BOARD FOR WATERWORKS AND WASTEWATER WORKS
OPERATORS AND ONSITE SEWAGE SYSTEM PROFESSIONALS

WATERWORKS AND WASTEWATER WORKS OPERATORS' EXAMINATIONS TASK FORCE

***Tentative* AGENDA FEBRUARY 2, 2023**
10:00 A.M. BOARD ROOM 2-- SECOND FLOOR

DEPARTMENT OF PROFESSIONAL AND OCCUPATIONAL REGULATION
PERIMETER CENTER -- 9960 MAYLAND DRIVE
RICHMOND, VIRGINIA 23233

I. CALL TO ORDER

II. EMERGENCY EVACUATION PROCEDURES

III. APPROVAL OF AGENDA
a. Task Force Agenda, February 2, 2023

IV. WELCOME AND INTRODUCTION OF TASK FORCE

V. PUBLIC COMMENT PERIOD

VI. RESOURCES AND INFORMATION
a. Statutes and Regulations
   1. Chapter 23 of Title 54.1 of the Code of Virginia
   2. Waterworks and Wastewater Works Operators Licensing Regulations
c. Examination "Need to Know" Criteria
   1. Waterworks Operator Class 1 *(WPI Class IV)*
   2. Waterworks Operator Class 2 *(WPI Class III)*
   3. Waterworks Operator Class 3 *(WPI Class II)*
   4. Waterworks Operator Class 4 *(WPI Class I)*
   5. Waterworks Operator Class 5 *(WPI Very Small Water Systems)*
   6. Wastewater Works Operator Class 1 *(WPI Class IV)*
   7. Wastewater Works Operator Class 2 *(WPI Class III)*
   8. Wastewater Works Operator Class 3 *(WPI Class II)*
   9. Wastewater Works Operator Class 4 *(WPI Class I)*
d. Examination Statistics
   1. Waterworks Operator
   2. Wastewater Works Operator
   3. Historical Statistic Data
   4. Examination Statistics from Other States
e. Training Courses and Exam Preparation
   1. Training Courses Currently Board-Approved for Pre-License Education Credit
   2. Post Exam Survey Questions and Statistics

VII. OVERVIEW OF SCOPE
a. Staffing Challenges
b. Reciprocity
c. Training Availability

VIII. RECESS

IX. DISCUSSION

a. Breakout Sessions
    1. Pass Rates
    2. Training
    3. Staffing Challenges
b. Review of Session Discussions
c. Plan for Next Meeting

X. COMPLETE CONFLICT OF INTEREST FORMS AND TRAVEL VOUCHERS

XI. ADJOURN

Persons desiring to participate in the meeting and requiring special accommodations or interpretative services should contact the Department at (804) 367-0362 at least ten days prior to the meeting so that suitable arrangements can be made for an appropriate accommodation. The Department fully complies with the Americans with Disabilities Act.

PERIMETER CENTER CONFERENCE CENTER
EMERGENCY EVACUATION OF BOARD AND TRAINING ROOMS
(Script to be read at the beginning of each meeting.)

PLEASE LISTEN TO THE FOLLOWING INSTRUCTIONS ABOUT EXITING THE PREMISES IN THE EVENT OF AN EMERGENCY.

In the event of a fire or other emergency requiring the evacuation of the building, alarms will sound. When the alarms sound, leave the room immediately. Follow any instructions given by Security staff

Board Room 1

Exit the room using one of the doors at the back of the room. Upon exiting the room, turn **RIGHT.** Follow the corridor to the emergency exit at the end of the hall.

Upon exiting the building, proceed straight ahead through the parking lot to the fence at the end of the lot. Wait there for further instructions.

Board Room 2

Exit the room using one of the doors at the back of the room. (Point) Upon exiting the room, turn **RIGHT.** Follow the corridor to the emergency exit at the end of the hall.

Upon exiting the building, proceed straight ahead through the parking lot to the fence at the end of the lot. Wait there for further instructions.

You may also exit the room using the side door, turn **Right** out the door and make an immediate **Left**. Follow the corridor to the emergency exit at the end of the hall.

Upon exiting the building, proceed straight ahead through the parking lot to the fence at the end of the lot. Wait there for further instructions.

Board Rooms 3 and 4

Exit the room using one of the doors at the back of the room. Upon exiting the room, turn **RIGHT.** Follow the corridor to the emergency exit at the end of the hall.

Upon exiting the building, proceed straight ahead through the parking lot to the fence at the end of the lot. Wait there for further instructions.

Training Room 1

Exit the room using one of the doors at the back of the room. Upon exiting the room, turn **LEFT.** Follow the corridor to the emergency exit at the end of the hall.

Upon exiting the building, proceed straight ahead through the parking lot to the fence at the end of the lot. Wait there for further instructions.

Training Room 2

Exit the room using one of the doors at the back of the room. Upon exiting the doors, turn **LEFT.** Follow the corridor to the emergency exit at the end of the hall.

Upon exiting the building, proceed straight ahead through the parking lot to the fence at the end of the lot. Wait there for further instructions.

WELCOME AND INTRODUCTION OF TASK FORCE

PUBLIC COMMENT PERIOD

Five minute public comment, per person, with the exception of any open disciplinary or application files.

Code of Virginia
Title 54.1. Professions and Occupations
Subtitle II. Professions and Occupations Regulated by the Department of Professional and Occupational Regulation and Boards within the Department

Chapter 23. Waterworks and Wastewater Works Operators

§ 54.1-2300. Definitions

As used in this chapter, unless the context requires a different meaning:

"Board" means the Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals.

"Onsite sewage system" means a conventional onsite sewage system or alternative onsite sewage system as defined in § 32.1-163.

"Operator" means any individual employed or appointed by any owner, and who is designated by such owner to be the person in responsible charge, such as a supervisor, a shift operator, or a substitute in charge, and whose duties include testing or evaluation to control waterworks or wastewater works operations or to operate and maintain onsite sewage systems. Not included in this definition are superintendents or directors of public works, city engineers, or other municipal or industrial officials whose duties do not include the actual operation or direct supervision of waterworks or wastewater works.

"Owner" means the Commonwealth of Virginia, or any political subdivision thereof, any public or private institution, corporation, association, firm or company organized or existing under the laws of this Commonwealth or of any other state or nation, or any person or group of persons acting individually or as a group, who own, manage, or maintain waterworks or wastewater works.

"Person" means any individual, group of individuals, a corporation, a partnership, a business trust, an association or other similar legal entity engaged in operating waterworks or wastewater works.

"Wastewater works" means each system of (i) sewerage systems or sewage treatment works, serving more than 400 persons, as set forth in § 62.1-44.18;(ii) sewerage systems or sewage treatment works serving fewer than 400 persons, as set forth in § 62.1-44.18, if so certified by the State Water Control Board; and (iii) facilities for discharge to state waters of industrial wastes or other wastes, if certified by the State Water Control Board.

"Waterworks" means each system of structures and appliances used in connection with the collection, storage, purification, and treatment of water for drinking or domestic use and the distribution thereof to the public, except distribution piping. Systems serving fewer than 400 persons shall not be considered to be a waterworks unless certified by the Board to be such.

1970, c. 768, § 54-573.2; 1972, c. 682; 1988, c. 765; 2007, cc. 892, 924.

§ 54.1-2301. Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals; membership; terms; duties

A. The Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals shall consist of 11 members as follows: the Director of the Office of Water

Programs of the State Department of Health, or his designee, the Executive Director of the State Water Control Board, or his designee, a currently employed waterworks operator having a valid license of the highest classification issued by the Board, a currently employed wastewater works operator having a valid license of the highest classification issued by the Board, a faculty member of a public institution of higher education in the Commonwealth whose principal field of teaching is management or operation of waterworks or wastewater works, a representative of an owner of a waterworks, a representative of an owner of a wastewater works, a licensed alternative onsite sewage system operator, a licensed alternative onsite sewage system installer, a licensed onsite soil evaluator, and one citizen member. The alternative onsite sewage system operator, alternative onsite sewage system installer, and onsite soil evaluator shall have practiced for at least five consecutive years immediately prior to appointment. No owner shall be represented on the Board by more than one representative or employee operator. The term of Board members shall be four years.

B. The Board shall examine waterworks and wastewater works operators and issue licenses. The licenses may be issued in specific operator classifications to attest to the competency of an operator to supervise and operate waterworks and wastewater works while protecting the public health, welfare and property and conserving and protecting the water resources of the Commonwealth.

C. The Board shall establish a program for licensing individuals as onsite soil evaluators, onsite sewage system installers, and onsite sewage system operators.

D. The Board, in consultation with the Board of Health, shall adopt regulations for the licensure of (i) onsite soil evaluators; (ii) installers of alternative onsite sewage systems, as defined in § 32.1-163;and (iii) operators of alternative onsite sewage systems, as defined in § 32.1-163. Such regulations shall include requirements for (a) minimum education and training, including approved training courses; (b) relevant work experience; (c) demonstrated knowledge and skill; (d) application fees to cover the costs of the program, renewal fees, and schedules; (e) the division of onsite soil evaluators into classes, one of which shall be restricted to the design of conventional onsite sewage systems; and (f) other criteria the Board deems necessary.

E. The Board shall permit any wastewater works operator to sit for the conventional onsite sewage system operator examination.

1970, c. 768, §§ 54-573.1, 54-573.3; 1981, c. 447; 1988, c. 765; 1989, c. 97; 2007, cc. 892, 924; 2008, c. 67;2013, c. 731.

§ 54.1-2302. License required

No person shall operate a waterworks or wastewater works, perform the duties of an onsite soil evaluator, or install or operate an alternative onsite sewage system, without a valid license.

1979, c. 408, § 54-573.18; 1988, c. 765; 2007, cc. 892, 924.

COMMONWEALTH OF VIRGINIA

BOARD FOR WATERWORKS AND WASTEWATER WORKS OPERATORS AND ONSITE SEWAGE SYSTEM PROFESSIONALS

WATERWORKS AND WASTEWATER WORKS OPERATORS LICENSING REGULATIONS

Last Updated December 8, 2021

STATUTES
Title 54.1, Chapter 23

Department of Professional and Occupational Regulation

9960 Mayland Drive, Suite 400
Richmond, VA 23233
(804) 367-8500
www.dpor.virginia.gov

NOTICE
SUMMARY OF SIGNIFICANT CHANGES

Included in this document are relevant excerpts from the Virginia Administrative Code. Please note that the Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals is responsible for promulgating regulations in accordance with the Administrative Process Act (§ 2.2-4000 et seq.), and the Virginia Code Commission is responsible for compiling and codifying all of the administration regulations of state agencies into the Virginia Administrative Code.

It is your responsibility to stay informed and follow all regulations and statutes governing your profession or occupation. As a regulant of the Board, you should read and become familiar with all regulations applicable to your profession or occupation. You can stay informed of regulatory actions that may result in changes to the regulations at Virginia Regulatory Town Hall (www.townhall.virginia.gov).

This document is a complete, edited (unofficial) copy of the Waterworks and Wastewater Works Operators Regulations (18VAC160-30). Please refer to the Virginia Administrative Code for an official copy of the regulations applicable to your profession or occupation. You can access the Virginia Administrative Code online at http://law.lis.virginia.gov/admincode.

The following is a brief summary of significant revisions to the regulations effective December 8, 2021, but may not include all changes that were made to the Waterworks and Wastewater Works Operators Licensing Regulations:

- The regulations were amended to conform to SB 1406, enacted by the General Assembly during the 2021 Special Session I. Requirements for licensure were revised to exclude marijuana-related misdemeanor convictions from convictions that must be disclosed on an application. Standards of conduct and practice were revised to exclude marijuana-related drug distribution misdemeanor convictions from convictions that a regulant must report to the Board.

