Water Transmission and Distribution I

Course Overview

This course is designed to provide a foundational understanding of Water Transmission and Distribution, system maintenance and inspection, and the safety of the public water supply. Course material consists of reading assignments, video lectures, review questions, study problems and lesson quizzes.

Course completion requires that the student successfully complete each component of each individual lesson. Review questions and written assignments must be submitted either online or uploaded in a Word document for the professor's review. Lesson quizzes have a minimum passing score of 70%.

Upon successful completion of the course requirements, students will receive a certificate of completion for 4.8 CEUs (48 contact hours) the *Water Transmission and Distribution I* course, which is applicable toward a Certificate in Water Transmission Technology from American Water College.

Water Transmission and Distribution I (4.8 CEUs)

- Introduction to Water Distribution Systems
- Pipe Systems and Piping
- Water Storage
- Pumping Stations and Pumps
- Hydraulics of Water Distribution Systems
- Valves
- Fire Hydrants
- Motors and Engines
- Instrumentation and Control

Required Texts

Textbook: Water Distribution Operator Training Handbook
Edition: Fourth Edition
Authors: William C. Lauer
ISBN: 978-1-58321-954-6

Textbook: Water Treatment Operator Training Handbook
Edition: Third Edition
Authors: Nicholas Pizzi and William C. Lauer
ISBN: 978-1-58321-861-7

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Educational Objectives

- To provide students with an overview of system design, operation, and maintenance
- To provide students with a foundational knowledge of types of equipment used to transmit and distribute water
- To acquaint students with the principles of water storage and safety
- To provide students with a foundational knowledge of pumps, pumping stations, operation, safety, record keeping and maintenance
- To acquaint students with valves and hydrants, their inspection, installation, and maintenance
- To provide a foundational overview of motors and engines used in water transmission and distribution
- To acquaint students with the instrumentation and control of a water distribution system

Evaluation

Students will be graded on their performance on each lesson quiz, and their course participation. Unless each unit is completed, the student will not be permitted to advance to the next lesson, and the student will not be awarded credit for completion until all assignments, quizzes and lectures are completed. Please contact our office with any questions.

Support

Students can contact our student support staff with any course-related, content-related, or technology-related inquiries. Our office hours are Monday-Thursday, 9-5 CT, and Friday 9-12 CT.

Contact Info:

Phone Number: (661) 874-1655
Email Inquiries: Info@americanwatercollege.org

Additionally, students are encouraged to contact their professor directly with any questions or comments.

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Lesson 1 – Introduction to Water Distribution Systems

Summary of This Lesson

Planning is the first step in the creation of a distribution system. Proper planning will reflect the consumption and fire demand of the community. In this lesson we will cover the various types of distribution systems based on the water sources from ground water to purchased surface water. We will also cover the components and purpose of the distribution system for the different water sources.

Lesson Objectives

Upon completion of this lesson, students will gain an understanding of:

- The purpose of drinking water distribution systems
- The types of public water systems categorized by water source
- The components of distribution systems

Assignments for This Lesson

- Read Chapters 1-4 in Water Distribution Operator Training Handbook
- Watch the video lecture for Lesson 1
- Answer Review Questions
- Complete the quiz for Lesson 1

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Lesson 2 – Pipe Systems and Piping

Summary of This Lesson

There are three basic distribution layouts; arterial-loop systems, grid systems, and tree systems. Each system type has advantages and disadvantages. Depending on the needs of the system, a different layout should be chosen. Once the layout is chosen, you must map the system and select your pipe materials. In this lesson, we will cover the considerations for selecting the layout as well as the pipe materials.

Lesson Objectives

Upon completion of this lesson, students will gain an understanding of:

- The common configurations used in distribution system design
- The principal considerations involved in sizing water mains
- Considerations that must be made when piping materials are selected
- The purpose of AWWA and ANSI/NSF standards
- The four general types of piping used in water systems
- The general characteristics of commonly used pipe materials
- The principal advantages and disadvantages of each type of pipe
- The types of joints and fittings used with each type of pipe

Assignments for This Lesson

- Read Chapter 5 in Water Distribution Operator Training Handbook
- Watch the video lecture for Lesson 2
- Answer Review Questions
- Complete the quiz for Lesson 2

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Lesson 3 – Water Storage

Summary of This Lesson

Distribution storage is an important part of meeting the consumer and fire demands of a public water system. In this lesson we will cover the purposes of water storage as well as the different storage structure options for different community needs.

Lesson Objectives

Upon completion of this lesson, students will gain an understanding of:

- The principal reasons for storing water in the distribution system
- The difference between operating storage and emergency storage requirements
- The common construction features and accessory devices for water storage tanks
- The key factors that must be considered to select the proper size and location for a water reservoir
- The important points in the operation and maintenance of water storage facilities

Assignments for This Lesson

- Read Chapter 10 in Water Distribution Operator Training Handbook
- Watch the video lecture for Lesson 3
- Answer Review Questions
- Complete the quiz for Lesson 3

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Lesson 4 – Pumping Stations and Pumps

Summary of This Lesson

When pumps are used in a distribution system, they account for most of the energy consumed in the distribution system. The purposes and types of pumps varies by needs. We will cover the types of pumps and their uses as well as the maintenance for each type of pump.

