



5
Modules

Certificate Program

WATER TRANSMISSION TECHNOLOGY

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Certificate in Water Transmission Technology

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AMERICAN WATER COLLEGE

(661) 874-1655

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Water Transmission Technology

The Water Transmission Technology Certificate Program includes five modules. All modules are self-paced, online courses. Students will receive a certificate upon completing each module as well as an overall certificate after completing all five modules. The topics of the five modules are outlined below.

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

Water Transmission and Distribution II (4.9 CEUs)

- Water Meters
- Backflow Prevention and Cross-Connections Control
- Water Main Installation
- Backfilling, Main Testing, and Installation Safety
- System Operations
- Water Services
- Information Management
- System Security and Emergency Response
- Public Relations

Water Quality (4.1 CEUs)

- Public Water Supply

- Regulations
- Water Quality Monitoring
- Laboratory Equipment and Instruments
- Microbiological Contaminants
- Physical and Aggregate Properties of Water
- Inorganic Chemicals
- Organic Contaminants
- Radiological Contaminants
- Customer Complaint Investigations

Applied Hydraulics (2.0 CEUs)

- Density and Specific Gravity
- Pressure and Force
- Piezometric Surface and Hydraulic Grade Line
- Head
- Head Loss
- Pumping Problems
- Flow Rate Problems
- Thrust Control

Electricity for the Water Industry (1.4 CEUs)

- Electricity, Magnetism, and Electrical Measurements
- Electrical Quantities and Terms
- Functions and Ratings of Electrical Equipment

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



Water Transmission and Distribution I

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.

Water Transmission and Distribution I

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 Chapter 1, "Introduction to Water Distribution Systems," in Water Transmission and Distribution
- Watch the video lecture for Lesson 1
- Answer Review Questions 1-10 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 1

Water Transmission and Distribution I

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 2, "Pipe Systems and Piping" in Water Transmission and Distribution
- Read Appendix A, " Specifications and Approval of Treatment Chemicals and System Components" in Water Transmission and Distribution
- Watch the video lecture for Lesson 2
- Answer Review Questions 1-12 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1-2 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 2

Water Transmission and Distribution I

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 3, "Water Storage" in Water Transmission and Distribution
- Watch the video lecture for Lesson 3
- Answer Review Questions 1-9 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #2 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 3

Water Transmission and Distribution I

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 types 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 4, "Pumping Stations and Pumps" in Water Transmission and Distribution
- Watch the video lecture for Lesson 4
- Answer Review Questions 1-14 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 4

Water Transmission and Distribution I

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 5, "Hydraulics of Water Distribution Systems" in Water Transmission and Distribution
- Watch the video lecture for Lesson 5
- Answer Review Questions 1-10 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 5

Water Transmission and Distribution I

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, "Valves" in Water Transmission and Distribution
- Watch the video lecture for Lesson 6
- Answer Review Questions 1-10 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1-4 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 6

Water Transmission and Distribution I

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 7, "Fire Hydrants" in Water Transmission and Distribution
- Watch the video lecture for Lesson 7
- Answer Review Questions 1-14 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1-4 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 7

Water Transmission and Distribution I

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 8, "Motors and Engines" in Water Transmission and Distribution
- Watch the video lecture for Lesson 8
- Answer Review Questions 1-11 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 8

Water Transmission and Distribution I

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 9, "Instrumentation and Control" in Water Transmission and Distribution
- Watch the video lecture for Lesson 9
- Answer Review Questions 1-9 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #2 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 9

Water Transmission and Distribution II

Course Overview

This course is designed to provide an advanced 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 4.9 CEUs (49 contact hours) for the Water Transmission and Distribution II course, which is applicable toward a Certificate in Water Treatment Technology from American Water College.

