



## **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 water treatment and water distribution 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:

<b>Montana Distribution Exam</b>	<b>ABC Distribution Equivalent</b>
Class 3A	Class I

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:

- Water Operator Certification Study Guide
  - AWWA publication (see contact and order information on last page or go to [www.awwa.org](http://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.



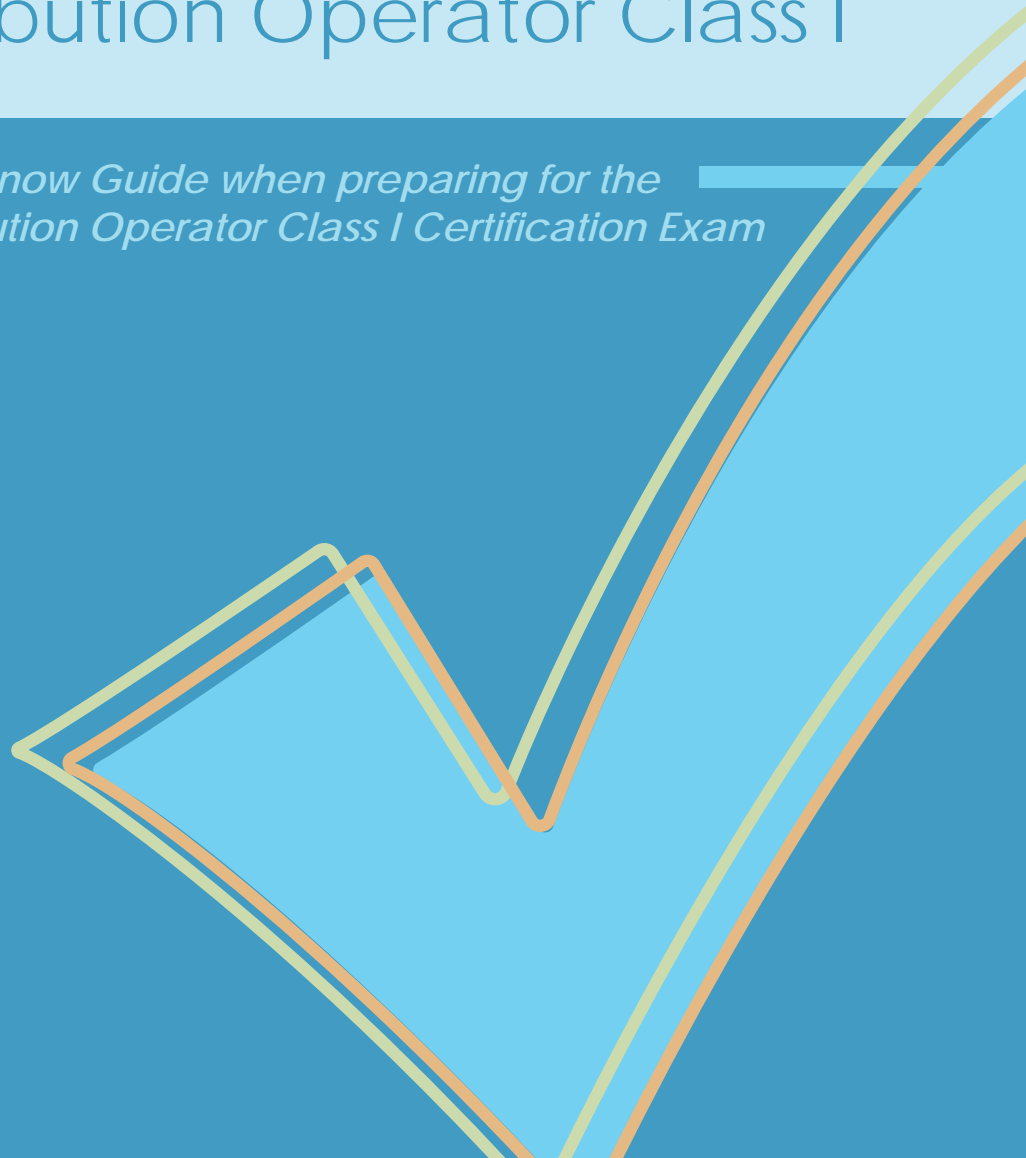
# ABC

Association of  
Boards of Certification

2017

## Need-to-Know Criteria Water Distribution Operator Class I

*A Need-to-Know Guide when preparing for the  
ABC Water Distribution Operator Class I Certification Exam*



