



BACKFLOW ASSEMBLY TESTER CERTIFICATION COURSE OUTLINE AND AGENDA

Objective

This five-day course is designed to meet the regulatory agency's requirements for initial Backflow Assembly Tester certification. Topics covered include:

- Cross connection control program regulations
- Plumbing codes
- Understanding hydraulics
- Hazards of cross connections and backflow, and selection of the appropriate protection for the hazard
- Installation guidelines
- Presentation of backflow incidents
- Safety
- Understanding the approved test procedures for each of the four types of assemblies as well as diagnosis of failure conditions when testing the various backflow assemblies.

A test simulator and altered assembly components are used to create a variety of failures for students to recognize and accurately diagnose in the field.

Instructors

- Garrett Yates

Target Audience

- 1) Individuals seeking certification as a Backflow Assembly Testers requiring a 40-hour course

Text manuals and materials

- Handout of current Drinking Water Regulations pertinent to Cross-Connection Control.
- *Backflow from A to Z, A Comprehensive Guide to Backflow Assembly Testing*, by BMI 1996, updated 2011.



- *Manual of Cross Connection Control, 10th Edition*, University of Southern California Foundation for Cross Connection Control and Hydraulic Research.
- *PNWS-AWWA Cross Connection Control Manual, 7th Edition*, PNWS-AWWA Cross Connection Control Committee.
- Test procedures and troubleshooting quick reference sheets for backflow assembly testing.
- 30" x 48" wall placards of various assemblies showing interior component designs.
- Brass cutaways of testable assemblies and non-testable devices.
- Overhead projection of manual text, assembly installation guidelines, test report forms and other topics.
- Pressurized test stands (each stand includes RP, DCVA, PVB, and SVB assemblies)
- Failure Simulator – a manifold of valves that is used to simulate assembly component part failures while student performs test procedures.
- Differential pressure field test kits, sight tubes, and bleed valve arrangements

Agenda

Each day runs from 8:00 AM to 5:30 PM, with a one-hour lunch break and two 2 15-minute breaks each day.

Day 1

- 1) Introductions** – Instructor, students, objectives of training course and covering student requirements for becoming certified testers **30 Minutes**
- 2) Hydraulics of Backflow** – Basic hydraulic principles, backsiphonage backflow, backpressure backflow, venture effect, booster, elevated piping, thermal expansion, actual and potential cross connections. **1 Hour**
- 3) Case Histories/Backflow Incidents** – A study of several documented backflow incidents demonstrating hydraulic conditions and the need for backflow protection. **30 Minutes**
- 4) Definitions** – Explanation and examples of cross connection control terminology. **1 Hour**



- 5) **Backflow Prevention Assemblies** – An overview of backflow prevention assemblies including: AVB, PVB, SVB, DCVA, DCDA RPBA and RPDA, dual checks, hose bibb vacuum breaker, AVB's. Explanation of the assembly approval process. **1 Hour**
- 6) **Reduced-Pressure Principle Backflow Assembly (RPBA)** – Text and explanation on the design and function of the RPBA. Emphasis placed on understanding how the assembly works prior to learning testing procedure. **1 Hour**
- 7) **Testing the RPBA** – Text, explanation and demonstration of approved RPBA test procedures. Test gauges: emphasis on how gauges work internally. **1 Hour**
- 8) **Student Testing Practice on RPBA** – Students team up at test stands and perform test procedures under the guidance of the instructor. **2 Hour**
- 9) **After Class Homework Assignment** – Students are assigned to do Section I review questions in BMI manual and review all training material handouts.

