APPROVED FIELD TEST PROCEDURES FOR BACKFLOW PREVENTION ASSEMBLIES

PREPARATION (***Notify, Identify, Observe & Inspect***)

1. OBTAIN PERMISSION FROM THE OWNER OR REPRESENTATIVE TO SHUT DOWN THE WATER SUPPLY. JUST PRIOR TO TESTING, THE CUSTOMER SHOULD BE NOTIFIED THAT THE WATER SERVICE WILL BE DISCONTINUED TEMPORARILY

*** **IF THE SERVICE WITH BACKFLOW ASSEMBLY BEING TESTED SUPPLIES A FIRE LINE THE APPROPRIATE OFFICIALS MUST BE NOTIFIED OF THE SHUT DOWN. THE ALARM COMPANY MUST BE NOTIFIED. THE TESTER IS REQUIRED TO MEET ALL CODE AND REGULATIONS AS IMPOSED BY THE GOVERNING FIRE OFFICIAL. SEE BULLETIN #8 GUIDELINES FOR TESTING BACKFLOW PREVENTION DEVICES ON FIRE LINES.**

2. OBSERVE AND RECORD THE PHYSICAL CONDITIONS OF THE ASSEMBLY AND SURROUNDING AREA. OBSERVE THE DIRECTION OF FLOW. **IS THIS THE CORRECT ASSEMBLY FOR ITS APPLICATION?**

3. RECORD OR VERIFY THE FOLLOWING INFORMATION ON EACH ASSEMBLY:

   MANUFACTURER
   MODEL
   SERIAL #
   SIZE OF ASSEMBLY
   LOCATION OF ASSEMBLY

4. REMOVE ANY LODGED FOREIGN MATERIAL THAT MIGHT INTERFERE WITH TEST. FLUSH TEST COCKS BY OPENING #4 TEST COCK TO MAINTAIN FLOW THROUGH ASSEMBLY, THEN OPEN AND CLOSE TEST COCK #1, #2, #3, THEN CLOSE #4 TEST COCK. ATTACH APPROPRIATE FITTINGS TO TEST COCKS THEN FOLLOW TEST STEPS OUTLINED FOR PARTICULAR ASSEMBLY.

Trouble Shooting

Check valve # 1 leaking

In CV #1 test. Water stops running out of the vertical tube installed at testcock # 3 and the gauge reading stabilized at 0.0psid **this indicates a leaking check valve # 1**.

Check valve # 2 leaking

In CV #2 test. Water stops running out of the vertical tube installed at testcock # 4 and the gauge reading stabilized at 0.0 psid **this indicates a leaking check valve # 2**.

Shutoff valve # 1 leaking

In CV #1 test. Water continuously flows from the vertical tube installed at testcock # 3. with the compensating tee installed on testcock # 2 and the bleed valve opened until there is only a slight drip from the vertical tube installed at testcock # 3. **This indicates a leaking shutoff valve # 1**.

Shutoff valve # 2 leaking with backpressure

In CV #2 test. Water continuously flows from the vertical tube installed at testcock # 4. With the compensating tee installed on testcock # 3 and the bleed valve fully open. Water continues to flow from the vertical tube installed at testcock # 4. **This indicates a leaking shutoff valve # 2 with backpressure**.

Shutoff valve # 2 leaking with flow to customer (no backpressure)

In CV #2 test. Water level in the vertical tube installed at testcock # 4 drops when testcock # 4 is opened. **This indicates a leaking shutoff valve # 2 with flow to customer (no backpressure)**.

Check valve # 2 and shutoff valve # 2 leaking with backpressure

In CV #1 test. Water continuously flows from the vertical tube installed at testcock # 3. With the compensating tee installed on testcock # 2 and the bleed valve fully open. Water continues to flow from the vertical tube installed at testcock # 3. **This indicates a leaking check valve # 2 and leaking shutoff valve # 2 with backpressure**.