Water Transmission and Distribution II (4.9 CEUs)

- Water Meters
- Backflow Prevention and Cross- Connections Control
- Water Main Installation
- Backfilling, Main Testing, and Installation Safety
- System Operations
- Water Services
- Information Management
- System Security and Emergency Response
- Public Relations

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

Water Transmission and Distribution II

Educational Objectives

- To acquaint students with water metering, meter testing, maintenance and repair, and meter reading
- To provide students with a foundational knowledge of backflow prevention and the reasons for cross-connection control
- To acquaint students with water mains, installation and safety
- To provide students with a foundational knowledge information management and record-keeping responsibilities
- To acquaint students with threats to the public water supply, vulnerabilities in the public water supply, and emergency response plans
- To provide a foundational understanding of public relations and the importance of an informed public

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.

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Water Transmission and Distribution II

Lesson 1 – Water Meters

Summary Of This Lesson

There are many types of water meters ranging from positive-displacement to magnetic and sonic meters. Each meter has advantages for different situation including corrosive water, large flow volumes, small/occasional flow and more. We will be covering the types of meters and their uses as well as installation and maintenance in this lesson.

Lesson Objectives

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

- The importance of metering water entering the distribution system, as well as water used by customers
- The basic operating principles of meters commonly used in water systems
- Factors that influence the type and size of meter used for various purposes
- Conditions that influence where meters are located

Assignments For This Lesson

- Read Chapter 10, "Water Meters," in Water Transmission and Distribution
- Watch the video lecture for Lesson 1
- Answer Review Questions 1-10 in the *Water Transmission and Distribution Student Workbook*. Submit your answers online.
- Complete the quiz for Lesson 1

Water Transmission and Distribution II

Lesson 2 – Backflow Prevention and Cross-Connection Control

Summary Of This Lesson

Cross-connections can lead to nonpotable water entering the distribution system. This can lead to serious consequences if not controlled. Backflow devices are designed to prevent this from happening. This lesson will give you a brief overview backflow prevention and cross-connection control. We will cover the backflow prevention devices and how to how cross-connections occur.

Lesson Objectives

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

- The public health hazards that are created by cross-connections
- The factors that allow backflow and backsiphonage to occur
- Types of installations or facilities that are likely to have cross-connections
- Appropriate backflow-prevention devices that should be used based on the degree of hazard involved

Assignments For This Lesson

- Read Chapter 11, "Backflow Prevention and Cross-Connection Control" in Water Transmission and Distribution
- Watch the video lecture for Lesson 2
- Answer Review Questions 1-10 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1-2 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 2

Water Transmission and Distribution II

Lesson 3 – Water Main Installation

Summary Of This Lesson

Water main installation is one of the most important parts of a distribution system. Improper installation can lead to unnecessary maintenance resulting in frequent loss of service and fire protection as well as higher operating cost. Different pipe materials will have different specific installation guidelines. In this lesson we will cover the general principles of preparation and safety that can be applied to any main installation.

Lesson Objectives

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

- How pipes and fittings should be handled and prepared for installation
- Methods of excavations for water main installation
- Safety precautions that should be observed during trenching and pipe installation, and methods of preventing trench wall failure
- Procedures to be followed while laying pipe
- Methods of making connections to existing mains
- The importance of blocking and anchoring mains against movement and common restraint methods that are used

Assignments For This Lesson

- Read Chapter 12, "Water Main Installation" in Water Transmission and Distribution
- Watch the video lecture for Lesson 3
- Answer Review Questions 1-11 in the *Water Transmission and Distribution Student Workbook*. Submit your answers online.
- Answer Study Problem #1 in the *Water Transmission and Distribution Student Workbook*. Submit your report online.
- Complete the quiz for Lesson 3

Water Transmission and Distribution II

Lesson 4 – Backfilling, Main Testing, and Installation Safety

Summary Of This Lesson

Once the water main has been installed, backfilling, testing for leaks, disinfection, and bacteriological testing must be done to ensure the pipe is ready for use. We will be covering the purpose and methods of backfilling and leak testing the water mains. Then we will cover the disinfection and flushing required before the water main goes online. Lastly, the area should be restored to the state it was before the construction took place, including structures and vegetation.

