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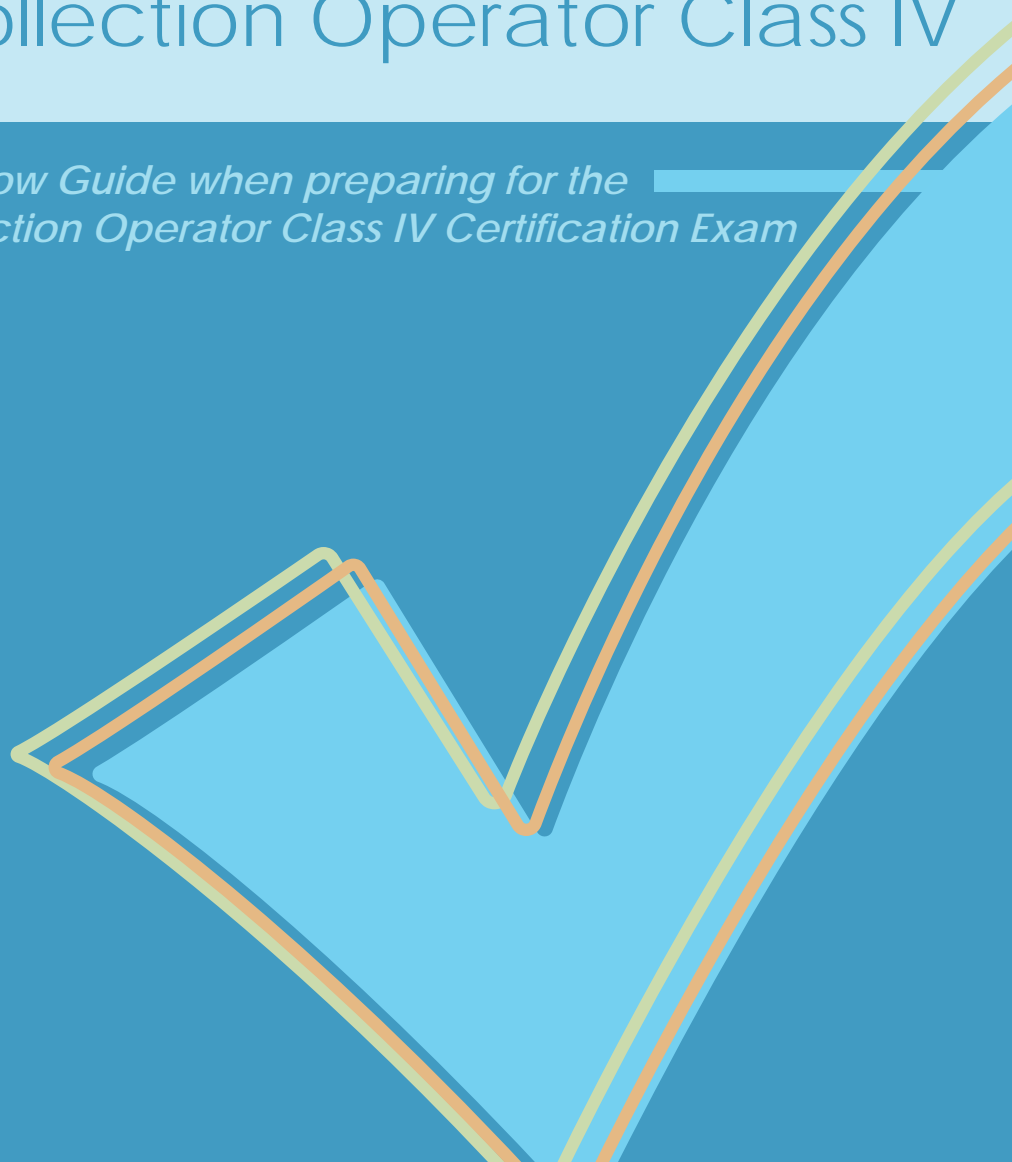
Association of
Boards of Certification

2017

Need-to-Know Criteria

Wastewater Collection Operator Class IV

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



Before You Dive In...

