



Water Systems Operations Specialist

**New Jersey Water Association
U.S. Highway 9
Lanoka Harbor, NJ 08734**

Appendix A - 1

WORK PROCESS SCHEDULE

AND

RELATED INSTRUCTION OUTLINE



Water Systems Operations Specialist

Appendix A-1

WORK PROCESS SCHEDULE
Water Systems Operation Specialist
(Existing Title: Water Treatment - Plant Operator)
O*NET-SOC CODE: 51-8031.00 RAPIDS CODE: 0507

This schedule is attached to and a part of these Standards for the above identified occupation.

1. TYPE OF OCCUPATION

Time-based Competency-based Hybrid

2. TERM OF APPRENTICESHIP

The term of the occupation is two (2) years with an OJL attainment of approximately 4,000 hours, supplemented by a recommended 288 hours of related instruction.

3. RATIO OF APPRENTICES TO LICENSED OPERATOR (T and W License Class)

The apprentice to Licensed Operator ratio is: one (1) Apprentice to one (1) Licensed Operator on the jobsite.

4. APPRENTICE WAGE SCHEDULE

Apprentices shall be paid a progressively increasing schedule of wages based as outlined in Appendix E, Employer Acceptance Agreement.

Period of Apprenticeship	Advancement Requirements
Period 1	1,000 hours of on-the-job training + completion of the identified curriculum with a passing grade + satisfactory evaluation
Period 2	1,000 hours of on-the-job training + completion of the identified curriculum with a passing grade + satisfactory evaluation.
Period 3	1,000 hours of on-the-job training + completion of the identified curriculum with a passing grade + satisfactory evaluation. Obtain the NJDEP Class 1 Water Operator License
Period 4	1,000 hours of on-the-job training + completion of the identified curriculum with a passing grade + satisfactory evaluation.
Completion	Apprentice completes when all the above identified requirements are met

5. WORK PROCESS SCHEDULE (See below)

6. RELATED INSTRUCTION OUTLINE (See Below)



Water Systems Operations Specialist

WORK PROCESS SCHEDULE

OCCUPATION TITLE : Water Treatment Plant Operator
Alternate Title: Water Treatment Specialist)
O*NET-SOC CODE : 51-8031.00 **RAPIDS CODE : 0507**

Apprentices shall receive on-the-job instruction and experience as is necessary to become a qualified Water Systems Operations Specialist versed in the theory and practice of the occupation. The following is a condensed schedule of work experience, which every apprentice shall follow as closely as conditions will permit.

WORK PROCESSES	Approximate Hours
A. Tools, Equipment and Work Place Safety <ol style="list-style-type: none"> 1. Become familiar with tools, pipe and other materials used out on the job 2. Understand and use personal protective equipment and safety procedures 3. Demonstrate general plant safety and security operations 4. Plan and set up work areas for safety of crew and public 5. Confined spaces and traffic control zones 6. Perform all work in conformance with OSHA regulations 	240
B. Vehicles and Specialized Equipment <ol style="list-style-type: none"> 1. Ensure that vehicles and equipment are adequately stocked & serviced 2. Become familiar working with excavation and other specialized equipment 	400
C. System Operations & Maintenance <ol style="list-style-type: none"> 1. Develop a working knowledge of the operation, methods and procedures of a water treatment & distribution system 2. Perform installation and inspection of new water lines and services 3. Understand and implement customer metering and billing procedures 4. Perform leak detection and understand water loss control 5. Reading water meters, perform testing & proper sizing 6. Demonstrate ability to read and interpret maps and drawings of the water system, to locate valves and water mains 7. Assist with the installation, maintenance and repair of the treatment plant, storage tanks, and the distribution system 8. Develop a working knowledge of preventive maintenance, troubleshooting & repair of mechanical equipment 9. Develop working knowledge of SCADA system 	1920
D. Quality Control <ol style="list-style-type: none"> 1. Learn to perform all aspects of sampling, monitoring and testing required to maintain compliance with Federal State and Local regulations 2. Identify normal/out-of-range values 3. Maintain open communication & report results to supervisors 4. Learn emergency response procedures 	960
E. Logistics, Reports and Supervision <ol style="list-style-type: none"> 1. Complete work order forms & document routine maintenance 2. Order equipment and supplies as needed 3. Visit other facilities to learn about new technology 	480
TOTAL HOURS	4000



Water Systems Operations Specialist

Related Technical Instruction
OCCUPATION TITLE : Water Systems Operation Specialist
(Alternate Title: Water Treatment Specialist)
O*NET-SOC CODE : 51-8031.00 **RAPIDS CODE : 050Z**

A minimum of 288 hours of related instruction are required for each apprentice. Courses may be assigned from any of the following offerings. NJ requires Introduction to Water/Wastewater Operations and Advanced Water Operations Courses for licensure.

