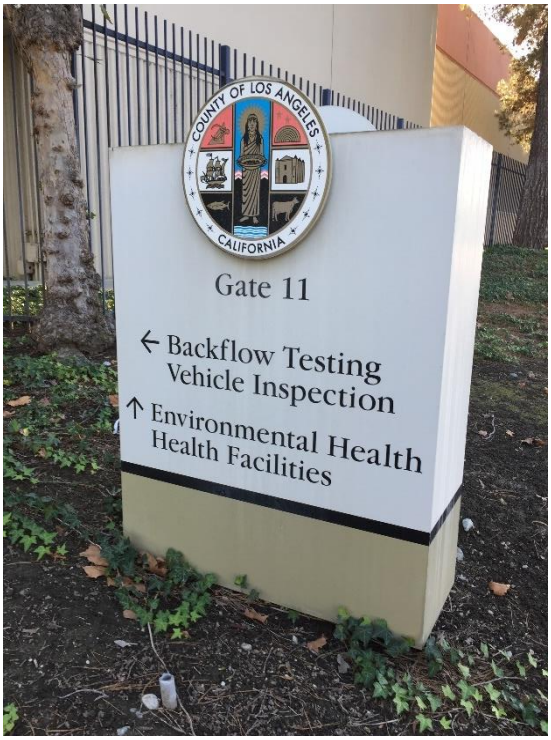
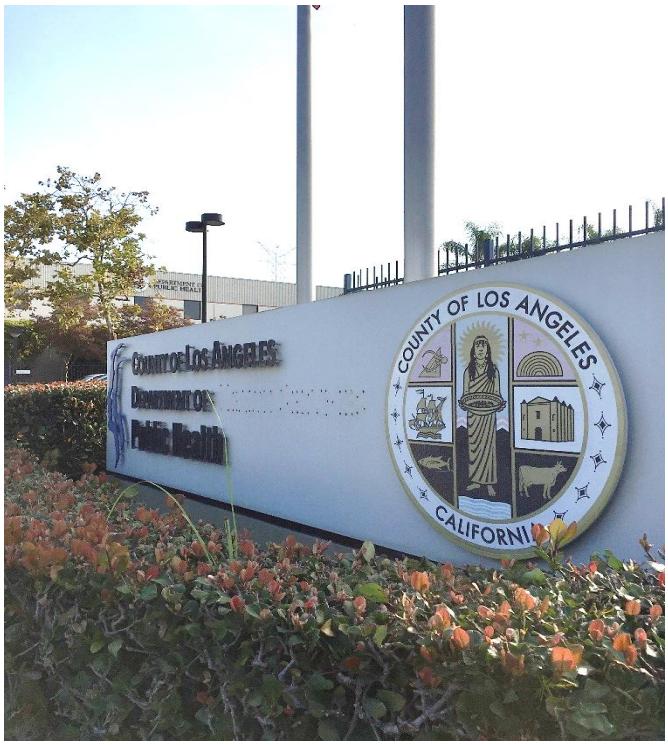
COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC HEALTH

ENVIRONMENTAL HEALTH DIVISION

CROSS CONNECTION AND WATER POLLUTION CONTROL PROGRAM





BACKFLOW PREVENTION ASSEMBLY TESTING MANUAL

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TESTING TECHNIQUES REQUIRED FOR BACKFLOW CERTIFICATION IN LOS ANGELES COUNTY

GENERAL INFORMATION

Backflow prevention assemblies are to be tested according to the following instructions, and the results documented on field testing and maintenance report forms furnished by this Department. Any part of the check valve, relief valve or air inlet valve found defective must be repaired or replaced, and a retest must show the assembly is operating properly. Leaking shut off valves which prevents a test from being made must be repaired.

DIFFERENTIAL PRESSURE GAUGE – dial range, 0 – 15 psi, 0.2 psi intervals. The following is a list of several gauges reviewed by the University of Southern California Foundation of Cross Connection and Hydraulic Research and found to be acceptable as testing equipment for backflow prevention assemblies and meet general guidelines found in Section 10.2 of their 10th Edition of the Manual of Cross Connection Control for testing equipment.

Apollo Valves/Conbraco Industries, Inc.

Model 40-200-TKU

Model 40-200-TK5U

Astra Model Promaster ASRP-4

Cameron (formerly Prime Measurement, ITT Barton Measurement System Division)

Model 226

Model 227

Model 246

Model 247

Model 226C

Model 227C

Model 246C

Model 247C

Flowmatic Corp.

Model TK1

Duke

Model 75

Model 75B

Model 1000

Model EZ900

Febco Model TK845-5

Meriam Instrument Model 1124

Mid-West Model 830

Model 835

Model 845-2

Model 845-3

Model 845-5

Watts Model TKDR

Model TKDP

Model TK99D

Wilkins Regulator Co.

Model TG-3

Model TG-5

Model 100

BACKFLOW PREVENTION ASSEMBLY TESTING

BACKFLOW ASSEMBLIES

Backflow assemblies shall be from the University of Southern California Foundation of Cross Connection and Hydraulic Research approved listing or under the supervision of the Foundation.

DOUBLE CHECK VALVE BACKFLOW PREVENTION ASSEMBLY, DOUBLE CHECK VALVE DETECTOR BACKFLOW PREVENTION ASSEMBLY and DOUBLE CHECK VALVE DETECTOR BACKFLOW PREVENTION ASSEMBLY TYPE 2

Double Check Valve Backflow Prevention Assemblies shall be tested by using an acceptable differential pressure gauge and water column.

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY, REDUCED PRESSURE PRINCIPLE DETECTOR BACKFLOW PREVENTION ASSEMBLY and REDUCED PRESSURE PRINCIPLE DETECTOR BACKFLOW PREVENTION ASSEMBLY TYPE 2

Reduced Pressure Principle Backflow Prevention Assemblies shall be tested by using an acceptable differential pressure gauge

PRESSURE VACUUM BREAKER BACKFLOW PREVENTION ASSEMBLY

Pressure Vacuum Breaker Backflow Prevention Assemblies shall be tested by using an acceptable differential pressure gauge and water column.