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

This ABC Wastewater Collection Operator Class IV Need-to-Know Criteria was developed to assist operators in understanding the content that will be covered in ABC's 2017 Standardized Wastewater Collection Operator Class IV exam. During 2014-2016, a methodical and comprehensive international investigation was conducted to determine the most significant job tasks performed by wastewater collection 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 2017 edition of the ABC Standardized Wastewater Collection 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 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 Collection Operator Class IV Need-to-Know Criteria



















Exam Content

The Wastewater Collection 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 collection 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
25	Equipment Operation, Evaluation, & Maintenance	 5  15  5
25	Collection System Operation, Maintenance, & Restoration	 5  15  5
15	Lift Station Operation & Maintenance	 3  7  5
15	Collection System Monitoring, Evaluation, & Adjustment	 3  9  3
20	Security, Safety, & Administrative Procedures	 4  4  12
100*	Total	 20  50  30

This exam includes
15
calculation questions

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



5 Recall



15 Application



5 Analysis

Equipment Operation, Evaluation, & Maintenance

Job Tasks Included in this Content Area:

1. Adjust and calibrate gas meters, flow meters, and blower meters
2. Calibrate and adjust pneumatic equipment systems
3. Clean the collection system through the use of:
 - a. Hydraulic cleaning (e.g., balling, flushing, poly pigs)
 - b. Jet rodding
 - c. Blockage removal
 - d. Rodding
 - e. Root control using chemical addition
4. Operate the following equipment:
 - a. Computers
 - b. Heavy equipment (e.g., vehicles requiring a CDL license)
5. Evaluate and maintain the operation of equipment by:
 - a. Inspecting abnormal conditions
 - b. Measuring temperature
 - c. Reading charts
 - d. Reading gauges
 - e. Reading meters
6. Evaluate and maintain the operation of electrical equipment:
 - a. Variable frequency drives (VFD's)
 - b. Motor control centers
 - c. Low voltage equipment (e.g., flow meters, float switch, PID controls, pressure sensors)
7. Inspect system using the following approaches:
 - a. Dye testing
 - b. Physical inspection
 - c. Smoke test
8. Rehabilitate and repair collection system:
 - a. Lift station (e.g., wet wells, fittings and piping)
 - b. Manholes
 - c. Sewer lines
 - d. Taps (e.g., top hat, grouting, protruding laterals)
 - e. Infiltration, inflow, exfiltration
9. Inspect equipment or monitor operating conditions, meters, and gauges to determine load requirements and detect malfunctions of lift station
10. Inspect the operation of equipment to determine malfunction
11. Perform system inspections (e.g., air release valves, inlets, manholes, outfalls, overflows, regulators, siphons, sluice gates)
12. Perform preventative maintenance including repair, replacement, and installation of the following equipment:
 - a. Chemical feed systems
 - b. Motors
 - c. Pumps
 - d. Valves
 - e. Compressors
 - f. Engines
 - g. Gearboxes
 - h. Generators
 - i. Pneumatic and hydraulic systems
13. Operate the following equipment and/or tools:
 - a. Aeration tanks and blowers
 - b. Air compressors
 - c. Backflow prevention devices
 - d. Backhoes

- e. Chain pull hoists and overhead cranes
- f. Chemical feed systems
- g. Chlorination systems
- h. Dump trucks
- i. Pumps (fixed and portable, all types)
- j. Engines
- k. Flushing unit (dumping water into the system)
- l. Front-end loaders
- m. Hydrant operations
- n. Hydraulic equipment (e.g., jacks, press, compactor)
- o. Metal detectors and pipe locators
- p. Pneumatic tools
- q. Power tools (e.g., drills, grinders, saws)
- r. Precision measuring instruments
- s. Rodding equipment
- t. Manhole guide rollers
- u. Samplers
- v. Tapping equipment
- w. Testing equipment
- x. Welding equipment (e.g., MIG, TIG, arc, plasma, oxy acetylene)
- y. Fans (e.g., forced air, air extraction)
- z. Easement hydro-jetter machine (portable)



5 Recall



15 Application



5 Analysis

Collection System Operation, Maintenance, & Restoration

Job Tasks Included in this Content Area:

1. Clean and maintain tanks (e.g., wetwells, chemical, holding)
2. Collect and document data from charts, gauges and other instrumentation
3. Excavate wastewater mains and lines
4. Use high pressure hydraulics to clean wastewater mains and lines
5. Inspect structures (e.g., manholes, vaults, wet wells for damage, cave-ins, and debris)
6. Interpret blueprints, GIS and sketches of system showing location and configuration of collection system components
7. Lubricate engines and pumps
8. Maintain all equipment (e.g., pumps, motors, chlorinators, chemical feeds) in accordance with OEM specifications
9. Maintain an inventory of chemicals and materials
10. Monitor panel board and adjust controls to regulate flow rates
11. Monitor CSO basin operations and functions and adjust as necessary
12. Operate pumping equipment during emergency bypass operations
13. Operate odor control devices and systems
14. Perform maintenance and inspection through the use of:
 - a. Hydraulic cleaning
 - b. Rodding
 - c. Closed circuit television (CCTV) camera inspection and locating



3 Recall



7 Application



5 Analysis

Lift Station Operation & Maintenance

Job Tasks Included in this Content Area:

1. Ensure that the following electrical devices are functioning properly:
 - a. Fuses
 - b. Motors
 - c. Relays
 - d. Starters
2. Ensure that the following electronic devices are functioning properly:
 - a. Alarms
 - b. Controllers
 - c. Gas detection
 - d. Level detection system
 - e. Telemetry (e.g., RTU's, SCADA, PLC's)
3. Ensure that the following devices are functioning properly:
 - a. Piping
 - b. Pressure relief valves (e.g., compressors, hot water heaters)
 - c. Chemical addition
 - d. Pumps
 - e. Valves
 - f. Wetwells (e.g., screens and level controls)
 - g. Air relief/vacuum valves (force mains)
 - h. Seals
 - i. Air exchangers/exhaust fans
 - j. HVAC systems
4. Adjust equipment and increase or decrease pumping capacity for proper flow
5. Perform calculations to ensure proper operations
6. Calibrate and adjust variable frequency drive (VFD) systems
7. Monitor panel board and adjust controls to:
 - a. Loss of head pressure
 - b. Wetwell elevation
8. Operate the following equipment and/or tools:
 - a. Bar screens
 - b. Wetwells
 - c. Variable frequency drives (VFD's)
 - d. Electric motors



3 Recall



9 Application



3 Analysis

Collection System Monitoring, Evaluation, & Adjustment

Job Tasks Included in this Content Area:

1. Perform adjustments on the following components of the collection system:
 - a. Aeration for hydrogen sulfide control
 - b. Biological filters for odor control
 - c. Chemical addition for hydrogen sulfide control
 - d. Flow monitoring
 - e. Force mains
 - f. Gravity sewers
 - g. Lift stations
 - h. Manholes/cleanouts
 - i. Measuring and control systems
 - j. Pressure sewers (S.T.E.P.)
 - k. Vacuum sewers
2. Analyze and adjust chemical feed devices that inject specified amounts of chemicals into sewer systems
3. Analyze ongoing collection system operations for defects
4. Assist lab technician in the collection of wastewater and perform field/laboratory tests and analyses
5. Calibrate and adjust the following systems:
 - a. Aeration systems
 - b. Atmosphere testers
 - c. PID loop controllers
 - d. Programmable Logic Controllers (PLC's)
 - e. Supervisory Control and Data Acquisition (SCADA)
 - f. Level and flow meters
 - g. Telemetry equipment
6. Check equalization basins and CSO structures
7. Ensure accurate sampling of waste collection system according to standard methods
8. Identify physical and/or abnormal characteristics of wastewater
9. Inspect the installation of piping
10. Operate electric motors, pumps, and valves to regulate flow
11. Repair and replace:
 - a. Sewer lines
 - b. Combined sewer lines
12. Review automated information and control system data and revise settings as required
13. Utilize wastewater analysis devices for chemical detection in collection systems (e.g., nitrate, hydrogen sulfide, pH, phosphorous)
14. Operate flow sensors



4 Recall
4 Application
12 Analysis

Security, Safety, & Administrative Procedures




Job Tasks Included in this Content Area:

1. Analyze/estimate cost (e.g., equipment, material, power, fuel, staffing)
2. Analyze regulatory and/or compliance requirements
3. Assign work crews to work areas
4. Assist in the handling, delivery, and storage of chemicals
5. Authorize equipment repairs
6. Calculate cleaning and production rates
7. Compile technical and statistical data and prepare comprehensive written reports
8. Comply with all health and safety procedures and protocols
9. Conduct safety inspections
10. Configure traffic plans and set up signs for traffic control
11. Coordinate wastewater program activities with other divisions and outside agencies, contractors, and developers
12. Determine work schedules for closed circuit television (CCTV) crews
13. Determine location of underground utilities (e.g., combined sewers, cross connections, force mains, inlets laterals, manholes, outfalls, sanitary sewers, laterals)
14. Determine shift schedules and assign work crews to ensure continuity of operation
15. Develop operating and capital budgets
16. Develop preventive maintenance procedures
17. Develop safety procedures
18. Develop training programs (e.g., start-up and testing, standard operating procedures, and technical documentation for operations)
19. Comply with safety standards and safety programs
20. Ensure compliance of discharge limits are in accordance with all applicable local, state and federal regulations
21. Establish wastewater policies, procedures, and guidelines
22. Assess training needs to upgrade operational skills
23. Implement a QA/QC program to ensure that products and services received meet contractual requirements
24. Inspect and analyze system logs records, gauges, meters, and other testing and measuring devices
25. Investigate various customer issues (e.g., sewer backup and/or odor complaints)
26. Maintain knowledge of regulatory permit requirements
27. Maintain effective working relationships with city officials, employees, public, and outside agencies
28. Manage employee certification programs
29. Maintain knowledge of cost accounting and budget procedures and practices
30. Maintain records and file reports (e.g., internal or regulatory requirements)
31. Maintain knowledge of current regulatory requirements
32. Monitor status of customer work orders and assure customer responsiveness
33. Monitor work and job site condition to ensure protection of workers, public pedestrian and vehicular traffic
34. Perform the following administrative activities:
 - a. Safety/security evaluation and compliance
 - b. Budget development
 - c. Capital improvement plan development
 - d. Operation and maintenance plan development
 - e. Employee supervision and performance evaluations
 - f. Employee hiring
 - g. Planning and organization of work activities
 - h. Record keeping and evaluation of data
 - i. Responses to public complaints
 - j. Report writing (e.g., federal, internal, state)

35. Perform the following safety procedures:
 - a. Calibration of atmospheric testing devices
 - b. Chemical spill responses
 - c. Confined space entry
 - d. Electrical grounding, hazards and arc flash
 - e. Fires (e.g., prevention, fire extinguishers)
 - f. First aid
 - g. Hazardous materials
 - h. Infectious diseases/blood borne pathogen protection
 - i. Lifting
 - j. Lockout/tagout
 - k. Personal protection equipment (e.g., respiratory protection, safety glasses, gloves, hardhats, fall protection)
 - l. Shoring, trenching, and excavation
 - m. Traffic control/work zone safety
36. Plan for the execution of the following emergency plans:
 - a. Sewer overflow
 - b. Disasters
 - c. Manhole hazards
 - d. System failure
 - e. Inter-agency assistance
37. Perform facility safety audits
38. Prepare bid specifications
39. Purchase replacement equipment
40. Review/update employment policies and procedures
41. Review employee reports regarding customer back up in home
42. Train new operators
43. Review easement and right-of-way issues/problems

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	Equipment Operation, Evaluation, & Maintenance (25%)*	Collection System Operation, Maintenance, & Restoration (25%)*	Lift Station Operation & Maintenance (15%)*	Collection System Monitoring, Evaluation, & Adjustment (15%)*	Security, Safety, & Administrative Procedures (20%)*
Aerobic and Anaerobic principles (e.g., wetwells, diffusers, surge basins, available oxygen)	Intermediate		Intermediate	Intermediate	
Backflow cross-connection and prevention		Intermediate			Intermediate
Biology (e.g., bloodborne pathogens, hydrogen sulfide formation, odors, wastewater characteristics)					Intermediate
Biological laboratory testing (e.g., BOD, COD, DO, pH, sampling, identification, oil, grease)				Intermediate	
Chemistry (e.g., chemical addition, odor and corrosion control)				Intermediate	
Hydraulic principles (e.g., pump operation, pressures, pipe capacity, velocity, storage time, surcharging)	Intermediate	Intermediate	Intermediate	Advanced	
Laboratory techniques (e.g., grab and composite sampling, sample preservation)				Intermediate	
Mechanical principles (e.g., lift station pumps, engines, air exchangers, continuous rodders)	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate
Blueprint reading (e.g., service connections, as built plans, process and instrumentation diagrams)	Intermediate	Intermediate	Intermediate	Intermediate	
Building codes (e.g., easements/right-of-ways and sewer use ordinances, pipe specifications and inspections)		Intermediate		Intermediate	Intermediate
Chemical properties (e.g., chlorine, hydrogen sulfide, methane, carbon monoxide, oxygen)				Intermediate	Advanced

