Welcome to Montana's Operator Certification Program

The study material in this packet is designed to offer you a basic knowledge of the subject areas you need to be familiar with in order to take the operator certification exams successfully. Montana uses ABC (Association of Boards of Certification) standardized exams for testing. This ensures up-to-date exams based on national standards and EPA requirements.

Because Montana's Industrial wastewater classification system is not labeled the same as ABC's, you will need to determine which levels you are studying for by using the following chart:

Montana Industrial Wastewater Exam	ABC Industrial Equivalent
Class 1D	Physical/Chemical Class IV
Class 2D	Biological Class III
Class 3D	Physical/Chemical Class II
Class 4D	Biological Class I

Remember that this material is supplemental and it is recommended that you consider the suggested reference materials listed on the last page of the Need-to-Know Criteria booklet. Also ***highly*** recommended:

- Wastewater Operator Certification Study Guide
    - AWWA publications (see contact and order information on last page or go to www.awwa.org)

If you have any questions concerning these study materials or anything about Operator Certification, please feel free to contact the operator certification program at 406-444-4584.

ABC Need-to-Know Criteria for Industrial Waste Operators

ABC

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Introduction

As part of the development of its certification exams, the Association of Boards of Certification (ABC) conducted a job analysis of industrial waste operators during 2001 and 2002. The purpose of the job analysis was to identify the essential job tasks performed by industrial waste operators and the capabilities required to competently perform these job tasks. The results of this job analysis provide ABC with the foundation for the development of new physical/chemical and biological industrial waste certification exams.

The *Need-to-Know Criteria* was developed from the results of ABC's industrial waste operator job analysis. The information in this document reflects the essential job tasks performed by operators and their requisite capabilities. This document is intended to be used by certification programs and trainers to help prepare operators for certification.

How the Job Analysis was Conducted

Committee Meeting

A subject matter expert committee was formed to provide technical assistance in the development of the industrial waste operator job analysis. During their meeting, this committee developed a list of the important job tasks performed by both physical/chemical and biological industrial waste operators. The committee verified the technical accuracy, clarity, and comprehensiveness of the job tasks. The committee then identified the capabilities (i.e., knowledge, skills, and abilities) required to perform the identified job tasks. Identification of capabilities was done on a task-by-task basis, so that a link was established between each task statement and requisite capability.

Task Inventory

A task inventory was developed from the data collected during the committee meeting. The inventory included 8-point rating scales for frequency of performance and seriousness of inadequate or incorrect performance. These two rating scales were used because they provide useful information (i.e., how critical each task is and how frequently each task is performed) pertaining to certification.

The task inventory also included a background information section where demographic data such as gender, age, ethnic origin, educational level attained, work experience, and certification level were collected. Space was provided at the end of the inventory for operators to list any important tasks performed on their job which were not included on the inventory, and to make general comments.

The task inventory was sent to 381 industrial waste operators throughout the United States and Canada. 83 out of the 381 inventories mailed were returned for a response rate of 21.8%. Of the respondents, 44.3% worked at physical/chemical treatment plants, 34.4% worked at biological treatment plants, and 21.3% worked at both physical/chemical and biological treatment plants.

Results

The mean, standard deviation, and the percentage of respondents performing each task statement were computed. The mean was used to determine the importance of items and the standard deviation was used to identify items with a wide variation in responses. The percentage of respondents performing each task statement was used to identify tasks and capabilities commonly performed by operators throughout the United States and Canada. The analysis was run separately for physical/chemical and biological treatment operators in order to accurately determine what tasks would be covered on each exam.

A criticality value of 2(mean seriousness rating) + mean frequency rating was calculated for each item on the inventory. This formula gives extra weight to the seriousness rating in determining critical items and was appropriate because it emphasized the purpose of certification — to provide competent operators.

Core Competencies

The subject matter expert committee reviewed the results of the operator survey to identify the most important and commonly performed job tasks and capabilities for physical/chemical and biological treatment operators. The essential tasks and capabilities that were identified through this process are called the core competencies. The core competencies are clustered into six job areas:

- Treatment processes (either physical/chemical or biological) – monitor, evaluate, and adjust treatment processes
- Laboratory analysis – collect samples, perform laboratory analysis and interpret analysis
- Operate support equipment – operate equipment such as chemical feeders and pumps
- Evaluate and maintain support equipment – evaluate operation of equipment, perform diagnostic, preventive and corrective maintenance
- Administrative duties – perform administrative duties, establish recordkeeping system and record information
- Safety and emergency preparedness – establish safety programs and emergency plans, perform safety procedures and respond to emergencies

Because the results reflect only those tasks with a high criticality value, some frequently performed tasks will be missing from the results. For example, a task may be performed every day but if the potential seriousness of inadequate or incorrect performance is negligible the task will not appear in the results. Because the purpose of certification is to protect the public, it was not reasonable to include tasks of negligible seriousness.