TWO CHECK VACUUM BREAKER BACKFLOW PREVENTION ASSEMBLY

Two Check Vacuum Breaker Backflow Prevention Assemblies shall be tested by using an acceptable differential pressure gauge and water column.

SPILL-RESISTANT PRESSURE VACUUM BREAKER BACKFLOW PREVENTION ASSEMBLY

Spill-Resistant Pressure Vacuum Breakers Backflow Prevention Assemblies shall be tested by using an acceptable differential pressure gauge.

CONCEPTS OF BACKFLOW PREVENTION ASSEMBLY TESTING

The following is based upon the operational experience of the Los Angeles County Department of Public Health Cross Connection and Water Pollution Control Program:

Testers are presumed to be familiar with backflow prevention assemblies and various testing techniques. Little mention is made, therefore, of procedures such as flushing of test cocks, inadvertent discharge of relief valve, installing and compensating with bleed valve assemblies, when to install and how to use a reference tube, relieving air from the differential pressure gauge, isolating units for test or connecting test equipment and trouble-shooting scenarios.

Troubleshooting is an integral part of testing and necessary to avoid unjustified assembly replacement or repair.

Do not check for a leaking No. 1 shut-off valve by lowering the pressure upstream of the check valve being tested.

DOUBLE CHECK VALVE BACKFLOW PREVENTION ASSEMBLIES

For double check valves and two check vacuum breaker backflow prevention assembly, accurate differential pressure gauge readings of check valves are dependent on a solid downstream reference tube. If the downstream test cock is at the highest point on the body, this can be the reference point where the gauge is held. However, if the downstream test cock is below the top of the valve body, then a piece of pipe or tubing (Reference Tube) must be attached to the downstream test cock so that it rises at least to the top of the valve body. If a reference tube is attached to the downstream test cock, hold the differential pressure gauge at the same water level in the reference tube prior to closing shut-off valve No.1.

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLIES

In testing a reduced pressure principle assembly, a tester must recognize that a relief valve discharge following closing of the downstream shutoff valve is caused by pressure equalization across a leaking first check valve. Pressure spikes may be caused from closing downstream resilient shutoff valves causing the second check disk to compress inducing the relief valve to discharge or if the second check was leaking, the pressure spike will make the relief valve discharge.

Valves that make up a reduced pressure principle assembly must be tight against reverse flow under all pressure differentials. The static pressure drop across check valve No. 1 of at least 3.0 psid greater than the relief valve opening is not a requirement. The 3-psi buffer is a manufacturer's specification that a result less than 3 psi would not automatically fail a device providing the check valve is holding tight.

In testing a reduced pressure principle backflow prevention assembly, a tester must be able to distinguish between:

Relief Valve Not Discharging Under Testing Conditions

a. A leaking downstream shutoff valve which prevents relief valve from opening. Compensating for a flow through condition is not allowed.

b. A reading on the differential gauge drops to zero on the gauge may be indicative of a defective relief valve sensing line and an inoperable relief valve.

Relief Valve Continuously Discharging Under Testing Conditions

c. A relief valve continuous discharge caused by a defective first check valve with the No. 2 Shut-Off valve in the closed position and under a no flow condition.
d. A defective second check valve under back pressure
e. A defective relief valve.

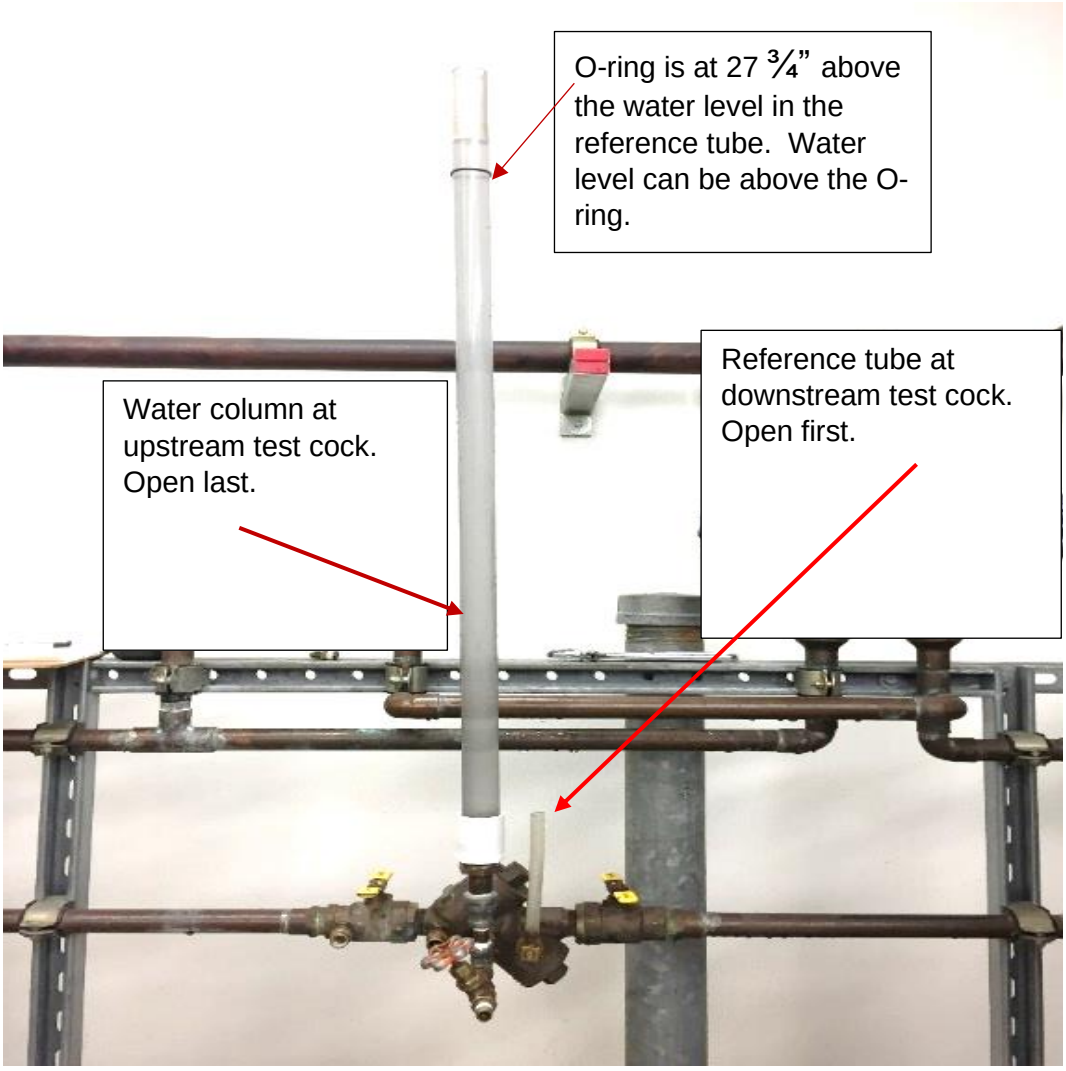
Other Trouble-Shootings Upon Initial Visit