Supporting Knowledge Type	Equipment Operation, Evaluation, & Maintenance (23%)*	Collection System Operation, Maintenance, & Restoration (23%)*	Lift Station Operation & Maintenance (15%)*	Collection System Monitoring, Evaluation, & Adjustment (15%)*	Security, Safety, & Administrative Procedures (24%)*
Chemical metering (e.g., gas, liquids, solids)	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate
Comminuters, grinders, bar screens	Intermediate	Intermediate	Intermediate	Intermediate	
Computer operations (SCADA systems, telemetry, flow metering, computerized maintenance management systems)	Advanced	Advanced	Advanced	Advanced	Advanced
Contaminants (e.g., volatile organics, high temperatures, viscous materials)		Intermediate	Intermediate	Intermediate	Intermediate
Contract negotiation (e.g., vendors, pre-treatment negotiations, union contracts)					Intermediate
Corrosion control process (e.g., cathodic protection, hydrogen sulfide, manhole and pipe rehabilitation)	Advanced	Advanced	Advanced	Advanced	Advanced
Disinfection concepts (e.g., chlorination, hydrogen peroxide addition, personal hygiene)					Intermediate
Electrical principles (e.g. troubleshooting breakers, relays, circuits)	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate
Employment laws					Intermediate
Flow measuring devices (e.g., parshal flumes, mag meter, flow meters, venturis)	Intermediate	Intermediate	Intermediate	Intermediate	
Lubricants and fluids	Intermediate	Basic	Intermediate	Basic	
Maintenance practices (e.g., preventative, reactive, predictive)	Advanced	Advanced	Advanced	Advanced	Intermediate
Safety Data Sheets					Advanced
Normal characteristics of wastewater (e.g., color, odor, concentration, aerobic, anaerobic, wastestream, per capita contributions)		Intermediate	Intermediate	Intermediate	Intermediate
Normal chemical ranges			Intermediate	Intermediate	
Pneumatic principles (e.g., troubleshooting actuators, compressors, sprayers)	Intermediate	Intermediate	Intermediate		
Pipe fittings and joining methods (e.g., pipeline construction principles)		Advanced			Intermediate
Piping material type and size (e.g., PVC, CMP, RCP)		Intermediate			Intermediate
Principles of asset management (e.g., preventive, reactive, predictive maintenance)	Intermediate	Intermediate	Intermediate	Intermediate	Advanced
Principles of finance (e.g., bonds, rate structures)					Intermediate
Principles of supervision					Advanced
Process control instrumentation (e.g., PLCs, SCADA, continuous online monitoring)	Intermediate	Intermediate	Intermediate	Intermediate	
Public administration practices (e.g., open meeting laws, record keeping, budgeting, notifications, reporting requirements)					Advanced
Risk management (e.g., natural, man-made, overflow response plans)					Advanced
Sanitary survey processes (e.g., I & I, collection system operation)					Advanced
Start-up and shut-down procedures (e.g., lift stations)	Advanced		Advanced		
Wastewater collection design parameters (e.g., slope, distances between manholes, pipe specifications)		Advanced			Advanced
Pipeline cleaning (e.g., mechanical, hydraulic)	Intermediate	Intermediate	Intermediate	Intermediate	
Sanitary sewer overflows (e.g., SSO, CSO)	Basic	Advanced	Intermediate	Advanced	Advanced

*Percent of exam associated with the Content Area



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