ABC
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Boards of Certification

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ABC

Association of Boards of Certification

Wastewater Treatment Need-to-Know Criteria

A Need-to-Know Guide when preparing for the ABC Wastewater Treatment Certification Examination.

Acknowledgement

The Association would like to thank the members of the 2010-2011 Wastewater Treatment Validation and Examination Committee for their effort in conducting the job analysis and developing the ABC *Need-to-Know Criteria* for Wastewater Treatment Operators. Committee members included:

- John "Jack" W. Vanderland, Virginia (Chair)
- Michael Bolt, North Carolina
- Frank DeOrio, New York
- Chris Hoffman, New Jersey
- Paul Krauth, Utah
- Barbara Monroe, Louisiana
- John Reynolds, British Columbia
- LeAnna Risso, Nevada
- Donovan Sheppard, Washington

Introduction

As part of the development of its certification exams, the Association of Boards of Certification (ABC) conducted a job analysis of wastewater treatment operators in 2010. As part of this process, ABC conducted a national survey of wastewater treatment operators. This *Need-to-Know Criteria* was developed from the results of ABC's 2010 wastewater treatment operator job analysis.

How the *Need-to-Know Criteria* Was Developed

Review of Task Survey

The results of the 2010 task analysis survey were provided to the ABC Wastewater Treatment V&E Committee. In the task analysis survey, operators rated job tasks and capabilities 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. Of the 1018 individuals in the wastewater treatment industry who completed the survey, 119 were class I operators, 162 were class II operators, 237 were class III operators, and 366 were class IV operators.

Analysis of Ratings

The composite criticality ratings and percentage of operators reporting that they performed the tasks were presented to the Wastewater Treatment V&E Committee in January 2011 to begin development of the new *Need-to-Know Criteria*. V&E committee members were given the opportunity to retain tasks which did not meet decision criteria (a criticality value of at least 10.5, and a percent performing value of at least 50%) if a significant rationale could be provided for their importance on the examination. The V&E committee members were also given the opportunity to remove any tasks which met criteria on the survey but were deemed untestable or inappropriate for the wastewater treatment certification examination. Final examination blueprint weights were calculated by summing the criticality values of all remaining tasks, and dividing the criticality value of each task by the grand total criticality value. Weights of individual tasks were summed for each core competency area to determine the proportion of the wastewater treatment certification examination devoted to each core competency.

Core Competencies

The essential tasks and capabilities that were identified through this process are called the core competencies. The following pages list the core competencies for wastewater treatment operators. The core competencies are clustered into the following job duties:

- Evaluate Physical Characteristics of Wastestream
- Perform Security, Safety, and Administrative Procedures
- Evaluate and Maintain Equipment
- Operate Equipment
- Monitor, Evaluate, and Adjust Treatment Processes
- Laboratory Analysis

The level of knowledge (i.e., comprehension, application, analysis) required for each task is also identified in the following pages.

- **Comprehension** is the most basic level of understanding and remembering. Items written at the comprehension level require examinees to recognize, remember, or identify important ideas.
- Items written at the **application** level require examinees to interpret, calculate, predict, use or apply information and solve problems.
- Items written at the **analysis** level require examinees to compare, contrast, diagnose, examine, analyze, and relate important concepts.

The level of knowledge is a hierarchy from basic comprehension to analysis. The level of knowledge tested is cumulative. Therefore, tasks identified as application may include questions written at both the application and comprehension levels. Tasks identified as analysis may include questions written at the comprehension, application and analysis levels.

About the Association of Boards of Certification

Established in 1972, the Association of Boards of Certification (ABC) is a non-profit member-driven organization dedicated to protecting public health and the environment by advancing the quality and integrity of environmental certification programs. ABC membership includes almost 100 certifying authorities, representing more than 40 states, nine Canadian provinces as well as several international programs. Existing solely for its members, ABC is the voice for the profession and serves as the conduit for information in an ever-changing industry.

Over 70 certification programs currently test approximately 35,000 operators and laboratory analysts annually through ABC's industry-leading Certification & Testing Services. Over 400,000 water and wastewater operators, laboratory analysts, and backflow prevention assembly testers have taken an ABC exam since the testing program began in 1982.

ABC Vision
Promote integrity in environmental certification throughout the world.

