



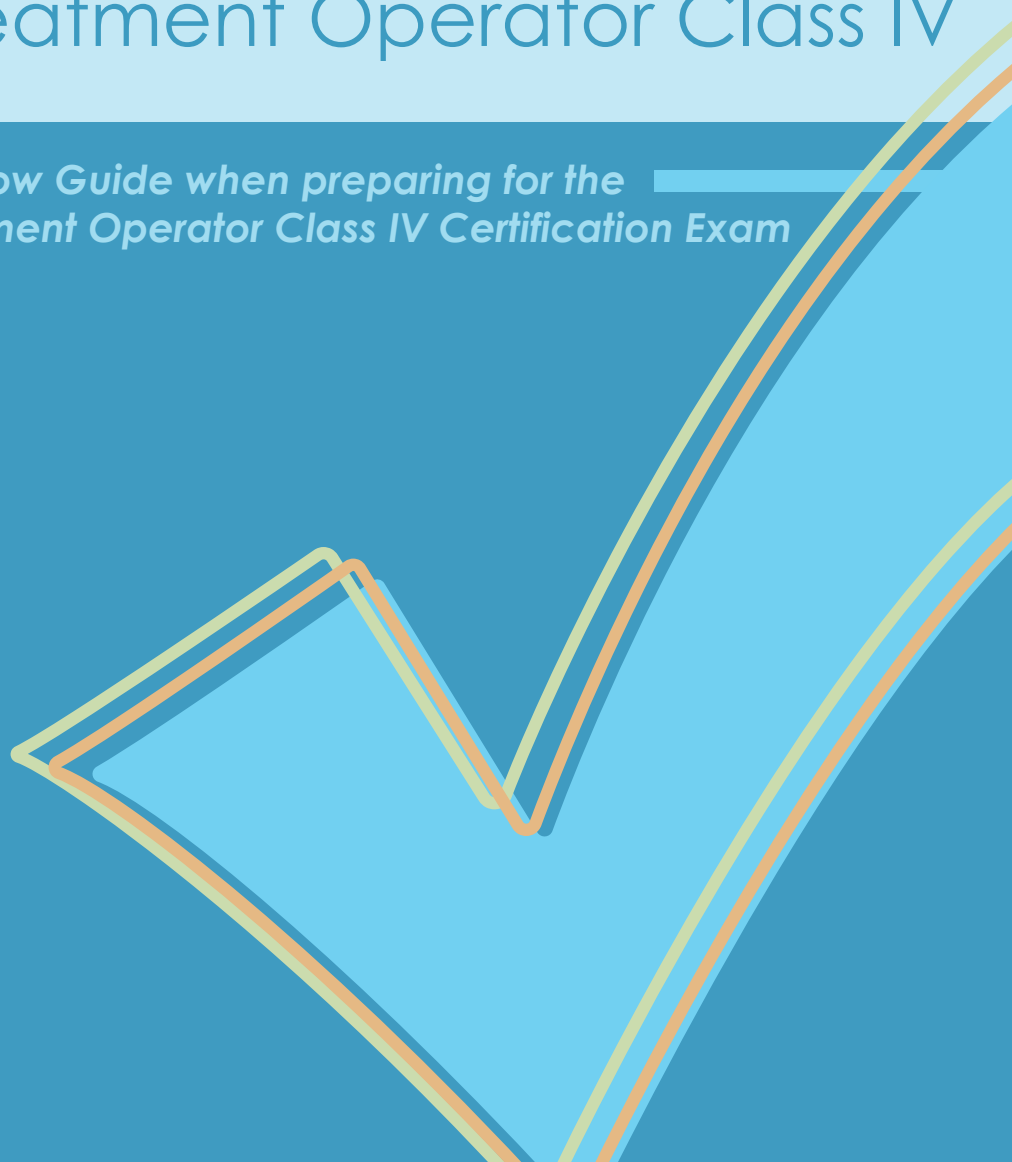
# ABC

Association of  
Boards of Certification

## Need-to-Know Criteria

### Wastewater Treatment Operator Class IV

*A Need-to-Know Guide when preparing for the  
ABC Wastewater Treatment Operator Class IV Certification Exam*



## Before You Dive In...

### What is ABC's Need-to-Know Criteria?

This *ABC Wastewater Treatment Operator Class IV Need-to-Know Criteria* was developed to assist operators in understanding the content that will be covered in ABC's Standardized Wastewater Treatment Operator Class IV exam. A methodical and comprehensive international investigation was conducted to determine the most significant job tasks performed by wastewater treatment 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 system/facility. The following pages organize these job tasks into Content Areas and identify the amount of the test devoted to each area.

