

ABC Need-to-Know Criteria for Small Wastewater System Operators



ABC
Association of
Boards of Certification

TM

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ABC Small Wastewater System Operator Certification Exam

The ABC small wastewater system operator certification exam evaluates an operator’s knowledge of tasks related to the operation of small wastewater systems. To successfully take an ABC exam, an operator must demonstrate knowledge of the core competencies, or essential tasks and capabilities, in this document. The following pages list the core competencies for small wastewater system operators. The core competencies are clustered into the following job duties:

- Evaluate Incoming Wastestream/Sidestream Characteristics
- Monitor, Evaluate and Adjust Treatment Processes
- Collect Samples, Interpret Analyses, and Perform Laboratory Analyses
- Evaluate and Maintain Equipment
- Operate Equipment
- Perform Security, Safety and Administrative Procedures

Because certificates may be used to work in various systems, the exam may include technologies that are not used in each system but are commonly used in many systems.

ABC Small Wastewater System Exam Specifications

The specifications for the exam list the percentage of questions on the exam that fall under each job duty. For example, 6% of the questions on the exam relate to the job duty “Evaluate Incoming Wastestream/Sidestream Characteristics.” For a list of tasks and capabilities associated with each job duty, please refer to the list of core competencies in the following pages.

ABC Small Wastewater System Exam Specifications

Evaluate Incoming Wastestream/Sidestream Characteristics	6%
Monitor, Evaluate and Adjust Treatment Processes	47%
Collect Samples, Interpret Analyses, and Perform Laboratory Analyses	8%
Evaluate and Maintain Equipment	15%
Operate Equipment	6%
Perform Security, Safety and Administrative Procedures	18%

Core Competencies for Small Wastewater System Operators

Evaluate Incoming Wastestream/Sidestream Characteristics

Core Competencies:

- Biological/Chemical
- Color
- Flow pattern
- Odor/Off-gas
- Solids concentration
- Temperature
- Volume

Required Capabilities:

- Ability to communicate observations verbally and in writing
- Ability to discriminate between normal and abnormal conditions
- Knowledge of industrial sources and characteristics
- Knowledge of normal characteristics of wastewater

Monitor, Evaluate and Adjust Treatment Processes

Core Competencies:

Preliminary Treatment

- Flow equalization
- Grit removal
- Screening

Primary Treatment

- Clarifiers

Secondary Treatment

- Activated sludge
- Fixed-film reactors (trickling filters, RBCs)
- Stabilization ponds with aeration
- Stabilization ponds without aeration

Additional Treatment

- Odor control
- Septage

Chemical Addition

- Add dry chemicals
- Add gaseous chemicals
- Add liquid chemicals

Disinfection

- Chlorination
- Dechlorination

Effluent Discharge and Reuse

Solids Handling

- Conditioning (chemical, thermal, elutriation)
- Dewatering (filtration, centrifugation, drying beds)
- Land application
- Stabilization (digestion, thermal, chemical)
- Thickening (gravity, flotation, centrifugation, filtration)
- Volume reduction (drying, incineration, composting)

Required Capabilities:

- Ability to adjust chemical feed rates, flow patterns, and process units
- Ability to calculate dosage rates
- Ability to confirm chemical strength
- Ability to evaluate, diagnose, and troubleshoot process units
- Ability to interpret Material Safety Data Sheets
- Ability to maintain processes in normal operating conditions
- Ability to measure and prepare chemicals
- Ability to perform basic math and process control calculations
- Knowledge of biological science
- Knowledge of biosolids policies and regulations
- Knowledge of flow measurement principles
- Knowledge of general chemistry
- Knowledge of general electrical and mechanical principles
- Knowledge of normal chemical range
- Knowledge of personal protective equipment
- Knowledge of physical science
- Knowledge of principles of measurement
- Knowledge of proper application, handling, and storage of chemicals
- Knowledge of proper lifting procedures
- Knowledge of regulations
- Knowledge of sludge management practices
- Knowledge of urban water reuse
- Knowledge of wastewater treatment concepts and treatment processes

Collect Samples, Interpret Laboratory Analyses, and Perform Laboratory Analyses

Core Competencies:

Collect Samples and Interpret Laboratory Analyses

- Alkalinity
- Ammonia (nitrate/nitrite)
- Bacteriological
- Biochemical oxygen demand
- Chain-of-Custody
- Chlorine residual
- Dissolved oxygen
- pH
- Phosphorus
- Settleability testing
- Solids
- Temperature
- Turbidity

Perform Laboratory Analyses

- Alkalinity
- Chlorine residual
- Dissolved oxygen
- pH
- Settleability testing
- Temperature
- Turbidity

Required Capabilities:

- Ability to calibrate instruments
- Ability to follow written procedures
- Ability to interpret Material Safety Data Sheets
- Ability to perform laboratory calculations
- Ability to recognize abnormal analytical results
- Knowledge of approved analytical procedures
- Knowledge of biological science
- Knowledge of chain of custody
- Knowledge of general chemistry
- 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 and assurance practices
- Knowledge of safety regulations
- Knowledge of sampling and preservation procedures

Evaluate and Maintain Equipment

Core Competencies:

Evaluate Equipment

- Check and evaluate capacity of equipment
- Inspect equipment for abnormal conditions
- Measure and evaluate head loss
- Read and evaluate chart and meter results
- Read and evaluate gauges

Perform Maintenance

- Backflow prevention devices
- Blowers and compressors
- Chemical feeders
- Drives
- Engines (gas, diesel)
- Fittings/Piping
- Hydraulic equipment
- Instrumentation
- Motors
- Pumps
- Valves