STATEMENT OF PURPOSE

This document contains the information you will need to obtain your license. The law that governs your profession is found in the *Code of Virginia*, 1950, as amended, in Title 54.1, Chapter 23. That law permits the Department of Professional and Occupational Regulation to issue regulations that tell you more about what is expected of you in your profession. This document contains a copy of the law and regulations that you will need to know and obey to obtain and keep your license. **BE SURE YOU READ AND UNDERSTAND THE STANDARDS OF PRACTICE AND CONDUCT. YOUR FAILURE TO OBEY THESE STANDARDS COULD RESULT IN A MONETARY PENALTY OR THE LOSS OF YOUR LICENSE.**

It is the goal of the Department of Professional and Occupational Regulation to provide you with the information you need to comply with the law and regulations. If you have a question and cannot find the answer to it in this document, please write to:

Virginia Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals
Department of Professional and Occupational Regulation
9960 Mayland Drive, Suite 400
Richmond, Virginia 23233

You may also call the Agency at (804) 367-8500 or (804) 367-8595 or e-mail WaterWasteOper@dpor.virginia.gov.

TABLE OF CONTENTS

Part IV Continuing Professional Education

Part V Training Course Approval

Part VI Standards of Practice and Conduct

PART I.

DEFINITIONS

18VAC160-30-10. Definitions.

A. Section 54.1-2300 of the Code of Virginia provides definitions of the following terms and phrases as used in this chapter:

"Board"

"Onsite sewage system"

"Operator"

"Owner"

"Wastewater works"

"Waterworks"

B. The following words, terms, and phrases when used in this chapter shall have the following meanings unless the context clearly indicates otherwise:

"Applicant" means an individual who submits an application with the appropriate fee and other required documentation.

"Application" means a completed, board-prescribed form submitted with the appropriate fee and other required documentation.

"Category" means a profession under the board's purview, which includes waterworks and wastewater works as applicable to the licensure of waterworks and wastewater works operators.

"Classification" means the division within each category of license as it relates to the classified facility. Class 1 represents the highest classification for each category of license.

"Contact hour" means 50 minutes of participation in a structured training activity.

"Department" means the Virginia Department of Professional and Occupational Regulation.

"DEQ" means the Virginia Department of Environmental Quality.

"Direct supervision" means being immediately available and fully responsible for the provision of waterworks and wastewater works operation regulated pursuant to Chapter 23 (§ 54.1-2300 et seq.) of Title 54.1 of the Code of Virginia and this chapter.

"Direct supervisor" means a licensed waterworks or wastewater works operator who assumes the responsibility of direct supervision.

"Licensee" means an individual holding a valid license issued by the board.

"Licensure" means a method of regulation whereby the Commonwealth, through the issuance of a license, authorizes a person possessing the character and minimum skills to engage in the practice of a profession or occupation that is unlawful to practice without such license.

"Maintenance" or "maintain" means performing adjustments to equipment and controls and in-kind replacement of normal wear and tear parts such as light bulbs, fuses, filters, pumps, motors, or other like components. Maintenance includes pumping the tanks or cleaning the building sewer on a periodic basis.

"Operate" means the act of (i) placing into or taking out of service a unit process or unit processes or (ii) making or causing adjustments in the operation of a unit process at a waterworks or wastewater works.

"Renewal" means the process and requirements for periodically approving the continuance of a license.

"Training credit" means a unit of board-approved training or formal education completed by an individual that may be used to substitute for experience when applying for a license.

"Treatment works" means any device or system used in the storage, treatment, disposal, or reclamation of sewage or combinations of sewage and industrial wastes including pumping power and other equipment and appurtenances, septic tanks, and any works, including land, that are or will be (i) an integral part of the treatment processes or (ii) used for ultimate disposal or residues or effluent resulting from such treatment.

"VDH" means the Virginia Department of Health.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

PART II.

ENTRY

18VAC160-30-20. Application procedures.

A. All applicants seeking licensure shall submit an application with the appropriate fee specified in 18VAC160-30-40. Application shall be made on forms provided by the board or its agent. By submitting the application to the department, the applicant certifies that the applicant has read and understands the applicable statutes and the board's regulations. The receipt of an application and the deposit of fees by the board does not indicate approval of the application by the board.

B. The board may make further inquiries and investigations with respect to the applicant's qualifications to confirm or amplify information supplied. All applications shall be completed in accordance with the instructions contained in this chapter and on the application. Applications will not be considered complete until all required documents are received by the board. An applicant will not be permitted to sit for the applicable board-approved examination until the application is complete and approved.

C. The applicant will be notified within 30 days of the board's receipt of an initial application if the application is incomplete. An individual who fails to complete the application process within 12 months of receipt of the application in the board's office must submit a new application. An applicant has 12 months from approval of the application to pass the board-approved examination. Failure to pass the board-approved examination within 12 months of approval will result in the applicant being required to submit a new application to be considered for licensure.

D. The applicant shall immediately report all changes in information supplied with the application, if applicable, prior to issuance of the license or expiration of the application or examination period.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-30. General fee requirements.

All fees are nonrefundable and shall not be prorated. The date on which the fee is received by the department or its agent will determine whether the fee is on time. Checks or money orders shall be made payable to the Treasurer of Virginia.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-40. Fee schedule.

Fee Type	Fee Amount	When Due
Initial application (for each profession, class, and category of license)	$100	With application
Renewal (for each profession, class, and category of license)	$80	With renewal application
Reinstatement (for each profession, class, and category of license)	$105 (renewal fee + $25 reinstatement fee)	With reinstatement application

For wastewater works operator licenses expiring on February 28, 2018, and waterworks operator licenses expiring on February 28, 2019, the renewal fee shall be $50. For reinstatement applications received after February 28, 2018, and on or before February 29, 2020, the total reinstatement fee shall be $75.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017; amended, Virginia Register Volume 34, Issue 7, eff. January 1, 2018.

18VAC160-30-50. Examination fee.

The fee for examination or reexamination is subject to charges to the department by an outside vendor based on a contract entered into in compliance with the Virginia Public Procurement Act (§ 2.2-4300 et seq. of the Code of Virginia). Fees may be adjusted and charged to the candidate in accordance with this contract.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-60. General requirements for licensure.

A. In addition to the specific qualifications for each category and classification of licensure, each applicant for licensure shall meet the requirements provided in this section.

1. The applicant shall be at least 18 years old.

2. The applicant shall disclose the applicant's mailing address. A post office box is only acceptable as a mailing address when a physical address is also provided.

3. In accordance with § 54.1-204 of the Code of Virginia, each applicant shall disclose the following information.

a. All felony convictions.

b. All misdemeanor convictions, except marijuana convictions, in any jurisdiction that occurred within three years of the date of application.

Any plea of nolo contendere or finding of guilt regardless of adjudication or deferred adjudication shall be considered a conviction for the purposes of this section. The record of conviction certified or authenticated in such form as to be admissible in evidence under the laws of the jurisdiction where convicted shall be admissible as prima facie evidence of such guilt.

B. The board, at its discretion, may deny licensure to any applicant in accordance with § 54.1-204 of the Code of Virginia.

C. The applicant shall report any suspension, revocation, or surrender of a license, certification, or registration in connection with a disciplinary action or that has been the subject of discipline in any jurisdiction prior to applying for licensure. The board, at its discretion, may deny licensure to any applicant based on prior suspensions, revocations, or surrenders of licenses based on disciplinary action by any jurisdiction.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017; amended, Virginia Register Volume 38, Issue 6, eff. December 8, 2021.

18VAC160-30-70. Examination procedures and conduct.

A. Upon approval of the application, the board will notify the applicant of his eligibility to take the applicable examination. The license will not be issued prior to receipt of a passing score for the applicable examination.

B. An applicant who does not receive a passing score within one year after the date of approval of the application by the board to sit for the examination, must submit a new application and meet the entry requirements in effect at the time of submittal of the new application.

C. The applicant shall follow all rules established by the board with regard to conduct at the examination. Such rules shall include all written instructions communicated prior to the examination date and all instructions communicated at the site, either written or oral, on the date of examination. Failure to comply with all rules established by the board and the testing organization with regard to conduct at the examination may be grounds for denial of the application, voiding of examination scores, or any combination thereof.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-80. Individuals certified or licensed in another jurisdiction.

An applicant holding a valid license or certificate in another jurisdiction who meets the requirements of this chapter, including having equivalent experience and education, shall pass a board-approved examination to become licensed.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-90. License required.

A. No individual shall serve as the operator of a waterworks or wastewater works without possessing a valid category of license issued by the board in a classification equal to or greater than the classification of the applicable waterworks or wastewater works.

B. An individual cannot simultaneously hold two licenses of different classifications in the same category.

C. Experience used to qualify for licensure must be obtained under the direct supervision of an operator holding a valid license of the same category and of a classification equal to or higher than the classification of the waterworks or wastewater works at which the experience was gained.

D. Experience operating and maintaining water distribution systems shall only be considered for Class 5 or Class 6 waterworks operator license applicants.

E. Experience limited solely to the operation and maintenance of wastewater collection systems, laboratory work, plant maintenance, and other nonoperating duties shall not be counted as experience as an operator or an operator-in-training.

F. Provisional licensure alone shall not authorize an individual to serve as the operator of a classified waterworks or wastewater works facility.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-100. Full-time experience or equivalent.

For the purposes of this part, experience requirements are expressed in terms of calendar periods of full-time employment as an operator or as an operator-in-training at a waterworks or wastewater works in the same category for which licensure is sought pursuant to this chapter.

1. A year of full-time employment is defined as a minimum of 1,760 hours during a 12-month period or a minimum of 220 workdays in a 12-month period. A workday is defined as attendance at a waterworks or wastewater works to the extent required for proper operation. More than 1,760 hours or 220 workdays during a 12-month period will not be considered as more than one year of full-time employment.

2. Partial credit may be given for actual hours of work experience if the applicant works as an operator or as an operator-in-training less than full time.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-110. Qualifications for examination approval.

A. An applicant for licensure as a waterworks or wastewater works operator shall furnish acceptable documentation that one of the following qualifications has been met.

TABLE 1
Waterworks and Wastewater Works Operator Experience and Education

Classes	Education Required	Current License	Minimum Experience	Facility Type	Experience with Substitutions
Class 6 (Waterworks Operator Only)	High school diploma or GED	N/A	Six months	Class 6 or higher facility	N/A
	No high school diploma or GED	N/A	One year	Class 6 or higher facility	N/A
Class 5 (Waterworks Operator Only)	High school diploma or GED	N/A	Six months	Class 5 or higher facility	N/A
	No high school diploma or GED	N/A	One year	Class 5 or higher facility	N/A
Class 4	High school diploma or GED	N/A	Six months	Class 4 or higher facility	N/A
	No high school diploma or GED	N/A	One year	Class 4 or higher facility	N/A
Class 3	Bachelor's or master's degree	N/A	Six months	Class 4 or higher facility	N/A
	Associate's degree	N/A	Nine months	Class 4 or higher facility	Six months

	High school diploma or GED	N/A	One year	Class 4 or higher facility	Six months
	No high school diploma or GED	Class 4 license	Three years	Class 3 or higher facility	One and one-half years
Class 2	Bachelor's or master's degree	N/A	One year	Class 3 or higher facility	Six months
	Associate's degree	N/A	18 months	Class 3 or higher facility	Nine months
	High school diploma or GED	N/A	Two years	Class 3 or higher facility	One year
	No High school diploma or GED	Class 3 license	Five years	Class 2 or higher facility	Three and one-half years
Class 1	Bachelor's or master's degree	Class 2 license	Two years	Class 2 or higher facility	One year
	Associate's degree	Class 2 license	Three years	Class 2 or higher facility	One and one-half years
	High school diploma or GED	Class 2 license	Four years	Class 2 or higher facility	Two years
	No high school diploma or GED	Class 2 license	Nine years	Class 2 or higher facility	Four and one-half years
Where applicable, the current license held, minimum experience, and the facility type must coincide with the category of license for which the application is being submitted.					

B. The direct supervisor shall certify the experience on the application form as accurate and relevant to the classification and category of license for which is being submitted. In the event that a licensed operator is not available to certify the experience of the applicant, the experience may be certified by a representative of the facility owner with first-hand knowledge of the applicant's experience.

Historical Notes

Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-120. Provisional licensure for nonclassified facility operation.

