, resilient seat values in series. The unit includes tightly closing shutoff valves located on

each end of the assembly and suitable connections for testing the water-tightness of each check valve.

C. The DC will function under pressure for extended periods and, when functioning properly, will protect against backpressure and back-siphonage conditions. Unlike the RPZ, protection against backflow is not provided when both check valves leak.

D. Devices ¾" through 2" shall have bronze bodies and 2-1/2" through 10" shall have fusion epoxy coated bodies rated at a minimum175 pounds working pressure and water temperature 32 to 140 degrees Fahrenheit. Contact KUB for questions regarding operating pressure before installation. Some locations may require a minimum of 250 pounds working pressure.

E. Test cocks must be of bronze, stainless steel, or polymer construction. They must also be resilient seated, have full port characteristic, and be located as follows:

1. On the upstream side of the #1 shut off valve.
2. Between the #1 shut off valve and the #1 check valve.
3. Between the check valves.
4. Between the #2 check valve and the #2 shut off valve.

Note: See Figures 4-02519-d through 5-02519-e for test cock locations

VII. INSTALLATION - DC

A. DC’s shall be installed in a location such that:

1. The device is located before the first use of water.
2. The device is not installed in a way that allows it to be bypassed.
3. The device can be easily accessed for testing on an annual basis and repaired as needed.
4. The device is installed with at least 12" between the floor and the bottom of the BFD.
5. The device is installed at least 6" away from walls for BFDs size 2" and under and at least 12" away from walls for BFDs over 2".
6. The device is not installed below ground or inside a pit.
7. The device is not exposed to grit, sticky, corrosive, or abrasive substances.
8. The device is protected from mechanical abuse, freezing, and flooding.
9. The device is adequately supported to prevent the unit from sagging. Special supports are needed for units in the 4" to 10" size range.

B. The water line shall be thoroughly flushed to expel all debris prior to installation of DC.

C. DC devices shall be installed in accordance with the installation drawing of these specifications (See Figures 4-02519-d and 5-02519-e) and according to manufacturers' instructions. Any variations in this drawing must have prior approval of the OWNER.

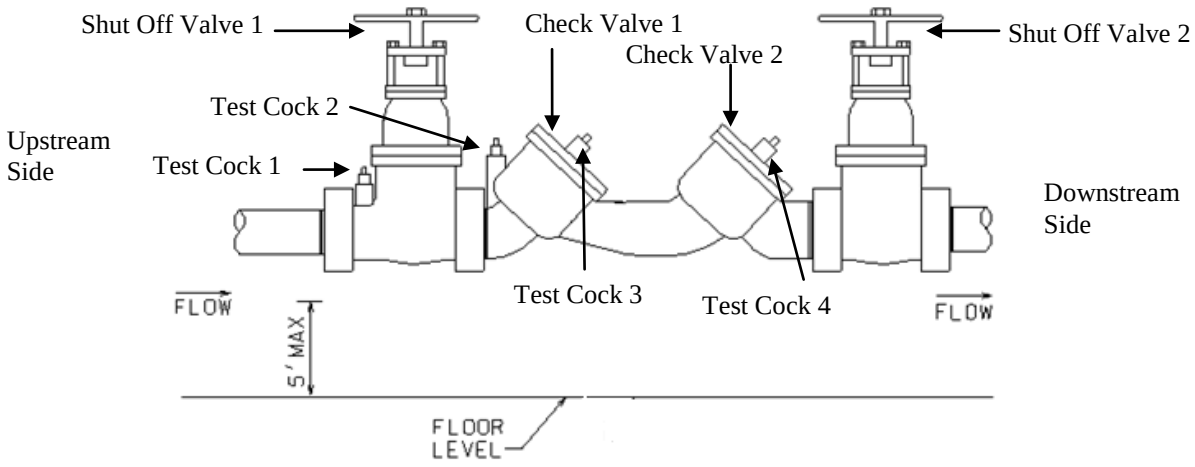

Figure 4- 02519-d (DC, Size 3/4" to 2" BFD)

Notes: The device must be installed:

- Above floor level,
- Within a minimum of 12" and a maximum of 5' from the floor,
- Within a minimum of 6" clearance from all walls, and
- With adequate support to prevent sagging.