- If closing the inlet shutoff valve causes the relief valve to fully dump, the first check valve leaks.
- If closing the inlet shutoff valve produces no change in the discharge, and opening test cocks in 4, 3, 2 order results in continuous flow at test cock 4 and test cock 3, the second check valve is leaking under back pressure; if flow occurs at test cock 2, either the first check valve leaks in reverse and/or the inlet shutoff valve leaks; if no flow occurs at test cock 4 and test cock 2, the relief valve is leaking.

Achieving and maintenance of tester competency is composite of initial instruction, certification followed by review of reporting and reinforcement, and reexamination/recertification at least every two years.

PROPER CHECK VALVE TESTING PROCEDURES USING A WATER COLUMN

Testing a Check Valve with a Water Column and Reference Tube – connect the reference tube to the test cock downstream from the check valve being tested and fill with water.

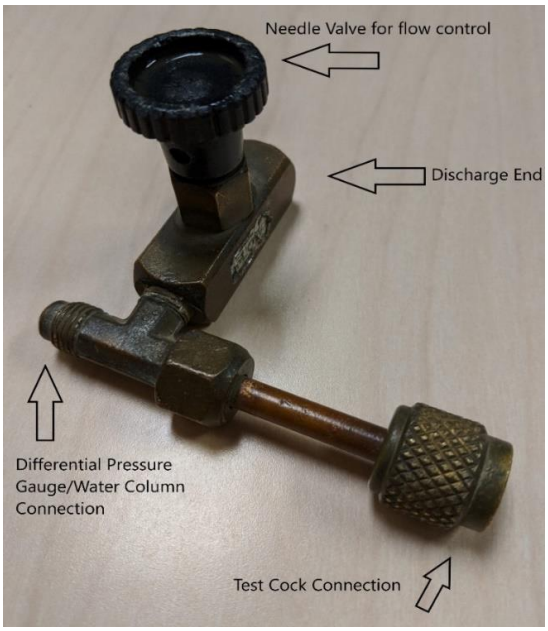


Close the downstream test cock. Connect water column to the upstream test cock with a bleed valve assembly and fill with water to at least 27 ¾" **above the reference tube water level**. Close the upstream test cock. Close downstream and then upstream shutoff valve. **Open the downstream test cock first and then open the upstream test cock.** Observe reference tube. If necessary, make further adjustments through the bleed valve assembly until there is only one drop of water is coming out at a time from the reference tube. For ease, having water level beyond 27 ¾" inside the water column is preferred.

NOTE: While the use of water columns for field test reporting purposes has been relegated for confirming differential pressure gauge readings, check valves and air-inlet accuracy, testers will still be required to demonstrate proficiency in water column procedures at the time of certification and recertification.

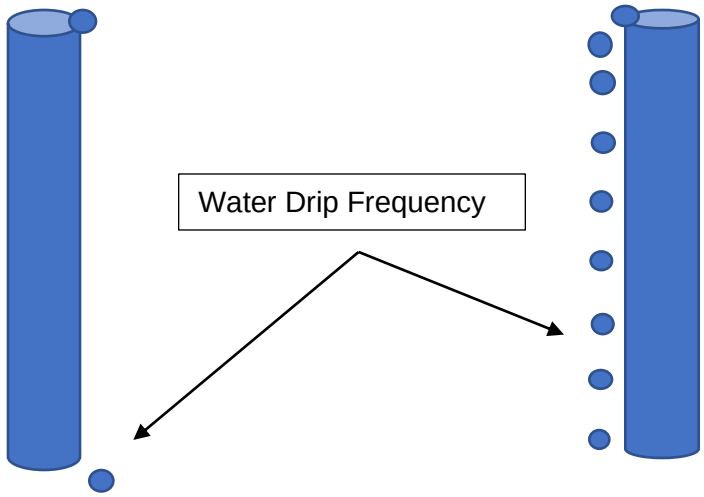
BLEED VALVE ASSEMBLY OPERATION

With the bleed valve assembly connected to a check valve or an air-inlet test cock, open the bleed valve in increments of a quarter of a turn and observe results on differential pressure gauge or water column.



Basic Anatomy of a Bleed Valve Assembly

DRIP FREQUENCY WHILE COMPENSATING FOR A LEAKING SHUT-OFF VALVE TUBE



When compensating for Shut Off Valve leak, make a final adjustment of the bleed valve assembly to allow a drip of water coming out at a time from the reference tube (see diagram above). If the check valve is operating properly, the reading of the differential pressure gauge should be 1.0 psi or greater and recorded as the static pressure across the check valve.

