


TREEO Conference

Why Do We Do That? – Field Testing Procedures

28th April 2021
Virtual



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TREEO Conference

Why Do We Do That? – Field Testing Procedures

Presenter: Henry W. Chang
Chief Engineer and Program Manager
USC FCCCHR



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What's New at the USC Foundation?




USC Foundation
for Cross-Connection Control and Hydraulic Research



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Why Do We Do That During The Field Testing Procedures?



44

Field Testing Procedures


- USC 10th edition
- TREEO
- ABPA
- AWWA CA-NV
- ASSE-CA/AZ/UT



45

Field Testing Procedures Criteria

- Understand Operation of Assemblies
- Field Test Procedures



46

Steps Common to all Assemblies

- Preliminary Steps
- Flushing test cocks and/or vent valve
- Bleeding the field test kit/gage



47

Steps Common to all Assemblies

- Preliminary Steps
- Flushing test cocks and/or vent valve
- Bleeding the field test kit/gage



48

Preliminary Steps Field Test Procedures

- Notify
- Identify
- Inspect
- Observe



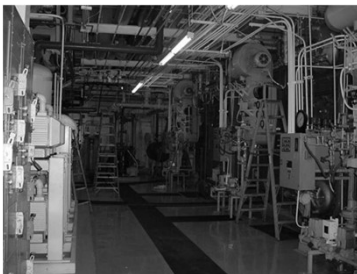
49

Preliminary Steps Field Test Procedures



50

Preliminary Steps Field Test Procedures



51

Preliminary Steps Field Test Procedures



52

**Preliminary Steps
Field Test Procedures**



53

**Preliminary Steps
Field Test Procedures**

- Notify
- Identify
- Inspect
- Observe



54

**Preliminary Steps
Field Test Procedures**

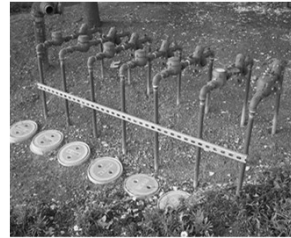
Which one do I test?



55

**Preliminary Steps
Field Test Procedures**

- Eeny Meeny Miney Mo



56

**Preliminary Steps
Field Test Procedures**

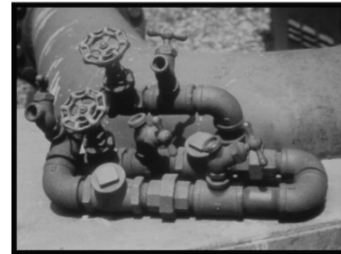
Which one do I test?



57

**Preliminary Steps
Field Test Procedures**

Identify

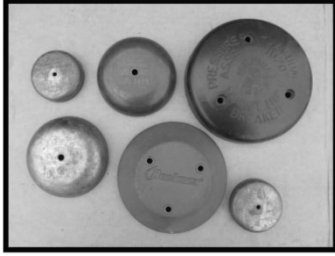


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Why Do We Do That? – Field Testing Procedures
28 April 2021

Preliminary Steps
Field Test Procedures

Identify



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Preliminary Steps
Field Test Procedures

Identify



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Preliminary Steps
Field Test Procedures

Identify



61

**Preliminary Steps
Field Test Procedures**

- Notify
- Identify
- Inspect
- Observe



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**Field Issues
Field Test Procedures**

Inspect



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**Field Issues
Field Test Procedures**



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**Field Issues
Field Test Procedures**



65

**Preliminary Steps
Field Test Procedures**

- Notify
- Identify
- Inspect
- Observe



66

**Field Issues
Field Test Procedures**

Observe



67

**Field Issues
Field Test Procedures**

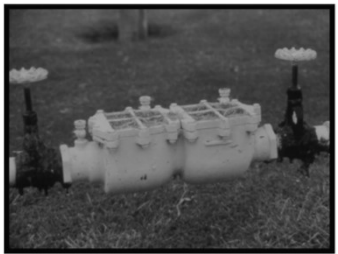
Observe



68

**Field Issues
Field Test Procedures**

Observe



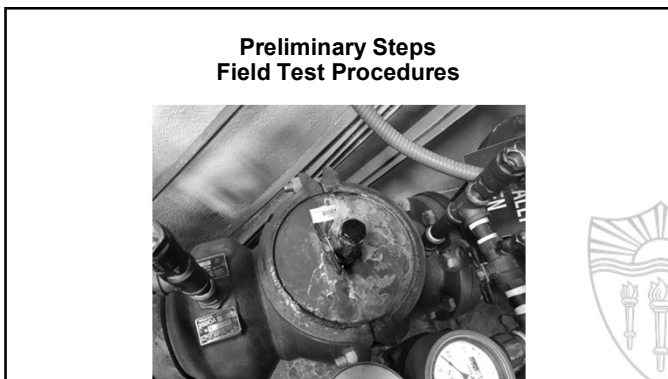
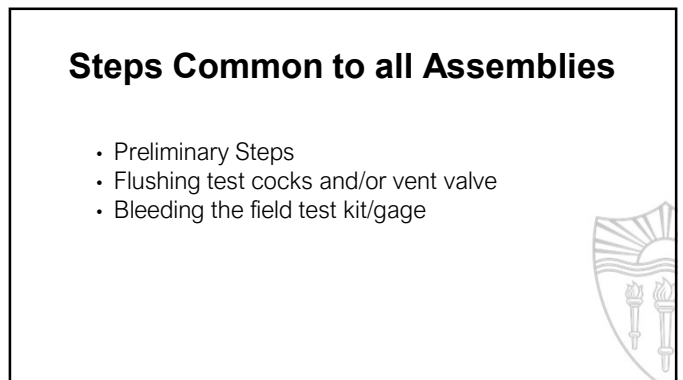
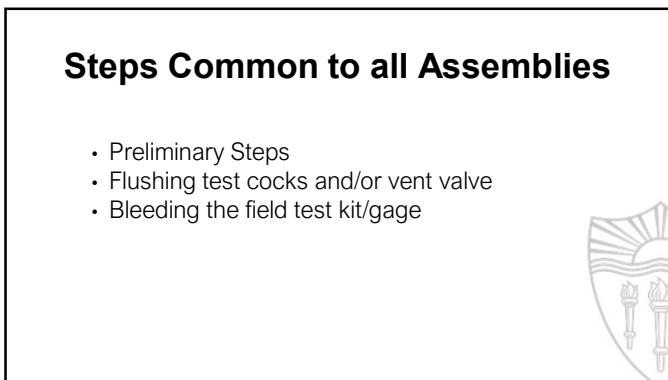
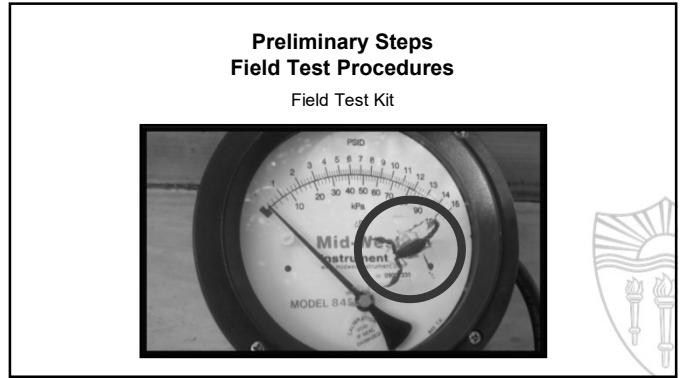
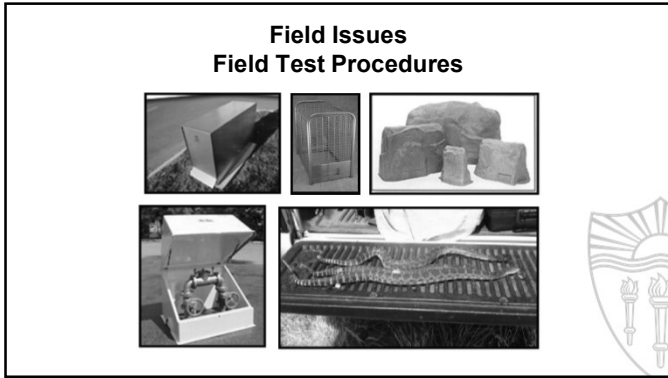
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**Field Issues
Field Test Procedures**