ABC Mission
ABC is dedicated to advancing the quality and integrity of environmental certification programs.

ABC Objectives
- Promote certification as a means of protecting public health, the infrastructure, and the environment.
- Promote uniformity of standards and best practices in certification.
- Serve as the technical resource for certification entities.
- Facilitate the transfer of certification between certifying authorities.
- Serve the needs of our members.

ABC Wastewater Treatment Certification Exams

The ABC wastewater treatment certification exams evaluate an operator's knowledge of tasks related to the operation of wastewater treatment systems. The ABC Wastewater Treatment V&E Committee determined the content of each exam based on the results of the national task analysis survey. To successfully take an ABC exam, an operator must demonstrate knowledge of the core competencies in this document.

Four levels of certification exams are offered by ABC, with class I being the lowest level and class IV the highest level. 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, 16% of the questions on the ABC class I wastewater treatment exam relate to the job duty "Operate Equipment." For a list of tasks and capabilities associated with each job duty, please refer to the list of core competencies on the following pages.

ABC Wastewater Treatment Exam Specifications

Blueprint Area	Class I	Class II	Class III	Class IV
Evaluate Physical Characteristics of Wastestream	5%	6%	5%	5%
Perform Security, Safety, & Administrative Procedures	11%	11%	10%	10%
Evaluate and Maintain Equipment	28%	28%	27%	27%
Operate Equipment	16%	16%	16%	16%
Monitor, Evaluate, & Adjust Treatment Processes	33%	32%	35%	35%
Laboratory Analysis	7%	7%	7%	7%

Evaluate Physical Characteristics of Wastestream	Class I	Class II	Class III	Class IV
Color	Analysis	Analysis	Analysis	Analysis
Flow	Analysis	Analysis	Analysis	Analysis
Foam	Analysis	Analysis	Analysis	Analysis
Mixing	Analysis	Analysis	Analysis	Analysis
Odor	Analysis	Analysis	Analysis	Analysis
Solids concentration	Analysis	Analysis	Analysis	Analysis
Temperature	Analysis	Analysis	Analysis	Analysis
Volume/loading	Analysis	Analysis	Analysis	Analysis

Required Capabilities

Knowledge of:

- Normal characteristics of wastewater
- Personal protective equipment
- Proper safety procedures
- Regulations
- Reporting requirements

Ability to:

- Communicate in writing
- Communicate verbally
- Demonstrate safe work habits
- Discriminate between normal and abnormal conditions
- Operate safety equipment
- Perform physical measurements
- Recognize unsafe work conditions
- Record information
- Report findings

Perform Security, Safety, & Administrative Procedures	Class I	Class II	Class III	Class IV
Apply Safety Procedures				
Bloodborne pathogens	Analysis	Analysis	Analysis	Analysis
Waterborne pathogens	Analysis	Analysis	Analysis	Analysis
Chemical Hazards				
Chemical hazard communication	Analysis	Analysis	Analysis	Analysis
Chemical spill response	Analysis	Analysis	Analysis	Analysis
Personal Protective Equipment				
Respiratory protection	Analysis	Analysis	Analysis	Analysis
Self-contained breathing apparatus	Analysis	Analysis	Analysis	Analysis
Other Personal protective equipment	Analysis	Analysis	Analysis	Analysis
General Safety and Health				
Confined space entry	Analysis	Analysis	Analysis	Analysis
Emergency eyewash/shower	Analysis	Analysis	Analysis	Analysis
Fire suppression	Analysis	Analysis	Analysis	Analysis
First aid	Analysis	Analysis	Analysis	Analysis
Lifting	Analysis	Analysis	Analysis	Analysis
Personal hygiene	Analysis	Analysis	Analysis	Analysis
Slips, trips, and falls	Analysis	Analysis	Analysis	Analysis

Perform Security, Safety, & Administrative Procedures Continued	Class I	Class II	Class III	Class IV
Establish & Follow Emergency Preparedness Plan				
Facility upset	Analysis	Analysis	Analysis	Analysis
Major spill response	Analysis	Analysis	Analysis	Analysis
Natural disasters	Analysis	Analysis	Analysis	Analysis
Record Information				
Corrective actions	Analysis	Analysis	Analysis	Analysis
Facility operation	Analysis	Analysis	Analysis	Analysis
Financial	Analysis	Analysis	Analysis	Analysis
Laboratory	Analysis	Analysis	Analysis	Analysis
Maintenance	Analysis	Analysis	Analysis	Analysis
Respond to complaints	Analysis	Analysis	Analysis	Analysis
Write/complete reports (federal, state, internal)	Analysis	Analysis	Analysis	Analysis

