Welcome to Montana’s Operator Certification Program

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

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

<table>
<thead>
<tr>
<th>Montana Municipal Wastewater Exam</th>
<th>ABC Wastewater Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 3C</td>
<td>Small Wastewater System Operator</td>
</tr>
</tbody>
</table>

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

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

If you have any questions concerning these study materials or anything about Operator Certification, please feel free to contact the operator certification program at 406-444-4584.
ABC Need-to-Know Criteria for Small Wastewater System Operators

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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.

<table>
<thead>
<tr>
<th>ABC Small Wastewater System Exam Specifications</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Evaluate Incoming Wastestream/Sidestream Characteristics</td>
<td>6%</td>
</tr>
<tr>
<td>Monitor, Evaluate and Adjust Treatment Processes</td>
<td>47%</td>
</tr>
<tr>
<td>Collect Samples, Interpret Analyses, and Perform Laboratory Analyses</td>
<td>8%</td>
</tr>
<tr>
<td>Evaluate and Maintain Equipment</td>
<td>15%</td>
</tr>
<tr>
<td>Operate Equipment</td>
<td>6%</td>
</tr>
<tr>
<td>Perform Security, Safety and Administrative Procedures</td>
<td>18%</td>
</tr>
</tbody>
</table>
Core Competencies for Small Wastewater System Operators

Evaluate Incoming Wastestream/Sidestream Characteristics

<table>
<thead>
<tr>
<th>Core Competencies:</th>
<th>Required Capabilities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Biological/Chemical</td>
<td>• Ability to communicate observations verbally and in writing</td>
</tr>
<tr>
<td>• Color</td>
<td>• Ability to discriminate between normal and abnormal conditions</td>
</tr>
<tr>
<td>• Flow pattern</td>
<td>• Knowledge of industrial sources and characteristics</td>
</tr>
<tr>
<td>• Odor/Off-gas</td>
<td>• Knowledge of normal characteristics of wastewater</td>
</tr>
<tr>
<td>• Solids concentration</td>
<td></td>
</tr>
<tr>
<td>• Temperature</td>
<td></td>
</tr>
<tr>
<td>• Volume</td>
<td></td>
</tr>
</tbody>
</table>

Monitor, Evaluate and Adjust Treatment Processes

<table>
<thead>
<tr>
<th>Core Competencies:</th>
<th>Required Capabilities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary Treatment</td>
<td>• Ability to adjust chemical feed rates, flow patterns, and process units</td>
</tr>
<tr>
<td>• Flow equalization</td>
<td>• Ability to calculate dosage rates</td>
</tr>
<tr>
<td>• Grit removal</td>
<td>• Ability to confirm chemical strength</td>
</tr>
<tr>
<td>• Screening</td>
<td>• Ability to evaluate, diagnose, and troubleshoot process units</td>
</tr>
<tr>
<td>Primary Treatment</td>
<td>• Ability to interpret Material Safety Data Sheets</td>
</tr>
<tr>
<td>• Clarifiers</td>
<td>• Ability to maintain processes in normal operating conditions</td>
</tr>
<tr>
<td>Secondary Treatment</td>
<td>• Ability to measure and prepare chemicals</td>
</tr>
<tr>
<td>• Activated sludge</td>
<td>• Ability to perform basic math and process control calculations</td>
</tr>
<tr>
<td>• Fixed-film reactors (trickling filters, RBCs)</td>
<td>• Knowledge of biological science</td>
</tr>
<tr>
<td>• Stabilization ponds with aeration</td>
<td>• Knowledge of biosolids policies and regulations</td>
</tr>
<tr>
<td>• Stabilization ponds without aeration</td>
<td>• Knowledge of flow measurement principles</td>
</tr>
<tr>
<td>Additional Treatment</td>
<td>• Knowledge of general chemistry</td>
</tr>
<tr>
<td>• Odor control</td>
<td>• Knowledge of general electrical and mechanical principles</td>
</tr>
<tr>
<td>• Septage</td>
<td>• Knowledge of normal chemical range</td>
</tr>
<tr>
<td>Chemical Addition</td>
<td>• Knowledge of personal protective equipment</td>
</tr>
<tr>
<td>• Add dry chemicals</td>
<td>• Knowledge of physical science</td>
</tr>
<tr>
<td>• Add gaseous chemicals</td>
<td>• Knowledge of principles of measurement</td>
</tr>
<tr>
<td>• Add liquid chemicals</td>
<td>• Knowledge of proper application, handling, and storage of chemicals</td>
</tr>
<tr>
<td>Disinfection</td>
<td>• Knowledge of proper lifting procedures</td>
</tr>
<tr>
<td>• Chlorination</td>
<td>• Knowledge of regulations</td>
</tr>
<tr>
<td>• Dechlorination</td>
<td>• Knowledge of sludge management practices</td>
</tr>
<tr>
<td>Effluent Discharge and Reuse</td>
<td>• Knowledge of urban water reuse</td>
</tr>
<tr>
<td>Solids Handling</td>
<td>• Knowledge of wastewater treatment concepts and treatment processes</td>
</tr>
<tr>
<td>• Conditioning (chemical, thermal, elutriation)</td>
<td></td>
</tr>
<tr>
<td>• Dewatering (filtration, centrifugation, drying beds)</td>
<td></td>
</tr>
<tr>
<td>• Land application</td>
<td></td>
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<tr>
<td>• Stabilization (digestion, thermal, chemical)</td>
<td></td>
</tr>
<tr>
<td>• Thickening (gravity, flotation, centrifugation, filtration)</td>
<td></td>
</tr>
<tr>
<td>• Volume reduction (drying, incineration, composting)</td>
<td></td>
</tr>
</tbody>
</table>
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

**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

**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
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)
  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
- Water Environment Federation, WEF/ABC Wastewater Operators’ Guide to Preparing for the Certification Examination (www.wef.org; complete contact information is listed above)