Lesson Objectives

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

- The proper methods of backfilling and compacting the backfill in an excavation
- The procedures in pressure and leak testing of new water mains
- The methods of flushing and disinfecting newly constructed or repaired water mains
- Restoration of structures and vegetation following construction
- Safety precautions that must be followed on a construction site to protect worker and the public

Assignments For This Lesson

- Read Chapter 13, " Backfilling, Main Testing, and Installation Safety " in Water Transmission and Distribution
- Watch the video lecture for Lesson 4
- Answer Review Questions 1-11 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 4

Water Transmission and Distribution II

Lesson 5 – System Operations

Summary Of This Lesson

There are two primary objectives of distribution system operations. First is to maintain water quality through the distribution starting from the point of entry and ending at the point of use. Second is to maintain pressure to meet peak demand and fire flow requirements. With these two objectives in mind, we will discuss operational practices and procedures to accomplish these tasks.

Lesson Objectives

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

- The importance and techniques for maintaining distribution system water quality
- The practices and procedures to ensure system reliability resulting in acceptable pressure at all times and providing adequate flow for all distribution system uses

Assignments For This Lesson

- Read Chapter 14, " System Operations" in Water Transmission and Distribution
- Watch the video lecture for Lesson 5
- Answer Review Questions 1-9 in the *Water Transmission and Distribution Student Workbook*. Submit your answers online.
- Complete the quiz for Lesson 5

Water Transmission and Distribution II

Lesson 6 – Water Services

Summary Of This Lesson

Water is delivered from the main line to the customer through water service lines. These vary in size and length depending on the connection type and flow required. This lesson will look at the components of a service line, factors governing the size, pipe materials, operating the equipment used for a service tap and record keeping for a service installation.

Lesson Objectives

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

- What is meant by a service connection
- The components that make up a typical residential connection
- The principal factors that govern the size of water service lines
- Factors that should be evaluated in the selection of pipe materials used for a service connection
- The different types and sizes of connections used to connect service lines
- The use of corporation stops and the different types available
- The method of operating the equipment used in making service taps
- The need for keeping good records of water service installations

Assignments For This Lesson

- Read Chapter 15, "Water Services" in Water Transmission and Distribution
- Watch the video lecture for Lesson 6
- Answer Review Questions 1-10 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 6

Water Transmission and Distribution II

Lesson 7 – Information Management

Summary Of This Lesson

We have gone over the importance of good record keeping, but now we will cover how to manage all the records and other information collected. We will cover typical groups of information, uses of computers, system maps and records for system equipment. All this is important not only for new employees to have access to, but also for the seasoned operators to make informed decisions.

Lesson Objectives

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

- Typical uses of computers for water system information management
- The importance of maintaining system maps, drawing, and records
- Examples of maps, drawings, and records commonly used in distribution system operations, as well as their purposes
- Records that should be maintained for water distribution system equipment

Assignments For This Lesson

- Read Chapter 16, "Information Management" in Water Transmission and Distribution
- Watch the video lecture for Lesson 7
- Answer Review Questions 1-11 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 7

Water Transmission and Distribution II

Lesson 8 – System Security and Emergency Response

Summary Of This Lesson

Supplying clean reliable drinking water is something most people take for granted. They rarely stop to think about it until it's not there. Natural disasters like hurricanes, earthquakes, and draughts are just a couple of causes for water shortage or quality concerns. Terror attacks are another threat to be aware of. This lesson will cover the types of emergencies that effect water utilities in the supply or quality of the water and the ways that utilities are vulnerable.