Pages 3 – 18 list the core competencies for industrial waste operators. Pages 3 – 8 list the core competencies related to biological treatment processes and laboratory analysis for biological industrial waste operators only. Pages 9 – 14 list the core competencies related to physical/chemical treatment processes and laboratory analysis for physical/chemical industrial waste operators only. Pages 15 – 18 list additional core competencies for both biological and physical/chemical industrial waste operators. Biological industrial waste operators are responsible for the core competencies on pages 3 – 8 and 15 – 18. Physical/chemical industrial waste operators are responsible for the core competencies on pages 9 – 18.

Core Competencies for Biological Industrial Waste Operators: Treatment Processes

Monitor Treatment Processes (check process, record data)	Class I	Class II	Class III	Class IV
Grease removal	X	X	X	X
Plant pumping of main flow	X	X	X	X
Screening	X	X	X	X
Flow equalization	X	X	X	X
Sedimentation/clarification	X	X	X	X
Dissolved air flotation	X	X	X	X
Coagulation/flocculation	X	X	X	X
Activated sludge with secondary clarifiers	X	X	X	X
Stabilization ponds with aeration	X	X	X	X
Sequenting batch reactors		X	X	X
Trickling filters	X	X	X	X
Polishing ponds for advanced waste treatment	X	X	X	X
Chemical/physical advanced waste treatment following secondary		X	X	X
Biological or chemical/biological advanced waste treatment		X	X	X
pH adjustment	X	X	X	X
Oil removal	X	X	X	X
Oil separation	X	X	X	X
Chemical pretreatment (except chlorination, enzymes)		X	X	X
Solids conditioning	X	X	X	X
Solids thickening	X	X	X	X
Anaerobic digestion of solids		X	X	X
Aerobic digestion of solids	X	X	X	X
Sludge drying	X	X	X	X
Mechanical dewatering	X	X	X	X
Solids reduction (including incineration, wet oxidation)		X	X	X
Solids composting	X	X	X	X
Post aeration	X	X	X	X
Land disposal-evaporation	X	X	X	X
Subsurface disposal	X	X	X	X
Biological or chemical scrubbers for odor control		X	X	X
Disinfection	X	X	X	X
SCADA systems	X	X	X	X
Evaluate Treatment Processes (review data, make decision)				
Grease removal	X	X	X	X
Plant pumping of main flow	X	X	X	X
Screening	X	X	X	X
Flow equalization	X	X	X	X
Sedimentation/clarification	X	X	X	X
Dissolved air flotation		X	X	X
Coagulation/flocculation		X	X	X
Activated sludge with secondary clarifiers		X	X	X
Stabilization ponds with aeration	X	X	X	X
Sequenting batch reactors		X	X	X
Trickling filters		X	X	X

Core Competencies for Biological Industrial Waste Operators: Treatment Processes (continued)