Day 2

- 1) **Discussion of Section I Review Questions** **30 Minutes**
- 2) **Responsibilities of Certified Testers** – Discussion of tester liabilities and performance requirements. Demonstration and instruction on correctly completing the test report form. **1 Hour**
- 3) **Student Testing Practice on RPBA** – Approved test procedure practice on the RPBA including proper completion of test report forms with instructor oversight. **30 Minutes**
- 4) **Troubleshooting the RPBA** – Classroom explanation of how to diagnose failures and leaky shut-off valves. Test stand demonstration using simulation of possible assembly failures. **1 Hour**
- 5) **Student Testing and Troubleshooting Practice on RPBA** – Students use simulator test stands to become familiar with assembly failures and practice test procedures under guidance of the instructor. Explanation of disc compression. **1 Hour**
- 6) **Regulations** – Text and explanation of federal, state, plumbing code and local cross connection regulations; concepts of an enabling authority for water systems. **1 Hour**



- 7) **Types of Hazards and Protection** – Overview of chemical, biological and physical backflow hazards; point of use and premises protection concepts including an exercise on applying the appropriate protection for given hazards. **1 Hour**
- 8) **Student Testing Practice on RPBA** – Practice test procedures and troubleshooting practice in water lab with instructor oversight. **2 Hour**
- 9) **After Class Homework Assignment** - Students are assigned to do Section II review questions in the BMI manual and read the section on the DCVA to prepare for Day 3.

Day 3

- 1) **Discussion of Section II Review Questions** **30 Minutes**
- 2) **Double Check Valve Assembly (DCVA)** – Text and explanation of design and function of double check and double detector check assembly. Emphasis on the interior components and how the assembly works to prevent backflow. **1.5 Hour**
- 3) **Testing the DCVA and the DCDA** – Explanation, test and test stand demonstration of approved DCVA test procedures including sight tube, approved differential gauge testing method and bleed valve arrangement use. **1 Hour**
- 4) **Student Testing Practice on DCVA** - Students team up at test stands and perform test procedures under the guidance of the instructor. **1.5 Hour**
- 5) **Troubleshooting the DCVA** – Classroom explanation of how to diagnose failures. Test stand demonstration using a simulator to create failures and leaks. **1 Hour**
- 6) **Student Testing Practice on DCVA** - Students team up at test stands and perform test procedures using the simulator to create and diagnose failures under the guidance of the instructor. Includes proper completion of test report forms. **2.5 Hour**
- 7) **After Class Homework Assignment** - Students are assigned to do Section III, IV and definition review questions in the BMI manual.



Day 4

- 1) **Discussion of Sections III, IV and Definitions Review Questions** **1 Hour**
- 2) **Student Practice on RPBA and DCVA Test Procedures** - Practice test procedures and troubleshooting practice in water lab with instructor oversight. **30 Minutes**
- 3) **Pressure Vacuum Breaker (PVB) and Spill-resistant Vacuum Breaker (SVB)** – Text and explanation on design and function of PVB and SVB, Test stand demonstration of test procedures. **1 Hour**
- 4) **Student Testing Practice on PVB and SVB** - Students team up at test stands and perform test procedures under the guidance of the instructor. **30 Minutes**
- 5) **Troubleshooting the PVB and SVB** – Classroom explanation and demonstration of failures and leaky shut-off valves. Test stand demonstration using a simulator. **1 Hour**
- 6) **Student Practice on PVB and SVB Test Procedures and Troubleshooting** - Approved test procedure practice and troubleshooting on PVB and SVB including proper completion of test report forms and instructor oversight. **2 Hour**
- 7) **Test Gauge Care** – Types of gauges, calibration, accuracy verification and maintaining gauges in good working order. **1 Hour**
- 8) **Basic Assembly Repair** – Overview and discussion on disassembly, cleaning, flushing and removable of the internal components of assemblies. **1 Hour**
- 9) **After Class Homework Assignment** - Students are assigned to review all sections in the BMI manual in preparation for the written exam.

Day 5

- 1) **Student Practice of All Four Assemblies** - Approved test procedure practice and troubleshooting on all assemblies including proper completion of test report forms and instructor oversight. **1 Hour**
- 2) **Student Independent Study** – Emphasis on major topics of hydraulics, backflow, cross connections, test procedures, assembly design, function and purpose, safety and tester responsibilities. **1 Hour**



- 3) **Written Exam** – Closed book exam of 100 questions **3 Hour**
- 4) **Practical Test Procedure Exam** – Each student demonstrates to a proctor the approved test procedures on a RPBA, DCVA, PVB and SVB, including diagnosis of one or more failures on each assembly, and proper completion of a test report form for each assembly. **3 Hour**