Required Capabilities

Knowledge of:

- Arbitration procedures
- Building codes
- Clean Water Act
- Code of Federal Regulations
- Disciplinary procedures
- Emergency plans
- Facility operation and maintenance
- Function of recordkeeping system
- Human resource practices
- Legislative process
- Local codes and ordinances
- Material Safety Data Sheet
- Monitoring requirements
- Operation and maintenance practices
- Personal protective equipment
- Potential causes of disasters in facility
- Potential impact of disasters on facility
- Principles of behavioral psychology
- Principles of finance
- Principles of general communication
- Principles of management
- Principles of measurement
- Principles of public relations
- Principles of supervision
- Proper chemical handling and storage

Ability to:

- Assess likelihood of disaster occurring
- Assign work to proper trade
- Communicate in writing
- Communicate verbally
- Conduct meetings
- Conduct training programs
- Coordinate emergency response with other organizations
- Demonstrate safe work habits
- Determine what information needs to be recorded
- Develop a budget
- Develop a public relations campaign
- Develop a staffing plan
- Develop a work unit
- Evaluate employee performance
- Evaluate promotional materials
- Evaluate proposals
- Generate a written safety program
- Generate capital plans
- Generate long term plans
- Generate short term plans
- Identify potential safety hazards
- Interpret data
- Interpret Material Safety Data Sheet

Required Capabilities Continued

Knowledge of:

- Proper lifting procedures
- Proper safety procedures
- Public administration practices
- Public participation process
- Recordkeeping policies
- Regulations
- Reporting requirements
- Risk management
- Safety regulations
- Wastewater treatment design parameters
- Watershed protection
- State/provincial and federal wastewater regulations and effluent guidelines
  - Clean Water Act Section 301: Effluent Standards
  - Clean Water Act Section 302: Water Quality-Related Effluent Limitations
  - Clean Water Act Section 307: Toxic and Pretreatment Effluent Standards
  - Clean Water Act Section 402: National Pollutant Discharge Elimination System
  - Clean Water Act Section 405: Disposal of Sewage Sludge
  - 40 CFR 136: Guidelines establishing test procedures for the analysis of pollutants
  - 40 CFR 401.11: General definitions (concerning Clean Water Act legislation)
  - 40 CFR 401.15: Toxic pollutants
  - 40 CFR 401.16: Conventional pollutants
  - 40 CFR 401.17: pH effluent limitations under continuous monitoring
  - 40 CFR 403: General pretreatment regulations
  - 40 CFR 405-699: Pretreatment categorical standards

Ability to:

- Negotiate contracts Order necessary spare parts
- Organize information
- Perform impact assessments
- Prepare proposals
- Recognize unsafe work conditions
- Record information
- Report findings
- Review reports
- Select safety equipment
- Transcribe data
- Translate technical language into common terminology
- Write policies and procedures

Evaluate and Maintain Equipment	Class I	Class II	Class III	Class IV
Evaluate Equipment				
Calibrate chemical feeders	Analysis	Analysis	Analysis	Analysis
Check and evaluate capacity of equipment	Analysis	Analysis	Analysis	Analysis
Check speed of equipment	Analysis	Analysis	Analysis	Analysis
Electrical grounding	Comprehension	Comprehension	Application	Application
Inspect equipment for abnormal conditions	Analysis	Analysis	Analysis	Analysis