	Class I	Class II	Class III	Class IV
Polishing ponds for advanced waste treatment		X	X	X
Chemical/physical advanced waste treatment following secondary		X	X	X
Biological or chemical/biological advanced waste treatment		X	X	X
pH adjustment		X	X	X
Oil removal	X	X	X	X
Oil separation	X	X	X	X
Chemical pretreatment (except chlorination, enzymes)		X	X	X
Solids conditioning		X	X	X
Solids thickening		X	X	X
Anaerobic digestion of solids		X	X	X
Aerobic digestion of solids		X	X	X
Sludge drying	X	X	X	X
Mechanical dewatering		X	X	X
Solids reduction (including incineration, wet oxidation)			X	X
Solids composting		X	X	X
Post aeration	X	X	X	X
Land disposal-evaporation			X	X
Subsurface disposal		X	X	X
Biological or chemical scrubbers for odor control		X	X	X
Disinfection		X	X	X
SCADA systems		X	X	X
Adjust Treatment Processes (make correction)				
Grease removal		X	X	X
Plant pumping of main flow		X	X	X
Screening	X	X	X	X
Flow equalization		X	X	X
Sedimentation/clarification		X	X	X
Dissolved air flotation		X	X	X
Coagulation/flocculation		X	X	X
Activated sludge with secondary clarifiers		X	X	X
Stabilization ponds with aeration	X	X	X	X
Sequenting batch reactors		X	X	X
Trickling filters		X	X	X
Polishing ponds for advanced waste treatment		X	X	X
Chemical/physical advanced waste treatment following secondary		X	X	X
Biological or chemical/biological advanced waste treatment		X	X	X
pH adjustment		X	X	X
Oil removal	X	X	X	X
Oil separation	X	X	X	X
Chemical pretreatment (except chlorination, enzymes)		X	X	X
Solids conditioning		X	X	X
Solids thickening		X	X	X
Anaerobic digestion of solids		X	X	X
Aerobic digestion of solids		X	X	X
Mechanical dewatering		X	X	X
Solids reduction (including incineration, wet oxidation)			X	X

Core Competencies for Biological Industrial Waste Operators: Treatment Processes (continued)

	Class I	Class II	Class III	Class IV
Solids composting		X	X	X
Post aeration		X	X	X
Land disposal-evaporation			X	X
Subsurface disposal		X	X	X
Biological or chemical scrubbers for odor control		X	X	X
Disinfection	X	X	X	X
SCADA systems		X	X	X
Chemical Addition				
Add dry chemicals	X	X	X	X
Add liquid chemicals	X	X	X	X
Add gaseous chemicals	X	X	X	X

Required Capabilities:

Knowledge of amphoteric material
Knowledge of chemical properties
Knowledge of computer operation
Knowledge of general chemistry and biology
Knowledge of general electrical and mechanical principles
Knowledge of hydraulic principles
Knowledge of normal characteristics of wastewater (e.g., color, flow pattern)
Knowledge of normal chemical range
Knowledge of personal protective equipment
Knowledge of physical science
Knowledge of primary, secondary and tertiary treatment processes
Knowledge of principles of measurement
Knowledge of programmable logic controllers
Knowledge of proper application, handling and storage of chemicals
Knowledge of proper lifting procedures
Knowledge of regulations
Knowledge of safety issues related to specific processes
Knowledge of wastewater treatment concepts and design parameters
Ability to adjust chemical feed rates and flow patterns
Ability to calculate dosage rates
Ability to calibrate equipment
Ability to communicate verbally and in writing
Ability to confirm chemical strength
Ability to diagnose/troubleshoot process units
Ability to discriminate between normal and abnormal conditions
Ability to evaluate and adjust process units
Ability to interpret Material Safety Data Sheets
Ability to maintain processes in normal operating condition
Ability to perform basic math and process control calculations
Ability to perform physical measurements
Ability to prepare and measure chemicals

Core Competencies for Biological Industrial Waste Operators: Laboratory Analysis

Collect Samples	Class I	Class II	Class III	Class IV
Alkalinity	X	X	X	X
Ammonia		X	X	X
Biochemical oxygen demand	X	X	X	X
Chemical oxygen demand		X	X	X
Chlorine residual	X	X	X	X
Coliform	X	X	X	X
Color	X	X	X	X
Conductivity	X	X	X	X
Dissolved oxygen	X	X	X	X
Kjeldahl nitrogen		X	X	X
Metals (sludge); for example, arsenic, barium, etc.	X	X	X	X
Microscopic exam	X	X	X	X
Nitrate		X	X	X
Nitrite		X	X	X
Oil and grease	X	X	X	X
Oxidation-reduction potential	X	X	X	X
pH	X	X	X	X
Phosphorus		X	X	X
Priority pollutants	X	X	X	X
Settleable solids	X	X	X	X
Sulfate	X	X	X	X
Sulfide	X	X	X	X
Temperature	X	X	X	X
Total dissolved solids	X	X	X	X
Total organic carbon	X	X	X	X
Total suspended solids	X	X	X	X
Toxicity	X	X	X	X
Turbidity	X	X	X	X
Volatile suspended solids	X	X	X	X
Perform Laboratory Analysis				
Alkalinity		X	X	X
Ammonia			X	X
Biochemical oxygen demand		X	X	X
Chemical oxygen demand			X	X
Chlorine residual	X	X	X	X
Coliform		X	X	X
Color	X	X	X	X
Conductivity	X	X	X	X
Dissolved oxygen	X	X	X	X
Kjeldahl nitrogen			X	X
Microscopic exam		X	X	X
Nitrate			X	X
Nitrite			X	X