Check valve # 2 and shutoff valve # 2 leaking with flow to customer (no backpressure)

In CV #1 test. Water level in the vertical tube installed at testcock # 3 drops when testcock # 3 is opened. **This indicates a leaking check valve # 2 and leaking shutoff valve # 2 with flow to customer (no backpressure)**.

Double Check Valve Assembly Test Procedures

(for use with five valve equipment)

Preparation	Notify customer Inspect area Flush testcocks Install fittings Inspect test kit – close all needle valves
Note:	**test gauge and hoses must be at same level**
CV #1 Test	Install vertical tube on testcock #3 Install compensating tee on testcock #2 Attach high hose to compensating tee installed on testcock #2 Open testcock #2 slowly Open high-pressure bleed valve then close high-pressure bleed valve Open testcock #3 to fill vertical tube Close testcock #3 Close #2 shut-off valve **Record** line pressure Close #1 shut-off valve Open testcock #3 **Record status** of check valve #1 (closed tight or leaking), **Record value** of check valve #1 (1.0 psid. or greater to pass) Close testcock #2 and testcock #3 Open #1 shut-off valve
CV #2 Test	Move vertical tube from testcock #3 to testcock #4 Move high hose and compensating tee from testcock #2 to testcock #3 Open testcock #3 slowly Open high-pressure bleed valve then close high-pressure bleed valve Open testcock #4 to fill vertical tube Close testcock #4 Close #1 shut-off valve Open testcock #4 **Record status** of check valve #2 (closed tight or leaking), **Record value** of check valve #2 (1.0 psid or greater to pass)
Record Shut-Off Valve	**Record** #1 & #2 shut-off valve as (closed tight or leaking)
Final	Close testcocks #3 & #4, remove all test equipment Open #1 shut-off valve **Open #2 shut-off valve slowly**, Notify customer

Trouble Shooting

With compensating tee arrangement attached to high hose any time water continues to run out of the vertical sight tube you must *observe and note gauge reading* and prepare to operate the compensating tee in efforts to reduce the flow out of the sight tube to a sight drip.

NOTE: Flushing and/or cleaning the internal components can correct many problems. Carefully observe condition of components.

PROBLEM	MAY BE CAUSED BY
During CV #1 test, water stops running Out of vertical tube and gauge drops to 0.0 psid. ***(Leaking CV #1 fix and retest)***	1. Dirty or damaged CV #1 disk 2. Dirty or damaged CV #1 seat 3. Guide members hanging up 4. Weak or broken CV #1 spring
During CV #1 test, water continues running out of vertical tube after compensating tee runs out of water. ***(Take observed reading and record CV #1)***	1. Leaking CV #2 and leaking #2 shut-off with backpressure
During CV #1 test, water continues running out of vertical tube and it *can be controlled* to a slight drip ***(Record Check Valve #1)***	1. Slightly damaged #1 shut-off
During CV #1 test, water continues running out of vertical tube and it *cannot be controlled* to a slight drip ***(stop test, resolve problem w/valve and retest)***	1. Severely damaged #1 shut-off valve
During CV #1 test, water stops running out of vertical tube and starts to recede into the tube ***(Lower equipment to centerline of assembly and record CV #1)***	1. Leaking CV #2 and Slightly Damaged #2 shut-off with flow to customer
During CV #2 test, water stops running out of vertical tube and gauge drops to 0.0 psid. ***(Leaking CV #2 fix and retest)***	1. Dirty or damaged CV #2 disk 2. Dirty or damaged CV #2 seat 3. Guide members hanging up 4. Weak or broken CV #2 spring
During CV #2 test, water continues running out of vertical tube and it *can be controlled* to a slight drip ***(Record Check Valve #2)***	1. Slightly damaged #1 shut-off
During CV #2 test, water continues running out of vertical tube after compensating tee runs out of water. ***(Take observed reading and record CV #2)***	1. Leaking #2 shut-off with backpressure
During CV #2 test, water stops running out of vertical tube and starts to recede into the tube ***(Lower equipment to centerline of assembly and record CV #2)***	1. Leaking #2 shut-off with flow to customer

