

# NEED-TO-KNOW CRITERIA

# Wastewater Treatment Operator Class III

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

**ABC Wastewater Treatment Operator Class III Certification Exam** 



The Associated Boards of Certification

Superior Water Starts Here™

### **Before You Dive In...**

#### What is the Need-to-Know Criteria?

This ABC Wastewater Treatment Operator Class III Need-to-Know Criteria was developed to assist operators in understanding the content that will be covered in the ABC Standardized Wastewater Treatment Operator Class III 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?

WPI offers a variety of standardized and customized exam services. This document is reflective only of the ABC Standardized Wastewater Treatment Operator Class III 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 WPI 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 **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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### Wastewater Treatment Operator Class III Need-to-Know Criteria

#### **EXAM CONTENT**

The Wastewater Treatment Operator Class III 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.



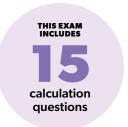
**Application** – tasks at this level will involve some basic problem solving, calculations, or the interpretation and application of data. You may be asked to calculate, categorize, classify, compare, differentiate, explain, specify, translate, and/or apply knowledge.



**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<br>QUESTIONS | CONTENT AREA  | JOB TASK<br>COMPLEXITY<br>LEVELS |
|------------------------|---|----------------------------------|
| 15                     | Laboratory Analysis                                       | © 2                              |
| 20                     | Equipment Evaluation<br>& Maintenance                     | © 6                              |
| 25                     | Equipment Operation                                       | © 5                              |
| 30                     | Treatment Process Monitoring,<br>Evaluation, & Adjustment | © 5                              |
| 10                     | Security, Safety, &<br>Administrative Procedures          | <ul><li></li></ul>               |
| 100*                   | Total   | © 22                             |

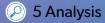


\*Your exam may contain up to 10 extra unscored pre-test questions (see *Before You Dive* In for more details).









## 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:

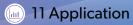
- a. Bacteriological analyses
- b. Biological analyses (e.g., BOD, CBOD)
- c. Chemical analyses (e.g., COD, nutrients, metals)
- d. Physical analyses
- e. Process control laboratory testing
- f. Required regulatory laboratory testing

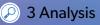
#### 4. Interpret data from the following:

- 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)









## **Equipment Evaluation & Maintenance Job Tasks Included in this Content Area:**

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 flow meters
- 5. Monitor telemetry systems
- 6. Perform basic electrical troubleshooting
- 7. Perform preventive maintenance on equipment
- 8. Inspect the following equipment:
  - a. Aeration basins
  - b. Aeration systems(e.g., blowers, surface aerators, diffusors)
  - c. Air compressors
  - d. Anaerobic digesters
  - e. Analyzers (e.g., DO, pH, H2S, ORP)
  - f. Bar screens
  - g. Chemical feed systems (e.g., polymer, ferric)
  - h. Chlorination systems
  - Clarifiers/sedimentation basins
  - j. Conveyors
  - k. Dechlorination systems
  - I. Disinfection equipment (e.g., UV, ozone)
  - m. Flow equalization systems
  - n. Gates and valves
  - o. Generators
  - p. Grit removal processes
  - q. Hand tools
  - r. Heavy equipment
  - s. Hoists and cranes
  - t. Instrumentation (e.g., flow, pressure, telemetry)
  - Mechanical dewatering equipment (e.g., presses, centrifuges)
  - v. Mixers
  - w. Motors
  - x. Odor control devices (e.g., biofilters, scrubbers)
  - v. Power tools
  - z. Pumps centrifugal
  - aa. Pumps positive displacement

- bb. Supervisory Control and Data Acquisition (SCADA) systems
- cc. Solids thickening processes (e.g., DAF, belt, rotary drum)
- dd. Suspended growth (e.g., activated sludge, MBR, SBR)

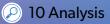
#### 9. Maintain the following equipment:

- a. Aeration basins
- b. Aeration systems(e.g., blowers, surface aerators, diffusors)
- c. Air compressors
- d. Anaerobic digesters
- e. Analyzers (e.g., DO, pH, H2S, ORP)
- f. Bar screens
- g. Chemical feed systems (e.g., polymer, ferric)
- h. Chlorination systems
- i. Clarifiers/sedimentation basins
- j. Conveyors
- k. Dechlorination systems
- I. Disinfection equipment (e.g., UV, ozone)
- m. Flow equalization systems
- n. Gates and valves
- o. Generators
- p. Grit removal processes
- q. Hand tools
- r. Heavy equipment
- s. Hoists and cranes
- t. Instrumentation (e.g., flow, pressure, telemetry)
- Mechanical dewatering equipment (e.g., presses, centrifuges)
- v. Mixers
- w. Motors
- x. Power tools
- y. Pumps centrifugal
- z. Pumps positive displacement
- aa. Supervisory Control and Data Acquisition (SCADA) systems
- bb. Solids thickening processes (e.g., DAF, belt, rotary drum)
- cc. Suspended growth (e.g., activated sludge, MBR, SBR)









# **Equipment Operation**Job Tasks Included in this Content Area:

- Analyze data to evaluate and adjust equipment
- 2. Check filters for proper operation
- 3. Conduct wastewater pipe repairs
- 4. Follow safety rules and guidelines when working with chemical equipment
- 5. Follow safety rules and guidelines when working with mechanical equipment
- 6. Follow Standard Operating Procedures (SOPs)
- 7. Monitor lift stations to ensure equipment is operating properly
- 8. Monitor motor control center
- 9. Transport biosolids offsite for disposal/reuse