Lesson Objectives

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

- The types of emergencies that could effect water utilities
- The areas that could make a water utility vulnerable
- The importance of protecting computer systems at a water utility
- The components of a vulnerability assessment

Assignments For This Lesson

- Read Chapter 17, " System Security and Emergency Response" in Water Transmission and Distribution
- Watch the video lecture for Lesson 8
- Answer Review Questions 1-11 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 8

Water Transmission and Distribution II

Lesson 9 – Public Relations

Summary Of This Lesson

Distribution operators are the most important people when it comes to public relations. Operators have more direct contact with the customers and will either instill confidence or distrust in the quality of the water. Happy and confident customers will pay their bills promptly and without complaint. Unhappy customers will complain and resort to drinking bottled water. The media campaigns projects will only be undermined if the operators have poor attitudes toward customers.

Lesson Objectives

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

- How public relations enhance a water utility's image
- Specific personal behaviors that improve or detract from customer relations
- Why informed employees are necessary for good public relations
- How written guidelines can assist personnel in maintaining good relations with customers
- Types of formal public relations programs and how they benefit customer awareness and utility operations

Assignments For This Lesson

- Read Chapter 18, "Public Relations" in Water Transmission and Distribution
- Watch the video lecture for Lesson 9
- Answer Review Questions 1-9 in the Water Transmission and Distribution Student Workbook. Submit your answers online.
- Answer Study Problem #1-2 in the Water Transmission and Distribution Student Workbook. Submit your report online.
- Complete the quiz for Lesson 9

Water Quality

Course Overview

This course is designed to provide an overview of water quality regulations, methods of compliance, instrumentation used to monitor and ensure water quality, and the analysis required to supply clean and safe drinking water to the public. 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 the Water Quality course, which is applicable toward a Certificate in Water Treatment Technology from American Water College.

Water Quality (4.1 CEUs)

- Public Water Supply Regulations
- Water Quality Monitoring
- Laboratory Equipment and Instruments
- Microbiological Contaminants
- Physical and Aggregate Properties of Water
- Inorganic Chemicals
- Organic Contaminants
- Radiological Contaminants
- Customer Complaint Investigations

Required Texts

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



Water Quality

Educational Objectives

- To provide an overview of state and federal water quality regulations
- To acquaint students with the instrumentation utilized in maintaining water quality
- To acquaint students with tests and methods of compliance
- To provide an overview of analysis and data monitoring
- To demonstrate the public's reliance on operators to provide clean and safe drinking water

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.

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Water Quality

Lesson 1 – Public Water Supply Regulations

Summary of This Lesson

There are both state and federal regulations that govern water quality standards and methods of treatment. The Safe Drinking Water Act is the most widespread and overarching regulation in effect today. This lesson takes a detailed look at the SDWA, other regulations, and the contaminants that are regulated, with their maximum allowable levels.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain why the Safe Drinking Water Act was passed by Congress
- Explain why amendments to the SDWA were passed
- Identify the classes of public water systems covered by the act
- Explain the principle requirements of the act
- Explain special regulation requirements that have been enacted by USEPA

Assignments for This Lesson

- o Read Chapter 1, “Public Water Supply Regulations,” in *Water Quality*
- o Watch the video lecture for Lesson 1
- o Answer Review Questions 1-11 in the *Water Quality Student Workbook*. Submit your answers online.
- o Answer Study Problem #1 in the *Water Quality Student Workbook*. Submit your report online.
- o Complete the quiz for Lesson 1

Water Quality

Lesson 2 – Water Quality Monitoring

Summary of This Lesson

All water systems must monitor their water quality to some extent; a surface water treatment plant may need more monitoring, while a groundwater system may require less. It is important to monitor water for contaminants and to ensure that the treatment process is both effective and economical.