## Before You Dive In...

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

This *ABC Water Distribution Operator Class I Need-to-Know Criteria* was developed to assist operators in understanding the content that will be covered in ABC's 2017 Standardized Water Distribution Operator Class I exam. During 2014-2016, a methodical and comprehensive international investigation was conducted to determine the most significant job tasks performed by water distribution 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 Water Distribution Operator Class I 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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# Water Distribution Operator Class I Need-to-Know Criteria






## Exam Content

The Water Distribution Operator Class I 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 water distribution 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	Distribution System Components	 10  15  0
24	Equipment Installation, Operation, & Maintenance	 10  14  0
27	Disinfection Monitoring, Evaluation, Adjustment, & Laboratory Analysis/ Interpretation	 19  8  0
24	Security, Safety, Administrative Procedures, & Public Interactions	 10  14  0
100*	Total	 49  51  0

This exam includes **8** calculation questions

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



10 Recall



15 Application



0 Analysis

## Distribution System Components

Job Tasks Included in this Content Area:

1. Aid in the design of water distribution projects
2. Assess water production (e.g., water restrictions and demand)
3. Adjust the water production to meet the demand (e.g., start pumps, adjust flow valves)
4. Understand backflow prevention and control devices
5. Implement a cross-connection control program
6. Monitor water distribution system pressure
7. Determine water volume (e.g., tank, main)
8. Determine water flow rate (e.g., mains, pumps, services)
9. Maintain an up-to-date map of the distribution system (e.g., GIS, repairs, replacements)
10. Maintain distribution system components:
  - a. Pumps and related equipment (e.g., packing pumps, starters and controls)
  - b. Mains and related equipment (e.g., hydrants and valves)
  - c. Metering and related equipment (e.g., remote readers, meter replacements)
  - d. Finished water storage and related equipment (e.g., tanks, overflow pipe, vents, access hatches)
11. Understand schematic diagrams



10 Recall



14 Application



0 Analysis

## Equipment Installation, Operation, & Maintenance

Job Tasks Included in this Content Area:

1. Install water lines:
  - a. Service lines (e.g., tapping, curb stops, corporation stops)
  - b. Water mains (e.g., valves, hydrants)
2. Inspect new construction
3. Maintain pump stations and related equipment (e.g., check valves, control systems)
4. Monitor pump stations and related equipment (e.g., records, online monitoring equipment)
5. Clean the finished water storage facilities
6. Inspect finished water storage facilities (e.g., drains, screens, corrosion control)
7. Conduct distribution system flushing
8. Repair water line (e.g., install repair clamps and sleeves)
9. Repair distribution components (e.g., mains, services, meters, valves, hydrants, pumps)
10. Disinfect components used during install/repairs
11. Conduct a leak detection program (e.g., survey, testing meters, water loss audit)
12. Operate well and related equipment
13. Maintain well and related equipment
14. Maintain the sanitary condition of the well
15. Measure static water levels and pumping water levels
16. Locate water lines (e.g., valves, hydrants)
17. Perform underground locating, marking, and notification



19 Recall



8 Application



0 Analysis

## Disinfection Monitoring, Evaluation, Adjustment, & Laboratory Analysis / Interpretation

Job Tasks Included in this Content Area:

1. Adjust the disinfection dosage
2. Perform routine maintenance on the disinfection equipment
3. Handle disinfection chemicals
4. Secure the disinfection chemicals (e.g., chain cylinders, lock the disinfection facility)
5. Maintain an adequate supply of the disinfection chemicals
6. Monitor the disinfection equipment
7. Collect samples to determine:
  - a. Chlorine residual
  - b. Microbiological
  - c. Lead/copper
  - d. pH
  - e. Radionuclides
  - f. Organic chemicals
  - g. Inorganic chemicals
  - h. Temperature
  - i. Disinfectant byproducts
8. Perform analyses to determine:
  - a. Chlorine residual
  - b. pH
  - c. Temperature
9. Interpret laboratory analysis for:
  - a. Chlorine residual
  - b. Chlorine demand
  - c. Microbiological
  - d. Lead/copper
  - e. pH
  - f. Organic chemicals
  - g. Inorganic chemicals
  - h. Temperature
  - i. Disinfectant byproducts
  - j. Compliance with established water quality standards
  - k. Meeting standard operating practices



10 Recall



14 Application



0 Analysis

## Security, Safety, Administrative Procedures, & Public Interactions




Job Tasks Included in this Content Area:

1. Participate in safety/compliance program
2. Perform traffic control during maintenance, repairs, and construction
3. Implement a confined space program
4. Communicate observed unsafe workplace conditions
5. Identify opportunities to mitigate risks
6. Work in or around excavation sites:
  - a. Implement cave-in protection program
  - b. Secure the excavation site
  - c. Excavate the site
  - d. Restore the excavation site
7. Work in and around confined spaces:
  - a. Implement a confined space program
  - b. Enter confined spaces
  - c. Monitor activities in and around confined spaces
8. Secure all water system facilities in a manner that protects the supply from contamination and prevents unauthorized entry and vandalism
9. Investigate system tampering
10. Maintain an emergency plan of operations
11. Maintain system records (e.g., laboratory, consumption, maintenance)
12. Interpret plans, maps, and system standard specifications
13. Participate in the budget process
14. Address water quality communications (e.g., taste, odor, color)
15. Conduct meter reading
16. Address customer inquiry (e.g., pressure, employee performance, billing)
17. Answer questions from the public
18. Participate in consumer confidence reports
19. Inform customers of planned repairs or changes in the water line



## 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	Distribution System Components (25%)*	Equipment Installation, Operation, & Maintenance (24%)*	Disinfection Monitoring, Evaluation, Adjustment, & Laboratory Analysis / Interpretation (27%)*	Security, Safety, Administrative Procedures, & Public Interactions (24%)*
Characteristics of chlorine and chlorine compounds (e.g., gas/liquid)			Intermediate	
Chlorination/dechlorination (e.g., safety, storage, handling, feeding, measurements)		Intermediate	Intermediate	Intermediate
Chlorine demand significance and relationship to dose			Basic	
Coliform group (e.g., monitoring, occurrence, significance)	Basic	Basic	Basic	Basic
Control systems (e.g., SCADA, pumps, valves)	Basic	Intermediate		
Corrosion control process (e.g., cathodic protection)	Intermediate	Intermediate		
Cross-connection control program and principles (e.g., surveys, method, devices)	Intermediate	Intermediate		Basic
Disinfection concepts (e.g., pipes, tanks, repairs, wells)	Intermediate	Intermediate	Intermediate	Intermediate
Emergency/contingency response plans	Basic	Basic	Intermediate	Intermediate