Year 1

Topic	Hours*
A. Orientation 1. Apprenticeship Program overview <ul style="list-style-type: none"> a. NJ Water Association Standards of Apprenticeship b. Qualifications for Apprenticeship c. Policy manual d. Apprenticeship Training Committee (ATC) 2. Basic job duties & work environment 3. On the Job Learning (OJL) <ul style="list-style-type: none"> a. Work process schedule b. Supervision 4. Related Instruction Opportunities and Requirements 5. NRWA Water University 6. WaterPro Online Community Apprenticeship Forum	6
B. Professional Requirements 1. NJ Certifications & licensure 2. Responsibilities of a NJ Water Treatment Plant Operator 3. Ethics as a public health & environmental professional 4. Customer service & community outreach 5. Professional organizations	6
C. Introduction to Water & Waste Water Operations - Part 1 NJDEP Licensing Requirement Course may be offered at colleges, vocational/technical schools, and on-line. Text: Water Treatment Plant Operation Vol I, II. Text: Water Distribution System Operation & Maintenance	90
1. MATHEMATICS: <ul style="list-style-type: none"> a. Basic Math <ul style="list-style-type: none"> i. Fractions and Decimals ii. Ration and Proportions iii. Percent and Unit Analysis iv. Graphs and Significant Numbers v. Review of Addition, Subtraction, etc. vi. Conversions and Averaging vii. Usage of Scientific Calculator viii. Metric System 	36

<p>4. MICROBIOLOGY</p> <ul style="list-style-type: none"> a. Cell Structure b. Cell Metabolism-Reproduction c. Microorganisms-Bacteria, Algae d. Nitrogen and other Cycles e. Environmental Factors Affecting Microorganisms f. Classification <ul style="list-style-type: none"> i. Aerobic ii. Anaerobic iii. Facultative g. Pathogens h. Typical Microorganisms Related to Water and Wastewater 	11
<p>5. MISCELLANEOUS</p> <ul style="list-style-type: none"> a. Terminology b. Laboratory Equipment Familiarization c. Basic Laboratory Testing <ul style="list-style-type: none"> i. pH and temperature ii. Chlorine Residual iii. Settleable Solids 	6
<p>D. INTRODUCTION TO WATER OPERATIONS PART II NJDEP Licensing Requirement Courses may be offered at colleges, vocational/technical schools, and on-line. Text: Water Treatment Plant Operation Vol I, II. Text: Water Distribution System Operation & Maintenance</p>	45
<p>1. ADMINISTRATIVE</p> <ul style="list-style-type: none"> a. Rules and Regulations b. Reporting to Regulatory Agencies c. Budgeting d. Record Keeping e. Safety-OSHA 	6
<p>2. WATER SOURCES AND CHARACTERISTICS</p> <ul style="list-style-type: none"> a. Hydrological Cycle b. Surface Water Supply c. Ground Water Supply and Others 	3
<p>3. WELLS</p> <ul style="list-style-type: none"> a. Types and Construction b. Operation and Treatment c. Monitoring and Record Keeping 	3
<p>4. WATER TREATMENT</p> <ul style="list-style-type: none"> a. Sedimentation and Precipitation <ul style="list-style-type: none"> i. Operation and Records 	12