Core Competencies for Biological Industrial Waste Operators: Laboratory Analysis (continued)

	Class I	Class II	Class III	Class IV
Oil and grease			X	X
Oxidation-reduction potential	X	X	X	X
pH	X	X	X	X
Phosphorus			X	X
Settleable solids	X	X	X	X
Temperature	X	X	X	X
Total dissolved solids		X	X	X
Total suspended solids		X	X	X
Turbidity	X	X	X	X
Volatile suspended solids		X	X	X
Interpret Analysis				
Alkalinity		X	X	X
Ammonia		X	X	X
Biochemical oxygen demand		X	X	X
Chemical oxygen demand		X	X	X
Chlorine residual	X	X	X	X
Coliform	X	X	X	X
Color	X	X	X	X
Conductivity	X	X	X	X
Dissolved oxygen	X	X	X	X
Kjeldahl nitrogen			X	X
Metals (sludge); for example, arsenic, barium, etc.			X	X
Microscopic exam		X	X	X
Nitrate		X	X	X
Nitrite		X	X	X
Oil and grease		X	X	X
Oxidation-reduction potential		X	X	X
pH	X	X	X	X
Phosphorus		X	X	X
Priority pollutants			X	X
Settleable solids	X	X	X	X
Sulfate			X	X
Sulfide			X	X
Temperature	X	X	X	X
Total dissolved solids		X	X	X
Total organic carbon		X	X	X
Total suspended solids		X	X	X
Toxicity		X	X	X
Turbidity		X	X	X
Volatile suspended solids		X	X	X

Core Competencies for Biological Industrial Waste Operators: Laboratory Analysis (continued)

Required Capabilities:
Knowledge of chain of custody procedures
Knowledge of chemical properties
Knowledge of EPA approved analytical methods
Knowledge of general chemistry and biology
Knowledge of laboratory equipment and procedures
Knowledge of normal characteristics of wastewater
Knowledge of physical science
Knowledge of principles of measurement
Knowledge of proper chemical handling and storage
Knowledge of quality control/quality assurance practices
Knowledge of safety regulations
Knowledge of sample preservation
Knowledge of sampling procedures
Ability to calibrate instruments
Ability to collect representative samples
Ability to follow written procedures
Ability to interpret Material Safety Data Sheets
Ability to operate automatic samplers
Ability to perform laboratory calculations
Ability to recognize abnormal analytical results

Core Competencies for Physical/Chemical Industrial Waste Operators: Treatment Processes

Monitor Treatment Processes (check process, record data)	Class I	Class II	Class III	Class IV
Grease removal	X	X	X	X
Plant pumping of main flow	X	X	X	X
Screening	X	X	X	X
Flow equalization	X	X	X	X
Sedimentation/clarification	X	X	X	X
Dissolved air flotation	X	X	X	X
Coagulation/flocculation	X	X	X	X
Microscreens			X	X
Ion exchange for advanced waste treatment		X	X	X
Reverse osmosis		X	X	X
Electrodialysis		X	X	X
Electrolytic recovery		X	X	X
Carbon adsorption	X	X	X	X
Bag filtration	X	X	X	X
Granular media filtration	X	X	X	X
Air stripping	X	X	X	X
Chromium reduction	X	X	X	X
Cyanide destruction	X	X	X	X
Metal hydroxide precipitation	X	X	X	X
Metal reduction recovery	X	X	X	X
Metal sulfide precipitation	X	X	X	X
Microfiltration	X	X	X	X
Oil recovery	X	X	X	X
Oil removal	X	X	X	X
Oil separation	X	X	X	X
pH adjustment	X	X	X	X
Ultrafiltration	X	X	X	X
Solids thickening	X	X	X	X
Sludge drying	X	X	X	X
Mechanical dewatering	X	X	X	X
SCADA systems	X	X	X	X
Evaluate Treatment Processes (review data, make decision)				
Grease removal	X	X	X	X
Plant pumping of main flow	X	X	X	X
Screening	X	X	X	X
Flow equalization	X	X	X	X
Sedimentation/clarification	X	X	X	X
Dissolved air flotation	X	X	X	X
Coagulation/flocculation	X	X	X	X
Microscreens			X	X
Ion exchange for advanced waste treatment		X	X	X
Reverse osmosis		X	X	X
Electrodialysis		X	X	X
Electrolytic recovery		X	X	X

Core Competencies for Physical/Chemical Industrial Waste Operators: Treatment Processes (cont.)