Supporting Knowledge Type	Distribution System Components (25%)*	Equipment Installation, Operation, & Maintenance (24%)*	Disinfection Monitoring, Evaluation, Adjustment, & Laboratory Analysis / Interpretation (27%)*	Security, Safety, Administrative Procedures, & Public Interactions (24%)*
Flow effect of pipe size, type, head loss, and C factor	Basic	Basic		
Groundwater and surface water supplies (e.g., water quality, characteristics)			Basic	
Hazards and safety requirements (e.g., confined space, excavation, trench safety)		Intermediate		Intermediate
Leak detection and repair (e.g., mains, service lines, meters)	Intermediate	Intermediate	Intermediate	Basic
Metering technologies (e.g., AMR, meter types)	Basic	Basic		
Monitoring requirements (e.g., water quality, pressure)		Basic	Intermediate	
Operation of laboratory field equipment (e.g., chlorine monitor, pH monitor)		Intermediate	Intermediate	
Piping materials (e.g., pipes, valves, hydrants, fittings, joints, restraints)	Intermediate	Intermediate		
Potential waterborne diseases (e.g., types, causes, prevention)			Basic	Basic
Proper sampling requirements and procedures		Intermediate	Intermediate	
Public notification requirements (e.g., CCR, advisories, violations)				Intermediate
Quality control/quality assurance practices (e.g., laboratory, field unit)		Intermediate	Intermediate	
Reporting requirements and frequency (e.g., CCR, samples)				Intermediate
Sanitary survey processes (e.g., system responsibilities, preparation)	Basic			Intermediate
Security practices and procedures	Basic			Intermediate
Source water protection (e.g., ground water, surface water)		Intermediate		Advanced
Standard disinfection methods (e.g., new/repared mains, storage facilities, wells)	Intermediate	Intermediate	Intermediate	
System damage prevention (e.g., water hammer, cavitation)	Basic	Basic		
System documents (e.g., as-builts, blueprint, records, GIS)	Intermediate			Intermediate
Tool selection/use (e.g., safety, efficiency)		Basic		Intermediate
Underground utility identification practices	Basic			Basic
Variable/positive displacement pumps (e.g., centrifugal, diaphragm, peristaltic)	Intermediate	Intermediate	Intermediate	
Water quality standards and compliance procedures (e.g., regional requirements, drinking water legislation)			Intermediate	Intermediate

Supporting Knowledge Type	Distribution System Components (25%)*	Equipment Installation, Operation, & Maintenance (24%)*	Disinfection Monitoring, Evaluation, Adjustment, & Laboratory Analysis / Interpretation (27%)*	Security, Safety, Administrative Procedures, & Public Interactions (24%)*
Water storage facilities (e.g., maintenance, security, operation)	Intermediate	Intermediate		Intermediate
Well operation, monitoring, and maintenance	Intermediate	Intermediate	Intermediate	Intermediate
Workplace safety rules, regulations, practices, and procedures		Intermediate		Advanced

\*Percent of exam associated with the Content Area



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## Water Distribution Operator Exam References

The following are approved as reference sources for the 2017 ABC standardized water distribution operator exams. Reference lists for prior generations of ABC standardized exams are included in the respective *Need-to-Know Criteria*.

### **American Water Works Association (AWWA)**

**<https://www.awwa.org/store/books.aspx>**

1-800-926-7337

- *\*WSO: Water Distribution Series (Grades 1 & 2, Grades 3 & 4)*
  - *Basic Science Concepts and Applications*
  - *Water Distribution Operator Training Handbook*
    - *Water Quality*
    - *Water System Security, A Field Guide*

\*These WSO texts replace previous AWWA title *Water Transmission and Distribution*. Visit [www.awwa.org/wso](http://www.awwa.org/wso) to learn more about transitioning between the guides.

### **Association of State Drinking Water Administrators (ASDWA) and National Rural Water Association (NRWA)**

**<https://www.asdwa.org/security/security-vulnerability-assessment-guides/>**

703-812-9505

- *Security Vulnerability Self-Assessment Guide for Small Drinking Water Systems*

### **California State University, Sacramento (CSUS) Foundation, Office of Water Programs**

**<http://www.owp.csus.edu/courses/drinking-water.php>**

**(916) 278-6142**

- *Small Water System Operation and Maintenance*
  - *Utility Management*
- *Water Distribution System Operation and Maintenance*
- *Water Treatment Plant Operation, Volume I and II*