

ABC Need-to-Know Criteria for Industrial Waste Operators



ABC

Association of
Boards of Certification

208 5th Street, Suite 201, Ames, Iowa 50010-6259

Phone (515) 232-3623 Fax (515) 232-3778

Email abc@abccert.org Website www.abccert.org

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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 $2(\text{mean seriousness rating}) + \text{mean frequency rating}$ 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 |
| Sequencing 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 |
| Sequencing 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 |
| Sequencing 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

| | Class I | Class II | Class III | Class IV |
|---|---------|----------|-----------|----------|
| Collect Samples | | | | |
| 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

| | Class I | Class II | Class III | Class IV |
|--|---------|----------|-----------|----------|
| Monitor Treatment Processes (check process, record data) | | | | |
| 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

| | Class I | Class II | Class III | Class IV |
|-------------------------------|---------|----------|-----------|----------|
| Collect Samples | | | | |
| 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.)

| | Class I | Class II | Class III | Class IV |
|------------------------------------|---------|----------|-----------|----------|
| Perform Laboratory Analysis | | | | |
| 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% |