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

ABC offers a variety of standardized and customized exam services. This document is reflective only of the ABC Standardized Wastewater Treatment Operator Class IV 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.

### Pre-Test Questions

Your exam may include up to 10 extra questions that have not been used on previous versions of the exam. These are known as "pre-test" questions and allow ABC to gather valuable data about the new questions before they are included in future tests. Pre-test questions are unidentified and scattered throughout the exam so you will answer them with the same care in which you address scored questions. The pre-test questions are not included in your final score.

### Exam Preparation Resources

Visit [www.abccert.org](http://www.abccert.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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# Wastewater Treatment Operator Class IV Need-to-Know Criteria



















## Exam Content

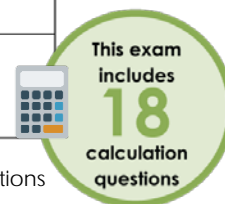
The Wastewater Treatment Operator Class IV exam will test you on essential job tasks. These job tasks have been categorized into the Content Areas detailed in the following pages. The table below summarizes the areas that are included on the exam, the number of test questions in each of these areas, and the complexity of the test questions in each area.

Just as wastewater treatment operator job duties vary in their complexity, so will the questions you are asked on the exam. Some will be more simple and routine, whereas others will be more complex, or cognitively demanding. The following three levels are used to describe the complexity of the questions you will encounter on this exam:

- 
**Recall** – tasks at this level typically require the simple recall or recognition of specific facts, concepts, processes, or procedures, with little to no problem-solving involved. You may be asked to identify, illustrate, recall, and/or recognize specific information.
- 
**Application** – tasks at this level will involve some basic problem solving, calculations, or the interpretation and application of data. You may be asked to calculate, categorize, classify, compare, differentiate, explain, specify, translate, and/or apply knowledge.
- 
**Analysis** – tasks at this level may involve higher level problem solving, evaluation, or the fitting together of a variety of elements into a meaningful whole; they will usually require many steps in the thought process. You may be asked to analyze, evaluate, formulate, generalize, judge, predict, and/or use inductive or deductive reasoning to arrive at a solution.

### Exam Content Outline

Number of Questions	Content Area	Job Task Complexity Levels
20	Laboratory Analysis	 3  10  7
15	Equipment Evaluation & Maintenance	 4  6  5
20	Equipment Operation	 2  10  8
35	Treatment Process Monitoring, Evaluation, & Adjustment	 5  15  15
10	Security, Safety, & Administrative Procedures	 2  4  4
100*	Total	 16  45  39



This exam includes **18** calculation questions

\*Your exam may contain up to 10 extra unscored pre-test questions (see *Before You Dive In* for more details).



3 Recall



10 Application



7 Analysis

## Laboratory Analysis

### Job Tasks Included in this Content Area:

1. Follow laboratory Standard Operating Procedures (SOPs)
2. Collect samples for the following:
  - a. Bacteriological analyses
  - b. Biological analyses (e.g., BOD, CBOD)
  - c. Chemical analyses (e.g., COD, nutrients, metals)
  - d. Physical analyses (e.g., pH, temperature, DO, settleable solids)
3. Conduct the following:
  - a. Bacteriological analyses
  - b. Biological analyses (e.g., BOD, CBOD)
  - c. Chemical analyses (e.g., COD, nutrients, metals)
  - d. Physical analyses
  - e. Process control laboratory testing
  - f. Required regulatory laboratory testing
4. Interpret data from the following:
  - a. Bacteriological analyses
  - b. Biological analyses (e.g., BOD, CBOD)
  - c. Chemical analyses (e.g., COD, nutrients, metals)
  - d. Physical analyses (e.g., pH, temperature, DO, settleable solids)