Repair Note: Lubricants shall **only** be used to assist with the re-assembly of components, and **shall be USDA approved and non-toxic.**

Reduced Pressure Principle Assembly

(for use with five valve equipment)

Preparation	Notify customer Inspect area Flush testcocks (open #4, open then close #1, #2 **slowly**, #3, close #4) Install fittings Inspect test kit - close all needle valves
Observe CV #1	Attach high hose to testcock #2 Attach low hose to testcock #3 Open testcock #3 slowly then open low-pressure bleed valve Open testcock #2 **slowly** then open high-pressure bleed valve Close high-pressure bleed valve Close low-pressure bleed valve Close #2 shut-off valve, **Record line pressure** Observe check valve #1 (5.0psid. or greater to continue)
Record **Relief** **Value**	Open high control valve two full turns Open low control valve **slowly** (no more than ¼ turn) **Record** relief valve opening (2.0 psid or greater to pass) Close low control valve only
Record CV #2 **Leaks** **or** **Closed** **Tight**	Bleed bypass hose by opening bypass valve Loosely attach bypass hose to testcock #4 Close bypass valve Tighten bypass hose to testcock #4 open testcock #4 Reset gauge (open and close low-pressure bleed valve) Open bypass valve two full turns Observe whether relief valve drips **Record status** of check valve #2 as (closed tight or leaking)
Record #2 shut-off **Leaks or** **Closed Tight**	Close testcock #2 observe gauge **Record** #2 shut-off valve as (closed tight or leaking)
Record CV #1	Close bypass valve Open testcock #2 Reset gauge (open and close low-pressure bleed valve) **Record status** of check valve #1 (closed tight or leaked) **Record value** of check valve #1 (5.0 psid or greater to pass) **Record buffer** value (cv#1 – rv = 3.0psid or greater to pass) Close testcocks #2, #3, and #4 Remove bypass hose from testcock #4
Record CV #2	Move low hose to testcock #4 Move high hose to testcock #3 Open testcock #4 slowly then open low-pressure bleed valve Open testcock #3 slowly then open high-pressure bleed valve Close high-pressure bleed valve Close low-pressure bleed valve **Record value** of check valve #2 (1.0 psid or greater to pass)
Final	Close testcocks #3 and #4, remove all equipment **Open #2 shut-off valve slowly**, Notify customer

Trouble Shooting

NOTE: Flushing and/or cleaning the internal components can correct many problems. Carefully observe condition of components.

PROBLEM	MAY BE CAUSED BY
Relief valve discharges continuously	1. Faulty check valve #1 2. Faulty check valve #2 with back-pressure condition 3. Faulty relief valve
Relief valve discharges intermittently	1. Properly working assembly with back-siphonage condition 2. 1st check valve “buffer” is too small (less than 3.0 psid), with line pressure fluctuation 3. Water hammer
Relief valve discharges after no. 2 shut-off valve is shut. (observe CV #1 test)	1. Normally indicates faulty check valve #1 a. dirty or damaged disk b. dirty or damaged seat
Relief valve would not open, differential on the gage would not drop (relief valve test)	1. Leaky #2 shut-off valve with flow through the assembly
Relief valve would not open, differential drops to zero (relief valve test)	1. Relief valve stuck closed due to corrosion or scale 2. Relief valve sensing line (s) plugged
Relief valve opens too high (with sufficiently high 1st check reading)	1. Faulty relief valve a. dirty or damaged RV disk b. dirty or damaged RV seat
1st check reading too low (less than 3.0 psid “buffer”) (observe CV #1 test, & Relief valve test)	1. Dirty or damaged CV #1 disk 2. Dirty or damaged CV #1 seat 3. Guide members hanging up 4. Weak or broken CV #1 spring
Leaky 2nd check valve (CV #2 back-pressure test) 2nd check valve reading too low (CV #2 differential test)	1. Dirty or damaged CV #2 disk 2. Dirty or damaged CV #2 seat 3. Guide members hanging up 4. Weak or broken CV #2 spring