DOUBLE CHECK VALVE BACKFLOW PREVENTION ASSEMBLY
DIFFERENTIAL PRESSURE GAUGE TEST PROCEDURE

Materials required for test equipment:

1. Differential Pressure Gauge
2. Bleed Valve Assembly, Reference Tube, and fittings.

Test Procedure Part A: Check Valve No. 1 Operation

Purpose: To test check valve for tightness in direction of normal water flow.

Requirement: The check valve, under static condition, shall hold water pressure at 1.0 psid or greater in direction of flow.

Procedure: Testing Check Valve No. 1 Operation

a. Attach high pressure side hose of differential pressure gauge with bleed valve assembly (closed) to test cock No. 2.
b. Open test cock No. 2. Vent air from hose and differential pressure gauge by opening the high side bleed needle valve and then close.
c. Install reference tube on test cock No. 3 and open test cock No. 3 to fill the reference tube. Close test cock No. 3.
d. While holding differential pressure gauge at the same water level as the water inside the reference tube, close shutoff valve No. 2, then No.1. See Concepts of Backflow Prevention Assembly testing, pages 5 and 6.
e. While maintaining differential pressure gauge at the same level as in the reference tube, open test cock No. 3. After the water level in the reference tube stabilizes, adjust differential pressure gauge level to match water level in the reference tube. Document gauge reading on the test report.
f. If necessary, make further adjustments to the bleed valve assembly until there is only one drop of water coming out at a time from the reference tube.
g. Close test cock No. 2 and No. 3 and remove testing equipment.

Test Procedure Part B: Check Valve No. 2 Operation

Purpose: The purpose and the requirement are the same as for Part A.

Procedure: Testing Check Valve No. 2

a. Move high pressure side hose of differential pressure gauge and bleed valve assembly (closed) to test cock No. 3 and reference tube to test cock No. 4. Open shut-off valve No. 1.
b. Follow procedures as directed on “Testing Check Valve No. 1.”
c. Document reading of gauge on the test report.
d. If necessary, make further adjustments to the bleed valve assembly until there is only one drop of water is coming out at a time from the reference tube.
e. Close test cocks No. 3 and No. 4, remove testing equipment.
f. Open shutoff valves No. 1 and No. 2.

DOUBLE CHECK VALVE BACKFLOW PREVENTION ASSEMBLY
WATER COLUMN TEST PROCEDURE

Materials required for test equipment:

1. Transparent Water Column (minimum 36" length or adjustable tube), Bleed Valve Assembly, Reference Tube
2. Tape Measure and fittings.

Test Procedure Part A: Check Valve No. 1 Operation

Purpose: To test check valve for tightness in direction or normal water flow.

Requirement: The check valve shall not allow water flow in the normal direction of water flow when the inlet pressure is 1 psi and the outlet pressure is atmospheric.

Procedure: Testing Check Valve No. 1

a. Install water column and bleed valve assembly on test cock No. 2. Install reference tube on test cock No. 3.
b. Open test cock No. 3, fill reference tube to the top and close test cock No. 3, use this water level as a reference point. On the water column make a mark at the same level as the reference point. Measure up from the reference point 27 ¾" and mark this as 1 psi.
c. Open test cock No. 2 and fill water column to the 1 psi mark or above. Close test cock No. 2. Close shut-off valve No. 2 and then No. 1.
d. Open test cock No. 3, then open test cock No. 2. After the water in the reference tube stabilizes and the water level in the water column remains at a height of 1 psi (or more) the check valve shall be considered as passing.
e. Close test cock No. 2 and No. 3. Remove testing equipment.

NOTE: If water continues to flow from the reference tube, compensate for a shutoff valve leak with the bleed valve assembly until there is only a slight drip from the reference tube. After the water in the reference tube stabilizes and the water level in the water column remains at a height of 1 psi (or more) the check valve shall be considered as passing. Close test cock No. 2 and No. 3. Remove testing equipment.

Test Procedure Part B: Check Valve No. 2 Operation

Procedure: Testing Check Valve No. 2

a. Install water column and bleed valve assembly on test cock No. 3. Install reference tube on test cock No. 4. Open shut-off valve No. 1.
b. Follow procedures as directed on "Testing Check Valve No. 1.
c. Close test cocks No. 3 and No. 4, remove testing equipment.
d. Open shut-off valve No. 1 and then No. 2.

DOUBLE CHECK DETECTOR BACKFLOW PREVENTION ASSEMBLY
DIFFERENTIAL PRESSURE GAUGE TEST PROCEDURE

Test Procedure Part A: Bypass Assembly Operation

Materials required for test equipment:

1. Differential Pressure Gauge
2. Bleed Valve Assembly, Reference Tube and fittings

Purpose: To test the operation of the bypass double check valve backflow prevention assembly.

Requirement: The bypass double check valve backflow prevention assembly shall comply with field test requirements of the double check valve backflow assembly.

Procedure:

a. Perform testing procedures found on page 9 for the bypass double check valve assembly.
b. Leave both shutoff valves on the bypass closed.

Test Procedure Part B: Main-Line Assembly Operation

Purpose: To test the operation of the main-line double check valve backflow prevention assembly.

Requirement: The main-line double check valve backflow prevention assembly shall comply with field test requirements of the double check valve backflow prevention assembly.

Procedure:

a. Perform testing procedures found on page 9 for the main-line double check valve assembly.
b. Open all shutoff valves on double check valve assembly.