An applicant for licensure as a provisional waterworks or wastewater works operator shall furnish acceptable documentation of having met all of the requirements of 18VAC160-30-110 except that the experience requirement may be met through experience gained as an operator or operator-in-training of a nonclassified facility. Such experience must be gained under the following conditions:

1. The experience is obtained at a nonclassified facility that is comparable in size and in treatment process as described in 18VAC160-30-360 and 18VAC160-30-370, as applicable.

2. The experience is obtained while performing nonclassified facility operation duties that provide experience comparable to that obtained at a classified facility. Experience operating and maintaining water distribution systems shall only be considered for a Class 5 or Class 6 provisional waterworks operator license. Experience limited solely to the operation and maintenance of wastewater collection system, laboratory work, plant maintenance, and other nonoperating duties shall not be counted as experience as a provisional operator or operator-in-training.

3. Any individual holding a provisional license may apply for licensure by submitting evidence of having met 50% of the experience required by 18VAC160-30-110 and submitting the appropriate application.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-130. Experience substitutions.

A. Experience obtained as a licensed alternative onsite sewage system operator before April 1, 2017, or a master alternative onsite sewage system operator may be substituted for the Class 4 wastewater works operator-in-training experience requirements.

B. 18VAC160-30-110 A provides the maximum experience substitutions that may be applied for each applicable class of license.

1. Experience gained in either waterworks or wastewater works operations may be substituted for up to one-half of the required experience in the alternate category so long as the experience was gained in an equivalent or higher class of facility.

2. Education may substitute for part of the required experience in the category of license applied for at a rate of one month of experience credit for each semester hour of college credit. Coursework must be relevant to the category and classification of the license being sought. The college credit must be from an

accredited college or university that is approved or accredited by the Commission on Colleges of the Southern Association of Colleges and Schools, a regional or national accreditation association, or by an accreditation agency that is recognized by the U.S. Secretary of Education.

3. Board-approved waterworks or wastewater works operator training courses may be utilized for experience at a rate of one month experience for each training credit approved by the board.

C. Substitutions shall not exceed 50% of the total experience required for licensure.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-140. Education.

A. Applicants seeking to qualify for licensure based on completion of an associate's, bachelor's, or master's degree shall submit an official transcript from the school where the applicable degree was obtained. Only degrees from an accredited college or university that is approved or accredited by the Commission on Colleges of the Southern Association of Colleges and Schools, a regional or national accreditation association, or by an accrediting agency that is recognized by the U.S. Secretary of Education will be considered. Formal education used to meet a specific education requirement for license entry cannot also be used as a training credit for experience substitution.

B. The following degrees shall be considered to qualify in accordance with 18VAC160-30-110:

1. Bachelor's or master's degree in engineering or engineering technology in a related physical, biological, environmental, or chemical science;

2. Bachelor's degree in a related physical, biological, environmental, or chemical science that includes a minimum 40 semester credit hours in any combination of science and math;

3. Master's degree in a related physical, biological, environmental, or chemical science, and a bachelor's degree in any major such that the combined degrees include a minimum 40 semester credit hours in any combination of science and math; or

4. Associate's degree in waterworks, in wastewater works, or in a related physical, biological, environmental, or chemical science that includes a minimum of 20 credit hours in any combination of science and math.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

PART III.

RENEWAL AND REINSTATEMENT

18VAC160-30-150. Expiration and renewal.

A. Licenses for waterworks operators shall expire on the last day of February of each odd-numbered year. Licenses for wastewater works operators shall expire on the last day of February of each even-numbered year.

B. Prior to the expiration date shown on the license, the board shall mail a renewal notice to the licensee's address of record. The licensee shall return to the board a renewal notice and the applicable renewal fee. Failure to receive a renewal notice from the board does not relieve the licensee of the obligation to renew. If the licensee fails to receive the renewal notice, a copy of the license may be submitted with the required fee as an application for renewal.

C. By submitting the renewal or reinstatement fee, the licensee is certifying his continued compliance with the Standards of Practice and Conduct (Part VI (18VAC160-30-290 et seq.) of this chapter, as established by the board. In addition, by submitting the renewal or reinstatement fee, licensees are certifying compliance with the continuing professional education requirements of this chapter.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-160. Reinstatement.

A. If all of the requirements for renewal of the license as specified in 18VAC160-30-150 are not completed within 30 days of the license expiration date, a reinstatement fee shall be required as established in 18VAC160-30-40.

B. A license may be reinstated for up to one year following the expiration date of the license. An individual who fails to reinstate the license within 12 months after the expiration date shall apply for a new license and meet entry requirements in effect at the time of the submittal of the new application. Such individual shall be deemed to be eligible to sit for the examination for the same category and classification of license as the expired license.

C. Any regulated activity conducted subsequent to the license expiration date may constitute unlicensed activity and be subject to the prosecution under Chapter 1 (§ 54.1-100 et seq.) of Title 54.1 of the Code of Virginia.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-170. Status of license during period prior to reinstatement.

A licensee who applies for reinstatement of the license shall be subject to all laws and regulations as if the licensee had been continuously licensed. The licensee shall remain under and be subject to the disciplinary authority of the board during this entire period.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-180. Board discretion to deny renewal or reinstatement.

The board may deny renewal or reinstatement of a license for the same reasons as the board may refuse initial licensure or discipline a licensee. The licensee has the right to request further review of any such action by the board under the Administrative Process Act (§ 2.2-4000 et seq. of the Code of Virginia).

The board may deny renewal or reinstatement of a license if the licensee has been subject to a disciplinary proceeding and has not met the terms of an agreement for licensure, has not satisfied all sanctions, or has not fully paid monetary penalties and costs imposed by the board.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

PART IV.

CONTINUING PROFESSIONAL EDUCATION

18VAC160-30-190. Continuing professional education.

A. Each licensee shall have completed the following number of continuing professional education (CPE) contact hours during each renewal cycle. CPE provisions do not apply for the renewal of licenses that were held for less than two years on the date of expiration.

1. Class 1, Class 2, and Class 3 waterworks and wastewater works operators shall obtain a minimum of 20 contact hours.

2. Class 4 waterworks and wastewater works operators shall obtain a minimum of 16 contact hours.

3. Class 5 waterworks operators shall obtain a minimum of eight contact hours.

4. Class 6 operators shall obtain a minimum of four contact hours.

B. CPE contact hours completed during the license period immediately prior to the expiration date of the license shall be acceptable in order to renew the license. CPE contact hours completed during a licensing renewal cycle to satisfy the CPE requirements of the preceding licensing renewal cycle shall be valid only for that preceding license renewal cycle and shall not be accepted for any subsequent renewal cycles.

C. The licensee will not receive CPE credit for completing the same continuing education course with the same content more than once during a license period.

D. A licensee may receive CPE credit for teaching a course that otherwise meets the requirements of this chapter; however, additional credit shall not be given for subsequent offerings of a course or activity with the same content within the same licensing cycle. In addition, a licensee may receive two hours of CPE no more than once during a single licensing cycle for the initial development or substantial updating of a CPE course.

E. Safety subjects shall not count for more than one-half of the total required CPE hours.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-200. CPE subject matter for waterworks operators.

A. The following course topics will be accepted for CPE credit for waterworks operators:

1. Waterworks operations;

2. Monitoring, evaluating, and adjusting treatment processes and systems;

3. Operating and maintaining equipment;

4. Security and safety procedures;

5. General science and mathematical principles;

6. Administrative processes and procedures applicable to licensure; and

7. Laws and regulations applicable to the profession.

B. Of the total 20 hours required, a minimum of five contact hours pertaining to utility management is required of Class 1 and Class 2 waterworks operators.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-210. CPE subject matter for wastewater works operators.

A. The following course topics will be accepted for CPE credit for wastewater works operators:

1. Wastewater works operations;

2. Monitoring, evaluating, and adjusting treatment processes and systems;

3. Operating and maintaining equipment;

4. Security and safety procedures;

5. General science and mathematical principles;

6. Administrative processes and procedures applicable to licensure; and

7. Laws and regulations applicable to the profession.

B. Of the total 20 hours required, a minimum of five contact hours pertaining to utility management is required of Class 1 and Class 2 wastewater works operators.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-220. Use of training credits and formal education for CPE credit.

Any course approved by the board for substitution as training credits or formal education semester hours, as provided for in Part V (18VAC160-30-240 et seq.) of this chapter, shall also be

acceptable on an hour-for-hour basis for CPE contact hours. One semester hour of college credit shall equal 15 CPE contact hours, and one-quarter hour of college credit shall equal 10 CPE credit hours.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-230. Maintenance of CPE.

A. For a period of at least two years following the end of the license renewal cycle for which the CPE was taken, the following evidence shall be maintained to document completion of the required hours of CPE:

1. Evidence of completion of a structured training activity, which shall consist of the name, address, and telephone number of the sponsor;

2. The dates the licensee participated in the training;

3. Description of the subject matter presented; and

4. A statement from the sponsor verifying the number of hours completed.

B. The board may conduct an audit of its licensees to ensure compliance with the applicable CPE requirements. Licensees who are selected for audit shall provide the necessary documentation stipulated in this section.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

PART V.

TRAINING COURSE APPROVAL

18VAC160-30-240. Approval of training courses.

A. Training courses may be substituted for experience pursuant to the provisions of Part II (18VAC160-30-20 et seq.) of this chapter. With the exception of training courses provided pursuant to 18VAC160-30-280, training courses that may be substituted for required experience must be approved by the board prior to commencing.

B. Each training provider seeking course approval shall submit an application for approval on a form provided by the board. Only classroom, laboratory, and field trip contact time will be used to compute training credits. No credit will be given for breaks, meals, or receptions.

1. Organization. The board will only approve training offered by a provider that is an identifiable organization with a mission statement outlining its functions, structure, process, and philosophy and that has a staff of one or more persons with the authority to administer and coordinate a training course.

2. Training course records. The board will only approve training offered by a provider that maintains training course records for all participants for a minimum of seven years and that has a written policy on retention and release of training course records.

3. Instructors. The board will only approve training conducted by personnel who have demonstrated competence in the subject being taught, an understanding of the learning objective, and knowledge of the learning process to be used.

4. Objectives. The board will only approve courses that have a series of stated objectives that are pertinent to the tasks performed by a licensee. The training course content must be consistent with those objectives.

5. Course completion requirements. For successful completion of a training course, participants must attend 90% or more of the class contact time and must demonstrate their learning through written examinations, completion of a project, oral examination, or other similar assessment technique.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-250. Application for training course approval.

A. The board shall consider the following information, to be submitted by the course provider or instructor on forms provided by the board:

1. Course information.

a. Course title;

b. Planned audience;

c. Name of provider;

d. Name, physical address, email address, and phone number of contact person;

e. Scheduled presentation dates;

f. Detailed course schedule, hour-by-hour, including start and ending times;

g. List of planned breaks;

h. Scheduled presentation location; and

i. Identification of the category and classification of license to which the course is applicable and relevancy to the identified license type.

2. Instructor qualifications.

a. Name of instructor;

b. Title;

c. Employer;

d. Board license number or numbers, if applicable; and

e. Summary of qualifications to teach the course.

3. Training materials.

a. Course objectives. A listing of the course objectives stated in terms of the skills and knowledge the participant will be able to demonstrate as a result of the training.

b. Course outline. A detailed outline showing the planned activities that will occur during the training course, including major topics, planned

presentation sequence, laboratory and field activities, audiovisual presentation, and other major activities.

c. Course reference materials. A list of the name, publisher, and publication date for commercially available publications. For reference materials developed by the course provider or available exclusively through the course, a copy of the reference.

d. Audiovisual support materials. A listing of any commercially available audiovisual support material that will be used in the program. A brief description of any provider or instructor generated audiovisual material that will be used.

e. Handouts. Identification of all commercially available handout materials that will be used, as well as copies of all other planned handouts.

4. Determination of successful completion. A description of the means that will be used to assess the learning of each participant to determine successful completion of the training program, such as examinations, projects, personal evaluations by the instructor, or other recognized evaluation techniques. Correspondence and other distance learning courses must include appropriate testing procedures to verify completion of the course.

B. Recurring training programs. If there are plans to present the same course of instruction routinely at multiple locations with only minor modifications and changes, the board may approve the overall program rather than individual presentations if so requested by the provider.