4 Recall



6 Application



5 Analysis

## Equipment Evaluation & Maintenance

### Job Tasks Included in this Content Area:

1. Calibrate meters (e.g., flow, pressure sensors)
2. Follow safety rules and guidelines when working with chemical equipment
3. Follow safety rules and guidelines when working with mechanical equipment
4. Monitor flowmeters
5. Monitor telemetry systems
6. Inspect the following equipment:
  - a. Aeration basins
  - b. Aeration systems (e.g., blowers, surface aerators, diffusers)
  - c. Air compressors
  - d. Anaerobic digesters
  - e. Analyzers (e.g., DO, pH, H<sub>2</sub>S, ORP)
  - f. Chemical feed systems (e.g., polymer, ferric)
  - g. Clarifiers / sedimentation basins
  - h. Disinfection equipment (e.g., UV, ozone)
  - i. Filtration and exchange units (e.g., sand, membranes)
  - j. Generators
  - k. Grit removal processes
  - l. Instrumentation (e.g., flow, pressure, telemetry)
  - m. Mechanical dewatering equipment (e.g., presses, centrifuges)
  - n. Odor control devices (e.g., biofilters, scrubbers)
  - o. Pumps - centrifugal
  - p. Pumps - positive displacement
  - q. SCADA systems
  - r. Solids thickening processes (e.g., DAF, belt, rotary drum)
  - s. Suspended growth (e.g., activated sludge, MBR, SBR)
7. Maintain the following equipment:
  - a. Aeration basins
  - b. Aeration systems (e.g., blowers, surface aerators, diffusers)
  - c. Air compressors
  - d. Anaerobic digesters
  - e. Analyzers (e.g., DO, pH, H<sub>2</sub>S, ORP)
  - f. Bar screens
  - g. Chemical feed systems (e.g., polymer, ferric)
  - h. Clarifiers / sedimentation basins
  - i. Disinfection equipment (e.g., UV, ozone)
  - j. Generators
  - k. Grit removal processes
  - l. Instrumentation (e.g., flow, pressure, telemetry)
  - m. Mechanical dewatering equipment (e.g., presses, centrifuges)
  - n. Odor control devices (e.g., biofilters, scrubbers)
  - o. Pumps - centrifugal
  - p. Pumps - positive displacement
  - q. SCADA systems
  - r. Suspended growth (e.g., activated sludge, MBR, SBR)



2 Recall



10 Application



8 Analysis

## Equipment Operation

### Job Tasks Included in this Content Area:

1. Analyze data to evaluate and adjust equipment
2. Check filters for proper operation
3. Follow safety rules and guidelines when working with chemical equipment
4. Follow safety rules and guidelines when working with mechanical equipment
5. Follow Standard Operating Procedures (SOPs)
6. Monitor lift stations to ensure equipment is operating properly
7. Monitor motor control center
8. Operate the following:
  - a. Aeration basins
  - b. Aeration systems (e.g., blowers, surface aerators, diffusers)
  - c. Air compressors
  - d. Anaerobic digesters
  - e. Analyzers (e.g., DO, pH, H<sub>2</sub>S, ORP)
  - f. Chemical feed systems (e.g., polymer, ferric)
  - g. Clarifiers / sedimentation basins
  - h. Disinfection equipment (e.g., UV, ozone)
  - i. Filtration and exchange units (e.g., sand, membranes)
  - j. Generators
  - k. Grit removal processes
  - l. Instrumentation (e.g., flow, pressure, telemetry)
  - m. Mechanical dewatering equipment (e.g., presses, centrifuges)
  - n. Motors
  - o. Odor control devices (e.g., biofilters, scrubbers)
  - p. Pumps - centrifugal
  - q. Pumps - positive displacement
  - r. SCADA systems
  - s. Solids thickening processes (e.g., DAF, belt, rotary drum)
  - t. Suspended growth (e.g., activated sludge, MBR, SBR)