DOUBLE CHECK DETECTOR BACKFLOW PREVENTION ASSEMBLY - TYPE II
DIFFERENTIAL PRESSURE GAUGE TEST PROCEDURE

Test Procedure Part A: Bypass Single Check Assembly Operation

Materials required for test equipment:

1. Differential Pressure Gauge
2. Bleed Valve Assembly, Reference Tube and fittings

Purpose: To test the operation of the bypass single check valve assembly in direction of normal flow.

Requirement: The check valve shall not allow water flow in normal direction when the water pressure is 1.0 psi, and the outlet pressure is atmospheric.

Procedure: Testing Check Valve No. 1 Operation

a. Attach high pressure side hose of differential pressure gauge and bleed valve assembly (closed) to test cock No. 2.
b. Open test cock No. 2 and vent air from hose and differential pressure gauge through high side bleed needle valve and then close high side bleed needle valve.
f. Install reference tube if necessary to test cock No. 3. Open test cock No. 3 to fill the reference tube. Close test cock No. 3.
g. While holding differential pressure gauge at the same level of the water inside the reference tube. Close shutoff valve No. 2, then No.1. See Concepts of Backflow Prevention Assembly testing.
h. Open test cock No. 3. If necessary, make further adjustments to the bleed valve assembly until there is only one drop of water is coming out at a time from the reference tube.
i. Document reading of differential pressure gauge. If 1.0 psi or above, note the gauge reading on the test report. If less than 1.0 psi, check valve is noted as fail.
j. Close test cock No. 2 and No. 3 and remove testing equipment.
k. Maintain No. 2 shutoff valve of the bypass single check assembly closed.

Test Procedure Part B: Main-Line Assembly Operation

Purpose: To test the operation of the main-line double check valve backflow prevention assembly.

Requirement: The main-line double check valve backflow prevention assembly shall comply with field test requirements of the double check valve backflow prevention assembly.

Procedure:

a. Perform testing procedures on main-line double check valve assembly found in page 9.
b. Open shutoff valve No. 1 and No. 2 of the DCDA-Type II and bypass single check assembly.

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY
DIFFERENTIAL PRESSURE GAUGE TEST PROCEDURE

Test Procedure Part A: Hose Set Up and Apparent Reading.

Materials required for test equipment:

1. Approved differential pressure gauge, fittings, and flexible hoses.

Purpose: To test operation of the differential pressure relief valve and to note the apparent static pressure drop across the first check valve.

Requirements: The differential pressure relief valve must operate to maintain the zone between the check valves at least 2.0 psi less than the supply pressure.

Step 1: Set Up

a. Flush test cocks in proper sequence to remove debris. Open test cock #4 to establish flow through the assembly, slowly open test cock No. 3, 2 and 1 to prevent unintentional discharge of the differential pressure relief valve.
b. Connect high side hose from the differential pressure gauge to test cock No. 2; low side hoe from the differential pressure gauge to test cock No. 3 and then loosely connect the bypass hose to test cock No. 4.
c. Open test cock No. 3 and open low side bleed needle valve on differential pressure gauge.
d. Open test cock No. 2 then open high side bleed needle valve on differential pressure gauge.
e. Close shut off valve No. 2.
f. Close the high side bleed needle valve, then close low side bleed needle valve.
g. After the differential pressure gauge reading stabilizes, record value on differential pressure gauge as the apparent static pressure drop across the #1 check valve.

Test Procedure Part B: Relief Valve Operation

Purpose: To test operation of differential pressure relief valve

Requirement: The differential pressure relief valve must operate to maintain the zone between the check valves at least 2.0 psi less than the supply pressure.

Step 2: Differential pressure relief valve opening point.

a. Open the high side control needle valve of the differential pressure gauge at least one full turn.
b. Open the low side control needle valve and no more than ¼ turn to bypass water. Observe the first discharge of water from the differential pressure relief valve. and record the value of the differential pressure gauge as the differential pressure opening point.
    1. If the value on the differential pressure gauge does not reach the differential pressure relief valve opening after the initial ¼ turn, then consider the #2 shutoff valve leaking.
    2. If the value on the differential pressure gauge drops to zero and the differential pressure relief valve does not discharge water, record that the differential pressure relief valve did not open.

c. Close low side control needle valve.

Test Procedure Part C: No. 2 Check Valve Operation

Purpose: To test No. 2 check valve for tightness against reverse flow.

Requirement: Valve must be tight against reverse flow under all pressure differentials

Step 3: No. 2 Check Valve

a. Bleed air from the bypass hose by opening the bypass control needle valve. Tighten bypass hose to test cock No. 4. Open test cock No. 4.
b. Open low side bleed needle valve on the differential pressure gauge to reestablish a reading above the apparent value of the #1 check valve. Close low side bleed needle valve.
c. Slowly open the bypass needle control valve while watching the gauge. Check valve No. 2 shall be recorded as "tight" if there is no discharge coming from the relief valve. If the gauge is dropping and water starts discharging from the differential pressure relief valve, the check valve may be leaking but there is a possibility of No. 2 check disc compression or No. 2 check movement that caused the relief valve to discharge. Before noting the check valve "leaking," the tester should open the low side bleed needle valve of the gauge to relieve any disc compression and thus confirm the check valve leaking if the gauge drops and the relief valve discharges. If no water is discharged the check valve shall be noted as "closed tight" and so checked on the report.

Test Procedure Part D: Check Valve No. 1 Operation (static)

Purpose: To test No. 1 check valve for tightness and to **record** the static pressure drop across the check valve.

Requirements: The static pressure drop across the check valve should be at least 3 psi greater than the relief valve opening recorded in test No. 2. The 3-psi buffer is a manufacturer's specification that a result less than 3 psi would not automatically fail a device providing the check valve is holding tight.

Step 4: No. 1 Check Valve

a. With the bypass hose still connected to test cock No. 4, bypass control valve and high side control valves open, open low side bleed valve to reestablish a reading above the apparent value of the #1 check valve. Close low side bleed needle valve. After the gauge reading stabilizes, record the value as the static differential pressure of the #1 check valve.
b. Closed all test cocks and remove all testing equipment.
c. Open shutoff valve No. 2.

