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Water Technology (WTER) 1510 – Introduction to Water Distribution (3)

Advisory: Eligibility for Math 1060 and English 1500 strongly recommended

Total Hours: 48 hours lecture

Catalog Description: This course provides a comprehensive introduction to water and related distribution systems for water distribution operators at system operator apprenticeship levels and those desiring to secure employment as a water distribution operator. This course also covers key concepts and terms in topic areas including water sources and regulations, wells and pumps, water pressure and head, water and power, instrumentation and controls, and water distribution system operation. The essentials of water mathematics are introduced throughout the course to increase skills necessary for using formulas and conversion factors on the job. Field trips will be required.

This course enhances professional development and reviews the necessary range-of-knowledge subjects tested by the California Department of Public Health Grades D1 and D2 exams for water distribution.

Type of Class/Course: Degree Credit

Text: Lauer, William. *Water Distribution Operator Training Handbook*. 4<sup>th</sup> ed. Denver: American Water Works: De, 2013. Print.

Recommended Reading: trade journals

Course Objectives:

By the end of the course a successful student will be able to:

1. Demonstrate knowledge of basic competencies for water system operation at the apprentice level.
  - a. Describe the end-to-end water distribution process.
  - b. Outline major tasks in the water distribution process.
  - c. Explain the roles and responsibilities of a water distribution operator.
2. Define key water terminology as they relate to all major topic areas covered.
3. Demonstrate competence in basic level water mathematics.

Course Scope and Content:

Unit I Introduction and Review

A. System Design and Classifications

- B. Regulatory History
  - a. Introduction to Federal and State Drinking Water Regulations
  - b. Regulatory Compliance Issues
- C. Public Water Systems
  - a. Types and Designs

Unit II Sources of Supply, Watershed Management, and Water Rights

- A. Groundwater vs. Surface Water
- B. Global Supply and Characteristics
- C. Hydrologic Cycle
- D. Wellhead Protection
- E. Groundwater Concerns and Terms
- F. Hardness and Iron/Manganese
- G. Groundwater Operations & Maintenance (O&M)
- H. Types, Construction, and Development of Wells
- I. Definitions and Terms
- J. Point Source vs. Non-Point Source Pollution/Contamination
- K. Watershed Basins and Their Management
- L. Surface Water Source Issues
- M. Reservoir Management
- N. Basic Water Rights

Unit III Pipes, Materials, Applications, and Joints

- A. Pipe Materials, Applications, and Characteristics
- B. Engineering Standards and Associations
- C. Pipe Classifications and Characteristics
- D. Types of Breaks
- E. C-Factor and Friction Loss Factors
- F. Common Issues
- G. Types of Joints and Applications

Unit IV Pipe Installation

- A. Pipeline Project Preparation, and Safety
- B. Common Terms
- C. Advanced Trenching and Issues
- D. Soil Types
- E. Backfilling
- F. Leak Testing and Site Restoration

Unit V Valves, Hydrants, Service Lines, and Water Storage

- A. Classifications, Types, and Applications of Valves
- B. Other Appurtenances Including Service Lines and Materials
- C. Common Classification and Styles of Hydrants
- D. Primary Uses of Hydrants
- E. Common Hydrant Operations and Issues
- F. Water System Storage Purposes, Types, and Issues

Unit VI Water Quality

- A. Water Quality Safeguards
- B. Terms
- C. Water Molecule

- D. Safe Drinking Water Act (SDWA) and Terms
- E. WQ Contaminants
- F. Disinfection
  - a. Types, Processes, and Applications
- G. Disinfectant/Disinfection Byproducts (D/DBPs)
- H. Alternative Disinfections Options
- I. Basic Chemistry and Microbiology
- J. Water Quality Sampling and Analyses
- K. Fluoride
- L. Chemical Processes
- M. Microbial
- N. Health Risks

Unit VII Cross Connection Control (CCC), Corrosion, Meters, and O&M

- A. CCC Types
- B. Backflow Conditions
- C. Diseases and Chemicals
- D. Backflow Prevention Measures, Devices, and Applications
- E. Corrosion Types and Prevention Options
- F. Corrosion Issues and Indicators
- G. Intent and Purpose of Meters
- H. Tapping
- I. Classification of Meters
- J. Common Meter Issues
- K. Flushing Programs
- L. Cavitation and Water Hammer
- M. Pipeline Rehabilitation
- N. Pipeline Leaks and Leak Audits
- O. Emergency Repairs

Unit VIII Pumps and Motors

- A. Types of Pumps
- B. Pump Design and Applications
- C. Pump Components, Parts, and Terminology
- D. Advantages and Disadvantages of Various Pump Designs
- E. Pump Curve Basics
- F. Pump Operations and Maintenance
- G. Motor Types, Design, Components, and Applications
- H. Motor and Electrical Terminology
- I. Single Phase vs. Three Phase Power
- J. Electric Motor Protection Options

Unit IX Safety

- A. Principles and Practices
- B. Employee-Right-To-Know Program(s) Basics
- C. Primary Division of Safety and Responsibilities
- D. Occupational Safety and Health Administration (OSHA)
- E. Confined Space
- F. First Aid
- G. Chlorine
- H. Chemical and Physical Characteristics of Chlorine

I. Lock Out and Tag Out (LOTO)

Unit X Information Management, Instrumentation & Control, and Public Relations

- A. Map Types and Applications
- B. Supervisory Control and Data Acquisition (SCADA)
- C. Telemetry
- D. Digital vs. Analog
- E. 4-20 mA Signals
- F. Stationing
- G. AM/FM/GIS Systems
- H. Categories of Instrumentation
- I. Control Elements
- J. Elements of Public Relations
- K. Annual Reports

Unit XI Applied Water Mathematics

- A. Introduction to Basic Math Skills and Mechanics
- B. Determining Averages (Consumption, Mileage, Metering)
- C. Unaccounted for Water
- D. Temperature Conversions
- E. Gallons Per Capita Day (GPCD)
- F. Well Yield
- G. Well Drawdown
- H. Specific Capacity Performance (Basic)
- I. Pressure and Head
- J. Surface Area
- K. Volume
- L. Dosage and Concentration
- M. Chlorine Residual and Application
- N. Detention Time
- O. Flows (Q)
- P. Trench Spoil Calculations
- Q. Pipe Displacement
- R. Pipeline Velocity
- S. Ohm's Law

Methods of Instruction:

- 1. Lecture and Discussions
- 2. Demonstrations
- 3. Field trip(s)

Methods of Evaluation:

- 1. Quizzes
- 2. Exams
- 3. Written Reports and Projects
- 4. Class Participation