Evaluate and Maintain Equipment Continued	Class I	Class II	Class III	Class IV
Evaluate Equipment Continued				
Measure and evaluate head loss	Comprehension	Application	N/A	N/A
Measure temperature of equipment	Analysis	Analysis	Analysis	Analysis
Read and evaluate charts	Analysis	Analysis	Analysis	Analysis
Read and evaluate gauges	Analysis	Analysis	Analysis	Analysis
Read and evaluate meter results	Analysis	Analysis	Analysis	Analysis
Perform Preventative and Corrective Maintenance				
Aerators	Analysis	Analysis	Analysis	Analysis
Backflow prevention devices	Comprehension	Comprehension	Comprehension	Comprehension
Bar screens	Analysis	Analysis	Analysis	Analysis
Bioreactors	Analysis	Analysis	Analysis	Analysis
Blowers and compressors	Analysis	Analysis	Analysis	Analysis
Boilers	Comprehension	Comprehension	Comprehension	Comprehension
Cathodic protection systems	N/A	Analysis	Analysis	Analysis
Chemical feeders	Analysis	Analysis	Analysis	Analysis
Chlorinators	Analysis	Analysis	Analysis	Analysis
Clarifiers	Analysis	Analysis	Analysis	Analysis
Comminuters	Analysis	Analysis	Analysis	Analysis
Dewatering equipment	Analysis	Analysis	Analysis	Analysis
Digesters (aerobic)	Comprehension	Application	Analysis	Analysis
Digesters (anaerobic)	Comprehension	Application	Analysis	Analysis
Drives	Comprehension	Application	Analysis	Analysis
Engines (gas, diesel)	Analysis	Analysis	Analysis	Analysis
Fittings/piping	Comprehension	Application	Application	N/A
Flow measuring devices	Analysis	Analysis	Analysis	Analysis
Gates	Analysis	Analysis	N/A	N/A
Generators	Analysis	Analysis	Analysis	Analysis
Grit collectors	Comprehension	Application	Analysis	Analysis
Heat exchangers	Comprehension	Comprehension	Comprehension	Comprehension
Hydraulic equipment	Comprehension	Comprehension	Comprehension	Comprehension

Evaluate and Maintain Equipment Continued	Class I	Class II	Class III	Class IV
Perform Preventative and Corrective Maintenance Continued				
Hypochlorinators	Analysis	Analysis	Analysis	Analysis
Instrumentation	Analysis	Analysis	Analysis	Analysis
Lock-out/tag-out	Analysis	Analysis	Analysis	Analysis
Motors	Application	Application	Application	Application
Off-gas equipment	Application	Application	Application	Application
Ozonators	Analysis	Analysis	Analysis	Analysis
Pneumatic equipment	Application	Application	Application	Application
Pumps	Analysis	Analysis	Analysis	Analysis
Safety equipment	Analysis	Analysis	Analysis	Analysis
Screw conveyors	Comprehension	Application	Analysis	Analysis
Valves	Analysis	Analysis	Analysis	Analysis

Required Capabilities

Knowledge of:

- Dewatering equipment
- Flow measuring devices
- Function of tools
- General electrical principles
- Grit collectors
- HVAC
- Hypochlorinators
- Internal combustion engines
- Lubricant and fluid characteristics
- Mechanical equipment
- Operation and maintenance practices
- Personal protective equipment
- Pneumatics
- Principles of measurement
- Process control instrumentation
- Proper lifting procedures
- Proper safety procedures
- Start-up and shut-down procedures

Ability to:

- Calibrate equipment
- Calibrate instruments
- Demonstrate safe work habits
- Differentiate between preventative and corrective maintenance
- Evaluate operation of equipment
- Identify potential safety hazards
- Monitor electrical equipment
- Monitor mechanical equipment
- Operate safety equipment
- Perform physical measurements
- Recognize unsafe work conditions
- Record information
- Report findings
- Select safety equipment
- Translate technical language into common terminology
- Use hand tools

Operate Equipment	Class I	Class II	Class III	Class IV
Backflow prevention devices	Comprehension	Comprehension	Comprehension	Comprehension
Blowers and compressors	Application	Application	Analysis	Analysis
Boilers	Comprehension	Comprehension	Application	Application
Cathodic protection systems	Comprehension	Comprehension	Comprehension	Comprehension
Chemical feeders	Application	Analysis	Analysis	Analysis