	Class I	Class II	Class III	Class IV
Carbon adsorption	X	X	X	X
Bag filtration	X	X	X	X
Granular media filtration	X	X	X	X
Air stripping		X	X	X
Chromium reduction		X	X	X
Cyanide destruction		X	X	X
Metal hydroxide precipitation		X	X	X
Metal reduction recovery		X	X	X
Metal sulfide precipitation		X	X	X
Microfiltration		X	X	X
Oil recovery	X	X	X	X
Oil removal	X	X	X	X
Oil separation	X	X	X	X
pH adjustment	X	X	X	X
Ultrafiltration		X	X	X
Solids thickening	X	X	X	X
Sludge drying	X	X	X	X
Mechanical dewatering		X	X	X
SCADA systems		X	X	X
Adjust Treatment Processes (make correction)				
Grease removal	X	X	X	X
Plant pumping of main flow	X	X	X	X
Screening	X	X	X	X
Flow equalization	X	X	X	X
Sedimentation/clarification	X	X	X	X
Dissolved air flotation	X	X	X	X
Coagulation/flocculation	X	X	X	X
Microscreens			X	X
Ion exchange for advanced waste treatment		X	X	X
Reverse osmosis		X	X	X
Electrodialysis		X	X	X
Electrolytic recovery		X	X	X
Carbon adsorption	X	X	X	X
Bag filtration	X	X	X	X
Granular media filtration	X	X	X	X
Air stripping		X	X	X
Chromium reduction		X	X	X
Cyanide destruction		X	X	X
Metal hydroxide precipitation		X	X	X
Metal reduction recovery		X	X	X
Metal sulfide precipitation		X	X	X
Microfiltration		X	X	X
Oil removal	X	X	X	X
Oil recovery		X	X	X
Oil separation	X	X	X	X

Core Competencies for Physical/Chemical Industrial Waste Operators: Treatment Processes (cont.)

	Class I	Class II	Class III	Class IV
pH adjustment	X	X	X	X
Ultrafiltration		X	X	X
Solids thickening		X	X	X
Sludge drying	X	X	X	X
Mechanical dewatering		X	X	X
SCADA systems		X	X	X
Chemical Addition				
Add dry chemicals	X	X	X	X
Add liquid chemicals	X	X	X	X
Add gaseous chemicals	X	X	X	X

Required Capabilities:

Knowledge of amphoteric material
Knowledge of chemical properties
Knowledge of computer operation
Knowledge of general chemistry and biology
Knowledge of general electrical and mechanical principles
Knowledge of hydraulic principles
Knowledge of normal characteristics of wastewater (e.g., color, flow pattern)
Knowledge of normal chemical range
Knowledge of personal protective equipment
Knowledge of physical science
Knowledge of primary and secondary treatment processes
Knowledge of principles of measurement
Knowledge of programmable logic controllers
Knowledge of proper application, handling and storage of chemicals
Knowledge of proper lifting procedures
Knowledge of regulations
Knowledge of safety issues related to specific processes
Knowledge of wastewater treatment concepts and design parameters
Ability to adjust chemical feed rates and flow patterns
Ability to calculate dosage rates
Ability to calibrate equipment
Ability to communicate verbally and in writing
Ability to confirm chemical strength
Ability to diagnose/troubleshoot process units
Ability to discriminate between normal and abnormal conditions
Ability to evaluate and adjust process units
Ability to interpret Material Safety Data Sheets
Ability to maintain processes in normal operating condition
Ability to perform basic math and process control calculations
Ability to perform physical measurements
Ability to prepare and measure chemicals

Core Competencies for Physical/Chemical Industrial Waste Operators: Laboratory Analysis