REDUCED PRESSURE PRINCIPLE DETECTOR BACKFLOW PREVENTION ASSEMBLY DIFFERENTIAL PRESSURE GAUGE TEST PROCEDURE

Test Procedure Part A: Main Line Assembly Operation

Materials required for test equipment:

1. Approved differential pressure gauge and flexible hose.

Purpose: To test the operation of the main-line reduced pressure principle backflow prevention assembly.

Requirement: The main-line reduced pressure principle backflow prevention assembly shall comply with field test requirements of the reduced pressure principle backflow assembly.

Procedure:

a. Close No. 2 shutoff valve of bypass assembly
b. Perform testing procedures on main-line assembly found in pages 13 and14.
c. Leave No. 2 shutoff valve on main line closed.

Test Procedure Part B – Bypass Assembly Operation

Purpose: To test the operation of the bypass reduced pressure principle backflow prevention assembly.

Requirement: The bypass reduced pressure principle backflow prevention assembly shall comply with field test requirements of the reduced pressure principle backflow assembly.

Procedure:

a. Perform testing procedures on bypass assembly found in pages 13 and 14.
b. Open all shutoff valves on the reduced pressure principle detector backflow prevention main-line and bypass assemblies.

REDUCED PRESSURE PRINCIPLE DETECTOR BACKFLOW PREVENTION ASSEMBLY - TYPE II
DIFFERENTIAL PRESSURE GAUGE TEST PROCEDURE

Test Procedure Part A: Main Line Assembly Operation

Materials required for test equipment:

1. Approved differential pressure gauge and flexible hose.
2. Fittings

Purpose: To test the operation of the main-line reduced pressure principle backflow prevention assembly.

Requirement: The main-line reduced pressure principle backflow prevention assembly shall comply with field test requirements of the reduced pressure principle backflow assembly.

Procedure:

a. Close No. 2 shutoff valve of bypass assembly
b. Perform testing procedures on main-line assembly found in pages 13 and 14.
c. Leave No. 2 shutoff valve on main line closed.

Test Procedure Part B – Bypass Single Check Valve Assembly Operation

Purpose: To test the operation of the bypass single check assembly.

Requirement: The bypass single check valve shall comply with field test requirements found in pages 13 and 14.

Procedure:

c. Perform testing procedures on bypass single check assembly.
d. Open shutoff valves on the bypass single valves and reduced pressure principle main-line backflow prevention assembly.

PRESSURE VACUUM BREAKER BACKFLOW ASSEMBLY
DIFFERENTIAL PRESSURE GAUGE TEST PROCEDURE

Test Procedure Part A: Air Inlet Operation

Materials required for test equipment:

1. Approved differential pressure gauge and flexible hose.
2. Bleed valve assembly
3. Tee, pipe nipples and fittings.

Purpose: To determine the Air Inlet opening pressure.

Requirements: The Air Inlet must open when the water pressure in the body is at least 1 psi above atmospheric pressure, and the Air Inlet must be fully open with water drained from body.

Procedure: Testing of Air Inlet

a. Remove canopy over Air Inlet to permit observation of opening of the Air Inlet.
b. Attach high pressure side hose from differential pressure gauge and bleed valve assembly to test cock #2.
c. Open test cock #2 and vent air from high side bleed needle valve. Close high side bleed needle valve.
d. While holding the differential pressure gauge at level of Air Inlet, close shutoff valve No. 2 and then No. 1.
e. Slowly open bleed valve assembly or open high side bleed needle valve of the differential pressure gauge. Note pressure on differential pressure gauge when Air Inlet opens at least 1 psid above atmospheric pressure.
f. Visually verify the air-inlet fully opens.
g. Close test cock No. 2 and remove equipment.

Test Procedure Part B: Check Valve Operation

Purpose: To test check valve for tightness in direction of normal water flow.

Requirement: The check valve, under static condition, shall hold water pressure at 1.0 psid or greater in the direction of flow.

Procedure: Testing Check Valve

a. Attach high pressure side hose from differential pressure gauge with bleed valve assembly (closed) to test cock No. 1. Open shut off valve No. 1.
b. Open test cock No. 1. Vent air from hose and differential pressure gauge by opening the high side bleed needle valve and then close.
c. While holding differential pressure gauge at the same level as the highest point of the check valve, close shut off valve No. 1.
d. Open test cock No. 2. Note pressure on differential pressure gauge when water from test cock No. 2 comes out intermittently and Air Inlet is holding at least 1 psi above atmospheric pressure.
e. Close test cock No. 1 and No. 2, replace canopy and remove testing equipment.
f. Open shutoff valves No. 1 and No. 2.

PRESSURE VACUUM BREAKER BACKFLOW ASSEMBLY
WATER COLUMN TEST PROCEDURE

Test Procedure Part A: Air Inlet Operation

Materials required for test equipment:

1. Transparent Water Column (minimum 36" length or adjustable tube), Bleed Valve Assembly, fittings, and tape measure.

Purpose: To determine the air inlet opening pressure.

Requirement: The air inlet must open when the water pressure in the body is at least 27 ¾" above atmospheric pressure, and the air inlet must be fully open with water drained from body.

Procedure: Testing of Air Inlet

a. Remove canopy over air inlet to permit visual observation of opening of the Air Inlet.
b. Attach water column and bleed valve assembly to test cock No. 2. Top of water column must be at least 27 ¾" inches above Air Inlet.
c. Open test cock No. 2 and fill water column to the top, at or above 27 ¾", then close test cock No. 2.
d. Close shutoff valve No. 2, then shutoff valve No. 1. While observing the water level in the water column, open test cock No. 2. If the Air Inlet opens at 27 ¾" or above, the Air Inlet is operating satisfactorily.
e. If Air Inlet does not open, release water from bleed valve assembly and note water level in water column when Air Inlet opens. If the Air Inlet opens at 27 ¾" or above, the Air Inlet is operating satisfactorily. If the Air Inlet opens when the water level in the column is less than 27 ¾", the Air Inlet does not meet standard.
f. Visually verify the Air Inlet fully opens.
g. Close test cock No. 2 and remove water column and bleed valve assembly.