Operate Equipment Continued	Class I	Class II	Class III	Class IV
Computers	Analysis	Analysis	Analysis	Analysis
Digesters and gas collection	Application	Application	Analysis	Analysis
Drives	Application	Analysis	Analysis	Analysis
Electronic testing equipment	Analysis	Analysis	Analysis	Analysis
Engines (gas, diesel)	Analysis	Analysis	Analysis	Analysis
Flow measuring devices	Analysis	Analysis	Analysis	Analysis
Gates	Analysis	Analysis	Analysis	Analysis
Generators	Analysis	Analysis	Analysis	Analysis
Hand and power tools	Analysis	Analysis	Analysis	Analysis
Heat exchangers	Application	Application	Analysis	Analysis
Heavy vehicles	Analysis	Analysis	Analysis	Analysis
Hydraulic equipment	Comprehension	Comprehension	Application	Application
Instrumentation	Analysis	Analysis	Analysis	Analysis
Motors	Analysis	Analysis	Analysis	Analysis
Off-gas equipment	Comprehension	Comprehension	Analysis	Analysis
Pneumatic equipment	Comprehension	Application	Analysis	Analysis
Pumps	Analysis	Analysis	Analysis	Analysis
Pure oxygen generators	N/A	N/A	Application	Analysis
SCADA	Analysis	Analysis	Analysis	Analysis
Valves	Analysis	Analysis	Analysis	Analysis

Required Capabilities

Knowledge of:

- Facility operation and maintenance
- Flow measuring devices
- General electrical principles
- HVAC
- Hydraulic principles
- Hypochlorinators
- Internal combustion engines
- Lubricant and fluid characteristics
- Mechanical equipment
- Operation and maintenance practices
- Pneumatics
- Proper lifting procedures
- Proper safety procedures
- Safety regulations
- Start-up and shut-down procedures

Ability to:

- Adjust equipment
- Calibrate equipment
- Calibrate instruments
- Demonstrate safe work habits
- Discriminate between normal and abnormal conditions
- Evaluate operation of equipment
- Identify potential safety hazards
- Interpret Material Safety Data Sheet
- Monitor electrical equipment
- Monitor mechanical equipment
- Operate safety equipment
- Perform physical measurements
- Recognize unsafe work conditions
- Record information
- Report findings

Monitor, Evaluate, & Adjust Treatment Processes	Class I	Class II	Class III	Class IV
Preliminary Treatment				
Comminution	Comprehension	Application	Analysis	Analysis
Flow Equalization	Comprehension	Application	Analysis	Analysis
Grit Removal	Comprehension	Comprehension	Analysis	Analysis
Plant pumping of main flow	Analysis	Analysis	Analysis	Analysis
Screening	Analysis	Analysis	Analysis	Analysis
Primary Treatment				
Clarifiers	Analysis	Analysis	Analysis	Analysis
Secondary Treatment				
Complete mix activated sludge	Comprehension	Analysis	Analysis	Analysis
Contact stabilization activated sludge	Comprehension	Analysis	Analysis	Analysis
Conventional activated sludge	Comprehension	Analysis	Analysis	Analysis
Extended aeration activated sludge	Comprehension	Analysis	Analysis	Analysis
Fixed-film bioreactor	Comprehension	Analysis	Analysis	Analysis
Oxidation ditches	Analysis	Analysis	Analysis	Analysis
Pure oxygen activated sludge	N/A	N/A	Analysis	Analysis
Rotating biological contactors	Analysis	Analysis	Analysis	Analysis
Secondary clarifiers	Analysis	Analysis	Analysis	Analysis
Sequencing batch reactors	Analysis	Analysis	Analysis	Analysis
Stabilization ponds with aeration	Analysis	Analysis	N/A	N/A
Stabilization ponds without aeration	Analysis	Analysis	N/A	N/A
Step-feed activated sludge	Comprehension	Analysis	Analysis	Analysis
Trickling filter	Analysis	Analysis	Analysis	Analysis