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<ul style="list-style-type: none"> ii. Operation Parameters and Problems iii. Applied Math b. Filtration <ul style="list-style-type: none"> i. Gravity and Pressure Filters ii. Construction iii. Operation Parameters and Problems iv. Applied Math c. Aeration and Air Stripping d. Reverse Osmosis e. Water Softening f. Iron Removal g. Distillation 	3
<p>5. DISINFECTION</p> <ul style="list-style-type: none"> a. Types-Chlorination, Ultra-Violet Light, others b. Method of Application c. Operation 	3
<p>6. WATER ANALYSIS AND INTERPRETATION: (3 Hours)</p> <ul style="list-style-type: none"> a. Drinking Water Standards b. Process Evaluation 	9
<p>7. DISTRIBUTION SYSTEM</p> <ul style="list-style-type: none"> a. Types of Pumps and Pipe b. Main Installation and Repair c. Water Meters and Valves d. Hydrant Installation and Repairs e. Physical and Cross-Connections 	3
<p>8. SAFETY</p>	3
<p>9. FIELD TRIP</p>	3
<p>Total Year 1 Related Technical Training</p>	147
<p>* - Hours are approximate and topics may change based on NJDEP requirements or industry needs.</p>	

Year 2

Topic	Hours*
A. ADVANCED WATER OPERATIONS-PART I NJDEP Requirement for Higher License Categories Courses may be offered at colleges, vocational/technical schools and on-line. Text: Water Treatment Plant Operation Vol I, II. Text: Water Distribution System Operation & Maintenance	45
1. SOURCES OF WATER <ul style="list-style-type: none"> a. Water cycle b. Water sources <ul style="list-style-type: none"> i. Surface ii. Ground iii. Other c. Developing Water Supply <ul style="list-style-type: none"> i. Ground vs. Surface ii. Economics iii. Design Criteria iv. Regulations d. Ground Water / Wells <ul style="list-style-type: none"> i. Locating Source ii. Test wells iii. Development/Testing iv. Safe Yield/Quality v. Production well design 	3
2. CHARACTERISTICS OF WATER SOURCES	3
3. SDWA STANDARDS <ul style="list-style-type: none"> a. Primary b. Secondary c. Monitoring/Reporting Requirements <ul style="list-style-type: none"> i. Sampling ii. Reporting d. Compliance <ul style="list-style-type: none"> i. Variances ii. Exemptions iii. Public Notification iv. Regulation Changes new/proposed 	5
4. POTABLE WATER SAMPLING AND ANALYSIS <ul style="list-style-type: none"> a. Sampling Requirements/Procedures <ul style="list-style-type: none"> i. Physical ii. Chemical iii. Microbiological v. Organics, Inorganics 	8

B. ADVANCED WATER OPERATIONS PART II COURSE OUTLINE	45
1. SURFACE WATER TREATMENT	25
<ul style="list-style-type: none"> a. Intakes <ul style="list-style-type: none"> i. Intake Structures ii. Screens iii. Microstraining iv. Flow Measurement b. Aeration <ul style="list-style-type: none"> i. Purpose ii. Types of aerators iii. Operation & Problems iv. Testing & Control c. Coagulation-Flocculation <ul style="list-style-type: none"> i. Purpose ii. Chemical addition iii. Mixing iv. Operation & Problems v. Testing & Control vi. Chemical Handling vii. Calculations d. Sedimentation <ul style="list-style-type: none"> i. Purpose ii. Types of Settling Basins iii. Operation & Problems iv. Testing & Control v. Solids-Contact Clarifiers vi. Calculations e. Filtration <ul style="list-style-type: none"> i. Purpose ii. Filter Construction iii. Filter Media iv. Pressure Filters v. Diatomaceous Earth Filters vi. Operation & Problems vii. Testing & Control viii. Filter Rate <ul style="list-style-type: none"> ix. Loss of Head x. Back Wash Procedure xi. Startup xii. Shutdown xiii. Operation Problems xiv. Residuals Handling xv. Calculations 	