Test Procedure Part B: Check Valve Operation

Purpose: To test check valve for tightness in direction of normal water flow.

Requirement: The check valve shall not allow water flow in the normal direction of water flow when the inlet pressure 1.0 psi and the outlet pressure is atmospheric.

Procedure: Testing of Check Valve

a. Install water column with bleed valve assembly on test cock No. 1.
b. Measure up 27 ¾" from test cock No. 2 and mark this as 1 psi.
c. Open shut-off valve No. 1. Open test cock No. 1 and fill water column to the top, at or above 27 ¾" inches.
d. Close shut-off valve No. 1 then open test cock No. 1 and test cock No. 2. When the water stops running from test cock No. 2 and if water remains in the water column at 27 ¾" inches or above, the check valve is operating satisfactorily.
e. If water drops in water column below 27 ¾" inches, the check valve does not meet the minimum standard of 1 psi and would require repair.
f. Close test cock No. 1 and No. 2, replace canopy and remove testing equipment.
g. Open shutoff valves No. 1 and No. 2.

TWO CHECK PRESSURE VACUUM BREAKER BACKFLOW PREVENTION ASSEMBLY
DIFFERENTIAL PRESSURE GAUGE TEST PROCEDURE

Test Procedure Part A: Air Inlet Operation

Materials required for test equipment:

1. Differential Pressure Gauge
2. Bleed Valve Assembly, Reference Tube, and fittings.

Purpose: To determine the air inlet opening pressure.

Requirement: The Air Inlet must open when the water pressure in the body is at least 1 psi above atmospheric pressure, and the Air Inlet must be fully open with water drained from body.

Procedure: Testing of Air Inlet

a. Remove canopy over Air Inlet to permit observation of opening of the Air Inlet.
b. Attach high pressure side hose from differential pressure gauge and bleed valve assembly to test cock #4.
c. Open test cock #4 and vent air from high side bleed needle valve. Close high side bleed needle valve.
d. While holding the differential pressure gauge at level of Air Inlet, close shutoff valve No. 2 and then No. 1.
e. Slowly open bleed valve assembly or open high side bleed needle valve of the differential pressure gauge. Note pressure on differential pressure gauge when Air Inlet opens at least 1 psid above atmospheric pressure.
f. Visually verify the air-inlet fully opened.
g. Close test cock #4 and remove equipment.

Test Procedure Part B: Check Valve No. 1 Operation

Purpose: To test check valve for tightness in direction of normal water flow.

Requirement: The check valve, under static condition, shall hold water pressure at 1.0 psid or greater direction of flow.

Procedure: Testing Check Valve No. 1 Operation

a. Attach high pressure side hose of differential pressure gauge with bleed valve assembly (closed) to test cock No. 2 and open shut-off valve No. 1.
b. Open test cock No. 2. Vent air from hose and differential pressure gauge by opening the high side bleed needle valve and then close.
c. Install reference tube on test cock No. 3 and open test cock No. 3 to fill the reference tube. Close test cock No. 3.
d. While holding differential pressure gauge at the same water level as the water inside the reference tube, close shutoff valve No. 1. See Concepts of Backflow Prevention Assembly testing, page 4 and 5.
e. While maintaining differential pressure gauge as the same level as in the reference tube, open test cock No. 3. After the water level in the reference tube stabilizes, adjust differential pressure gauge level to match water level in the reference tube. Document gauge reading on the test report.

f. If necessary, make further adjustments to the bleed valve assembly until there is only one drop of water is coming out at a time from the reference tube.
g. Close test cock No. 2 and No. 3. Remove testing equipment.

Test Procedure Part C: Check Valve No. 2 Operation

Purpose: The purpose and the requirement are the same as for Part B

Procedure: Testing Check Valve No. 2

a. Move high side pressure hose of differential pressure gauge and bleed valve (closed) to test cock No. 3 and reference tube to test cock No. 4. Open shut-off valve No. 1.
b. Follow procedures as directed on “Testing Check Valve No. 1,” Test Procedure Part B.
c. Document reading of gauge on the test report.
d. If necessary, make further adjustments to the bleed valve assembly until there is only one drop of water is coming out at a time from the reference tube.
e. Close test cocks No. 3 and No. 4, replace canopy and remove testing equipment.
f. Open shutoff valve No. 1 and then No. 2.

TWO CHECK PRESSURE VACUUM BREAKER BACKFLOW PREVENTION ASSEMBLY WATER COLUMN TEST PROCEDURE

Test Procedure Part A: Air Inlet

Material required for test equipment:

1. Transparent tube approximately ¾" diameter and Bleed Valve Assembly
2. Tee, pipe and fittings.

Purpose: To obtain the opening pressure differential of the Air Inlet valve.

Requirements: The Air Inlet must open when the water pressure in the body is at least 1 psi above atmospheric pressure, and the Air Inlet must be fully open with water is drained from body.

Procedure: Testing the Air-Inlet

a. Remove canopy over air inlet to permit visual observation of opening of the Air Inlet. Attach water column and bleed valve assembly on test cock No. 4. Water level inside the water column must be at least 27 ¾" inches above Air Inlet and mark this as 1 psi. Close test cock No. 4.
b. Close shutoff valve No. 2 and then No. 1. Open test cock No. 4. Air Inlet must open above or at the 27 ¾" to operate satisfactorily.
c. If Air Inlet does not open, release water from bleed valve assembly and note water level in water column when Air Inlet opens. If the Air Inlet opens at 27 ¾" or above, the Air Inlet is operating satisfactorily. Visually verify the Air Inlet fully opens. If the Air Inlet opens when the water level in the column is less than 27 ¾", the Air Inlet does not meet standard.
d. Close test cock No. 4, remove testing equipment and replace canopy.