1. The board shall consider all of the information listed in subsection A of this section except those items related to specific offerings of the course.

2. Board approval will apply only to those specific offerings certified by the provider as having been conducted by instructors meeting the established criteria and in accordance with the board-approved course outlines and objectives.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-260. Maintenance of training approval.

A. At times established by the board, the board may require that course providers that have previously obtained course approval provide the board with evidence, in a form set forth by the board, that the provider continues to comply with the requirements of this chapter. Failure to continue to comply with the board's requirements or respond to such a request may result in the board withdrawing its approval.

B. Substantial modifications or changes to the information provided in 18VAC160-30-240 and 18VAC160-30-250 must be reported to the board within 30 days of the change. Failure to report the changes as required may result in the withdrawal of approval by the board.

C. Any change of the address of the training provider shall be reported in writing within 30 days of the change.

D. The board may conduct an audit of the training provider to ensure compliance with this chapter.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-270. Withdrawal of approval.

The board may withdraw approval of any provider for the following reasons:

1. The courses being offered no longer meet the standards established by the board.

2. The provider, through an agent or otherwise, advertises its services in a fraudulent or deceptive manner.

3. The provider, instructor, or designee of the provider falsifies any information relating to the application for approval, course information, and student records.

4. The provider fails to respond to the board or any of its agents.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-280. Training courses offered by certain entities; board approval not required.

A. Training courses provided by (i) federal, state, or local government agencies; (ii) accredited colleges or universities approved or accredited by the Commission on Colleges of the Southern Association of Colleges and Schools; (iii) a regional or national accreditation association; or (iv) an accrediting agency that is recognized by the U.S. Secretary of Education do not require board approval to be used for experience substitution, provided the training course information submitted to the board includes the following:

1. The course must include the continuing education units awarded by the entity.

2. The course's subject matter must be related to the license category and classification, if applicable, for which experience substitution is sought.

B. The board may request additional information from the provider as necessary to ensure compliance with this section. If such assurance cannot be made by the board, the training course may not be used for experience substitution, or the provider may pursue board approval pursuant to this chapter.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

PART VI.

STANDARDS OF PRACTICE AND CONDUCT

18VAC160-30-290. Grounds for disciplinary action.

The board may place a licensee on probation; impose a monetary penalty in accordance with § 54.1-202 A of the Code of Virginia; or revoke, suspend, or refuse to renew any license when the licensee has been found to have violated or cooperated with others in violating any provision of the regulations of the board or Chapter 23 (§ 54.1-2300 et seq.) of Title 54.1 of the Code of Virginia.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-300. Maintenance of license.

A. No license issued by the board shall be assigned or otherwise transferred.

B. A licensee shall report, in writing, all changes of address and name to the board within 30 days of the change and shall return the license to the board. In addition to the address of record, a physical address is required for each license. If the licensee holds more than one license, the licensee shall inform the board of all licenses, certificates, and registrations affected by the address change. The board shall not be responsible for the licensee's failure to receive notices or correspondence due to the licensee's failure to report a change of address.

C. Any change in any of the requirements and qualifications for licensure found in Part II (18VAC160-30-20 et seq.) or Part III (18VAC160-30-150 et seq.) of this chapter shall be reported to the board within 30 days of the change.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 201.

18VAC160-30-310. Notice of adverse action.

A. Licensees shall notify the board of the following actions against the licensee:

1. Any disciplinary action taken by any jurisdiction, board, or administrative body of competent jurisdiction, including any reprimand, license or certificate revocation, suspension or denial, monetary penalty, requirement for remedial education, or other corrective action.

2. Any voluntary surrendering of a related license, certificate, or registration done in connection with a disciplinary action in another jurisdiction.

3. Any conviction, finding of guilt, or plea of guilty, regardless of adjudication or deferred adjudication, in any jurisdiction of the United States of any (i) misdemeanor involving lying, cheating, stealing, sexual offense, non-marijuana drug distribution, or physical injury, or relating to the practice of the profession, or (ii) felony, there being no appeal pending therefrom or the time for appeal having lapsed. Review of convictions shall be subject to the requirements of § 54.1-204 of the Code of Virginia. Any plea of nolo contendere shall be considered a conviction for the purpose of this section.

B. The notice must be made to the board in writing within 30 days of the action. A copy of the order or other supporting documentation must accompany the notice. The record of conviction, finding, or case decision shall be considered prima facie evidence of a conviction or finding of guilt.

Historical Notes

Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017; amended, Virginia Register Volume 38, Issue 6, eff. December 8, 2021.

18VAC160-30-320. Prohibited acts.

The following acts are prohibited and any violation may result in disciplinary action by the board:

1. Violating, inducing another to violate, cooperating with another to violate, or combining or conspiring with or acting as agent, partner, or associate for another to violate any of the provisions of Chapter 1 (§ 54.1-100 et seq.), 2 (§ 54.1-200 et seq.), or 23 (§ 54.1-2300 et seq.) of Title 54.1 of the Code of Virginia, or any of the regulations of the board.

2. Allowing a license issued by the board to be used by another.

3. Obtaining or attempting to obtain a license by false or fraudulent representation, or maintaining or renewing a license by false or fraudulent representation.

4. A licensee having been convicted, found guilty, or disciplined in any jurisdiction of any offense or violation enumerated in 18VAC160-30-310. Review of convictions shall be subject to the requirements of § 54.1-204 of the Code of Virginia.

5. Failing to inform the board in writing within 30 days that the licensee was convicted, found guilty, or disciplined in any jurisdiction of any offense or violation enumerated in 18VAC160-30-310.

6. Not demonstrating reasonable care, judgment, or application of the required knowledge, skill, and ability in the performance of the licensee's duties.

7. Having undertaken to perform or performed a professional assignment that the licensee is not qualified to perform by education, experience, training, or any combination thereof.

8. Failing to report a change as required by 18VAC160-30-300.

9. Negligence, misconduct, or incompetence in the practice of the profession.

10. Making any misrepresentation or engaging in acts of fraud or deceit in providing professional services.

11. Failing to adequately supervise and review work performed by licensed or unlicensed employees under direct supervision of the licensee.

12. Submitting or recording or assisting another in the submission or recording of false or misleading operational information relating to the performance and monitoring requirements of a waterworks or wastewater works.

13. Failing to act in providing waterworks and wastewater works operator services in a manner that safeguards the interests of the public.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-330. Conflicts of interest.

The licensee shall:

1. Promptly and fully inform an employer or client of any business association, interest, or circumstance that may influence the licensee's judgment or the quality of service.

2. Not accept compensation, financial or otherwise, from more than one party for services on or pertaining to the same project, unless the circumstances are fully disclosed to and agreed to by all interested parties in writing.

3. Neither solicit nor accept financial or other valuable consideration from material or equipment suppliers for specifying their products or services.

4. Not solicit or accept gratuities, directly or indirectly, from contractors or their agents or other parties dealing with a client or employer in connection with work for which the licensee is responsible.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-340. Licensee responsibility.

A. The primary obligation of the licensee is to the public. If the licensee's judgment is overruled and not adhered to when advising appropriate parties of circumstances of a substantial threat to the public health, safety, or welfare, the licensee shall inform the

employer or client, as applicable, of the possible consequences and notify appropriate authorities.

B. The licensee shall not knowingly associate in a business venture with, or permit the use of the licensee's name by, any person where there is reason to believe that person is engaging in activity of a fraudulent or dishonest nature or is violating any law or regulation of the board.

C. A licensee who has direct knowledge that another individual may be violating any of the provisions of this chapter or the provisions of Chapter 23 (§ 54.1-2300 et seq.) of Title 54.1 of the Code of Virginia shall immediately inform the board in writing and shall cooperate in furnishing any further information or assistance that may be required.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-350. Response to inquiry and provision of records.

A. A licensee must respond within 10 days to a request by the board or any of its agents regarding any complaint filed with the department.

B. Unless otherwise specified by the board, a licensee of the board shall produce to the board or any of its agents within 10 days of the request any document, book, or record concerning any transaction pertaining to a complaint filed in which the licensee was involved, or for which the licensee is required to maintain records. The board may extend such timeframe upon a showing of extenuating circumstances prohibiting delivery within such 10-day period.

C. A licensee shall not provide a false, misleading, or incomplete response to the board or any of its agents seeking information in the investigation of a complaint filed with the board.

D. With the exception of the requirements of subsections A and B of this section, a licensee must respond to an inquiry by the board or its agent within 21 days.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

18VAC160-30-360. Wastewater works.

A. A Class 4 wastewater works licensee may operate any wastewater works as follows:

1. A wastewater works employing biological mechanical methods (i.e., mechanical treatment process defined as those containing aerated and mixed flows using electrical or outside energy sources) with a design hydraulic capacity greater than 1,000 gallons per day but equal to or less than 0.04 MGD;

2. A wastewater works employing natural treatment methods (referenced in 9VAC25-790-870 as land treatment utilizing a secondary process for pretreatment followed by irrigation, overland flow infiltration-percolation, or combination thereof or aquatic ponds or constructed wetlands) with a design hydraulic capacity greater than 1,000 gallons per day but equal to or less than 1.0 MGD; or

3. Any other wastewater works classified by DEQ or VDH as a Class 4 wastewater works.

B. A Class 3 wastewater works licensee may operate any wastewater works as follows:

1. A wastewater works using biological treatment methods consisting of but not limited to (i) suspended growth reactors, (ii) aerated lagoons, (iii) constructed wetlands, (iv) filters or other attached growth contactors, (v) processes utilizing biological nutrient control, or (vi) processes utilizing land treatment having a design hydraulic capacity greater than 0.04 MGD, but equal to or less than 0.5 MGD;

2. A wastewater works using natural treatment methods (referenced in 9VAC25-790-870 as land treatment utilizing a secondary process for pretreatment followed by irrigation, overland flow infiltration-percolation, or combination thereof or aquatic ponds or constructed wetlands) with a design hydraulic capacity greater than 1.0 MGD;

3. A wastewater works using advanced waste treatment methods consisting of but not limited to (i) ammonia stripping, (ii) breakpoint chlorination, (iii) carbon adsorption, (iv) chemical coagulation, (v) flocculation, (vi) precipitation, (vii) filtration, or (viii) demineralization (i.e., ion exchange, reverse osmosis, or electrodialysis) having a design hydraulic capacity greater than 1,000 gallons per day but equal to or less than 0.1 MGD; or

4. A wastewater works classified by DEQ or VDH as a Class 3 or Class 4 wastewater works facility.

C. A Class 2 wastewater works licensee may operate any wastewater works as follows:

1. A wastewater works using biological treatment methods consisting of but not limited to (i) suspended growth reactors, (ii) aerated lagoons or constructed wetlands, (iii) filters or other attached growth contactors, (iv) processes utilizing biological nutrient control, or (v) processes utilizing land application having a design hydraulic capacity greater than 0.5 MGD but equal to or less than 5.0 MGD;

2. A wastewater works using advanced waste treatment methods consisting of but not limited to (i) ammonia stripping, (ii) breakpoint chlorination, (iii) carbon adsorption, (iv) chemical coagulation, (v) flocculation, (vi) precipitation, (vii) filtration, (viii) demineralization (i.e., ion exchange, reverse osmosis, or electrodialysis) and having a hydraulic capacity greater than 0.1 MGD but equal to or less than 2.5 MGD; or

3. A wastewater works classified by DEQ or VDH as a Class 2, Class 3, or Class 4 wastewater works.

D. A Class 1 wastewater works licensee may operate any wastewater works as follows:

1. A wastewater works using biological treatment methods consisting of but not limited to (i) suspended growth reactors, (ii) aerated lagoons or constructed wetlands, (iii) filters or other attached growth contactors, (iv) processes utilizing biological nutrient control, (v) processes utilizing land treatment and having a hydraulic capacity greater than 5.0 MGD;

2. A wastewater works using advanced waste treatment methods consisting of but not limited to (i) ammonia stripping, (ii) breaking chlorination, (iii) carbon adsorption, (iv) chemical coagulation, (v) flocculation, (vi) precipitation, (vii) filtration, (viii) demineralization (i.e., ion exchange, reverse osmosis, or electrodialysis) and having a design capacity greater than 2.5 MGD; or

3. A wastewater works classified by DEQ or VDH as a Class 1, Class 2, Class 3, or Class 4 wastewater works.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017; Errata, 33:15 VA.R. XXXX March 20, 2017.