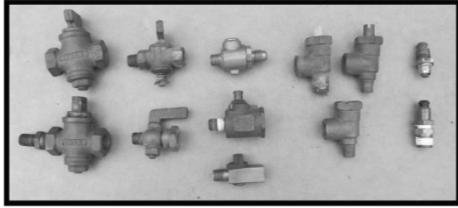
Observe



70

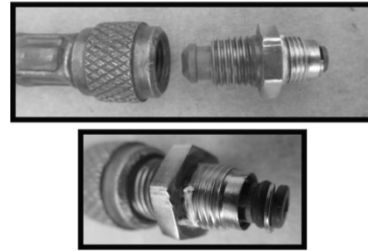


**Preliminary Steps
Field Test Procedures**



77

**Preliminary Steps
Field Test Procedures**



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Steps Common to all Assemblies

- Preliminary Steps
- Flushing test cocks and/or vent valve
- Bleeding the field test kit/gage

79

Steps Common to all Assemblies

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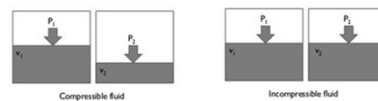
80



81

Air Water

Compressible and Incompressible flows




82

Standards

QUIZ QUESTION
In which Edition of the USC Manual was the new Standard added for Double Check Detector Assemblies (DCDA)?

- A. 4th Edition - 1969
- B. 6th Edition - 1979
- C. 8th Edition - 1988
- D. 9th Edition - 1993
- E. 10th Edition - 2009




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Standards


QUIZ QUESTION
In which Edition of the USC Manual was the new Standard added for Double Check Detector Assemblies (DCDA)?

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- D. 9th Edition - 1993
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84


**Reduced Pressure
Principle Assembly (RP)**



85

RP Assembly


- Three Components
 - First Check Valve
 - Second Check Valve
 - Relief Valve



86

RP – Field Test Procedure


- Test No. 1 – Relief Valve Opening Point Test
- Test No. 2 – Tightness of No. 2 Check Valve
- Test No. 3 - Tightness of No. 1 Check Valve



87

RP – Field Test Procedure

- Test No. 1 – Relief Valve Opening Point Test
 - Why do we test the relief valve first in an RP?



88

RP – Field Test Procedure

- Test No. 1 – Relief Valve Opening Point Test
 - It is one of the objectives of the field test procedure to determine the opening point value of the relief valve; the first time it opens under normal field operation.



89

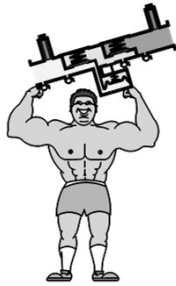
RP – Field Test Procedure

- Test No. 1 – Relief Valve Opening Point Test
 - In normal field operation, the relief valve may not get exercised prior to the occurrence of a backflow condition. Therefore, the corresponding field test should evaluate the assembly under the same conditions.



90

Exercising the Relief Valve



91

RP – Relief Valve

- Avoid the premature discharge of the Relief Valve
- Avoid exercising The Relief Valve
 - Not a repair technique
 - Misleading test result



92

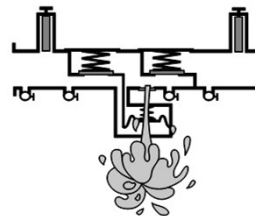
Exercising the Relief Valve

- Causing the relief valve to open and close before recording the opening point.
 - Will tend to increase the opening point value.
 - Perhaps from failing value to passing value
- RV doesn't get "exercised" prior to needed use.



93

Causes of Premature RV Discharge



- Improperly Flushing Testcocks
- Improperly Bleeding FTK/Gage
- Testing Check Valves First
- Opening the #2 test cock too quickly
- Closing #2 shutoff valve too early
- Closing #1 shutoff valve



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RP – Field Test Procedure

- Test No. 1 – Relief Valve Opening Point Test
- Flushing of the Testcocks
 - Open #4, #3, #2 (slowly) and #1 TCs to flush the TC, then close #1, #2, #3 and #4 TCs.



95

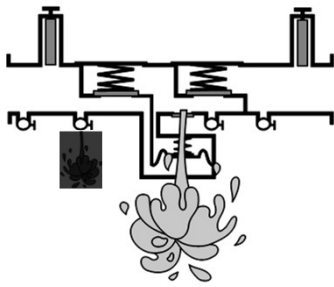
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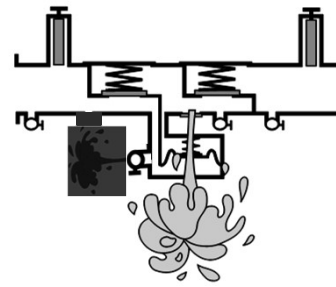
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Flushing of the TCs



97

Flushing of the TCs



98

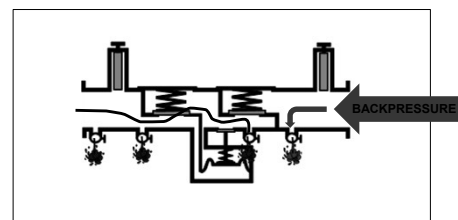
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 - Open #4, #3, #2 (slowly) and #1 TCs to flush the TC, then close #1, #2, #3 and #4 TCs.