This lesson covers sampling and monitoring, data and records, and sample preservation and transportation.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the importance of representative sampling
- Explain the way in which grab, and composite samples are collected, and under what circumstances each method is used
- Explain the selection of proper sample volumes
- Identify and explain methods of establishing representative sampling points
- Explain the importance and limitations of sample preservation
- Explain the importance of proper sample labeling and record keeping

Assignments for This Lesson

- Read Chapter 2, “Water Quality Monitoring,” in Water Quality
- Watch the video lecture for Lesson 2
- Answer Review Questions 1-11 in the Water Quality Student Workbook. Submit your answers online.
- Answer Study Problem #1 in the Water Quality Student Workbook. Keep the required sketch in your notes, and submit the remainder of your report online.
- Complete the quiz for Lesson 2

Water Quality

Lesson 3 – Water Laboratory Equipment and Instruments

Summary of This Lesson

In our last lesson, we covered the importance of monitoring water quality. In this lesson, we will cover the labware and instruments that allow operators to perform monitoring analyses. These analyses are important in identifying, correcting or preventing potential water quality issues, and all operators should understand the lab procedures for those reasons.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Identify general labware and laboratory equipment
- Identify analytical instruments commonly used in a laboratory
- Identify and explain basic labware and instruments necessary to conduct routine process control tests

Assignments for This Lesson

- o Read Chapter 3, “Water Laboratory Equipment and Instruments,” in *Water Quality*
- o Watch the video lecture for Lesson 3
- o Answer Review Questions 1-12 in the *Water Quality Student Workbook*. Submit your answers online.
- o Answer Study Problem #1 in the *Water Quality Student Workbook*. Submit your report online.
- o Complete the quiz for Lesson 3

Water Quality

Lesson 4 – Microbiological Contaminants

Summary of This Lesson

From bacteria and viruses to protozoa, water is prone to pathogenic (disease-causing) organisms. These microbiological pathogens can cause illness, or in some cases death. It's crucial to be aware of the different contaminants, their effect, and the method of treating or removing these contaminants.

This lesson covers the different types of microbiological contaminants, and the common methods of monitoring and removal.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the significance of pathogens in drinking water
- Explain why coliform bacteria are used as an indicator of pathogenic organisms
- Identify and explain the general procedures involved in the commonly used microbiological tests of drinking water
- Explain the important new concepts in the Total Coliform Rule

Assignments for This Lesson

- o Read Chapter 4, "Microbiological Contaminants," in *Water Quality*
- o Watch the video lecture for Lesson 4
- o Answer Review Questions 1-10 in the *Water Quality Student Workbook*. Submit your answers online.
- o Answer Study Problem #1 in the *Water Quality Student Workbook*. Submit your report online.
- o Complete the quiz for Lesson 4

Water Quality

Lesson 5 – Physical and Aggregate Properties of Water

Summary of This Lesson

The physical makeup of water can affect the treatment process, making chemical or biological contaminants harder to treat. This lesson covers the physical properties of water and how to sample and test the physical characteristics of water.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the significance of the more common physical tests required for public water system operation
- Identify and explain the methods of sampling for physical tests of water
- Identify and explain the methods of performing physical tests of water

Assignments for This Lesson

- o Read Chapter 5, “Physical and Aggregate Properties of Water,” in *Water Quality*
- o Watch the video lecture for Lesson 5
- o Answer Review Questions 1-10 in the *Water Quality Student Workbook*. Submit your answers online.
- o Answer Study Problems #1-3 in the *Water Quality Student Workbook*. Submit your reports online.
- o Complete the quiz for Lesson 5

Water Quality

Lesson 6 – Inorganic Chemicals

Summary of This Lesson

The USEPA regulates several inorganic compounds in water, including: antimony, asbestos, barium, beryllium, cadmium, chromium, copper, cyanide, fluoride, lead, mercury, nitrate, nitrite, selenium, thallium, arsenic, and others. In this lesson, we will explore the different inorganic contaminants, the significance of its presence in water, and the method of sampling or testing for these contaminants.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the significance of the more important inorganic chemicals of concern in drinking water treatment
- Identify and explain methods of sampling for inorganic chemicals
- Identify and explain methods of analysis for inorganic chemicals

Assignments for This Lesson

- o Read Chapter 6, “Inorganic Chemicals,” in Water Quality
- o Watch the video lecture for Lesson 6
- o Answer Review Questions 1-10 in the Water Quality Student Workbook. Submit your answers online.
- o Answer Study Problems #1-2 in the Water Quality Student Workbook. Submit your reports online.
- o Complete the quiz for Lesson 6