Required Capabilities:

- Ability to assign work to proper trade
- Ability to calibrate equipment
- Ability to diagnose and troubleshoot equipment
- Ability to differentiate between preventive and corrective maintenance
- Ability to discriminate between normal and abnormal conditions
- Ability to monitor and adjust equipment
- Ability to order necessary spare parts
- Ability to perform basic math
- Ability to perform general maintenance
- Knowledge of facility operation and maintenance
- Knowledge of general electrical and mechanical principles
- Knowledge of hydraulic and pneumatic principles
- Knowledge of internal combustion engines
- Knowledge of lubricant and fluid characteristics
- Knowledge of process control instrumentation
- Knowledge of safety regulations
- Knowledge of start-up and shut-down procedures

Operate Equipment

Core Competencies:

- Backflow prevention devices
- Blowers and compressors
- Chemical feeders
- Computers
- Drives
- Electronic testing equipment
- Engines
- Fittings/Piping
- Flow meters
- Hand and power tools
- Hydrants
- Hydraulic equipment
- Instrumentation
- Motors
- Odor control equipment
- Pneumatic equipment
- Pumps
- SCADA
- Traps and drains
- Valves

Required Capabilities:

- Ability to assess likelihood of disaster occurring
- Ability to communicate safety hazards verbally and in writing
- Ability to evaluate facility performance
- Ability to interpret and transcribe data
- Ability to monitor, evaluate and adjust equipment
- Ability to organize information and review reports
- Ability to perform basic math
- Ability to perform impact assessment of change
- Ability to recognize unsafe work conditions
- Ability to select and operate safety equipment
- Ability to translate technical language into common terminology
- Ability to write plans, policies and procedures
- Knowledge of emergency plans
- Knowledge of facility operation and maintenance
- Knowledge of function of tools
- Knowledge of general electrical and mechanical principles
- Knowledge of hydraulic and pneumatic principles
- Knowledge of potential causes and impact of disasters on facility
- Knowledge of recordkeeping functions & policies
- Knowledge of regulations
- Knowledge of regulations
- Knowledge of safety procedures
- Knowledge of start-up and shut-down procedures
- Knowledge of wastewater treatment concepts

Perform Security, Safety and Administrative Procedures

Core Competencies:

Perform Security and Safety Procedures

- Bloodborne pathogens
- Chemical handling
- Confined space entry
- Electrical hazards
- Facility upset
- Fire safety
- Hazardous environment
- Lock-out/tag-out
- Natural and manmade disasters
- Personal protective equipment
- Respiratory protection
- Spill response
- Transportation

Perform Administrative Procedures

- Administer compliance, emergency preparedness and safety program
- Develop budget
- Develop operation and maintenance plan
- Hire, discharge, and manage employees
- Plan and organize work activities
- Record and evaluate data
- Respond to complaints
- Write regulatory authority reports

Required Capabilities:

- Ability to assess likelihood of disaster occurring
- Ability to communicate safety hazards verbally and in writing
- Ability to conduct meetings and training programs
- Ability to coordinate emergency response with other organizations
- Ability to develop a public relations program
- Ability to evaluate facility performance
- Ability to interpret and transcribe data
- Ability to organize information and review reports
- Ability to perform basic math
- Ability to perform impact assessment of change
- Ability to prepare and evaluate proposals
- Ability to recognize unsafe work conditions
- Ability to select and operate safety equipment
- Ability to translate technical language into common terminology
- Ability to write plans, policies and procedures
- Knowledge of emergency plans
- Knowledge of facility operation and maintenance
- Knowledge of local codes and ordinances
- Knowledge of monitoring and reporting requirements
- Knowledge of potential causes and impact of disasters on facility
- Knowledge of principles of finance
- Knowledge of principles of management
- Knowledge of principles of public relations
- Knowledge of public administration practices
- Knowledge of public participation process
- Knowledge of recordkeeping functions & policies
- Knowledge of regulations

Suggested Small Wastewater System Exam References

The following are approved as reference sources for the ABC small wastewater system operator examination. Operators should use the latest editions of these reference sources to prepare for the exam.

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

- *Advanced Waste Treatment*
- *Industrial Waste Treatment, Volume I*
- *Manage for Success*
- *Operation and Maintenance of Wastewater Collection Systems, Volume I and II*
- *Operation of Wastewater Treatment Plants, Volume I and II*
- *Pretreatment Facility Inspection*
- *Treatment of Metal Wastestreams*
- *Utility Management*
- *Water Treatment Plant Operation, Volume I*

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

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
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

Regulations

For United States exams:

- *Code of Federal Regulations*, Title 40 (www.gpo.gov)
- State regulations (contact information for state certification programs is available on the Certification Contacts page of ABC's web site, www.abccert.org)
- American Public Health Association (APHA), American Water Works Association, and Water Environment Federation. *Standard Methods for the Examination of Water and Wastewater* (latest EPA-approved edition). Washington, DC: APHA. (www.apha.org)

For Canadian exams:

- Provincial and territorial regulations (contact information for provincial/territorial certification programs is available on the Certification Contacts page of ABC's web site, www.abccert.org)

Study Guides

- Price, Joanne. 2000. *Applied Math for Wastewater Plant Operators*. Boca Raton, FL: CRC Press. (www.crcpress.com)
- Water Environment Federation, *WEF/ABC Wastewater Operators' Guide to Preparing for the Certification Examination* (www.wef.org; complete contact information is listed above)