Water Systems: One Year Program: Scope & Sequence

Semester 1

ENS101- Environmental Sustainability I
(90 days)

District Pre-Assessment

Unit 1 (15 Days)

Basic Safety:

- Demonstrate knowledge of safety, health, and environmental rules and regulations to avoid workplace injury and maximize machine productivity.
- Demonstrate knowledge of electrical safety standards and electrical procedures to maintain industrial equipment safely.
- Demonstrate knowledge of safety practices of mechanical and fluid-controlled systems to maintain industrial equipment safely.
- Demonstrate knowledge of proper fall protection.
- Select appropriate Personal Protective Equipment (PPE) for various industrial safety situations.
- Describe how to appropriately use Personal Protective Equipment (PPE) for various industrial safety situations.

CTSO Integration (Leadership Skills): SkillsUSA Officer Elections and Training
Professional Skills: 1.A-D, 4.A-F, 7.A-C
Academic Standards: ELA.11-12.W.4, ELA.11-12.W.5, ELA.11-12.SL.4, ELA.11-12.L.4, 5.NF.B.3, 5.NF.B.6, 5.NF.B.7
Work-based Learning: Industry Guest Speaker, Mock Interview, Job Application
Technical Standards: 101.01-.06

Certification: OSHA 10

Unit 2 (75 Days)

Water Distribution Operator:
Introduction to Water Distribution

- Describe the water supply system and distribution's part in it.
- List the types and sources of water contamination in distribution systems and how to prevent or correct them.
- Discuss typical job duties of water distribution system operators.

Water Storage Facilities

- Identify types, determine suitable locations, and inspect storage facilities.
- Take a storage facility out of service and put it back on line.
- Safely operate and maintain a storage facility, including selecting and applying protective coatings.
- Collect samples from a storage facility.
- Troubleshoot storage facility problems.
- Protect a storage facility from corrosion.
- Disinfect a storage facility.
- Maintain records for a storage facility.

Distribution System Facilities

- Explain the effect of hydraulics on the performance of a distribution system.
- Describe the function of distribution storage facilities and pumping facilities.
- Identify and install various types of pipes and joints.
- Identify and test various types of meters.
- Determine the need for and install various types of backflow prevention devices.

Operation and Maintenance

- Develop and conduct programs for water distribution system surveillance, water quality monitoring, and cross-connection control.
- Locate and repair buried pipes and leaks.
- Make pipe connections and flush and clean pipes.
- Manage pipe lining jobs, thaw frozen pipes and hydrants, test and read meters, and disinfect mains and storage facilities.
- Develop a recordkeeping system and keep accurate records.
- Train operators to prepare for and respond to emergencies, deal with the public, maintain the distribution system facilities, and safely operate and maintain a water distribution system.

Disinfection

- Explain the disinfection process using chlorine and hypochlorite.
- Describe the breakpoint chlorination process.
- Identify the points of disinfectant application and select the proper dosage.
- Start up, shut down, troubleshoot, and maintain disinfection equipment and systems.
- Handle disinfectants safely and develop and conduct a chlorine safety program.

Water Distribution Safety

- Develop a safety program for a water utility agency, including delivering safety information and practices to other operators.
- Operate and maintain pumps, wells, and other facilities safely, with attention to the safety of operators and consumers.
- Work safely in streets while protecting road users and pedestrians from work areas in streets and sidewalks.
- Conduct a safety inspection of waterworks facilities.

Management

- Describe the functions and duties of a manager and understand authority, responsibility, delegation, and accountability.
- Handle personnel tasks and issues so that all job applicants and employees are treated equally, fairly, and professionally during the employee selection process, employee evaluations, and disciplinary meetings.
- Communicate effectively about operations, financial status, and other aspects of your utility within the organization, with media representatives, and with the community. Use written and oral reports, organizational

charts identifying lines of authority and responsibility, and calculations such as operating ratio, coverage ratio, and simple payback.
- Prepare long-term and short-term plans, emergency plans (including contingency plans), security plans, safety programs, and water and energy conservation programs (including best management practices) for your utility.
- Collect, organize, use, and dispose of plant records.

Examine piping systems:
- Apply safety principles pertaining to piping components and systems.
- Read and interpret technical documents pertaining to piping components and systems.
- Explain fundamental theories related to piping components and systems.
- Solve technical problems related to piping components and systems using equations and mathematical principles.
- Describe the operation of piping components and systems.
- Use tools and instruments to operate and maintain piping components and systems.
- Troubleshoot piping components and systems.

Examine pumps:
- Apply safety principles pertaining to pumps.
- Read and interpret technical documents pertaining to pumps.
- Explain fundamental theories related to pumps.
- Solve technical problems related to pumps using equations and mathematical principles.
- Describe the operation of pumps.
- Use tools and instruments to operate and maintain pumps.
- Troubleshoot pumps.

Examine valves:
- Apply safety principles pertaining to valves.
- Read and interpret technical documents pertaining to valves.
- Explain fundamental theories related to valves.
- Solve technical problems related to valves using equations and mathematical principles.
- Describe the operation of valves.
- Use tools and instruments to operate and maintain valves.
- Troubleshoot valves.