Water Quality

Lesson 7 – Organic Contaminants

Summary of This Lesson

Organic contaminants most often occur in surface water sources as the result of plants or algae growth, and human activities. Organic compounds can also occur as a result of water treatment and transmission. These contaminants can cause treatment issues and serious health problems if not treated properly. This lesson will cover the sources and solutions for organic contaminants.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Identify the basic properties of organic chemicals
- Identify the principal sources of natural and synthetic organic substances in water
- Explain the adverse health effects of organic chemicals
- Explain the methods of measuring the concentration of organic chemicals in water
- Explain the methods of controlling organic chemicals in drinking water

Assignments for This Lesson

- o Read Chapter 7, “Organic Contaminants,” in Water Quality.
- o Watch the video lecture for Lesson 7
- o Answer Review Questions 1-9 in the Water Quality Student Workbook. Submit your answers online.
- o Answer Study Problem #1 in the Water Quality Student Workbook. Submit your report online.
- o Complete the quiz for Lesson 7

Water Quality

Lesson 8 – Radiological Contaminants

Summary of This Lesson

Our final lesson on contaminants for this course focuses on radiological contamination issues. Natural radioactivity can contaminate water, or it can be the result of industrial or medical sources. The health risks are widespread and potentially life-threatening. This lesson takes an in-depth look at the structure of radioactive particles, the health hazards, and the methods of treating water for radioactivity removal.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the basic theory of radioactive materials
- Identify the radioactive materials of principal concern in drinking water
- Explain the adverse health effects of radioactivity in drinking water
- Explain radionuclide monitoring requirements
- Explain methods of treating water for radioactivity removal

Assignments for This Lesson

- o Read Chapter 8, “Radiological Contaminants,” in *Water Quality*
- o Watch the video lecture for Lesson 8
- o Answer Review Questions 1-10 in the *Water Quality Student Workbook*. Submit your answers online.
- o Answer Study Problem #1 in the *Water Quality Student Workbook*. Submit your report online.
- o Complete the quiz for Lesson 8

Water Quality

Lesson 9 – Customer Complaint Investigations

Summary of This Lesson

It is important for any water treatment operator to respond to a customer's inquiries or complaints about their water quality. Not only is this an important step in building the public confidence in their water supply, responding to a customer complaint may be an early warning sign of a contaminant issue or water quality problem.

This lesson will explain the differences between taste-and-odor investigations, physical appearance investigations, a laundry and fixture staining investigation, and investigating an alleged illness as a result of poor water quality.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the general principles of conducting an investigation in response to a customer complaint on water quality
- Explain the general principles of conducting a taste-and-odor complaint investigation
- Explain the general principles of conducting a physical appearance complaint investigation
- Explain the general principles of conducting an investigation of staining on laundry and plumbing fixtures complaint
- Explain the general principles of conducting an alleged illness complaint investigation

Assignments for This Lesson

- o Read Chapter 9, "Customer Complaint Investigations," in *Water Quality*
- o Watch the video lecture for Lesson 9
- o Answer Review Questions 1-10 in the *Water Quality Student Workbook*. Submit your answers online.
- o Answer Study Problem #1 in the *Water Quality Student Workbook*. Submit your report online.
- o Complete the quiz for Lesson 9

Applied Hydraulics

Course Overview

This course is designed to acquaint students with the hydraulics involved in water treatment, storage and distribution, and the math that applies to hydraulic principles. 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 the Applied Hydraulics course, which is applicable toward a Certificate in Water Treatment Technology from American Water College.