5 Recall



15 Application



15 Analysis

## Treatment Process Monitoring, Evaluation, & Adjustment

Job Tasks Included in this Content Area:

1. Add chemicals to disinfect and deodorize water and other liquids (e.g., ammonia, chlorine, lime)
2. Analyze laboratory data to evaluate and adjust processes
3. Follow industry safety rules and guidelines applicable to treatment processes
4. Implement changes as indicated by laboratory results
5. Operate chemical feed systems (e.g., polymer, ferric)
6. Operate odor control systems (e.g., biofilters, scrubbers)
7. Operate SCADA systems
8. Operate the preliminary treatment processes (e.g., screening, grit, flow equalization)
9. Operate the primary clarification / sedimentation processes
10. Operate the following secondary treatment processes:
  - a. Secondary clarification / sedimentation processes
  - b. Conventional activated sludge processes (e.g., step feed, plug flow, complete mix, MBR)
11. Operate the following tertiary treatment processes:
  - a. Nutrient removal systems
  - b. Filtration / ion exchange systems (e.g., sand, membranes)
  - c. Filtration systems (e.g., solids, liquid)
12. Operate the disinfection processes (e.g., UV, ozone)
13. Operate the following solids treatment processes:
  - a. Anaerobic digestion process
  - b. Mechanical dewatering processes (e.g., presses, centrifuges)
  - c. Solids thickening processes (e.g., DAF, belt, rotary drum)



2 Recall



4 Application



4 Analysis

## Security, Safety, & Administrative Procedures

### Job Tasks Included in this Content Area:

1. Adhere to established safety procedures (e.g., lock-out / tag-out, confined space, hazard communication, fall protection)
2. Assist in the selection of equipment for use in wastewater processing
3. Assist with budget preparation
4. Assist with the industrial pretreatment program in regard to effluent quality standards
5. Complete operation reports
6. Complete required regulatory reports
7. Ensure compliance with all applicable regulations
8. Generate maintenance reports (e.g., daily, monthly, annual)
9. Identify personnel training needs
10. Implement spill notification policy
11. Manage plant staff
12. Participate in studies related to increasing capacity, changes in treatment requirements or facility upgrades
13. Receive chemical deliveries and store
14. Respond to customer service requests and complaints
15. Schedule routine activities (e.g., maintenance, operations)
16. Update spill notification policy
17. Update Standard Operating Procedures (SOPs)



## Supporting Knowledge

The chart below outlines several types of knowledge that support the performance of the job tasks on which you may be tested. These types of knowledge are rated at one of three levels to represent the extent of knowledge needed to perform the job tasks assigned to each Content Area:

**Basic** – A fundamental or lower level of knowledge is required. Operators performing tasks requiring this level of knowledge will be able to do so with some training; this level of knowledge may also be acquired and developed through job experience. Such tasks may be routine, utilizing established procedures, and have a low level of complexity. Not having this level of knowledge will have minimal impact or significance on the performance of the tasks listed in the Content Area, or on public safety and welfare.

**Intermediate** – A level of knowledge beyond the basic level is required. Operators performing tasks requiring this level of knowledge will be able to do so with training beyond that of the basic level. The operator will not only be able to apply required fundamental concepts, but will be able to understand and discuss the application and implications of changes to processes, policies, and procedures within the Content Area. Not having this level of knowledge will have a significant impact on the performance of the job and on public safety and welfare.

**Advanced** – A very high level of knowledge/job expertise is required and the operator will be functioning at an expert level. The operator can apply all fundamental, as well as highly developed or complex concepts, and will be able to design, review, and evaluate processes, policies, and procedures within the Content Area. Not having this level of knowledge will have a serious impact on the performance of the job and will be very harmful to public safety and welfare.

