



NEED-TO-KNOW CRITERIA

Small Wastewater System Operator

A Need-to-Know Guide when preparing for the:

ABC Small Wastewater System Operator Certification Exam



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Before You Dive In...

What is the Need-to-Know Criteria?

This **ABC Small Wastewater System Operator** Need-to-Know Criteria was developed to assist operators in understanding the content that will be covered in the ABC Small Wastewater System Operator exam. A methodical and comprehensive international investigation was conducted to determine the most significant job tasks performed by operators. The content covered on the exam represents the job tasks identified through this research as essential operator competencies and is not limited to the practices of your site. The following pages organize these job tasks into Core Competency Job Areas and identify the amount of the test devoted to each area.

Is this Need-to-Know Criteria relevant to MY exam?

WPI offers a variety of standardized and customized exam services. This document is reflective only of the ABC Small Wastewater System Operator exam; older editions of the standardized exam and various customized exams are also administered by various certification programs. Please contact your certifying authority to determine whether they have implemented this exam for your program.

Exam Preparation Resources

Visit gowpi.org to access the formula/conversion table administered with this exam, a list of approved references, information on purchasing study guides available from partner organizations, and more.

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ABC Small Wastewater System Operator

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 a WPI 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.

CORE COMPETENCY JOB AREAS

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.

EXAM SPECIFICATIONS

CORE COMPETENCY JOB AREA	
 EVALUATE INCOMING WASTESTREAM/SIDESTREAM CHARACTERISTICS	6%
 MONITOR, EVALUATE, AND ADJUST TREATMENT PROCESSES	47%
 COLLECT SAMPLES, INTERPRET LABORATORY ANALYSES, AND PERFORM LABORATORY ANALYSES	8%
 EVALUATE AND MAINTAIN EQUIPMENT	15%
 OPERATE EQUIPMENT	6%
 PERFORM SECURITY, SAFETY, AND ADMINISTRATIVE PROCEDURES	18%



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	Chemical Addition
Flow equalization	Add dry chemicals
Grit removal	Add gaseous chemicals
Screening	Add liquid chemicals
Primary Treatment	Disinfection
Clarifiers	Chlorination
Secondary Treatment	Dechlorination
Activated sludge	Effluent Discharge and Reuse Solids Handling
Fixed-film reactors (trickling filters, RBCs)	Conditioning (chemical, thermal, elutriation)
Stabilization ponds with aeration	Dewatering (filtration, centrifugation, drying beds)
Stabilization ponds without aeration	Land application
Additional Treatment	Stabilization (digestion, thermal, chemical)
Odor control	Thickening (gravity, flotation, centrifugation, filtration)
Septage	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 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	Perform Laboratory Analyses
Alkalinity	Alkalinity
Ammonia (nitrate/nitrite)	Chlorine residual
Bacteriological	Dissolved oxygen
Biochemical oxygen demand	pH
Chain of custody	Settleability testing
Chlorine residual	Temperature
Dissolved oxygen	Turbidity
pH	
Phosphorus	
Settleability testing	
Solids	
Temperature	
Turbidity	

REQUIRED CAPABILITIES:

Ability to calibrate instruments
 Ability to follow written procedures
 Ability to interpret 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	Perform Maintenance
Check and evaluate capacity of equipment	Backflow prevention devices
Inspect equipment for abnormal conditions	Blowers and compressors
Measure and evaluate head loss	Chemical feeders
Read and evaluate chart and meter results	Drives
Read and evaluate gauges	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 shutdown procedures



Operate Equipment

Core Competencies:

Backflow prevention devices	Hydrants
Blowers and compressors	Hydraulic equipment
Chemical feeders	Instrumentation
Computers	Motors
Drives	Odor control equipment
Electronic testing equipment	Pneumatic equipment
Engines	Pumps
Fittings/Piping	SCADA
Flow meters	Traps and drains
Hand and power tools	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 and policies
 Knowledge of regulations
 Knowledge of regulations
 Knowledge of safety procedures
 Knowledge of start up and shutdown procedures
 Knowledge of wastewater treatment concepts



Perform Security, Safety, and Administrative Procedures

Core Competencies:

Perform Security and Safety Procedures	Perform Administrative Procedures
Bloodborne pathogens	Administer compliance, emergency preparedness, and safety program
Chemical handling	Develop budget
Confined space entry	Develop operation and maintenance plan
Electrical hazards	Hire, discharge, and manage employees
Facility upset	Plan and organize work activities
Fire safety	Record and evaluate data
Hazardous environment	Respond to complaints
Lock-out/tag-out	Write regulatory authority reports
Natural and manmade disasters	Respond to complaints
Personal Protective Equipment	Write regulatory authority reports
Respiratory protection	
Spill response	
Transportation	

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 and policies

Knowledge of regulations

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, Volumes I and II*
- *Operation of Wastewater Treatment Plants, Volumes 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
Website: 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*
- *Activated Sludge - Manual of Practice OM-9*

To order, contact: **Water Environment Federation**
601 Wythe Street
Alexandria, VA 22314-1994
Website: www.wef.org
Phone: (800) 666-0206
Fax: (703) 684-2492
E-mail: pubs@wef.org

References

Regulations for United States exams:

- *Code of Federal Regulations, Title 40* (<https://www.ecfr.gov/current/title-40>)
- State regulations (contact information for state certification programs is available on the [OpCert Program Contacts](#) page of WPI's website, www.gowpi.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, D.C.: APHA. (www.apha.org)

Regulations for Canadian exams:

- Provincial and territorial regulations (contact information for provincial/territorial certification programs is available on the [OpCert Program Contacts](#) page of WPI's website, www.gowpi.org)

Study Guides

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

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