Monitor, Evaluate, & Adjust Treatment Processes Continued	Class I	Class II	Class III	Class IV
Tertiary Treatment				
Advanced waste treatment chemical recovery, carbon regeneration	N/A	N/A	Comprehension	Comprehension
Biological or chemical/biological advanced waste treatment	Application	Analysis	Analysis	Analysis
Chemical/physical advanced waste treatment following secondary	Application	Application	Analysis	Analysis
Ion exchange for advanced waste treatment	N/A	N/A	Application	Analysis
Media filtration	Comprehension	Comprehension	Analysis	Analysis
Reverse osmosis, electrodialysis and other membrane filtration techniques	N/A	N/A	Analysis	Analysis
Disinfection				
Chlorination	Analysis	Analysis	Analysis	Analysis
Dechlorination	Analysis	Analysis	Analysis	Analysis
Hypochlorination	Analysis	Analysis	Analysis	Analysis
Ozonation	N/A	N/A	Analysis	Analysis
Ultraviolet irradiation	Comprehension	Analysis	Analysis	Analysis
Chemical Addition				
Dry chemical addition	Comprehension	Application	Application	Analysis
Gaseous chemical addition	Application	Application	Analysis	Analysis
Liquid chemical addition	Application	Analysis	Analysis	Analysis
Effluent Discharge				
Effluent discharge for reuse	Comprehension	Analysis	Analysis	Analysis
Effluent discharge to receiving stream	Comprehension	Analysis	Analysis	Analysis

Monitor, Evaluate, & Adjust Treatment Processes Continued	Class I	Class II	Class III	Class IV
Solids Handling				
Aerobic digestion	Analysis	Analysis	Analysis	Analysis
Anaerobic digestion	Comprehension	Application	Analysis	Analysis
Belt press	Analysis	Analysis	Analysis	Analysis
Centrifuge	Comprehension	Application	Analysis	Analysis
Compost	Comprehension	Application	Analysis	Analysis
Condition	Analysis	Analysis	Analysis	Analysis
Drying bed	Analysis	Analysis	Comprehension	Comprehension
Incinerate	N/A	N/A	Application	Analysis
Land apply	Comprehension	Comprehension	Analysis	Analysis
Landfill	Analysis	Analysis	Analysis	Analysis
Pressure filter	Analysis	Analysis	Analysis	Analysis
Stabilize	Application	Analysis	Analysis	Analysis
Storage	Application	Analysis	Analysis	Analysis
Thicken	Application	Analysis	Analysis	Analysis

Required Capabilities

Knowledge of:

- Aerators
- Bar screens
- Biological science
- Bioreactors
- Chemical properties
- Chlorinators
- Clarifiers
- Comminuters
- Dewatering equipment
- Facility operation and maintenance
- Flow measuring devices
- General chemistry
- Grit collectors
- Hydraulic principles
- Hypochlorinators
- Normal characteristics of wastewater
- Normal chemical range
- Operation and maintenance practices
- Ozonators
- Personal protective equipment
- Physical science
- Pneumatics

Ability to:

- Adjust chemical feed rates
- Adjust equipment
- Adjust flow patterns
- Adjust process units
- Calculate dosage rates
- Calibrate equipment
- Calibrate instruments
- Communicate in writing
- Communicate verbally
- Confirm chemical strength
- Demonstrate safe work habits
- Diagnose/troubleshoot process units
- Discriminate between normal and abnormal conditions
- Evaluate facility performance
- Evaluate process units
- Identify potential safety hazards
- Interpret data
- Maintain processes in normal operating condition
- Measure chemicals

Required Capabilities Continued

Knowledge of:

- Pollutants
- Primary treatment processes
- Principles of measurement
- Process control instrumentation
- Proper application of chemicals
- Proper chemical handling and storage
- Proper lifting procedures
- Proper safety procedures
- Safety regulations
- Screw conveyors
- Secondary treatment processes
- Start-up and shut-down procedures
- Tertiary treatment processes
- Wastewater treatment concepts
- Wastewater treatment design parameters
- State/provincial and federal wastewater regulations and effluent guidelines
    - Clean Water Act Section 301: Effluent Standards
    - Clean Water Act Section 302: Water Quality-Related Effluent Limitations
    - Clean Water Act Section 307: Toxic and Pretreatment Effluent Standards
    - Clean Water Act Section 402: National Pollutant Discharge Elimination System
    - Clean Water Act Section 405: Disposal of Sewage Sludge