Lesson Objectives

Upon completion of this lesson, students will gain an understanding of:

- The operating principles of common types of velocity and positive-displacement pumps
- The general operating procedures for centrifugal pumps and the reasons for these procedures
- The regular preventive maintenance procedures required for centrifugal pumps
- The purpose and function of the principle parts of a centrifugal pump

Assignments for This Lesson

- Read Chapter 14 in Water Distribution Operator Training Handbook
- Watch the video lecture for Lesson 4
- Answer Review Questions
- Complete the quiz for Lesson 4

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Lesson 5 – Hydraulics of Water Distribution Systems

Summary of This Lesson

This lesson covers specific areas of hydraulics related to the distribution system. These include pipe flows, water age and system performance, using a network analysis, and hydraulic transients.

Lesson Objectives

Upon completion of this lesson, students will gain an understanding of:

- How to calculate flow of water in a pipe
- How the variables in the Hazen-Williams formula are determined
- The components and interactions of system hydraulics
- The capabilities and use of network analysis

Assignments for This Lesson

- Read Chapter 21 in Water Distribution Operator Training Handbook
- Watch the video lecture for Lesson 5
- Answer Review Questions
- Complete the quiz for Lesson 5

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Lesson 6 – Valves

Summary of This Lesson

Every distribution system requires different types of valves. Even within one system you will have numerous valves for different purposes. This lesson will cover the different types of valves and the uses for each one. We will also cover the maintenance, inspections, and record keeping of the valves.

Lesson Objectives

Upon completion of this lesson, students will gain an understanding of:

- The conditions under which different types of valves are installed in the distribution system
- The common types of valves and components
- The purpose of a valve exercise program and how one should be conducted
- The recommended inspection checks and maintenance that should be performed on valves
- The various types of valve operators used in water systems
- Records that should be kept on distribution system valves

Assignments for This Lesson

- Read Chapter 6 in Water Distribution Operator Training Handbook
- Watch the video lecture for Lesson 6
- Answer Review Questions
- Complete the quiz for Lesson 6

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Lesson 7 – Fire Hydrants

Summary of This Lesson

Although fighting fires is the most important function of a fire hydrant, they do serve more purposes than just one. We will cover the different types of hydrants, the uses of hydrants, and the proper maintenance and testing of hydrants. We will also cover the safety precautions for testing and flushing a hydrant.

Lesson Objectives

Upon completion of this lesson, students will gain an understanding of:

- The various uses of hydrants in a distribution system
- The difference between the dry-barrel and wet-barrel hydrants
- The principal components of dry-barrel and wet-barrel hydrants
- Proper procedures for installing, operating, inspecting, and maintaining hydrants
- The proper way to perform a hydrant flow test
- The information that should be recorded when fire hydrants are installed, inspected, and repair
- Safety precaution to observe during flushing and testing

Assignments for This Lesson

- Read Chapter 9 in Water Distribution Operator Training Handbook
- Watch the video lecture for Lesson 7
- Answer Review Questions
- Complete the quiz for Lesson 7

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Lesson 8 – Motors and Engines

Summary of This Lesson

Both electric motors and combustion engines are used in the distribution system. Each has a different purpose. Electric motors make up 95% of the pumps used in distribution systems, while combustion engines are used primarily for power backup and use in remote locations where electricity is not available.

Lesson Objectives

Upon completion of this lesson, students will gain an understanding of:

- The types of electric motors used to power water systems components
- The principal types of motor control equipment used
- Methods used to improve the efficiency of electrically driven pumps
- The principal parts that must be periodically maintained or repaired in electric motors and control equipment
- The principal types of combustion engines used to power water system equipment
- The important points in the operation and maintenance of engines

Assignments for This Lesson

- Read Chapter 14 in Water Distribution Operator Training Handbook
- Watch the video lecture for Lesson 8
- Answer Review Questions
- Complete the quiz for Lesson 8

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Lesson 9 – Instrumentation and Control

Summary of This Lesson

SCADA allows an operator to monitor and control flowrates, pressures, water levels, and more that are part of the distribution network. In this lesson, we will look at the common sensors, telemetry, primary and secondary instrumentation. We will also cover the different degrees of automation ranging from manual to automatic.

Lesson Objectives

Upon completion of this lesson, students will gain an understanding of:

- The various types of primary and secondary instrumentation used in water system operation
- The method of operation of common sensors
- How a basic telemetry system works
- Ways in which manual, semiautomatic, and automatic control systems can be arranged to operate
- How supervisory control and data acquisition (SCADA) can be used in water system operation
- The general requirements for maintenance of instruments and control equipment

Assignments for This Lesson

- Read Chapter 18 in Water Distribution Operator Training Handbook
- Watch the video lecture for Lesson 9
- Answer Review Questions
- Complete the quiz for Lesson 9