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Field Test Procedures RP – Test Cock Flushing – Correct



100

RP – Field Test Procedure

- Test No. 1 – Relief Valve Opening Point Test
- Bleeding of Hoses and FTK/Gage



101

RP – Field Test Procedure

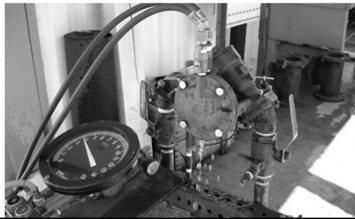
- Test No. 1 – Relief Valve Opening Point Test
- Bleeding of Hoses and FTK/Gage
 - Open #3 TC & Bleed the low side of FTK/Gage
 - Open #2 TC (slowly) & Bleed the high side of the FTK/Gage
 - Close #2 SOV



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RP – Field Test Procedure

- Test No. 1 – Relief Valve Opening Point Test
- Bleeding of Hoses and FTK/Gage



103

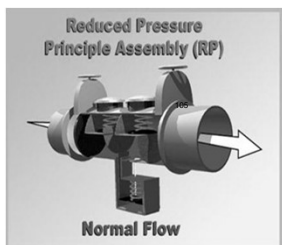
RP – Field Test Procedure

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 - Open #2 TC (slowly) & Bleed the high side of the FTK/Gage
 - Close #2 SOV



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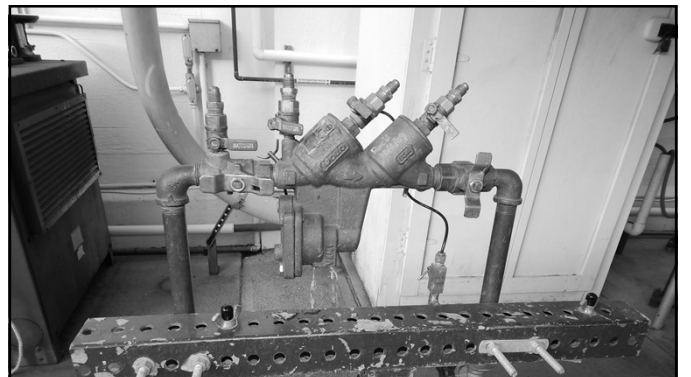
RP – Field Test Procedure



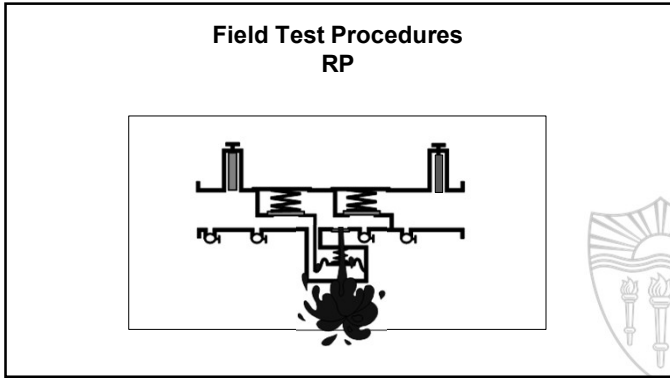
- Closing the #2 SOV too early



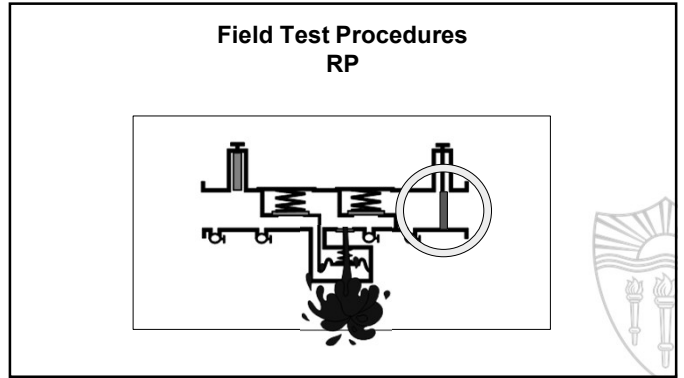
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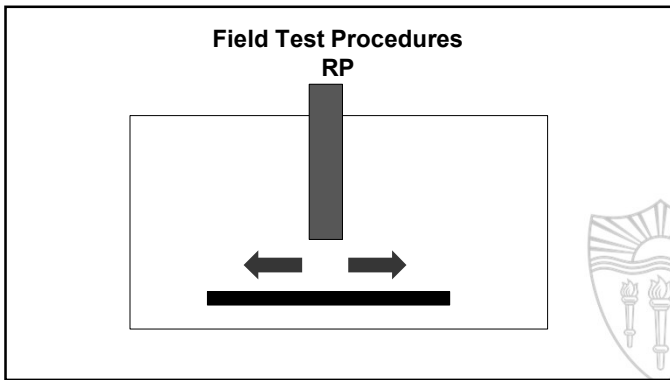
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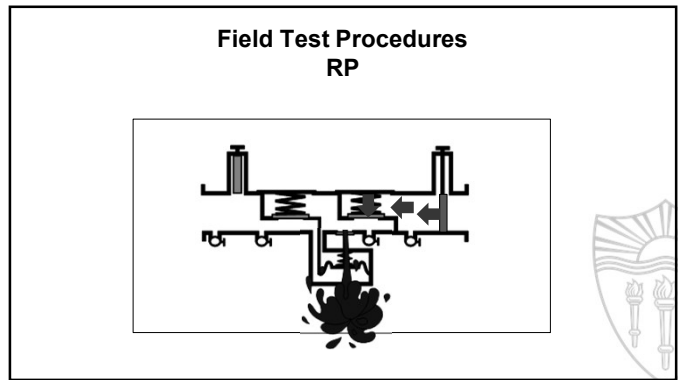
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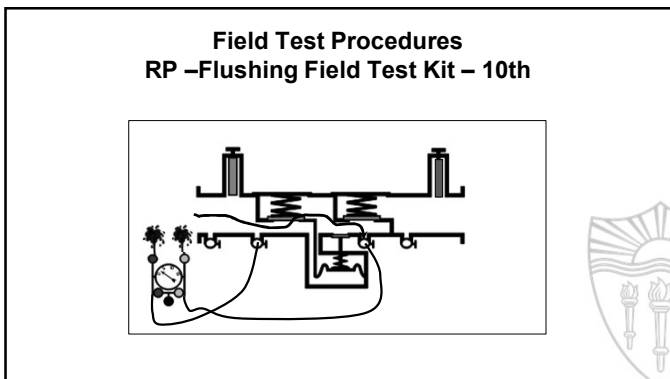
108



109



110



111

RP – Field Test Procedure

- Test No. 1 – Relief Valve Opening Point Test
- Observing the apparent 1st ck reading

112

RP – Field Test Procedure

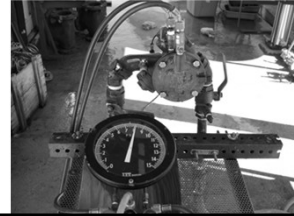
- Test No. 1 – Relief Valve Opening Point Test
 - Observing the apparent 1st ck reading
- Reading observed after the No. 2 SOV and FTK/gage bleeds are closed
- This is normally not recorded since it may not be the actual 1st ck reading



113

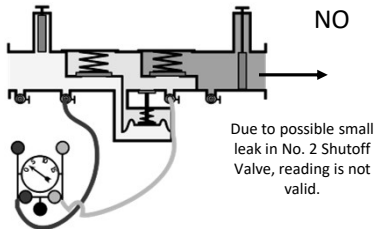
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- Test No. 1 – Relief Valve Opening Point Test
 - Observing the apparent 1st ck reading



114

RP Field Test Record First Check Reading?