Applied Hydraulics (2.0 CEUs)

- Density and Specific Gravity
- Pressure and Force
- Piezometric Surface and Hydraulic Grade Line
- Head
- Head Loss
- Pumping Problems
- Flow Rate Problems
- Thrust Control

Required Texts

Textbook: *Basic Science Concepts and Applications*, Principles and Practices of Water Supply Operations series

Edition: Fourth Edition

Author: Nicholas G. Pizzi

ISBN: 1-58321-778-9

Educational Objectives

- To provide students with an overview of density and specific gravity and the mathematical concepts that apply
- To provide students with an overview of pressure and force, and the mathematical concepts that apply
- To acquaint students with the principles of piezometric surface and hydraulic grade lines



Applied Hydraulics

- To acquaint students with head, head loss, and the mathematical applications that apply
- To acquaint students with pumps and calculating their efficiency
- To acquaint students with flow rate problems encountered in the water treatment and distribution process
- To acquaint students with thrust, thrust control, and the mathematical concepts that apply

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.



Applied Hydraulics

Lesson 1 – Density and Specific Gravity

Summary of This Lesson

This lesson will provide an overview of the methods of calculating density and specific gravity and how they are used in calculations in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the methods of calculating density and specific gravity
- Explain how density and specific gravity are used in calculations in water system operations

Assignments for This Lesson

- Read Hydraulics 1, "Density and Specific Gravity," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 1
- Answer Review Questions
- Complete the quiz for Lesson 1



Applied Hydraulics

Lesson 2 – Pressure and Force

Summary of This Lesson

This lesson will provide an overview of the methods of pressure and force and how they are used in calculations in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the methods of pressure and force
- Explain how pressure and force are used in calculations in water system operations

Assignments for This Lesson

- Read Hydraulics 2, "Pressure and Force," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 2
- Answer Review Questions
- Complete the quiz for Lesson 2



Applied Hydraulics

Lesson 3 – Piezometric Surface and Hydraulic Grade Line

Summary of This Lesson

This lesson will provide an overview of the methods of calculating piezometric surface and hydraulic grade line and how they are used in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the methods of calculating piezometric surface and hydraulic grade line
- Explain how piezometric surface and hydraulic grade lines are used in calculations in water system operations

Assignments for This Lesson

- Read Hydraulics 3, "Piezometric Surface and Hydraulic Grade Line," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 3
- Answer Review Questions
- Complete the quiz for Lesson 3



Applied Hydraulics

Lesson 4 – Head

Summary of This Lesson

This lesson will provide an overview of the methods of calculating hydraulic head and how it is used in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the methods of calculating hydraulic head
- Explain how hydraulic head is used in calculations in water system operations

Assignments for This Lesson

- Read Hydraulics 4, "Head," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 4
- Answer Review Questions
- Complete the quiz for Lesson 4



Applied Hydraulics

Lesson 5– Head Loss

Summary of This Lesson

This lesson will provide an overview of the methods used to calculate head loss and how the data is used in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the methods used to calculate head loss
- Explain how head loss data is used in calculations in water system operations

Assignments for This Lesson

- Read Hydraulics 5, "Head Loss," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 5
- Answer Review Questions
- Complete the quiz for Lesson 5



Applied Hydraulics

Lesson 6– Pumping Problems

Summary of This Lesson

This lesson will provide an overview of the methods of performing pumping calculations, including determining pumping rates, pump heads, horsepower, and efficiency, how to read pump curves, and the uses of pump calculations in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the methods of performing pumping calculations
 - determining pumping rates
 - pump heads
 - horsepower
 - efficiency
- Explain how to read pump curves
- Explain the uses of pump calculations in water system operations

Assignments for This Lesson

- Read Hydraulics 6, "Pumping Problems," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 6
- Answer Review Questions
- Complete the quiz for Lesson 6



Applied Hydraulics

Lesson 7 – Flow Rate Problems

Summary of This Lesson

This lesson will provide an overview of the methods used to perform flow rate calculations for pipes and channels, how commonly used flow measuring devices operate and are read, and how flow rate calculations are used in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the methods used to perform flow rate calculations for pipes and channels
- Explain how commonly used flow measuring devices operate and are read
- Explain how flow rate calculations are used in water system operations