Collect Samples	Class I	Class II	Class III	Class IV
Alkalinity	X	X	X	X
Ammonia		X	X	X
Arsenic	X	X	X	X
Barium	X	X	X	X
Cadmium	X	X	X	X
Calcium		X	X	X
Chemical oxygen demand		X	X	X
Chloride		X	X	X
Chlorinated organics		X	X	X
Chlorine residual	X	X	X	X
Chromium	X	X	X	X
Color		X	X	X
Conductivity		X	X	X
Copper	X	X	X	X
Cyanide		X	X	X
Fluoride		X	X	X
Iron	X	X	X	X
Lead	X	X	X	X
Manganese	X	X	X	X
Mercury	X	X	X	X
Nickel	X	X	X	X
Nitrate		X	X	X
Nitrite		X	X	X
Oil and grease	X	X	X	X
Oxidation-reduction potential	X	X	X	X
pH	X	X	X	X
Phenol		X	X	X
Phosphorus	X	X	X	X
Priority pollutants	X	X	X	X
Selenium	X	X	X	X
Settleable solids	X	X	X	X
Silver	X	X	X	X
Sulfide		X	X	X
Temperature	X	X	X	X
Total dissolved solids		X	X	X
Total organic carbon		X	X	X
Total suspended solids	X	X	X	X
Toxicity	X	X	X	X
Turbidity	X	X	X	X
Zinc	X	X	X	X

Core Competencies for Physical/Chemical Industrial Waste Operators: Laboratory Analysis (cont.)

Perform Laboratory Analysis	Class I	Class II	Class III	Class IV
Alkalinity	X	X	X	X
Chemical oxygen demand		X	X	X
Chlorine residual	X	X	X	X
Color		X	X	X
Conductivity		X	X	X
Oxidation-reduction potential	X	X	X	X
pH	X	X	X	X
Settleable solids	X	X	X	X
Temperature	X	X	X	X
Total dissolved solids		X	X	X
Total suspended solids		X	X	X
Turbidity	X	X	X	X
Interpret Analysis				
Alkalinity		X	X	X
Arsenic		X	X	X
Barium		X	X	X
Cadmium		X	X	X
Chemical oxygen demand		X	X	X
Chlorine residual		X	X	X
Chromium		X	X	X
Color	X	X	X	X
Conductivity		X	X	X
Copper		X	X	X
Cyanide		X	X	X
Iron		X	X	X
Lead		X	X	X
Manganese		X	X	X
Mercury		X	X	X
Nickel		X	X	X
Nitrate		X	X	X
Nitrite		X	X	X
Oil and grease		X	X	X
Oxidation-reduction potential		X	X	X
pH	X	X	X	X
Phenol		X	X	X
Phosphorus		X	X	X
Priority pollutants		X	X	X
Selenium		X	X	X
Settleable solids	X	X	X	X
Silver		X	X	X
Sulfide		X	X	X
Temperature	X	X	X	X

Core Competencies for Physical/Chemical Industrial Waste Operators: Laboratory Analysis (cont.)

	Class I	Class II	Class III	Class IV
Total dissolved solids		X	X	X
Total organic carbon		X	X	X
Total suspended solids	X	X	X	X
Toxicity		X	X	X
Turbidity		X	X	X
Zinc		X	X	X

Required Capabilities:

Knowledge of amphoteric material
Knowledge of chain of custody procedures
Knowledge of chemical properties
Knowledge of EPA approved analytical methods
Knowledge of general chemistry and biology
Knowledge of laboratory equipment and procedures
Knowledge of normal characteristics of wastewater
Knowledge of physical science
Knowledge of principles of measurement
Knowledge of proper chemical handling and storage
Knowledge of quality control/quality assurance practices
Knowledge of safety regulations
Knowledge of sample preservation
Knowledge of sampling procedures
Ability to calibrate instruments
Ability to collect representative samples
Ability to follow written procedures
Ability to interpret Material Safety Data Sheets
Ability to operate automatic samplers
Ability to perform laboratory calculations
Ability to recognize abnormal analytical results

Core Competencies for Biological and Physical/Chemical Industrial Waste Operators

Operate Support Equipment	Class I	Class II	Class III	Class IV
Blowers and compressors	X	X	X	X
Chemical feeders	X	X	X	X
Computers	X	X	X	X
Drives	X	X	X	X
Electronic testing equipment (e.g., volt meters)		X	X	X
Flow measurement devices	X	X	X	X
Generators		X	X	X
Hand tools	X	X	X	X
Instrumentation	X	X	X	X
Measuring and control systems	X	X	X	X
Motors	X	X	X	X
Pneumatic equipment	X	X	X	X
Power tools	X	X	X	X
Pumps	X	X	X	X
Valves	X	X	X	X