115

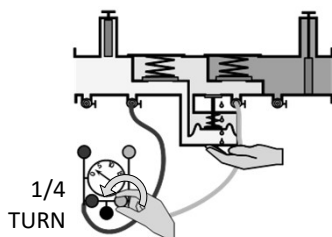
RP – Field Test Procedure

- Test No. 1 – Relief Valve Opening Point Test
 - Open high control needle valve approx. one turn
 - Open the low control needle valve no more than 1/4 of a turn



116

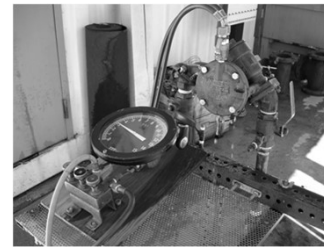
RP Field Test - RV Opening Point



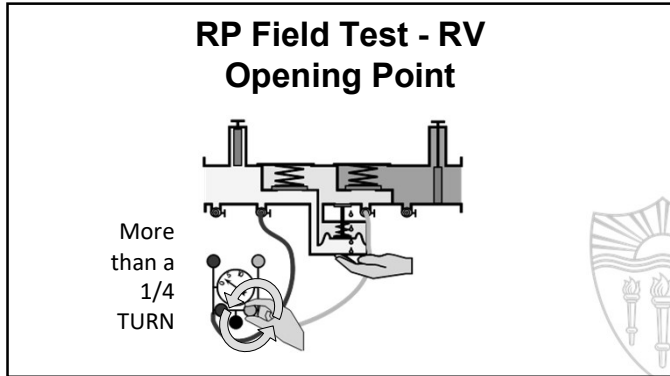
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RP – Field Test Procedure

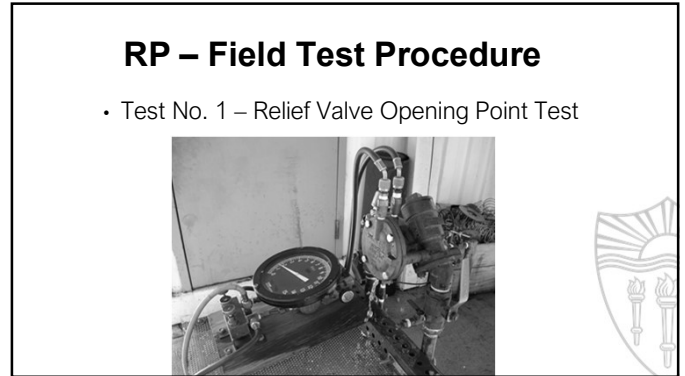
- Test No. 1 – Relief Valve Opening Point Test



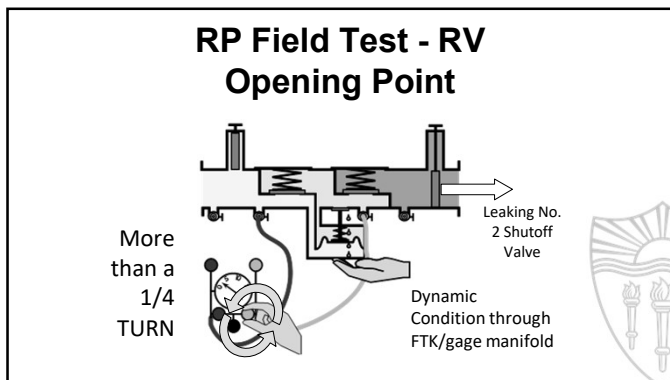
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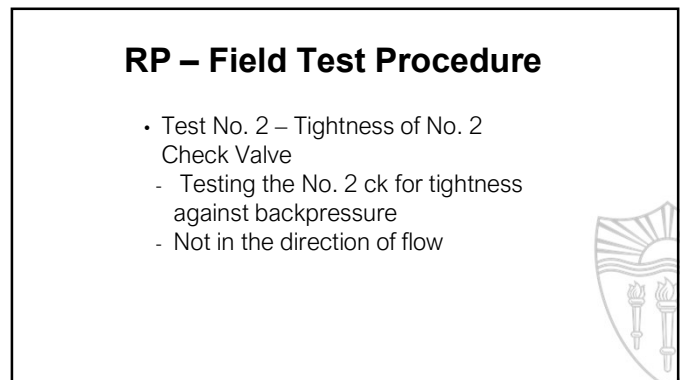
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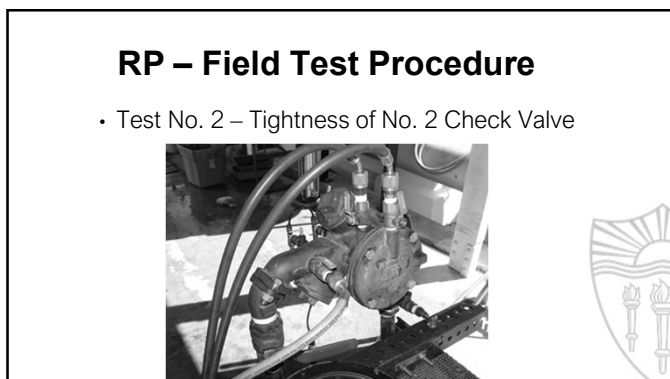
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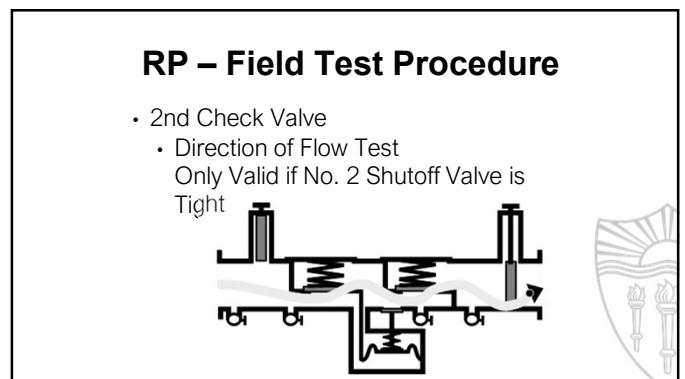
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122



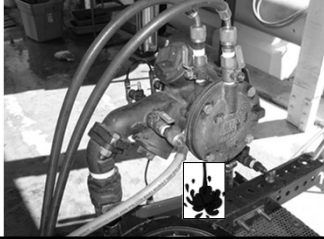
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124