Supporting Knowledge Type	Laboratory Analysis (20%)*	Equipment Evaluation & Maintenance (15%)*	Equipment Operation (20%)*	Treatment Process Monitoring, Evaluation & Adjustment (35%)*	Security, Safety, & Administrative Procedures (10%)*
Aeration principles (e.g. mixing, mechanical, diffusers)		Intermediate	Advanced	Advanced	Basic
Bacteriological laboratory testing (e.g. coliform, fecal, E coli)	Advanced			Advanced	Intermediate
Biological laboratory testing (e.g. BOD, SOUR, CBOD)	Advanced			Advanced	Intermediate
Biosolids disposal and monitoring requirements	Advanced			Advanced	Advanced
Chemical handling and storage		Advanced	Advanced		Basic
Chemical laboratory testing (e.g. ammonia, phosphorous, alkalinity)	Advanced			Advanced	Intermediate
Chlorinators (e.g. gas, liquid)		Advanced	Advanced	Advanced	Intermediate
Clarifiers		Advanced	Advanced	Advanced	Basic
Comminuters		Advanced	Advanced	Advanced	Basic
Conveyors		Advanced	Advanced	Advanced	Basic
Dewatering equipment (e.g. centerfuges, presses, drying beds)		Advanced	Advanced	Advanced	Basic
Documentation and record keeping	Advanced	Advanced		Advanced	Advanced

Supporting Knowledge Type	Laboratory Analysis (15%)*	Equipment Evaluation & Maintenance (20%)*	Equipment Operation (25%)*	Treatment Process Monitoring, Evaluation & Adjustment (30%)*	Security, Safety, & Administrative Procedures (10%)*
Effluent disposal and monitoring requirements	Advanced			Advanced	Intermediate
Electrical principles (e.g. troubleshooting breakers, relays, circuits)		Intermediate	Advanced		Basic
Emergency preparedness		Advanced	Advanced		Advanced
Flow measuring devices (e.g. parshal flumes, mag meter, venturis)		Intermediate	Advanced	Advanced	
Grit removal processes (e.g. grit chamber, aeration, cyclone)		Advanced	Advanced	Advanced	Intermediate
Heavy equipment (e.g. operation, preventative maintenance)		Intermediate	Advanced		Basic
Hydraulic principles (e.g. mass flow balance, detention time, loading, velocity, HRT)		Intermediate	Advanced	Advanced	
Industry safety practices (e.g. PPE, confined space, fall arrest, lock-out/tag-out)	Advanced	Advanced	Advanced		Intermediate
Influent monitoring and waste characteristics	Advanced			Advanced	Advanced
Maintenance practices (e.g. preventive, reactive, predictive)		Advanced	Advanced		Intermediate
Ozone generation equipment		Intermediate	Advanced	Advanced	Basic
Physical laboratory testing (e.g. temperature, solids, DO)	Advanced			Advanced	Intermediate
Pneumatic principles (e.g. troubleshooting actuators, compressors, sprayers)		Intermediate	Advanced	Advanced	Basic
Primary treatment processes (e.g. ponds, sedimentation basins)		Advanced	Advanced	Advanced	Intermediate
Principles of asset management (e.g. preventive, reactive, predictive maintenance)		Advanced	Advanced	Advanced	Intermediate
Process control instrumentation (e.g. PLCs, SCADA, continuous online monitoring)	Advanced	Intermediate	Advanced	Advanced	
Quality control / quality assurance practices	Advanced			Advanced	Intermediate
Screening technology (e.g. bar screens, micro screens)		Intermediate	Advanced	Advanced	Basic
Secondary treatment processes (e.g. activated sludge, MBR, SBR)		Advanced	Advanced	Advanced	Intermediate
Solids treatment concepts (e.g. dewatering, digestion, thickening)		Advanced	Advanced	Advanced	
Tertiary treatment processes (e.g. media filtration, disinfection, post aeration, reclaimed recharge)		Advanced	Advanced	Advanced	Intermediate
Treatment equipment (e.g. pumps, motors, generators)		Advanced	Advanced	Advanced	Basic
Wastewater treatment practices (e.g. sludge age, SRT, MCRT, F/M ratio)	Advanced			Advanced	

\*Percent of exam associated with the Content Area



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