Test Procedure Part B: Check Valve No. 1 Operation

Purpose: To test check valves for tightness in direction or normal water flow.

Requirements: The check valve shall not allow water flow in the normal direction of water flow when the inlet pressure is 1 psi, and the outlet pressure is atmospheric.

Procedure: Testing of Check Valve No. 1

a. Install water column and bleed valve assembly on test cock No. 2. Install reference tube on test cock No. 3.
b. Follow procedures as directed on "Double Check Valve Backflow Prevention Assembly Water Column Test Procedures Testing Check Valve No. 1."
c. Close test cocks No. 2 and No. 3, remove testing equipment.

Test Procedure Part C: Check Valve No. 2 Operation

Procedure: Testing of Check Valve No. 2

a. Install water column and bleed valve assembly on test cock No. 3. Install reference tube on test cock No. 4. Open shut-off valve No. 1.
b. Follow procedures as directed on “Double Check Valve Backflow Prevention Assembly Water Column Test Procedures Testing Check Valve No. 2.
c. Close test cocks No. 3 and No. 4, remove testing equipment.
d. Open shut-off valve No. 1 and then No. 2.

SPILL-RESISTANT PRESSURE VACUUM BREAKER
DIFFERENTIAL PRESSURE GAUGE TEST PROCEDURE

Test Procedure Part A: Check Valve Operation

Materials required for test equipment:

1. Approved differential pressure gauge, flexible hose, and Bleed Valve Assembly.
2. Tee, pipe and fittings.

Purpose: To test check valve for tightness in direction of normal flow.

Requirements: The check valve shall not allow water flow in normal direction when the water pressure is 1.0 psi, and the outlet pressure is atmospheric.

Procedure: Testing of Check Valve

a. Remove canopy to permit observation of Air Inlet valve.
b. Flush vent valve and test cock of any foreign material.
c. Attach high pressure side hose from differential pressure gauge with bleed valve assembly to the test cock. Open test cock and vent air from hose and differential pressure gauge by opening the high side bleed valve on the differential pressure gauge. While bleeding differential pressure gauge, fill top of air inlet with water which will make determining the opening point of the air inlet easier. Close the high side bleed valve.
d. While holding the differential pressure gauge at the same level as the vent screw, close shutoff valve No. 2 and then No. 1.
e. Slowly loosen vent screw while observing Air Inlet and Differential Pressure Gauge. If Air Inlet opens during this procedure, record the differential pressure gauge value as the Air Inlet opening point. Completely remove the vent valve screw. Continue with testing the check valve by slowly opening the high side bleed needle valve. When water stops flowing from the vent screw opening, record this value as the static pressure across the check valve. If Air Inlet does not open when water stops flowing, record this value as the static pressure across the check valve.

Test Procedure Part B: Air Inlet Operation

Purpose: To determine the Air Inlet opening pressure

Requirements: The Air Inlet valve must open when the water pressure in the body is at least 1 psi above atmospheric pressure, and the Air Inlet valve must be fully open with water drained from body.

a. To determine the Air Inlet opening point, slowly open the high side bleed needle valve and observe the first flow / movement of water from the vent screw opening.
b. Record the value Air Inlet opening point.
c. Replace vent screw and close test cock, remove testing equipment, and replace canopy.
d. Open shut-off valve No. 1 and then No. 2.

DIAGNOSTIC / TROUBLE SHOOTING

Understanding mechanical problems that occur with backflow prevention devices is a must for any competent backflow prevention device tester. Diagnosing and then troubleshooting the various problems is typical while working with these backflow assemblies. The following are some of the problems that backflow prevention assembly testers are expected to know, understand, troubleshoot and document properly on the test notices:

Reduced Pressure Principle:	Leaking First Check Leaking Second Check Leaking No. 1 Shutoff Valve Leaking No. 2 Shutoff Valve Stuck Relief Valve, either in the opened or closed position
Double Check:	Bad First Check Bad Second Check Bad No. 1 Shutoff Valve Bad No. 2 Shutoff Valve
Pressure Vacuum Breaker:	Bad First Check Bad Air-Inlet Bad No. 1 Shutoff Valve Bad No. 2 Shutoff Valve
Two Check Vacuum Breaker	Bad First Check Bad Air-Inlet Bad No. 1 Shutoff Valve Bad No. 2 Shutoff Valve
Spill-Resistant Vacuum Breaker	Bad First Check Bad Air Module Bad No. 1 Shutoff Valve Bad No. 2 Shutoff Valve
Gauge:	Out of Calibration Leaking Control Needle, Test Cocks and Bleed Valves

CERTIFICATION DAY ESSENTIALS

WHERE TO GO AND PARK: Enter through Gate 11

Los Angeles County Department of Public Health
Environmental Health Division
Cross Connection and Water Pollution Control Program
5050 Commerce Drive
Baldwin Park, CA 91706

Exam door entrance

WHAT TO BRING:

Testers will not be allowed to take their practical exam if they do not have the following: an approved differential gauge with hoses, water column (minimum length of 36.0” or longer), reference tube, bleed valve assembly, fittings of various sizes, screwdriver(s), measuring tape, plumber’s tape, pen or pencil and other necessary tools and equipment.

The use of any type of electronic devices including cell phones, ear buds and other communication equipment while taking the backflow certification exam is prohibited.

Cancellation Policy:

If you need to reschedule your backflow certification, please call the main office immediately at 626 430 5290. Failure to appear on backflow certification appointment or calling-in to cancel less than one week prior to backflow certification appointment will result to loosing one of two chances on passing the backflow certification exam.