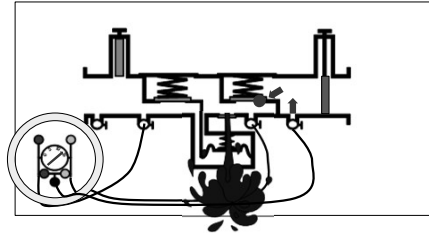
RP – Field Test Procedure

- Test No. 2 – No. 2 Check Valve Leaking



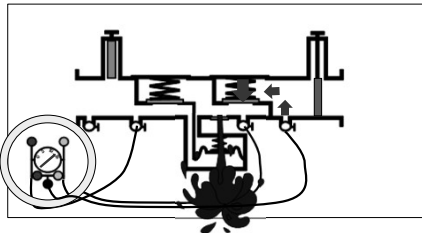
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Field Test Procedures RP – 2nd Check; 2nd Chance



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Field Test Procedures RP – 2nd Check; 2nd Chance



127

RP – Field Test Procedure

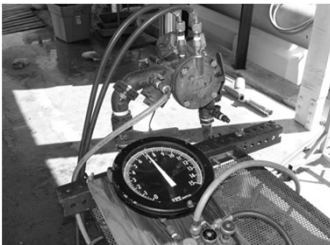
- Test No. 3 - Tightness of No. 1 Check Valve
 - Determine the static pressure drop across the 1st ck valve
 - Actual 1st ck reading and is recorded



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RP – Field Test Procedure

- Test No. 3 - Tightness of No. 1 Check Valve



129

RP – Field Test Procedure

- Test No. 3 - Tightness of No. 1 Check Valve

Apparent

Actual



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Field Testing Procedures

- USC 10th edition, TREEO, ABPA, AWWA CA-NV, ASSE-CA/AZ/UT
- Others



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RP – Field Test Procedure

- One Hose Method



132

RP – Field Test Procedure

- Test No. 1 – Relief Valve Opening Point Test
- It is one of the objectives of the field test procedure to determine the opening point value of the relief valve; the first time it opens under normal field operation.



133

RP – Field Test Procedure

- Test No. 1 – Relief Valve Opening Point Test
- In normal field operation, the relief valve may not get exercised prior to the occurrence of a backflow condition. Therefore, the corresponding field test should evaluate the assembly under the same conditions.



134

RP – Field Test Procedure one-hose method

- Test for Tightness of No. 1 Check Valve
- Test for Tightness of No. 2 Check Valve
- Tested Similar to a DC Test



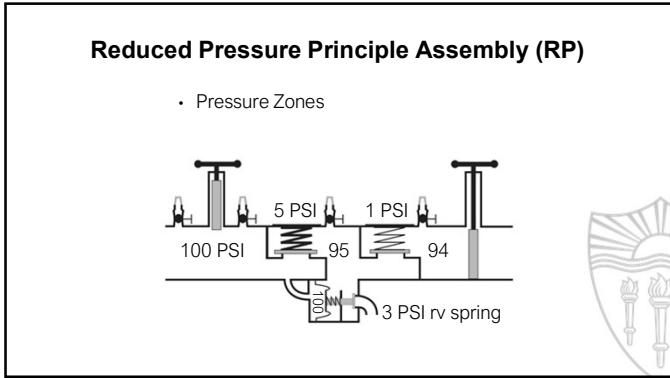
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RP – Field Test Procedure one-hose method

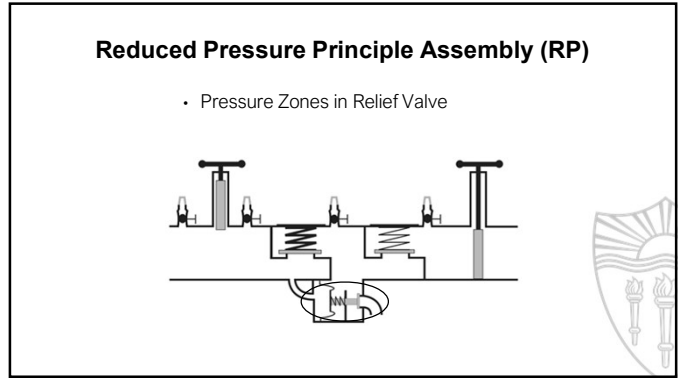
- Test No. 3 – Relief Valve Opening Point Test
- Tested at low pressure not the supply working pressure of the system or normal field operation