Required Capabilities:
Knowledge of backflow prevention devices
Knowledge of function of tools
Knowledge of general electrical & mechanical principles
Knowledge of hydraulic principles
Knowledge of pipes
Knowledge of plumbing
Knowledge of pneumatics
Knowledge of regulations
Knowledge of safety regulations
Knowledge of start-up and shut-down procedures
Knowledge of wastewater treatment concepts
Ability to evaluate and adjust equipment

Core Competencies for Biological and Physical/Chemical Industrial Waste Operators (continued)

Evaluate and Maintain Support Equipment	Class I	Class II	Class III	Class IV
Check speed of equipment	X	X	X	X
Inspect equipment for abnormal conditions	X	X	X	X
Measure head loss	X	X	X	X
Measure temperature of equipment	X	X	X	X
Read charts	X	X	X	X
Read meters	X	X	X	X
Read pressure gauges	X	X	X	X
Perform diagnostic and preventive maintenance on:				
Blowers and compressors	X	X	X	X
Chemical feeders	X	X	X	X
Drives	X	X	X	X
Instrumentation	X	X	X	X
Motors	X	X	X	X
Pumps	X	X	X	X
Valves	X	X	X	X
Perform corrective maintenance on:				
Chemical feeders	X	X	X	X
Drives	X	X	X	X
Instrumentation	X	X	X	X
Motors	X	X	X	X
Pumps	X	X	X	X
Valves	X	X	X	X

Required Capabilities:
Knowledge of facility operation and maintenance
Knowledge of general electrical and mechanical principles
Knowledge of hydraulic principles
Knowledge of internal combustion engines
Knowledge of lubricant and fluid characteristics
Knowledge of pneumatics
Knowledge of predictive maintenance
Knowledge of process control instrumentation
Knowledge of safety regulations
Knowledge of start-up and shut-down procedures
Ability to adjust equipment
Ability to calibrate equipment
Ability to differentiate between preventive and corrective maintenance
Ability to discriminate between normal and abnormal conditions
Ability to record information and report findings
Ability to troubleshoot and perform general maintenance

Core Competencies for Biological and Physical/Chemical Industrial Waste Operators (continued)

Perform Administrative Duties	Class I	Class II	Class III	Class IV
Administer compliance, safety and security program	X	X	X	X
Develop budget	X	X	X	X
Develop operation and maintenance plan	X	X	X	X
Evaluate employee performance	X	X	X	X
Evaluate laboratory data for quality assurance and control	X	X	X	X
Hire and discharge employees	X	X	X	X
Maintain records	X	X	X	X
Perform workplace safety evaluation	X	X	X	X
Plan and organize work activities	X	X	X	X
Record and evaluate data	X	X	X	X
Report noncompliance	X	X	X	X
Respond to public complaints	X	X	X	X
Supervise employee work activities	X	X	X	X
Write reports (federal, internal, state)	X	X	X	X
Establish recordkeeping system and record information:				
Facility operation	X	X	X	X
Financial	X	X	X	X
Laboratory	X	X	X	X
Maintenance	X	X	X	X
Permit compliance	X	X	X	X
Personnel	X	X	X	X

Required Capabilities:

Knowledge of computer operation
Knowledge of facility operation and maintenance
Knowledge of function of recordkeeping system
Knowledge of legal liability
Knowledge of local codes and ordinances
Knowledge of monitoring and reporting requirements
Knowledge of principles of general communication
Knowledge of recordkeeping policies
Knowledge of regulations for direct and indirect dischargers
Ability to accurately transcribe data
Ability to communicate verbally and in writing
Ability to determine what information needs to be recorded
Ability to evaluate facility performance
Ability to follow written procedures
Ability to interpret data
Ability to organize information
Ability to perform basic math
Ability to review reports

Core Competencies for Biological and Physical/Chemical Industrial Waste Operators (continued)

Safety and Emergency Preparedness	Class I	Class II	Class III	Class IV
Establish safety programs and perform safety procedures for:				
Blood borne pathogens	X	X	X	X
Chemical hazard communication	X	X	X	X
Confined space entry	X	X	X	X
Electrical grounding	X	X	X	X
Fire	X	X	X	X
First aid	X	X	X	X
Infectious diseases	X	X	X	X
Lifting	X	X	X	X
Lock-out/tag-out	X	X	X	X
Personal hygiene	X	X	X	X
Personal protective equipment	X	X	X	X
Respiratory protection	X	X	X	X
Slips, trips, and falls	X	X	X	X
Establish emergency plans and respond to emergencies for:				
Civil disorder	X	X	X	X
Facility upset	X	X	X	X
Hazardous waste	X	X	X	X
Natural disasters	X	X	X	X
Power disruption	X	X	X	X
Spill response	X	X	X	X