18VAC160-30-370. Waterworks.

A. A Class 6 waterworks licensee may operate any waterworks as follows:

1. A waterworks serving fewer than 400 persons that provides no treatment or employs one or more of the following treatment processes: (i) hypochlorination for disinfection, (ii) corrosion control with calcite or magnesium oxide contactors or solution feed except with caustic, or (iii) sequestration by solution feed; or

2. A waterworks classified by VDH as a Class 6 waterworks.

B. A Class 5 waterworks licensee may operate any waterworks as follows:

1. A waterworks serving 400 or more persons that provides no treatment or employs one or more of the following treatment processes: (i) hypochlorination

for disinfection, (ii) corrosion control with calcite or magnesium oxide contactors or solution feed except with caustic, or (iii) sequestration by solution feed; or

2. A waterworks classified by VDH as a Class 5 waterworks.

C. A Class 4 waterworks licensee may operate any waterworks as follows:

1. A waterworks or treatment facility serving fewer than 5,000 persons or having a treatment facility capacity of less than 0.5 MGD and employing one or more of the following: (i) disinfection other than with hypochlorination, (ii) caustic soda feed, (iii) iron and manganese removal, (iv) ion exchange, (v) slow sand filtration, (vi) aeration, (vii) rechlorination other than with hypochlorination, (viii) activated carbon contactors, (ix) membrane or other filtration technologies without chemical coagulation, or (x) fluoridation with a saturator; or

2. A waterworks classified by VDH as a Class 4 waterworks.

D. A Class 3 waterworks licensee may operate any waterworks as follows:

1. A waterworks or treatment facility serving fewer than 5,000 persons or having a treatment facility capacity less than 0.5 MGD, whichever is greater, and employing conventional filtration or chemical coagulation in combination with membrane filtration;

2. A waterworks or treatment facility serving 5,000 or more persons or having a treatment facility capacity of 0.5 MGD or more, whichever is greater, and employing one or more of the following: (i) disinfection other than with hypochlorination, (ii) caustic soda feed, (iii) iron and manganese removal, (iv) ion exchange, (v) slow sand filtration, (vi) aeration, (vii) rechlorination other than with hypochlorination, (viii) activated carbon contactors, (ix) membrane or other filtration technologies without chemical coagulation, or (x) fluoridation with a saturator or acid feed;

3. A waterworks or treatment facility employing fluoridation with other than a saturator not considered a Class 1 or Class 2 waterworks; or

4. A waterworks classified by VDH as a Class 3 waterworks.

E. A Class 2 waterworks licensee may operate any waterworks as follows:

1. A waterworks or treatment facility serving 5,000 or more persons but fewer than 50,000 persons or having a treatment facility capacity of 0.5 MGD or more but less than 5.0 MGD, whichever range applies, and employing rapid rate conventional filtration chemical coagulation in combination with membrane filtration;

2. A waterworks or treatment facility serving fewer than 50,000 persons or having a treatment facility capacity of less than 5.0 MGD employing high rate conventional filtration; or

3. A waterworks classified by the VDH as a Class 2 waterworks.

F. A Class 1 waterworks licensee may operate any waterworks as follows:

1. A waterworks or treatment facility serving 50,000 or more persons or having a treatment facility capacity of 5.0 MGD or more and employing conventional filtration or chemical coagulation in combination with membrane filtration; or

2. A waterworks classified by VDH as a Class 1 waterworks.

Historical Notes
Derived from Virginia Register Volume 33, Issue 11, eff. April 1, 2017.

Included in this document are relevant excerpts from the *Code of Virginia*. Please note that the Virginia General Assembly is responsible for creating and amending the *Code*, not the Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals. The version contained herein contains all changes, if any, that have been made by the General Assembly through the 2021 session. Any changes made during the 2021 session became effective July 1, 2021 unless otherwise noted. It is your responsibility to stay informed of revisions to the regulations and the statutes governing your profession or occupation. Please consult the General Assembly or your local library for annual changes.

Code of Virginia

Title 54.1, Chapter 23

§ 54.1-2300. Definitions.

As used in this chapter, unless the context requires a different meaning:

"Board" means the Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals.

"Onsite sewage system" means a conventional onsite sewage system or alternative onsite sewage system as defined in § 32.1-163.

"Operator" means any individual employed or appointed by any owner, and who is designated by such owner to be the person in responsible charge, such as a supervisor, a shift operator, or a substitute in charge, and whose duties include testing or evaluation to control waterworks or wastewater works operations or to operate and maintain onsite sewage systems. Not included in this definition are superintendents or directors of public works, city engineers, or other municipal or industrial officials whose duties do not include the actual operation or direct supervision of waterworks or wastewater works.

"Owner" means the Commonwealth of Virginia, or any political subdivision thereof, any public or private institution, corporation, association, firm or company organized or existing under the laws of this Commonwealth or of any other state or nation, or any person or group of persons acting individually or as a group, who own, manage, or maintain waterworks or wastewater works.

"Person" means any individual, group of individuals, a corporation, a partnership, a business trust, an association or other similar legal entity engaged in operating waterworks or wastewater works.

"Wastewater works" means each system of (i) sewerage systems or sewage treatment works, serving more than 400 persons, as set forth in § 62.1-44.18; (ii) sewerage systems or sewage

treatment works serving fewer than 400 persons, as set forth in § 62.1-44.18, if so certified by the State Water Control Board; and (iii) facilities for discharge to state waters of industrial wastes or other wastes, if certified by the State Water Control Board.

"Waterworks" means each system of structures and appliances used in connection with the collection, storage, purification, and treatment of water for drinking or domestic use and the distribution thereof to the public, except distribution piping. Systems serving fewer than 400 persons shall not be considered to be a waterworks unless certified by the Board to be such.

1970, c. 768, § 54-573.2; 1972, c. 682; 1988, c. 765; 2007, cc. 892, 924.

§ 54.1-2301. Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals; membership; terms; duties.

A. The Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals shall consist of 11 members as follows: the Director of the Office of Water Programs of the State Department of Health, or his designee, the Executive Director of the State Water Control Board, or his designee, a currently employed waterworks operator having a valid license of the highest classification issued by the Board, a currently employed wastewater works operator having a valid license of the highest classification issued by the Board, a faculty member of a public institution of higher education in the Commonwealth whose principal field of teaching is management or operation of waterworks or wastewater works, a representative of an owner of a waterworks, a representative of an owner of a wastewater works, a licensed alternative onsite sewage system operator, a licensed alternative onsite sewage system installer, a licensed onsite soil evaluator, and one citizen member. The alternative onsite sewage system operator, alternative onsite sewage system installer, and onsite soil evaluator shall have practiced for at least five consecutive years immediately prior to appointment. No owner shall be represented on the Board by more than one representative or employee operator. The term of Board members shall be four years.

B. The Board shall examine waterworks and wastewater works operators and issue licenses. The licenses may be issued in specific operator classifications to attest to the competency of an operator to supervise and operate waterworks and wastewater works while protecting the public health, welfare and property and conserving and protecting the water resources of the Commonwealth.

C. The Board shall establish a program for licensing individuals as onsite soil evaluators, onsite sewage system installers, and onsite sewage system operators.

D. The Board, in consultation with the Board of Health, shall adopt regulations for the licensure of (i) onsite soil evaluators; (ii) installers of alternative onsite sewage systems, as defined in § 32.1-163; and (iii) operators of alternative onsite sewage systems, as defined in § 32.1-163. Such regulations shall include requirements for (a) minimum education and training, including approved training courses; (b) relevant work experience; (c) demonstrated knowledge and skill; (d) application fees to cover the costs of the program, renewal fees, and schedules; (e) the

division of onsite soil evaluators into classes, one of which shall be restricted to the design of conventional onsite sewage systems; and (f) other criteria the Board deems necessary.

E. The Board shall permit any wastewater works operator to sit for the conventional onsite sewage system operator examination.

1970, c. 768, §§ 54-573.1, 54-573.3; 1981, c. 447; 1988, c. 765; 1989, c. 97; 2007, cc. 892, 924; 2008, c. 67; 2013, c. 731.

§ 54.1-2302. License required.

No person shall operate a waterworks or wastewater works, perform the duties of an onsite soil evaluator, or install or operate an alternative onsite sewage system, without a valid license.

1979, c. 408, § 54-573.18; 1988, c. 765; 2007, cc. 892, 924.

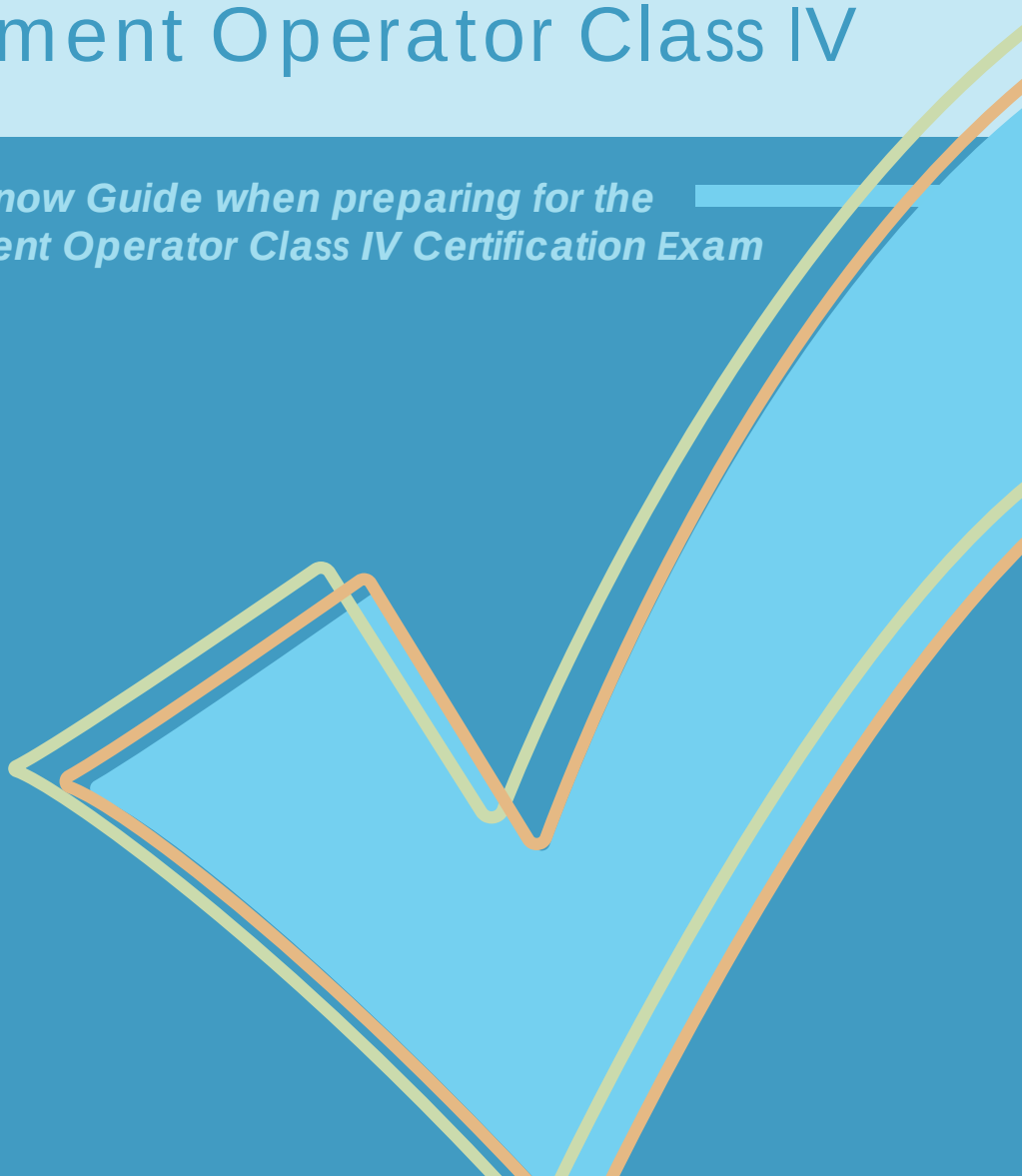
ABC
Association of
Boards of Certification

2017

Need-to-Know Criteria

Water Treatment Operator Class IV

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



Before You Dive In...