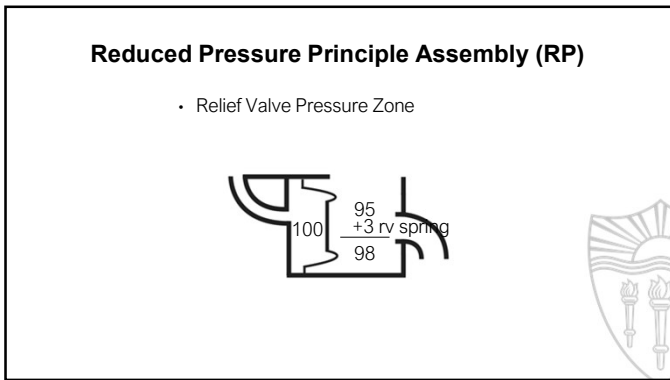
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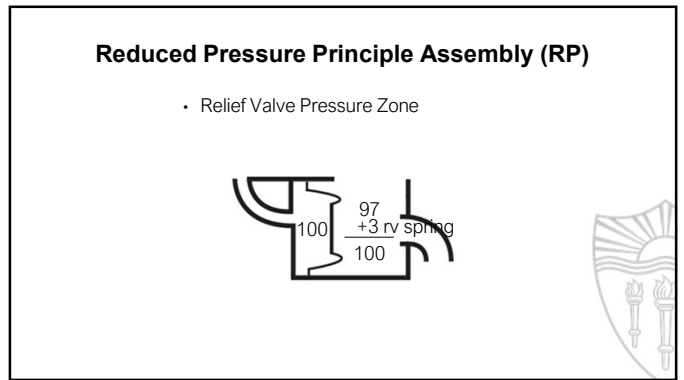
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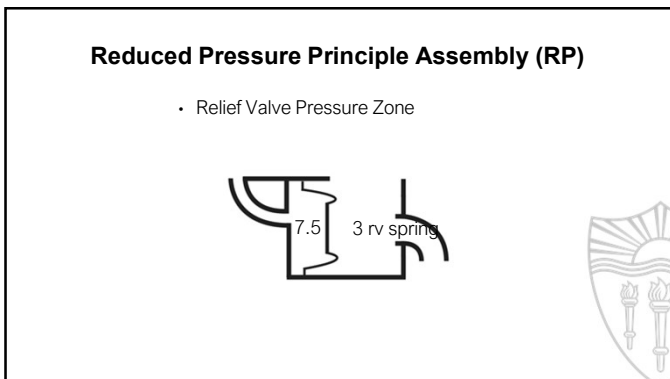
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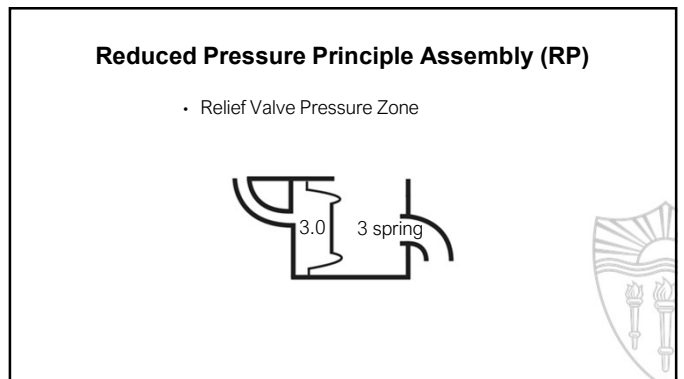
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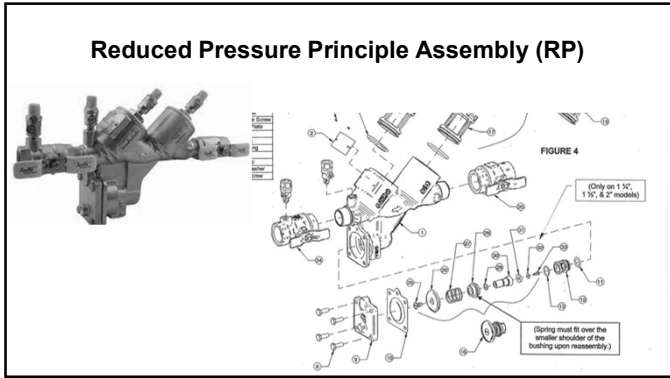
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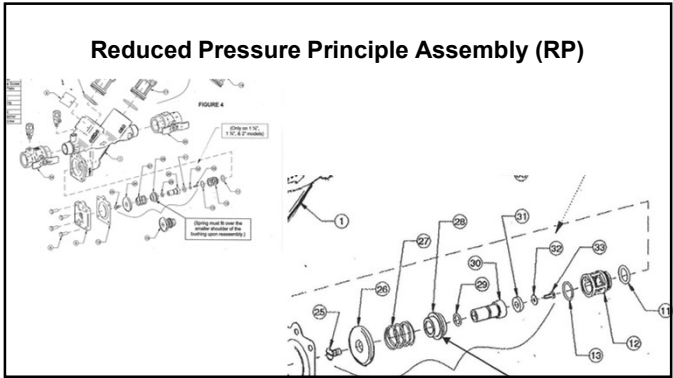
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Why Do We Do That? – Field Testing Procedures

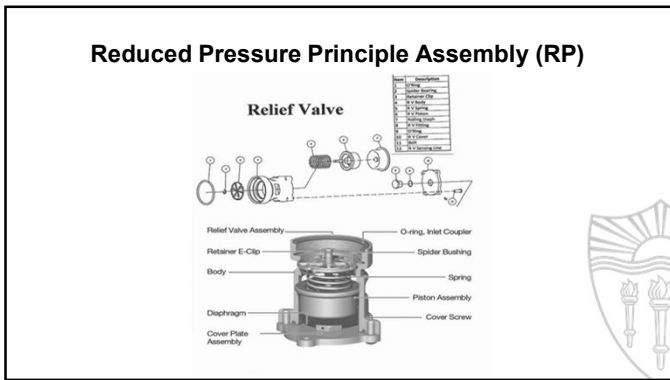
28 April 2021



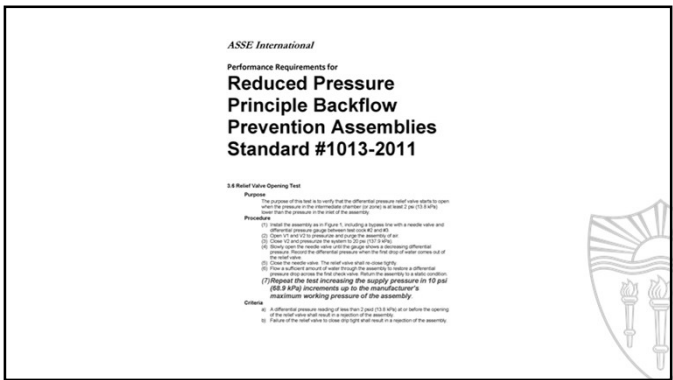
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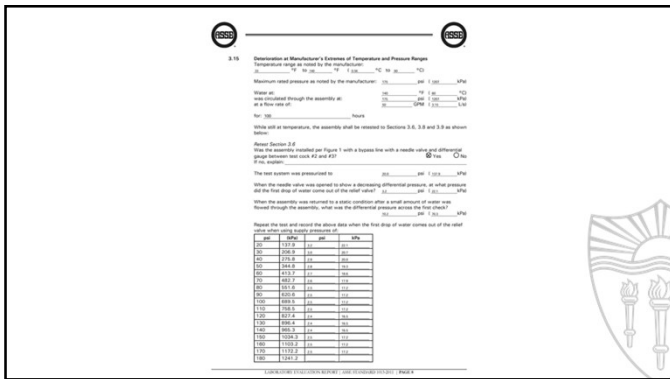
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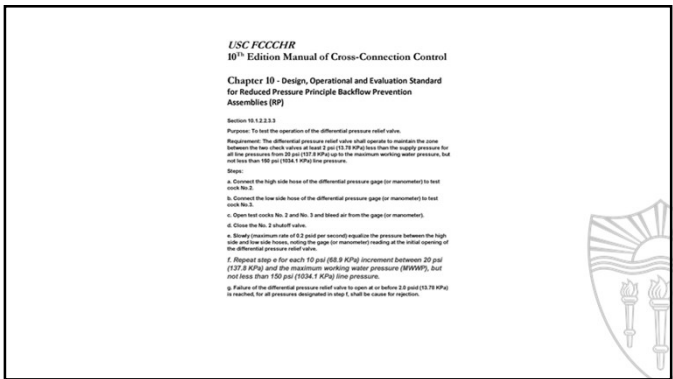
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Why Do We Do That? – Field Testing Procedures