Required Capabilities:
Knowledge of emergency plans
Knowledge of potential causes & impact of disasters on facility
Knowledge of safety regulations
Ability to assess likelihood of disaster occurring
Ability to communicate verbally and in writing
Ability to coordinate emergency response with organizations
Ability to follow written procedures
Ability to identify potential safety hazards
Ability to recognize unsafe work conditions
Ability to select and operate safety equipment

Industrial Waste Certification Exams

The industrial waste certification exams evaluate an operator's knowledge of tasks related to the operation of industrial waste treatment plants. The content of each exam was determined by the subject matter expert committee from the results of the job analysis. To successfully take an ABC exam, an operator must demonstrate knowledge of the core competencies in this document. Because certificates may be used to work in various sized treatment plants, the exams may include technologies that are not used in each treatment plant but are commonly used in many treatment plants.

Four levels of certification exams are offered by ABC, with class I being the lowest level and class IV the highest level. ABC offers both physical/chemical industrial waste and biological industrial waste exams. Each exam consists of 100 multiple-choice questions. The specifications for the exams are based on a weighting of the job analysis results so that they reflect the criticality of tasks performed on the job. The specifications list the percentage of questions on the exam that fall under each job duty. For example, the ABC class I biological industrial waste exam consists of 47 questions relating to the job duty "Biological Treatment Processes" and its associated tasks and capabilities. For a list of tasks and capabilities associated with each job duty, please refer to the list of core competencies on the previous pages. Biological treatment operators are responsible for the core competencies on pages 3 – 8 and 15 – 18. Physical/chemical treatment operators are responsible for the core competencies on pages 9 – 18.

ABC Biological Industrial Waste Exam Specifications

	Class I	Class II	Class III	Class IV
Biological Treatment Processes	47%	48%	45%	50%
Laboratory Analysis	5%	5%	9%	10%
Operate Support Equipment	15%	14%	13%	7%
Evaluate and Maintain Support Equipment	15%	15%	15%	15%
Administrative Duties	8%	8%	8%	8%
Safety and Emergency Preparedness	10%	10%	10%	10%

ABC Physical/Chemical Industrial Waste Exam Specifications

	Class I	Class II	Class III	Class IV
Physical/Chemical Treatment Processes	47%	48%	47%	52%
Laboratory Analysis	5%	5%	7%	8%
Operate Support Equipment	15%	14%	13%	7%
Evaluate and Maintain Support Equipment	15%	15%	15%	15%
Administrative Duties	8%	8%	8%	8%
Safety and Emergency Preparedness	10%	10%	10%	10%

Suggested References

The following are approved as reference sources for the ABC industrial waste examinations. Operators should use the latest edition of these reference sources to prepare for the exam.

California State University, Sacramento (CSUS) Foundation, Office of Water Programs

- *Industrial Waste Treatment,* Volumes I and II
- *Operation of Wastewater Treatment Plants*, Volumes I and II
- *Manage for Success*
- *Advanced Waste Treatment*
- *Treatment of Metal Wastestreams*
- *Pretreatment Facility Inspection*

To order, contact: Office of Water Programs
California State University, Sacramento
6000 J Street
Sacramento, CA 95819-6025

Web site: www.owp.csus.edu
Phone: (916) 278-6142
Fax: (916) 278-5959
E-mail: wateroffice@csus.edu

Water Environment Federation

- *Operation of Municipal Wastewater Treatment Plants,* Manual of Practice No. 11
- *Industrial Wastewater Management, Treatment, and Disposal,* Manual of Practice FD-3

To order, contact: Water Environment Federation
601 Wythe Street
Alexandria, VA 22314-1994

Web site: www.wef.org
Phone: (800) 666-0206
Fax: (703) 684-2492
E-mail: pubs@wef.org

Operators must also be knowledgeable about federal and state/provincial regulations that apply to industrial dischargers. Most of the US federal regulations that apply to industrial dischargers are found in the *Code of Federal Regulations,* Title 40 (www.gpo.gov).