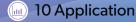
#### 10. Operate the following:

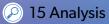
- a. Aeration basins
- b. Aeration systems(e.g., blowers, surface aerators, diffusors)
- c. Air compressors
- d. Anaerobic digesters
- e. Analyzers (e.g., DO, pH, H2S, ORP)
- f. Bar screens
- g. Chemical feed systems (e.g., polymer, ferric)
- h. Chlorination systems
- i. Clarifiers/sedimentation basins
- j. Conveyors
- k. Dechlorination systems
- I. Disinfection equipment (e.g., UV, ozone)
- m. Flow equalization systems
- n. Gates and valves
- o. Generators
- p. Grit removal processes

- g. Hand tools
- r. Heavy equipment
- s. Hoists and cranes
- t. Instrumentation (e.g., flow, pressure, telemetry)
- u. Mechanical dewatering equipment (e.g., presses, centrifuges)
- v. Mixers
- w. Motors
- x. Odor control devices (e.g., biofilters, scrubbers)
- y. Power tools
- z. Pumps centrifugal
- aa. Pumps positive displacement
- bb. Supervisory Control and Data Acquisition (SCADA) systems
- cc. Solids thickening processes (e.g., DAF, belt, rotary drum)
- dd. Suspended growth (e.g., activated sludge, MBR, SBR)







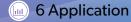


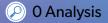
### Treatment Process Monitoring, Evaluation, & Adjustment Job Tasks Included in this Content Area:

- 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
- Operate chemical feed systems (e.g., polymer, ferric)
- 6. Operate Supervisory Control and Data Acquisition (SCADA) systems
- Operate the preliminary treatment processes (e.g., screening, grit, flow equalization)
- 8. Operate the primary clarification/ sedimentation processes
- 9. Operate the following secondary treatment processes:
  - a. Secondary clarification/sedimentation processes
  - b. Extended aeration processes(e.g., package, SBR, oxidation ditch)
  - c. Conventional activated sludge processes (e.g., step feed, plug flow, complete mix, MBR)
- 10. Operate the nutrient removal systems
- 11. Operate the following disinfection treatment processes:
  - a. Chlorination processes
  - b. Dechlorination processes
  - c. Disinfection processes (e.g., UV, ozone)
- 12. Operate the following solids treatment processes:
  - a. Anaerobic digestion process
  - Mechanical dewatering processes (e.g., presses, centrifuges)
  - c. Solids thickening processes (e.g., DAF, belt, rotary drum)









# Security, Safety, & Administrative Procedures Job Tasks Included in this Content Area:

- 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. Complete operation reports
- 4. Complete required regulatory reports
- 5. Conduct routine security checks
- 6. Ensure compliance with all applicable regulations
- Generate maintenance reports (e.g., daily, monthly, annual)
- 8. Implement spill notification policy
- 9. Inspect SCBA equipment
- 10. Manage plant staff
- 11. Participate in studies related to increasing capacity, changes in treatment requirements, or facility upgrades
- 12. Receive chemical deliveries and store
- 13. Respond to customer service requests and complaints
- **14. Schedule routine activities** (e.g., maintenance, operations)
- 15. Update spill notification policy
- 16. 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<br>Analysis<br>(15%)* | Equipment<br>Evaluation &<br>Maintenance<br>(20%)* | Equipment<br>Operation<br>(25%)* | Treatment Process Monitoring, Evaluation, & Adjustment (30%)* | Security,<br>Safety, &<br>Administrative<br>Procedures<br>(10%)* |
|--|----------------------------------|--|----------------------------------|---|--|
| Aeration principles (e.g., mixing, mechanical, diffusers)            |                                  | Intermediate                                       | Intermediate                     | Intermediate  | Basic  |
| Bacteriological laboratory testing (e.g., coliform, fecal, E. coli)  | Intermediate                     |  |                                  | Intermediate  | Intermediate   |
| Biological laboratory testing (e.g., BOD, SOUR, CBOD)                | Intermediate                     |  |                                  | Intermediate  | Intermediate   |
| Biosolids disposal and monitoring requirements                       | Intermediate                     |  |                                  | Intermediate  | Intermediate   |
| Chemical handling and storage  |                                  | Intermediate                                       | Intermediate                     |   | Basic  |
| Chemical laboratory testing (e.g., ammonia, phosphorous, alkalinity) | Intermediate                     |  |                                  | Intermediate  | Intermediate   |
| Chlorinators (e.g., gas, liquid)                                     |                                  | Intermediate                                       | Intermediate                     | Intermediate  | Intermediate   |
| Clarifiers   |                                  | Intermediate                                       | Intermediate                     | Intermediate  | Basic  |
| Comminutors  |                                  | Intermediate                                       | Intermediate                     | Intermediate  | Basic  |
| Conveyors  |                                  | Intermediate                                       | Intermediate                     | Intermediate  | Basic  |
| Dewatering equipment (e.g., centrifuges, presses, drying beds)       |                                  | Intermediate                                       | Intermediate                     | Intermediate  | Basic  |

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

<sup>\*</sup>Percent of exam associated with the Content Area





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