28 April 2021

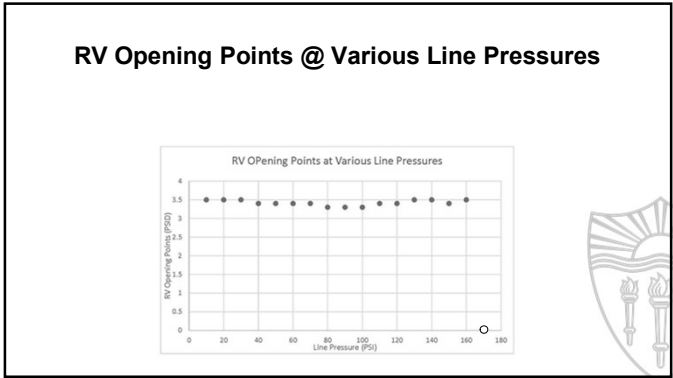
USC FCCCHR Laboratory Evaluation Report

Lab Pressure	Line P	1st Ck	RV opening point	Buffer
	175	6.5	2.5	4.5
	160	6.7	2.5	3.9
	150	6.6	2.5	3.9
	140	6.6	2.5	3.9
	130	6.5	2.5	3.9
	120	6.4	2.5	3.9
	110	6.6	2.5	3.7
	100	6.5	2.5	3.9
	90	6.4	2.5	3.9
	80	6.7	3.1	3.7
	70	6.8	3.1	3.7
	60	6.8	3.1	3.7
	50	6.8	3.1	3.9
	40	6.8	3.1	3.9
	30	6.7	3.1	3.4
	20	6.6	3.4	3.3

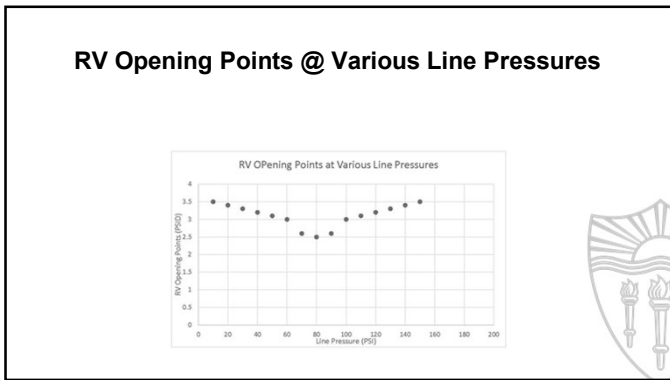
2nd Ck Opening Point	1st Ck	2nd Ck
	15.5 PSI	H2O
	15.5 PSI	PM
	15.5 PSI	MPA

Bypass	1st Ck	2nd Ck
	20.1 PSI	H2O
	20.1 PSI	PM
	20.1 PSI	MPA

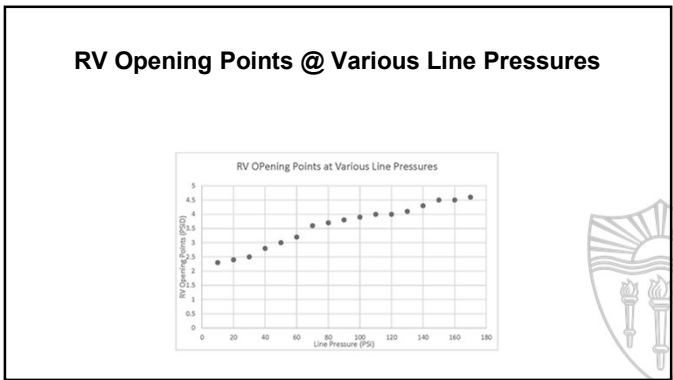
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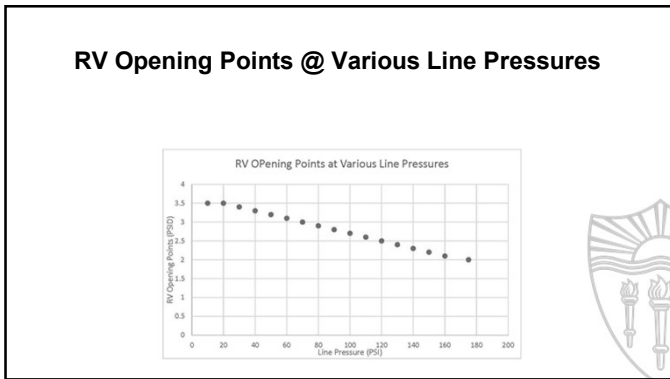
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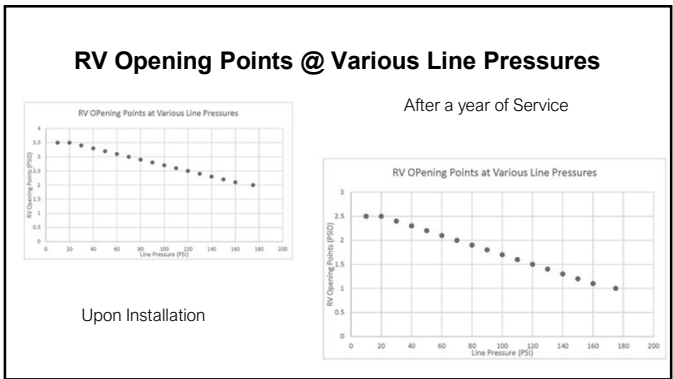
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152



153



154

Double Check Valve Assembly (DC)



155

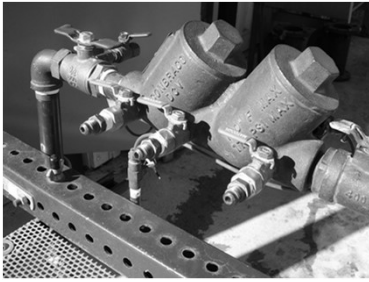
DC – Field Test Procedure

- When is a sight tube needed?
 - If the downstream test cock of the check valve body being tested is not at the highest point of that check valve; then a vertical tube is needed and must rise to the top of the check valve.



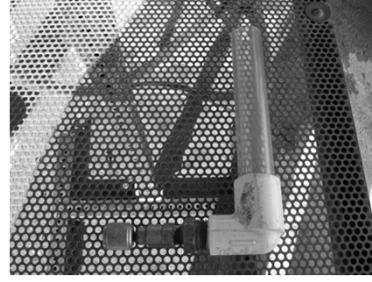
156

DC – Field Test Procedure



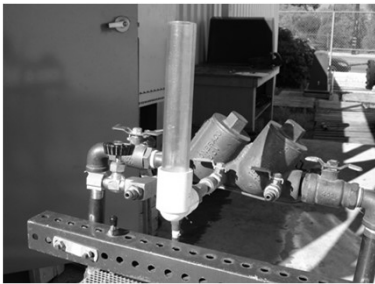
157

DC – Field Test Procedure



158

DC – Field Test Procedure



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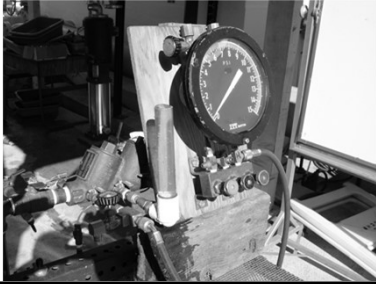
DC – Field Test Procedure

- When is it critical to have the FTK/gage at the proper location?
 - The FTK/gage must be held at the same level as the water in the vertical tube or the top of the test cock and must be located before the No. 1 shutoff valve is closed.