Examine heat exchangers:
- Apply safety principles pertaining to heat exchangers.
- Read and interpret technical documents pertaining to heat exchangers.
- Explain fundamental theories related to heat exchangers.
- Solve technical problems related to heat exchangers using equations and mathematical principles.
- Describe the operation of heat exchangers.
- Use tools and instruments to operate and maintain heat exchangers.
- Troubleshoot heat exchangers.

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Fundraiser, Fall Leadership Conference, Regionals Prep
Professional Skills: 3.A-E, 4.A-F
Academic Standards: ELA.11-12.W.4, ELA.11-12.SL.4, ELA.11-12.L.4, 5.NF.B.3 - 7, 6.RP.A.3, 7.RP.A.3, 7.G.B.4, G-GMD.A.3, HS.P1U1.1, Essential HS.P1U1.2
Work-based Learning: Resume and Cover Letter
Technical Standard: 101.01-06, AZ-ES-W-WD-1.1-3, 2.1-2.8, 3.1-3.5, 4.1-4.6, 5.1-5.5, 6.1-6.4, 7.1-5, 106.01-07, 107.01-07, 108.01-07, 109.01-07

Certification: ADEQ Water Distribution Operator Level 1

Semester 2

ENS102- Environmental Sustainability ll
(90 days)

Unit 3 (90 Days)

Water Treatment Operator:

Basic Microbiology and Chemistry
- Identify, describe and/or define the common microbiological contaminants of concern for water treatment processes.
- Identify, describe and/or define the common test methods used to detect microbiological contaminants of concern for water treatment processes.
- Identify, describe, explain and/or define basic chemistry concepts as they apply to water treatment processes.
- Classify, solve, complete and/or use chemical equations and formulas to determine and balance reactants and products.
- Identify, describe, explain and/or define the common non-biological contaminants of concern for water treatment processes.

Operator Math
- Identify, describe, explain, solve and/or define basic math concepts.
- USEPA Water Quality Regulation Overview
- Identify, describe, explain, and/or define regulations associated with the water treatment industry.
- Water Sources and Treatment Options
- Identify, describe, explain, and/or define elements of the hydrologic cycle.
- Identify, describe, explain, and/or define components of a basic water treatment process.

Groundwater Quality and Wells
- Identify, describe, explain, and/or define concepts associated with groundwater and aquifers.
- Surface Water Source Treatment
- Identify, describe, explain, and/or define concepts associated with surface water and source treatment.

Treatment Plant PreTreatment
- Identify, describe, explain, and/or define concepts associated with pretreatment processes.
- Coagulation and Flocculation

- Identify, describe, explain, or define concepts associated with coagulation and flocculation processes.

Sedimentation and Clarifiers

- Identify, describe, explain, and/or define concepts associated with sedimentation and clarifying processes.

Filtration Fundamentals

- Identify, describe, explain, and/or define concepts associated with filtration processes.

Disinfection

- Identify, describe, explain, and/or define concepts associated with disinfection processes.

Introduction to Iron and Manganese Treatment

- Identify, describe, explain, and/or define concepts associated with iron and manganese treatment.

Fluoridation

- Identify, describe, explain, and/or define concepts associated with fluoridation processes.

Water Quality Testing

- Demonstrate, describe, explain, and/or define concepts associated with laboratory processes, protocols and techniques.

Corrosion Control

- Describe, explain, and/or define concepts associated with corrosion and corrosion control processes.

Lime Softening Basics

- Describe, explain, and/or define concepts associated with lime and other softening techniques.

Introduction to Specialized Treatment Processes

- Describe, explain, and/or define concepts associated with adsorption, aeration, membranes and ozone processes.

Introduction to Electrical Systems

- Describe, explain, and/or define concepts associated with basic electrical concepts and systems.

Pumps

- Describe, explain, and/or define concepts associated with theory and operation of pumps.

Treatment Plant Safety

- Demonstrate, describe, explain, and/or define concepts associated with industrial safety.

Administration, Records and Reporting Procedures

- Demonstrate, describe, explain, and/or define concepts associated with administrative processes, reporting procedures and record keeping.

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Leadership lessons, Regionals prep and State Competition

Professional Skills: 5.A-E, 6.A-C

Academic Standards: ELA.11-12.W.4, ELA.11-12.W.5, ELA.11-12.L.4, ELA.11-12.S, 5.NF.B.3 - 7, 6.RP.A.3, 7.RP.A.3, 7.G.B.4, G-GMD.A.3, HS.P1U1.1, Essential HS.P1U1.2
Work-Based Learning: Industry Guest Speaker, Resume and Cover Letter

Technical Standard: AZ-ES-W-WWT-1.1-1.5, 2.1, 3.1 ,4.2, 5.1, 6.1, 7.1, 8.1, 9.1, 10.1, 11.1, 12.1, 13.1, 14.1, 15.1, 16.1, 17.1, 18.1, 19.1, 20.1, 21.1

Certification: ADEQ Water Treatment Operator Level 1

District Post Assessment

Arizona Department of Environmental Quality (ADEQ)
Common AZCCR Math Standards (CAMS)
English Language Art Standards (ELAS)
Safety and Health Administration (OSHA)