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

This *ABC Water Treatment 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 Water Treatment Operator Class IV exam. During 2014-2016, a methodical and comprehensive international investigation was conducted to determine the most significant job tasks performed by water 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 2017 edition of the ABC Standardized Water 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 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.

Copyright Notice

All ABC examination questions are the copyrighted property of ABC. It is forbidden under federal copyright law to copy, reproduce, record, distribute, or display these examination questions by any means, in whole or in part, without written permission from ABC. Doing so may subject violators to severe civil and criminal penalties.

Water Treatment Operator Class IV *Need-to-Know Criteria*

Exam Content

The Water 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 water 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
33	Treatment Process	5 19 9
13	Laboratory Analysis	3 7 3
21	Equipment Operation & Maintenance	4 11 6
9	Source Water Characteristics	2 5 2
24	Security, Safety, Compliance, & Administrative Procedures	6 9 9
100*	Total	20 51 29

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).

Treatment Process

Job Tasks Included in this Content Area:

1. Calculate and/or record:
    a. Plant residuals
    b. Backwash water
    c. Daily flow rate
    d. Chemical levels and previous days usage
    e. Filter performance data
    f. Online analyzers data
2. Calculate chemical dosages
3. Interact with HMI and SCADA
4. Determine correct disinfectant dosage and contact time to maintain desired level of residual in system
5. Control treatment plant processes, chemical dosages, and equipment used to treat water
6. Determine and adjust plant flows to meet system demands
7. Troubleshoot malfunctions and problems in plant process and equipment
8. Identify trends and abnormal operation in plant processes by interpreting data from gauges, meters, charts, and graphs
9. Interpret facility and process control water meters
10. Maintain records of operation of treatment facilities:
    a. Daily testing logs
    b. Daily equipment logs
    c. Daily intake and production
    d. Daily maintenance management reports and notes
    e. Microbiological sampling and testing
11. Make appropriate changes in plant processes to optimize performance and efficiency
12. Mix batches of chemical solutions
13. Add chemicals to hoppers and feed equipment
14. Monitor filter performance and backwash filters
15. Monitor the transmission and distribution system
16. Monitor, evaluate, and adjust:
    a. Pretreatment
    b. Coagulation and flocculation (e.g., flocculation tanks, rapid mix units)
    c. Clarification and sedimentation (e.g., inclined-plate, tube, up flow solids-contact)
    d. Filtration (e.g., biofiltration, diatomaceous earth filters, direct and conventional filtration, membranes, microscreens, slow sand, Greensand, pressure, upflow, rapid sand, cartridge)
    e. Residuals disposal (e.g., lagoons, sludge drying beds, land application, on-site disposal, solids composting)
    f. Backwash aids
    g. Source water treatment (e.g., copper sulfate, aeration, mixing)
    h. Iron/manganese treatment
    i. Lime-soda ash softening
    j. Granular activated carbon
    k. Powdered activated carbon
    l. Pressure testing membranes
    m. Ion exchange
    n. Chemical feed pumps
    o. Online instrumentation

17. Operate and control electric motors, pumps, and valves to regulate flow of water at the treatment facility
18. Perform calculations related to process monitoring
19. Ensure the proper handling, storage and use of chemicals:
    a. Acids
    b. Bases
    c. Oxidants
    d. Coagulants
    e. Coagulant aids
    f. Weighting agents
    g. Polymers
    h. Chemical disinfectants
    i. Fluoride
20. Corrosion control chemicals

Laboratory Analysis

Job Tasks Included in this Content Area:

1. Calibrate and repair laboratory instrumentation to ensure proper operation
2. Collect water samples
3. Perform sample preservation and documentation for laboratory samples
4. Perform lab tests, record results, and interpret data
5. Use equipment to evaluate water quality
6. Perform analyses:
    a. Color
    b. Taste and odor
    c. Turbidity
    d. Free Cl2 residual
    e. Total Cl2 residual
    f. Coagulant charge
    g. Fluoride
    h. pH
    i. Hardness
    j. Aluminum
    k. Alkalinity
    l. Iron
    m. Manganese
    n. Temperature
    o. DBP
    p. Bacteria
    q. Jar test
    r. Zeta potential
    s. Transmittance and absorbance

Equipment Operation & Maintenance

Job Tasks Included in this Content Area:

1. Adjust pumps to meet demand
2. Measure and analyze filter media to determine compliance with design specifications
3. Perform facility startup and shutdown per SOP
4. Calibrate inline instrumentation (e.g., pH, turbidimeters, Cl analyzer)
5. Complete equipment maintenance and repair records, including work orders
6. Update asset management log (e.g., CMS)
7. Ensure the operation and maintenance of equipment at the water treatment facility:
    a. Chlorine disinfection system.
    b. Filter systems (e.g., biofiltration, diatomaceous earth filters, direct and conventional filtration, membranes, microscreens, slow sand, Greensand, pressure, upflow, rapid sand, cartridge)
    c. Clarifier
    d. Treated water storage tanks
    e. Clearwell
    f. Programmable Logic Control (PLC) System
    g. SCADA
    h. Polymer feed system
    i. Raw and treated water pumping systems
    j. Raw water screening
    k. Ozone
    l. Ultraviolet
    m. On-site chlorine generation
    n. Water intake equipment
    o. Pumps
    p. Chemical feed equipment
    q. Chemical mixing equipment (e.g., rapid mix, flocculators, static mixers)
    r. Water quality analyzers
    s. Valves
    t. Injectors
8. Evaluate filter operation by performing filter surveillance tests
9. Inspect, exercise, and maintain valves
10. Maintain facility and process control water meters
11. Install and maintain facility piping (e.g., air, water, chemical)
12. Lubricate pumps, motors, chains, conveyors, and other machinery and equipment
13. Operate and maintain pumps, drivers, and auxiliary equipment
14. Operate and maintain onsite backup power generator
15. Perform calibration of chemical feeders
16. Perform efficiency tests on pumps and related equipment (e.g., pump curves)
17. Perform preventive and corrective maintenance to the auxiliary water treatment plant equipment:
    a. Electric motors
    b. Engines
    c. Gas and electric powered pumps
    d. Air compressors
    e. Emergency systems
    f. Power generation systems
    g. Pressure and flow regulators
    h. Online analyzers

i. Filters (e.g., air, oil)
j. Chemical feed systems
k. Blowers

18. Perform routine maintenance of grounds machinery, structures, equipment, and piping systems (e.g., cleaning, painting)
19. Perform inspections on clear well covers, hatches, access covers, vents, and overflows
20. Backwash filters

Source Water Characteristics

Job Tasks Included in this Content Area:

1. Calculate stored water release based on forecasted demand
2. Evaluate the following source water characteristics:
    a. Biological (bacterial, protozoa, viruses)
    b. Chemical
    c. Potential sources of source water contamination
    d. Physical
3. Measure static water level and pumping levels of wells
4. Measure and monitor raw water source
5. Perform inspections of surface water sources and report any issues that may affect water quality (e.g., non-native plant species, mussels, algae, erosion)
6. Perform inspections of ground water well sites and report any issues that may affect water quality (e.g., contamination, flooding, well head protection)
7. Perform raw water reservoir inspection, maintenance, and cleaning
8. Plan source water protection and watershed management, (e.g., watershed related to road construction and maintenance, silviculture and forest harvesting; watershed inspections public relations)
9. Determine if wells are under the direct influence of surface water (GWI)
10. Monitor lake stratification
11. Forecast future source water availability based on climatic data (e.g., climate change, hydrologic cycle, precipitation forecast)
12. Educate community on source water protection and conservation

24 Questions

- 6 Recall
- 9 Application
- 9 Analysis

Security, Safety, Compliance, & Administrative Procedures

Job Tasks Included in this Content Area:

1. Accept chemical shipments
2. Advise on need to order chemicals, repair parts, and tools
3. Advise system staff and/or contractors of potential problems and alarms
4. Prepare budget for chemicals, laboratory reagents, and equipment
5. Inspect plant safety equipment (e.g., fire extinguishers, AED, smoke and gas detectors)
6. Comply with safety requirements of the facility and actively promote safe work practices
7. Conduct tours of facilities
8. Develop and maintain standard operating procedures
9. Determine materials, labor, and cost needed for operation, maintenance, and repairs
10. Procure materials, labor, and cost needed for operation, maintenance, and repairs
11. Investigate consumer complaints regarding water quality and take remedial action
12. Take delivery of chemicals by unloading by hand or with equipment such as fork lifts and cranes (e.g., chlorine cylinders, bulk liquids, and dry bagged chemicals)
13. Inspect chemical containers and security tags before taking delivery (e.g., review SDS's)
14. Comply with lockout tagout procedures
15. Determine if water quality violations have occurred
16. Ensure compliance with regulatory agency standards
17. Manage safety and environmental issues in compliance with appropriate regulatory agencies (e.g., Hazardous Waste Disposal and Air Quality Standards)
18. Monitor and control residual effluents to comply with regulatory permit limits
19. Monitor the use of energy and chemicals
20. Complete monthly reports
21. Track and maintain inventory (e.g., equipment, chemical, and general supplies)
22. Evaluate operating records and trends
23. Maintain facility operation records
24. Conduct confined space entries according to appropriate regulatory guidelines
25. Notify the public when reportable maximum contaminant levels are exceeded
26. Perform facility and perimeter security checks
27. Use, handle, and dispose of chemicals according to safety standards
28. Perform safety procedures (e.g., calibration of atmospheric testing devices, chemical hazards and chemical spill response, pathogens, personal protective equipment)
29. Perform supervisory duties:
    a. Determining and assigning work schedules and tasks
    b. Enforcing policies and safety procedures
    c. Conducting performance evaluations
    d. Resolving grievances
    e. Making appropriate hiring decisions
    f. Initiating, investigating, and implementing disciplinary actions
    g. Coordinating schedule to ensure that plant resources are being utilized to achieve project specific objectives
30. Plan water treatment operations:
    a. Production
    b. Treatment and storage
    c. Budgeting
    d. Project management

e. Contract management
f. Capital improvement planning
g. Asset management

31. Review and update facility emergency response plans
32. Respond to emergencies (e.g., facility upset, major spill response, natural disasters, system contamination)

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	Treatment Process (33%)*	Laboratory Analysis (13%)*	Equipment Operation & Maintenance (21%)*	Source Water Characteristics (9%)*	Security, Safety, Compliance, & Administrative Procedures (24%)*
Arithmetic (e.g., measurements and calculations)	Advanced	Advanced	Advanced	Advanced	Advanced
Biology (e.g., pathogenic organisms)	Advanced	Advanced		Advanced	
Chemistry (e.g., water chemistry)	Advanced	Advanced		Advanced	
Chemical dosing (coagulants, oxidants, disinfectants, acids and bases)	Advanced				
Chemical feed equipment (e.g., liquid, solid, gases)			Advanced		
Chemical properties (e.g., reactivity, compatibility, pH)	Advanced	Advanced	Intermediate		
Contaminants (e.g., organic, inorganic)	Advanced	Advanced		Advanced	
Disciplinary procedures					Intermediate
General electrical principles (e.g. troubleshooting breakers, relays, circuits)			Intermediate		
Internal combustion engines			Intermediate		
Laboratory equipment (e.g., glassware)		Advanced			
Laboratory instrumentation (e.g., operation and calibration)		Advanced			