Assignments for This Lesson

- Read Hydraulics 7, "Flow Rate Problems," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 7
- Answer Review Questions
- Complete the quiz for Lesson 7



Applied Hydraulics

Lesson 8– Thrust Control

Summary of This Lesson

This lesson will provide an overview of the methods of performing thrust control calculations, and how calculations of thrust are used in water system operations.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the methods of performing thrust control calculations
- Explain how calculations of thrust are used in water system operations

Assignments for This Lesson

- Read Hydraulics 8, "Thrust Control," in *Basic Science Concepts and Applications*
- Watch the video lecture for Lesson 8
- Answer Review Questions
- Complete the quiz for Lesson 8



Electricity for the Water Industry

Course Overview

This course is designed to acquaint students with the electric terms, measurements and equipment used in water treatment, storage, and distribution. 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 the Electricity for the Water Industry course, which is applicable toward a Certificate in Water Treatment Technology from American Water College.

Electricity for the Water Industry (1.4 CEUs)

- Electricity, Magnetism, and Electrical Measurements
- Electrical Quantities and Terms
- Functions and Ratings of Electrical Equipment

Required Texts

Textbook: *Basic Science Concepts and Applications*, Principles and Practices of Water Supply Operations series

Edition: Fourth Edition

Author: Nicholas G. Pizzi

ISBN: 1-58321-778-9

Educational Objectives

- To provide students with an overview of electricity, magnetism and electrical measurements used in the water industry
- To provide students with the proper electrical quantities and terms used in the water industry
- To demonstrate the functions and the applicable ratings of electrical equipment used in the water industry



Electricity for the Water Industry

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.



Electricity for the Water Industry

Lesson 1 – Electricity, Magnetism, and Electrical Measurements

Summary of This Lesson

The basic building block of physical matter is the atom with its protons and neutrons and electrons. The electrons that orbit the nucleus of the atom can be released and transferred as a result of chemical reactions, electromagnetic forces. We will be drawing an analogy between hydraulic systems and electrical systems in an attempt to explain the components and forces that cause electricity to flow

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain basic electricity, magnetism, and electrical measurement terms
- Explain why a knowledge of electricity is important for water system operations

Assignments for This Lesson

- Watch the video lecture for Lesson 1
- Answer Review Questions
- Complete the quiz for Lesson 1



Electricity for the Water Industry

Lesson 2 – Electrical Quantities and Terms

Summary of This Lesson

This lesson will provide definitions of electrical quantities and terms.

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain basic electrical quantities and terms
- Explain why electrical quantities and terms are important in water system operations

Assignments for This Lesson

- Watch the video lecture for Lesson 2
- Answer Review Questions
- Complete the quiz for Lesson 2



Electricity for the Water Industry

Lesson 3 – Electrical Quantities and Terms

Summary of This Lesson

In this lesson we will be looking at major categories of electrical equipment which includes equipment that: generates, stores and changes electricity from one form to another

Lesson Objectives

Upon completion of this lesson, students will be able to:

- Explain the basic function of electrical equipment used in water systems

Assignments for This Lesson

- Watch the video lecture for Lesson 3
- Answer Review Questions
- Complete the quiz for Lesson 3



Enrollment & Payment Options

Students have the option to enroll in one course at a time or in the complete Water Treatment Technology Certificate Program. By enrolling in the complete program, students will receive a discounted enrollment fee.

Option 1 – Individual Course Enrollment

Water Transmission & Distribution I	\$474.99
Water Transmission & Distribution II	\$474.99
Water Quality	\$349.99
Applied Hydraulics	\$179.99
<u>Electricity for the Water Industry</u>	<u>\$119.99</u>
Total Program Cost	\$1,609.95

Option 2 – Complete Program Enrollment \$1,495.00

Enroll online at:

<https://americanwatercollege.org/water-transmission-certificate/>

Contact us for more information:

Phone – (661) 874-1655

Email – info@americanwatercollege.org