Laboratory Analysis	Class I	Class II	Class III	Class IV
General sampling practices	Analysis	Analysis	Analysis	Analysis
Complete chain-of-custody	Analysis	Analysis	Analysis	Analysis
Biological analyses	Analysis	Analysis	Analysis	Analysis
Biochemical oxygen demand	Analysis	Analysis	Analysis	Analysis
E. coli	Analysis	Analysis	Analysis	Analysis
Fecal coliform bacteria	Analysis	Analysis	Analysis	Analysis
Protozoan analysis	Analysis	Analysis	Analysis	Analysis
Whole effluent toxicity	Analysis	Analysis	Analysis	Analysis
Chemical analyses	Analysis	Analysis	Analysis	Analysis
Alkalinity	Analysis	Analysis	Analysis	Analysis
Ammonia nitrogen	Analysis	Analysis	Analysis	Analysis
Chemical oxygen demand	Analysis	Analysis	Analysis	Analysis
Dissolved metals	Analysis	Analysis	Analysis	Analysis
Heavy metals	Analysis	Analysis	Analysis	Analysis

Laboratory Analysis Continued	Class I	Class II	Class III	Class IV
Hexavalent chromium	Analysis	Analysis	Analysis	Analysis
Ortho-phosphate	Analysis	Analysis	Analysis	Analysis
Total phosphorus	Analysis	Analysis	Analysis	Analysis
Volatile acids	Analysis	Analysis	Analysis	Analysis
Volatile organic chemicals	Analysis	Analysis	Analysis	Analysis
Physical analyses	Analysis	Analysis	Analysis	Analysis
Chlorine residual	Analysis	Analysis	Analysis	Analysis
Conductivity	Analysis	Analysis	Analysis	Analysis
Dissolved oxygen	Analysis	Analysis	Analysis	Analysis
Oxidation-reduction potential	Analysis	Analysis	Analysis	Analysis
Oxygen uptake/respiration	Analysis	Analysis	Analysis	Analysis
pH	Analysis	Analysis	Analysis	Analysis
Settleable solids	Analysis	Analysis	Analysis	Analysis
Temperature	Analysis	Analysis	Analysis	Analysis
Total dissolved solids	Analysis	Analysis	Analysis	Analysis
Total solids	Analysis	Analysis	Analysis	Analysis
Total suspended solids	Analysis	Analysis	Analysis	Analysis
Turbidity	Analysis	Analysis	Analysis	Analysis
Volatile suspended solids	Analysis	Analysis	Analysis	Analysis

Required Capabilities

Knowledge of:

- Basic laboratory techniques
- Biological science
- Chemical properties
- Code of Federal Regulations
- Flow measuring devices
- General chemistry
- Laboratory equipment
- Monitoring requirements
- Normal chemical range
- Physical science
- Principles of measurement
- Proper chemical handling and storage
- Proper safety procedures
- Proper sampling procedures
- Quality control/quality assurance practices
- Regulations
- Reporting requirements
- Safety regulations

Ability to:

- Calibrate instruments
- Communicate in writing
- Communicate verbally
- Confirm chemical strength
- Demonstrate safe work habits
- Identify potential safety hazards
- Interpret data
- Interpret Material Safety Data Sheet
- Measure chemicals
- Perform basic math
- Perform laboratory calculations
- Perform physical measurements
- Prepare chemicals
- Recognize abnormal analytical results
- Recognize unsafe work conditions
- Record information
- Report findings
- Select safety equipment

Required Capabilities Continued

Knowledge of:

- Standard Methods
- State/provincial and federal wastewater regulations and effluent guidelines
    - Clean Water Act Section 405: Disposal of Sewage Sludge
    - 40 CFR 136: Guidelines establishing test procedures for the analysis of pollutants
    - 40 CFR 401.17: pH effluent limitations under continuous monitoring

Ability to:

- Transcribe data

References

The following are approved as reference sources for the ABC wastewater treatment 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

- *Operation of Wastewater Treatment Plants, Volume I and II*
- *Advanced Waste Treatment*
- *Manage for Success*

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@owp.csus.edu

National Environmental Training Center for Small Communities (NETCSC)

- *Protecting Your Community's Assets: A Guide for Small Wastewater Systems*

More information:
A PDF version of this guide is available from: www.nesc.wvu.edu/training.cfm
You may also request a printed and bound hard copy of the guide by calling NETCSC at (800) 624-8301, and asking for product TRBKMG03 (shipping and handling charges may apply).

Water Environment Federation

- *Operation of Municipal Wastewater Treatment Plants - Manual of Practice No. 11*
- *Activated Sludge - Manual of Practice OM-9*

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