Repair note: Lubricants shall **only** be used to assist with the re-assembly of components, and **shall be USDA approved and non-toxic.**

Pressure Vacuum Breaker

(for use with five valve equipment)

Preparation:
Notify customer
Inspect area
Flush testcocks
Install fittings
Remove air inlet valve canopy
Inspect test kit – close all needle valves

Note: **<u>Make sure</u> that all hoses and gauge are at the same level as the pressure vacuum breaker**
<u>Do not</u> have test kit attached to backflow prevention assembly when opening #1 shut-off valve

Air Inlet Test
Attach high hose to testcock #2
Open testcock #2 **slowly**
Open high-pressure bleed valve then close high-pressure bleed valve
Close #2 shut-off valve, then close #1 shut-off valve
Slowly open high-pressure bleed valve no more than ¼ turn, until air inlet valve opens.
Record value of air inlet valve (1.0psid. or greater to pass)
Close testcock #2 then remove high hose from testcock #2
Close high-pressure bleed valve
Open #1 shut-off valve to re-pressurize the assembly

Check Valve Test
Attach high hose to testcock #1
Open testcock #1 **slowly**
Open high-pressure bleed valve then close high-pressure bleed valve
Record line pressure
Close #1 shut-off valve
Open testcock #2 until water drains out of the body
Record value of check valve (1.0psid. or greater to pass)

Record #1 shut-Off Valve
Record #1 shut-off valve as (closed tight or leaking)

Final
Close testcocks #1 and #2, remove all test equipment
Open #1 shut-off valve
Open #2 shut-off valve
Replace air inlet valve canopy, Notify customer

Trouble Shooting

NOTE: Flushing and/or cleaning the internal components can correct many problems. Carefully observe condition of components.

PROBLEM	MAY BE CAUSED BY
Air inlet valve does not open, as gauge drops to 0.0 psid.	1. Air inlet disk stuck to seat 2. Broken or missing air inlet spring 3. “Old Style” pressure vacuum breaker (non-loaded air inlet valve)
Air inlet valve does not open, and differential on gauge will not drop	1. Leaky #1 shut-off valve 2. Parallel installation with leaky #2 shut-off valve
Air inlet opens below 1.0 psid.	1. Dirty or damage air inlet disk 2. Scale build up on seat
Check valve below 1.0 psid.	1. Dirty or damaged check disk 2. Damaged seat 3. Weak or broken spring
Water runs continuously from test cock #2 (CV test)	1. Leaky #1 shut-off valve

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SUMMARY OF BACKFLOW PREVENTION METHODS

	AIR GAP ANSI A112.1.2	AVB ASSE 1001	PVB ASSE 1020	DCVA ASSE 1015	RPZ ASSE 1013
Health(High) Hazard/Non-Health(Low) Hazard	H	H	H	N	H
Backpressure / Backsiphonage	Bp/Bs	Bs**	Bs	Bp/Bs	Bp/Bs
Pressure Loss Significant	Yes	No	No	No*	No*
Continuous Pressure Allowed	N/A	No	Yes	Yes	Yes
Vents to Atmosphere	Yes	Yes	Yes	No	Yes
Pit/Chamber Installation Acceptable	No	No	No	Yes	No
Vertical Installations Allowed	N/A	Yes	Yes	***	***
Isolation/Containment (Commonly)	I	I	I	C	C
Parallel Installation Common	N/A	No	No	Yes	Yes

Backflow Prevention Theory and Practice (Second Edition) Table 5-3, page 109

NA - Not Applicable Bp – Backpressure Bs - Backsiphonage

Continuous pressure - operating under pressure for 12 hours or more.

* The maximum pressure loss allowed on a DCVA is 10psi. The pressure loss through a RP assembly is approximately 7-14psi.

** No Valves Located Down Stream

*** Check Manufacturer's Approvals