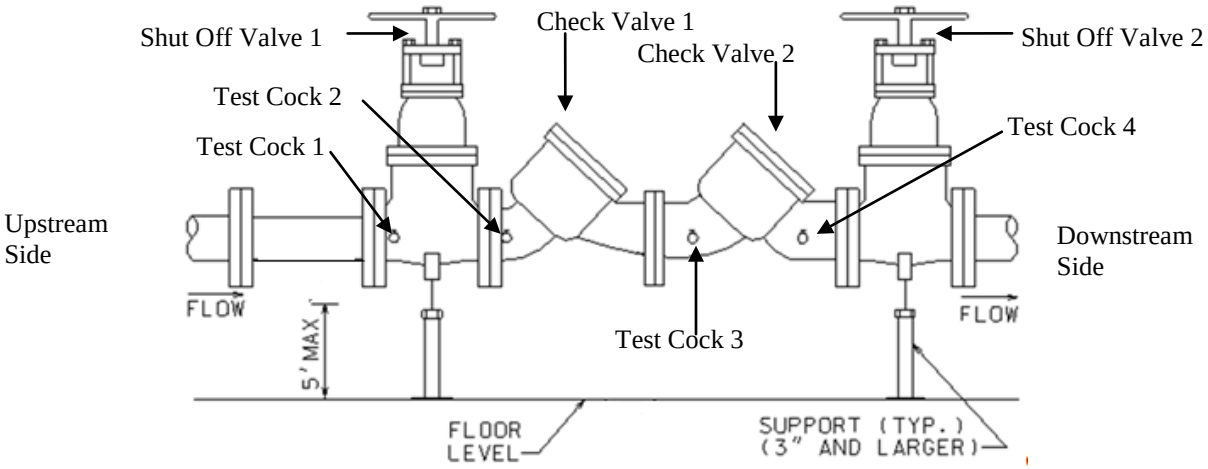

Figure 5- 02519-e (DC, Size 2 1/2" to 10" BFD)

Notes: The device must be installed:

- Above floor level,
- Within a minimum of 12" and a maximum of 5' from the floor,
- Within a minimum of 12" clearance from all walls, and
- With adequate support to prevent sagging.

VIII. INSPECTION - RPZ and DC

A. The OWNER shall examine:

1. Properties subject to frequent changes in on-site plumbing, where new cross-connections may be installed and existing protection may be bypassed, removed or otherwise made ineffective shall be subject to an annual inspection.

2. New Construction – all new commercial construction plans and specifications shall be made available to the OWNER for review.

3. Existing Facilities – existing facilities' cross connection protection shall be subject to inspection to determine the degree of hazard. Should installation of BFD or plumbing changes be required, the OWNER will notify the occupant of the requirements and a follow-up inspection will be made to assure proper protective devices have been installed.

IX. TESTING - RPZ and DC

A. Unless otherwise specified, it shall be the duty of the property owner/occupant to ensure annual (or more frequent, if necessary) testing of backflow devices.

B. BFDs shall be successfully tested:

1. Immediately upon completion of installation.
2. At least every 12 months, recommended more often for high-hazard installations.
3. When unit has been disassembled for cleaning and/or repairs.
4. When there is any indication the BFD is not functioning properly.

C. The OWNER shall keep an updated file on all BFDs that have been added to the system and records of annual tests of those devices.

X. COST - RPZ and DC

All costs associated with the subject program are to be borne by the customer or appropriate party. This includes the initial purchase of the BFD and its proper installation, testing, and maintenance.

XI. GENERAL

The procedures outlined herein are based on the principle of containment of the potential or actual hazard within the customer's premises. Should a customer refuse the right of entry of the OWNER or their designated representative, the OWNER must assume maximum hazard and therefore require the highest degree of protection on such a customer's service line.

XII. REFERENCE DOCUMENTS

A. EPA Cross Connection Control Manual

B. TDEC DWS Cross Connection Control Manual

C. ANSI/AWWA Standards C-510-89 and C-511-89

D. ASSE Standard 1013

E. Foundation for Cross Connection Control and Hydraulic Research, 7th Edition. University of Southern California Standards. 1985.

END OF SECTION