<ul style="list-style-type: none"> f. Softening <ul style="list-style-type: none"> i. Purpose ii. Hardness iii. pH iv. Alkalinity v. Lime-Soda Ash Softening vi. Removals-Chemical Reactions vii. Re-carbonation viii. Testing & Control ix. Ion Exchange Softening x. Process & Operation xi. Backwash xii. Regeneration xiii. Testing & Control xiv. Calculations g. pH Adjustment-Corrosion Control <ul style="list-style-type: none"> i. Purpose ii. Requirements iii. Langelier Index iv. Chlorine Residual v. Testing & Control vi. Distribution Problems h. Carbon Adsorption <ul style="list-style-type: none"> i. Purpose ii. THM Control iii. Taste & Odor <p>2. Distribution System</p> <ul style="list-style-type: none"> a. Construction Standards <ul style="list-style-type: none"> i. System Design ii. Main Sizing iii. Valve & Hydrant Spacing iv. Materials Selection v. Valve Selection vi. Fittings vii. Pipe Laying-Trenching viii. Pressure-Leakage Testing ix. Disinfection x. Calculations b. Pipe Tapping <ul style="list-style-type: none"> i. Service Taps ii. Large Main Taps iii. Tap Procedures iv. Equipment Handling c. Valves <ul style="list-style-type: none"> i. Purpose of valves ii. Selection of valves 	20
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<ul style="list-style-type: none"> iii. Check valves iv. Altitude valves v. Surge Relief valves vi. Pressure Reducing Valves vii. Electric-Hydraulic valves d. Fire Hydrants <ul style="list-style-type: none"> i. Purpose ii. Types iii. Location iv. Installation v. Maintenance & Inspection e. Safety <ul style="list-style-type: none"> i. Traffic Control ii. Trench Safety iii. Equipment Safety iv. Plant Safety v. Confined Space Entry f. Storage Tanks <ul style="list-style-type: none"> i. Purpose ii. Types of Tanks iii. Construction Materials iv. Requirements-Sizing v. Inspection vi. Painting g. Maintenance vii. Cathodic Protection g. Cross Connection Control <ul style="list-style-type: none"> i. Regulations-Requirements ii. Definitions iii. Backflow iv. Approved Devices <ul style="list-style-type: none"> v. Installation vi. Testing and Inspection vii. Public Health Significance h. Pumps and Motors <ul style="list-style-type: none"> i. Types of Pumps ii. Application iii. Sizing Pumps and Motors iv. Controls <ul style="list-style-type: none"> v. Maintenance of Pumps vi. Maintenance of Motors vii. Stand-by Power viii. Booster Station Requirements <ul style="list-style-type: none"> ix. Electrical Maintenance x. Safety i. Instrumentation and Controls <ul style="list-style-type: none"> i. Booster Stations ii. Tanks 	
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<ul style="list-style-type: none"> iii. System iv. Plant v. Use of Records vi. Maintenance of Equipment j. Meters <ul style="list-style-type: none"> i. Purpose ii. Sizing Meters and Services iii. Types of Meters iv. Installation e. Maintenance v. Testing vi. Complaints vii. Records k. Records <ul style="list-style-type: none"> i. NJDEP Requirements ii. Operating Requirements iii. System Maps iv. Valve and Curb Stop Locations v. Hydrant maintenance vi. Maintenance of Mains vii. Plant Maintenance viii. Pump and Motor Maintenance ix. Operation and Maintenance Manuals l. Public Relations <ul style="list-style-type: none"> i. Complaints of Quality ii. High Bills iii. Pressure iv. Requests for Test Results v. Newspaper Reporters vi. Public Speaking <p>Field Trips and Plant Tours will be scheduled during Part II.</p> <p>C. WATER SYSTEM OPERATIONS SAFETY RELATED MISCELLANEOUS TRAINING</p> <ul style="list-style-type: none"> 1. Approved Training Sources <ul style="list-style-type: none"> a. NJWA b. AWWA-NJ c. Universities and Colleges d. On-line providers d. NJDEP Certified Training Providers e. Standard CPR/AED/First Aid Certification (American Red Cross) 	<p>27</p>
<p>D. Security & Emergency Response</p> <ul style="list-style-type: none"> 1. Critical Infrastructure Sector designation <ul style="list-style-type: none"> a. Physical security b. Cybersecurity awareness 	<p>24</p>

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<ul style="list-style-type: none"> c. Human elements 2. Vulnerability assessments 3. National Incident Management System <ul style="list-style-type: none"> a. ICS-100: Introduction to the Incident Command System Certificate (FEMA) 4. Emergency response plans & procedures <p><i>Apprentices must pass the Operator Certification examination administered by NJDEP and obtain the necessary Operations License (Water Treatment Plant Operator Class 1 T and/or W License) required by the State of New Jersey prior to program completion.</i></p>	
Total Year 2 Related Technical Training	141
Total Program Related Technical Training	288
* - Hours are approximate and topics may change based on NJDEP requirements or industry needs.	