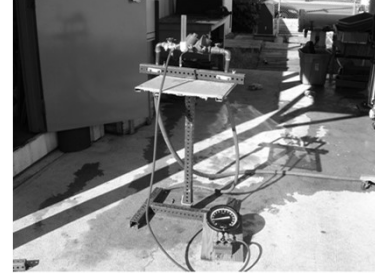
160

DC – Field Test Procedure



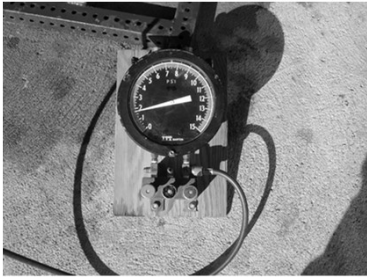
161

DC – Field Test Procedure



162

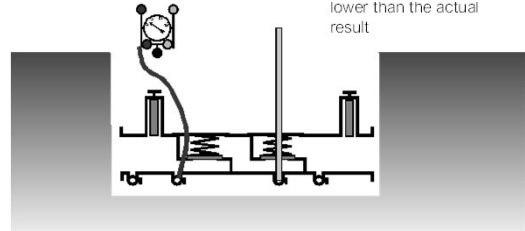
DC – Field Test Procedure



163

Gage Location – Not Too Low or High

- Misleading Results that may be higher or lower than the actual result



164

PVB & SVB – Field Test Procedures

- Air Inlet Valve Canopy Reinstall



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Field Issues Field Test Procedures

Air Inlet Canopy



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PVB & SVB – Field Test Procedures

- Air Inlet Valve Opening Point Test



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PVB & SVB – Field Test Procedures

- Air Inlet Opening Point Test
 - It is one of the objectives of the field test procedure to determine the opening point value of the air inlet valve; the first time it opens.



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PVB & SVB – Field Test Procedures

- Air Inlet Valve Opening Point Test
 - In normal field operation, the air inlet valve may not get exercised prior to the occurrence of a backsiphonage condition. Therefore, the corresponding field test should evaluate the assembly under the same conditions.



171

PVB & SVB – Air Inlet Valve

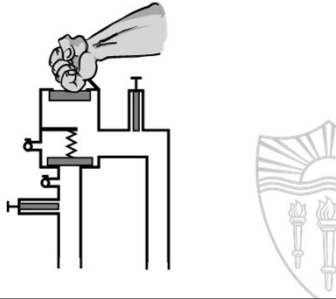
- Avoid the premature opening of the Air Inlet Valve
- Avoid exercising The Air Inlet Valve
 - Not a repair technique
 - Misleading test result



172

PVB Field Test

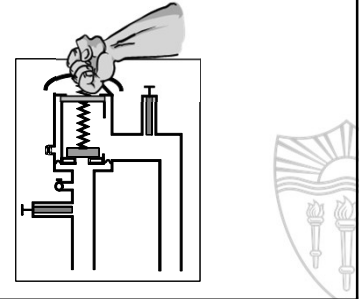
Do Not Force or Assist Opening of Air Inlet



173

SVB Field Test

Do Not Force or Assist Opening of Air Inlet



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Exercising the Air Inlet Valve

- Causing the air inlet valve to open and close before recording the opening point.
- Will tend to increase the opening point value.
 - Perhaps from failing value to passing value
- Air inlet valve doesn't get "exercised" prior to needed use.



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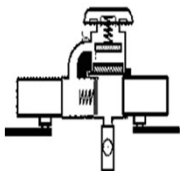
PVB & SVB – Field Test Procedures

- Test No. 1 – Air Inlet Valve Opening Point Test (fully open)



176

SVB- Test Procedure Techniques



- Filling the top of the Air Inlet with water
- Removing the vent screw from the vent valve

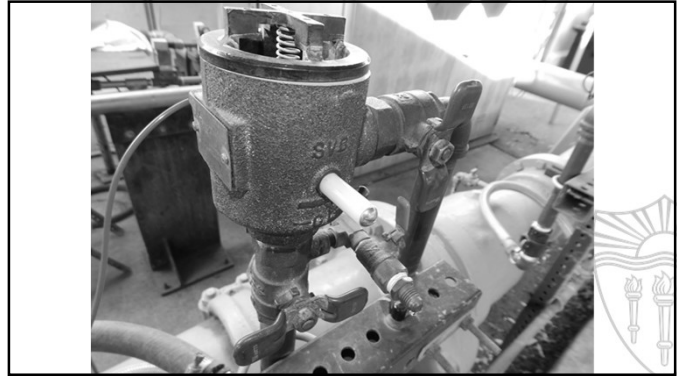
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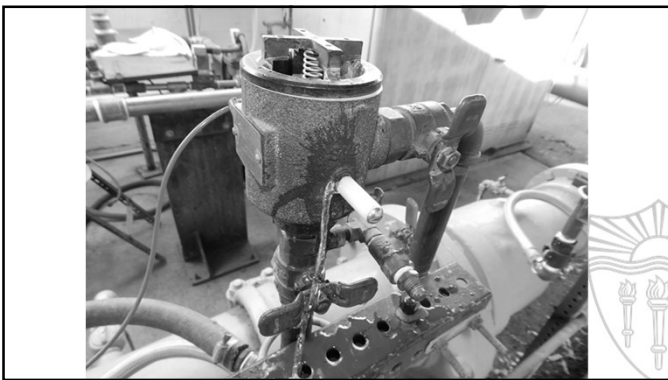
178



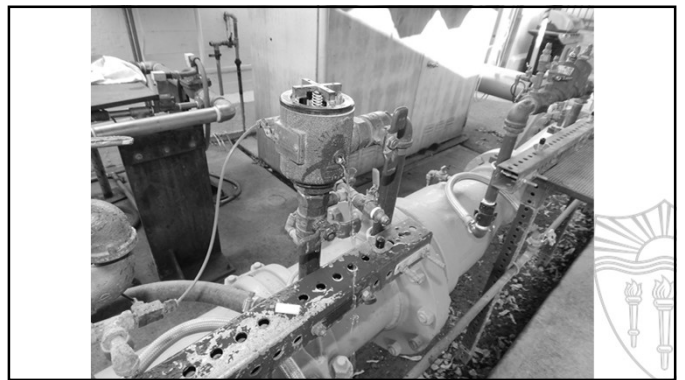
179



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Overview of the Procedure Steps

- The proper performance of field test procedures is important to determine the working conditions of a backflow prevention assembly.



183

Overview of the Procedure Steps

- The steps in each of the field test procedures are important to be done in a certain order to properly determine the working conditions of a backflow prevention assembly.



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Backflow Prevention Assemblies

- Health & Safety Device
- Protecting the Potable Drinking Water System



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Conclusion

- Can shortcuts or not following the steps effect the outcome of Field Test Procedure and Results?

- YES

FOLLOW THE FIELD TESTING PROCEDURES



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Questions & Discussion



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