Supporting Knowledge Type	Treatment Process (33%)*	Laboratory Analysis (13%)*	Equipment Operation & Maintenance (21%)*	Source Water Characteristics (9%)*	Security, Safety, Compliance, & Administrative Procedures (24%)*
Laboratory procedures and protocols (e.g., Standard Methods)		Advanced			
Laboratory techniques	Advanced	Advanced			
Legislative process					Advanced
Mechanical principles (e.g., mixing, solids compression)	Advanced		Advanced		
Pneumatics (e.g., actuators, compressors, valves)			Advanced		
Prime mover of water (e.g., pumps)			Advanced		
Principles of finance					Intermediate
Principles of hydraulics (e.g. mass flow balance, detention time, loading, velocity)	Advanced			Intermediate	
Principles of hydrology (e.g., hydraulic cycle, aquifers)				Advanced	
Principles of public relations (e.g., water quality concerns, rate increases)				Basic	Intermediate
Process control instrumentation (e.g., pH, turbidity, temperature, etc.)	Advanced		Advanced	Advanced	
Proper chemical handling and storage		Advanced	Advanced		Advanced
Proper lifting procedures					Basic
Proper sampling procedures (e.g., chain of custody, storage and preservation)		Advanced			Intermediate
Public administration procedures				Intermediate	Intermediate
Quality control/quality assurance practices		Advanced			Basic
Recordkeeping policies		Intermediate			Advanced
Reporting requirements (e.g., violations, annual reports)					Advanced
Risk management				Intermediate	Intermediate
Safety Data Sheets	Advanced	Advanced	Advanced		Advanced
Safety equipment (e.g., personal protective equipment, safety showers and eye washes)	Advanced	Advanced	Advanced		Advanced
Safety procedures and regulations (e.g., lockout tagout, confined space)					Advanced
Storage (e.g., clearwells, reservoirs)	Advanced		Advanced		
Valve operation and maintenance			Advanced		
Watershed protection				Advanced	

Percent of exam associated with the Content Area

ABC
Association of
Boards of Certification

Association of Boards of Certification
2805 SW Snyder Blvd., Suite 535
Ankeny, IA 50023
Phone: (515) 232-3623
www.abccert.org • abc@abccert.org
www.ProfessionalOperator.org • Info@ProfessionalOperator.org

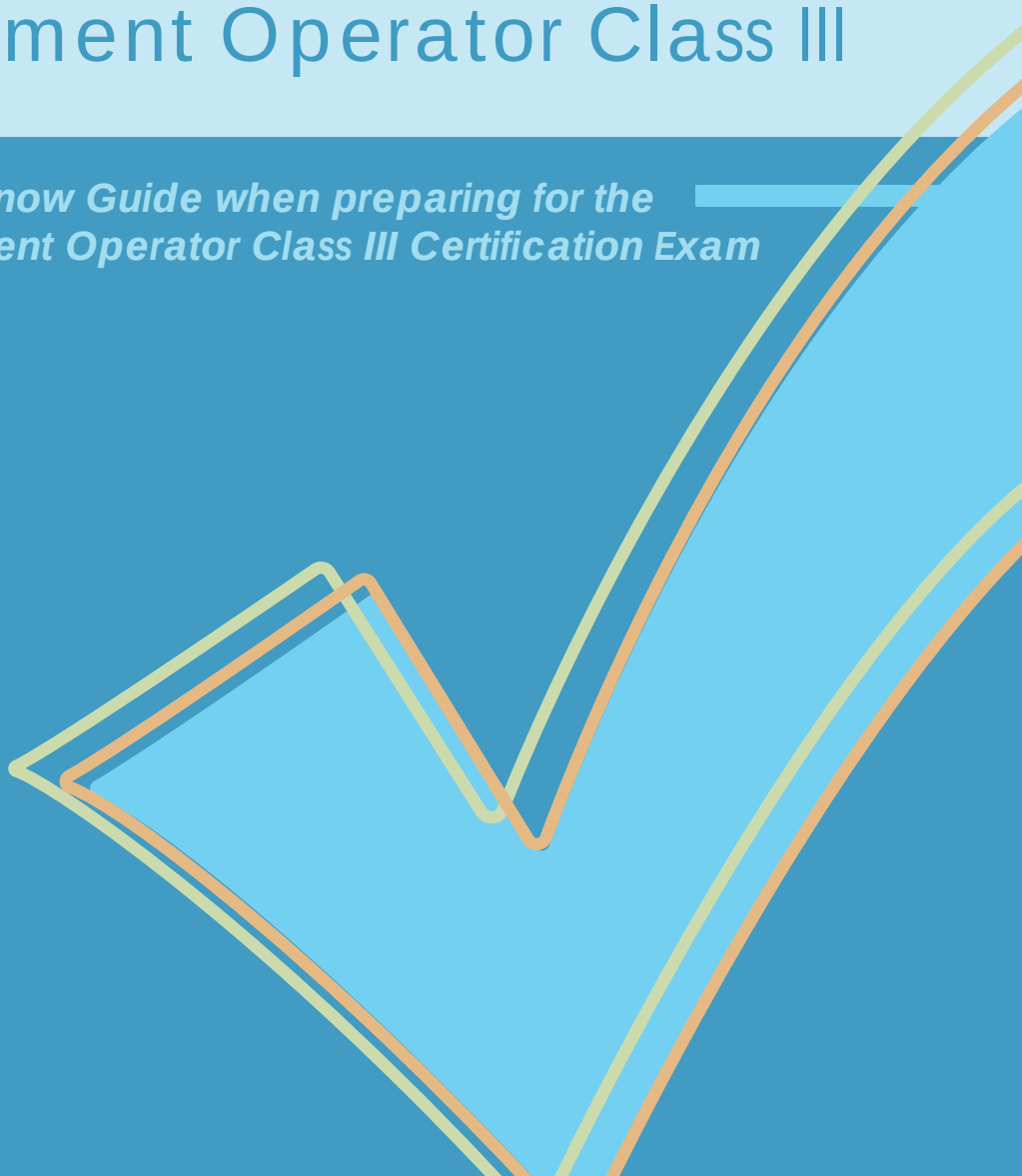
ABC
Association of
Boards of Certification

2017

Need-to-Know Criteria

Water Treatment Operator Class III

A Need-to-Know Guide when preparing for the ABC Water Treatment Operator Class III Certification Exam



Before You Dive In…

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

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

Copyright Notice

All ABC examination questions are the copyrighted property of ABC. It is forbidden under federal copyright law to copy, reproduce, record, distribute, or display these examination questions by any means, in whole or in part, without written permission from ABC. Doing so may subject violators to severe civil and criminal penalties.

Water Treatment Operator Class III *Need-to-Know Criteria*

Exam Content

The Water 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 water 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
30	Treatment Process	5 18 7
13	Laboratory Analysis	3 7 3
23	Equipment Operation & Maintenance	5 13 5
10	Source Water Characteristics	2 6 2
24	Security, Safety, Compliance, & Administrative Procedures	7 12 5
100*	Total	22 56 22

This exam includes 12 calculation questions

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

30 Questions

5 Recall

18 Application

7 Analysis

Treatment Process

Job Tasks Included in this Content Area:

1. Calculate and/or record:
   a. Plant residuals
   b. Backwash water
   c. Daily flow rates
   d. Chemical levels and previous days usage
   e. Filter performance data
   f. Online analyzers data
2. Calculate chemical dosages
3. Interact with HMI and SCADA
4. Determine correct disinfectant dosage and contact time to maintain desired level of residual in system
5. Control treatment plant processes, chemical dosages, and equipment used to treat water.
6. Determine and adjust plant flows to meet system demands
7. Troubleshoot malfunctions and problems in plant process and equipment
8. Identify trends and abnormal operation in plant processes by interpreting data from gauges, meters, charts, and graphs
9. Interpret facility and process control water meters
10. Maintain records of operation of treatment facilities:
    a. Daily testing logs
    b. Daily equipment logs
    c. Daily intake and production
    d. Daily maintenance management reports and notes
    e. Microbiological sampling and testing
11. Make appropriate changes in plant processes to optimize performance and efficiency
12. Mix batches of chemical solutions
13. Add chemicals to hoppers and feed equipment
14. Monitor filter performance and backwash filters
15. Monitor the transmission and distribution system
16. Monitor, evaluate, and adjust:
    a. Pretreatment
    b. Coagulation and flocculation (e.g., flocculation tanks, rapid mix units)
    c. Clarification and sedimentation (e.g., inclined-plate, tube, up-flow solids-contact)
    d. Filtration (e.g., biofiltration, diatomaceous earth filters, direct and conventional filtration, membranes, microscreens, slow sand, Greensand, pressure, upflow, rapid sand, cartridge).
    e. Residuals disposal (e.g., lagoons, sludge drying beds, land application, on-site disposal, solids composting)
    f. Backwash aids
    g. Source water treatment (e.g., copper sulfate, aeration, mixing).
    h. Iron/manganese treatment
    i. Lime-soda ash softening
    j. Granular activated carbon
    k. Powdered activated carbon
    l. Ion exchange
    m. Chemical feed pumps
    n. Online instrumentation
17. Operate and control electric motors, pumps, and valves to regulate flow of water at the treatment facility
18. Perform calculations related to process monitoring
19. Ensure the proper handling, storage and use of chemicals:
    a. Acids
    b. Bases
    c. Oxidants
    d. Coagulants

e. Polymers
f. Chemical disinfectants
g. Fluoride
h. Corrosion control chemicals

Laboratory Analysis

Job Tasks Included in this Content Area:

1. Calibrate and repair laboratory instrumentation to ensure proper operation
2. Collect water samples
3. Perform sample preservation and documentation for laboratory samples
4. Perform lab tests, record results, and interpret data
5. Use equipment to evaluate water quality
6. Perform analyses:
    a. Color
    b. Taste and odor
    c. Turbidity
    d. Free Cl2 residual
    e. Total Cl2 residual
    f. Fluoride
    g. pH
    h. Hardness
    i. Aluminum
    j. Alkalinity
    k. Iron
    l. Manganese
    m. Temperature
    n. Bacteria
    o. Jar test
    p. Zeta potential

Equipment Operation & Maintenance

Job Tasks Included in this Content Area:

1. Adjust pumps to meet demand
2. Measure and analyze filter media to determine compliance with design specifications
3. Perform facility startup and shutdown per SOP
4. Calibrate inline instrumentation (e.g., pH, turbidimeters, Cl analyzer)
5. Complete equipment maintenance and repair records, including work orders
6. Update asset management log (e.g., CMS)
7. Ensure the operation and maintenance of equipment at the water treatment facility:
    a. Chlorine disinfection system
    b. Filter systems (e.g., biofiltration, diatomaceous earth filters, direct and conventional filtration, membranes, microscreens, slow sand, Greensand, pressure, upflow, rapid sand, cartridge)
    c. Clarifier
    d. Treated water storage tanks
    e. Clearwell
    f. Programmable Logic Control (PLC) System
    g. SCADA
    h. Polymer feed system
    i. Raw and treated water pumping systems
    j. Raw water screening
    k. Water intake equipment
    l. Pumps
    m. Chemical feed equipment
    n. Chemical mixing equipment (e.g., rapid mix, flocculators, static mixers)
    o. Water quality analyzers
    p. Valves
    q. Injectors
8. Evaluate filter operation by performing filter surveillance tests
9. Inspect, exercise, and maintain valves
10. Maintain facility and process control water meters
11. Install and maintain facility piping (e.g., air, water, chemical)
12. Lubricate pumps, motors, chains, conveyors, and other machinery and equipment
13. Operate and maintain pumps, drivers, and auxiliary equipment
14. Operate and maintain onsite backup power generator
15. Perform calibration of chemical feeders
16. Perform efficiency tests on pumps and related equipment (e.g., pump curves)
17. Perform preventive and corrective maintenance to the auxiliary water treatment plant equipment:
    a. Electric motors
    b. Engines
    c. Gas and electric powered pumps
    d. Air compressors
    e. Emergency systems
    f. Power generation systems
    g. Pressure and flow regulators
    h. Online analyzers
    i. Filters (e.g., air, oil)
    j. Chemical feed systems
18. Perform routine maintenance of grounds machinery, structures, equipment, and piping systems (e.g., cleaning, painting)
19. Perform inspections on clear well covers, hatches, access covers, vents, and overflows
20. Backwash filters

Source Water Characteristics

Job Tasks Included in this Content Area:

1. Evaluate the following source water characteristics:
    a. Biological (bacterial, protozoa, viruses)
    b. Chemical
    c. Potential sources of source water contamination
    d. Physical
2. Measure static water level and pumping levels of wells
3. Measure and monitor raw water source
4. Perform inspections of surface water sources and report any issues that may affect water quality (e.g., non-native plant species, mussels, algae, erosion)
5. Perform inspections of ground water well sites and report any issues that may affect water quality (e.g., contamination, flooding, well head protection)
6. Perform raw water reservoir inspection, maintenance, and cleaning
7. Determine if wells are under the direct influence of surface water (GWI)
8. Monitor lake stratification
9. Educate community on source water protection and conservation

24 Questions

7 Recall
12 Application
5 Analysis

Security, Safety, Compliance, & Administrative Procedures

Job Tasks Included in this Content Area:

1. Accept chemical shipments
2. Advise on need to order chemicals, repair parts, and tools
3. Advise system staff and/or contractors of potential problems and alarms
4. Prepare budget for chemicals, laboratory reagents, and equipment
5. Inspect plant safety equipment (e.g., fire extinguishers, AED, smoke and gas detectors)
6. Comply with safety requirements of the facility and actively promote safe work practices
7. Conduct tours of facilities
8. Develop and maintain standard operating procedures
9. Determine materials, labor, and cost needed for operation, maintenance, and repairs
10. Procure materials, labor, and cost needed for operation, maintenance, and repairs
11. Investigate consumer complaints regarding water quality and take remedial action
12. Take delivery of chemicals by unloading by hand or with equipment such as fork lifts and cranes (e.g., chlorine cylinders, bulk liquids, and dry bagged chemicals)
13. Inspect chemical containers and security tags before taking delivery (e.g., review SDS's)
14. Comply with lockout tagout procedures
15. Determine if water quality violations have occurred
16. Ensure compliance with regulatory agency standards
17. Manage safety and environmental issues in compliance with appropriate regulatory agencies (e.g., Hazardous Waste Disposal and Air Quality Standards)
18. Monitor and control residual effluents to comply with regulatory permit limits
19. Monitor the use of energy and chemicals
20. Complete monthly reports
21. Track and maintain inventory (e.g., equipment, chemical, and general supplies)
22. Evaluate operating records and trends
23. Maintain facility operation records
24. Conduct confined space entries according to appropriate regulatory guidelines
25. Notify the public when reportable maximum contaminant levels are exceeded
26. Perform facility and perimeter security checks
27. Use, handle, and dispose of chemicals according to safety standards
28. Perform safety procedures (e.g., calibration of atmospheric testing devices, chemical hazards and chemical spill response, pathogens, personal protective equipment)
29. Perform supervisory duties:
    a. Determining and assigning work schedules and tasks
    b. Enforcing policies and safety procedures
    c. Conducting performance evaluations
    d. Resolving grievances
    e. Making appropriate hiring decisions
    f. Initiating, investigating, and implementing disciplinary actions
    g. Coordinating schedule to ensure that plant resources are being utilized to achieve project specific objectives
30. Plan water treatment operations:
    a. Production
    b. Treatment and storage
    c. Budgeting
    d. Project management
    e. Contract management
    f. Capital improvement planning
    g. Asset management
31. Review and update facility emergency response plans
32. Respond to emergencies (e.g., facility upset, major spill response, natural disasters, system contamination)

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	Treatment Process (30%)*	Laboratory Analysis (13%)*	Equipment Operation & Maintenance (23%)*	Source Water Characteristics (10%)*	Security, Safety, Compliance, & Administrative Procedures (24%)*
Arithmetic (e.g., measurements and calculations)	Advanced	Advanced	Intermediate	Intermediate	Intermediate
Biology (e.g., pathogenic organisms)	Intermediate	Advanced		Advanced	
Chemistry (e.g., water chemistry)	Advanced	Advanced		Advanced	
Chemical dosing (coagulants, oxidants, disinfectants, acids and bases)	Advanced				
Chemical feed equipment (e.g., liquid, solid, gases)			Advanced		
Chemical properties (e.g., reactivity, compatibility, pH)	Advanced	Intermediate	Intermediate		
Contaminants (e.g., organic, inorganic)	Advanced	Advanced		Advanced	
Disciplinary procedures					Basic
General electrical principles (e.g. troubleshooting breakers, relays, circuits)			Intermediate		
Internal combustion engines			Intermediate		
Laboratory equipment (e.g., glassware)		Advanced			
Laboratory instrumentation (e.g., operation and calibration)		Advanced			

Supporting Knowledge Type	Treatment Process (30%)*	Laboratory Analysis (13%)*	Equipment Operation & Maintenance (23%)*	Source Water Characteristics (10%)*	Security, Safety, Compliance, & Administrative Procedures (24%)*
Laboratory procedures and protocols (e.g., Standard Methods)		Advanced			
Laboratory techniques	Advanced	Advanced			
Legislative process					Intermediate
Mechanical principles (e.g., mixing, solids compression)	Intermediate		Intermediate		
Pneumatics (e.g., actuators, compressors, valves)			Intermediate		
Prime mover of water (e.g., pumps)			Advanced		
Principles of finance					Basic
Principles of hydraulics (e.g. mass flow balance, detention time, loading, velocity)	Intermediate			Intermediate	
Principles of hydrology (e.g., hydraulic cycle, aquifers)				Advanced	
Principles of public relations (e.g., water quality concerns, rate increases)				Basic	Intermediate
Process control instrumentation (e.g., pH, turbidity, temperature, etc.)	Intermediate		Advanced	Advanced	
Proper chemical handling and storage		Advanced	Advanced		Advanced
Proper lifting procedures					Basic
Proper sampling procedures (e.g., chain of custody, storage and preservation)		Advanced			Intermediate
Public administration procedures				Intermediate	Intermediate
Quality control/quality assurance practices		Intermediate			Basic
Recordkeeping policies		Intermediate			Advanced
Reporting requirements (e.g., violations, annual reports)					Advanced
Risk management				Intermediate	Basic
Safety Data Sheets	Advanced	Advanced	Advanced		Advanced
Safety equipment (e.g., personal protective equipment, safety showers and eye washes)	Advanced	Advanced	Intermediate		Advanced
Safety procedures and regulations (e.g., lockout tagout, confined space)					Intermediate
Storage (e.g., clearwells, reservoirs)	Intermediate		Intermediate		
Valve operation and maintenance			Intermediate		
Watershed protection				Advanced	

Percent of exam associated with the Content Area

ABC
Association of
Boards of Certification

Association of Boards of Certification
2805 SW Snyder Blvd., Suite 535
Ankeny, IA 50023
Phone: (515) 232-3623
www.abccert.org • abc@abccert.org
www.ProfessionalOperator.org • Info@ProfessionalOperator.org

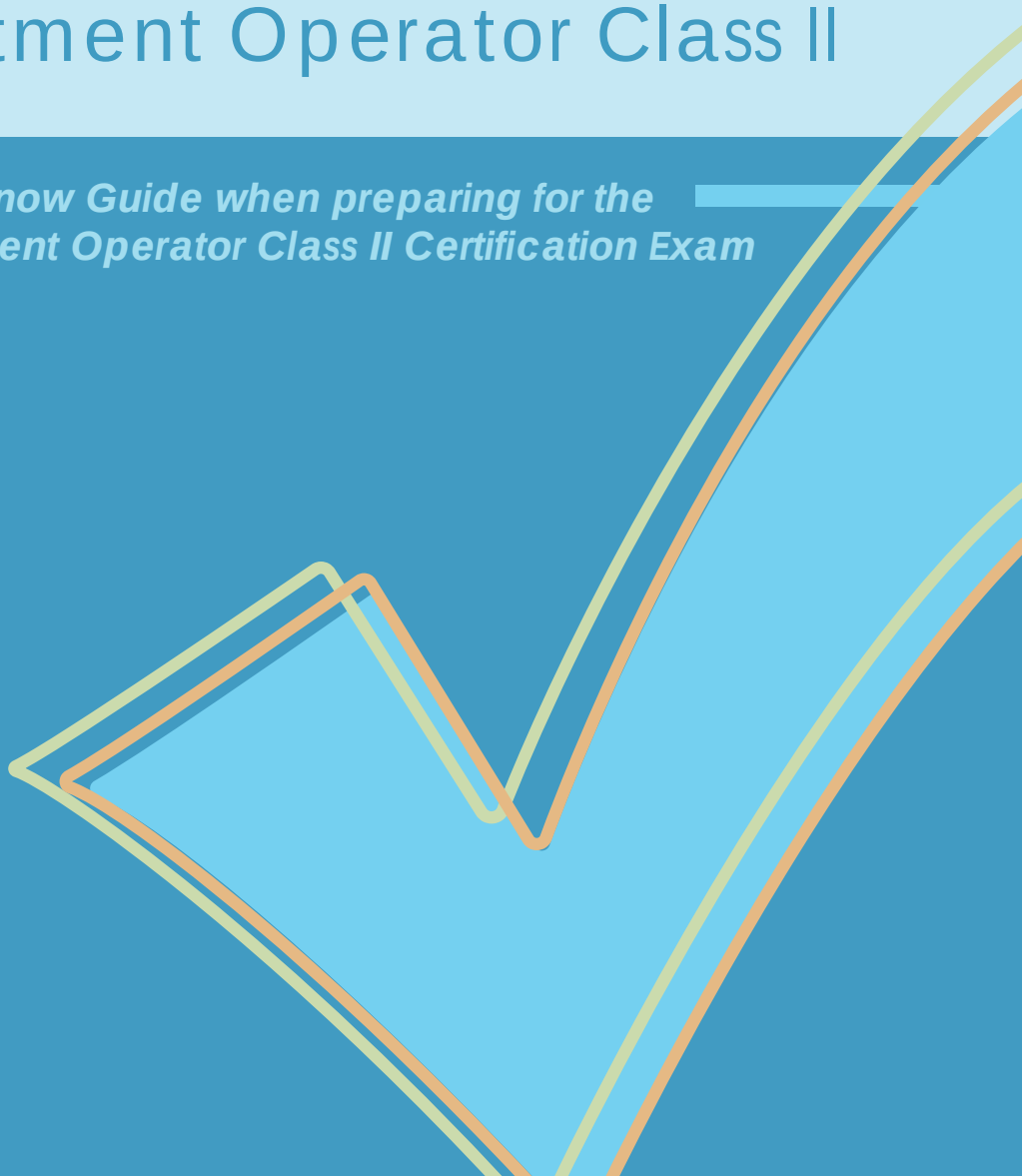
ABC
Association of
Boards of Certification

2017

Need-to-Know Criteria

Water Treatment Operator Class II

A Need-to-Know Guide when preparing for the
ABC Water Treatment Operator Class II Certification Exam



Before You Dive In...

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

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

Copyright Notice

All ABC examination questions are the copyrighted property of ABC. It is forbidden under federal copyright law to copy, reproduce, record, distribute, or display these examination questions by any means, in whole or in part, without written permission from ABC. Doing so may subject violators to severe civil and criminal penalties.

Water Treatment Operator Class II *Need-to-Know Criteria*

Exam Content

The Water Treatment Operator Class II 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 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
31	Treatment Process	8 17 6
14	Laboratory Analysis	5 8 1
24	Equipment Operation & Maintenance	7 15 2
11	Source Water Characteristics	2 7 2
20	Security, Safety, Compliance, & Administrative Procedures	9 11 0
100*	Total	31 58 11

This exam includes 10 calculation questions

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

31 Questions

8 Recall
17 Application
6 Analysis

Treatment Process

Job Tasks Included in this Content Area:

1. Calculate and/or record:
   a. Plant residuals
   b. Backwash water
   c. Daily flow rates
   d. Chemical levels and previous days usage
   e. Filter performance data
   f. Online analyzers data
2. Calculate chemical dosages
3. Interact with HMI and SCADA
4. Determine correct disinfectant dosage and contact time to maintain desired level of residual in system
5. Control treatment plant processes, chemical dosages, and equipment used to treat water
6. Determine and adjust plant flows to meet system demands
7. Troubleshoot malfunctions and problems in plant process and equipment
8. Identify trends and abnormal operation in plant processes by interpreting data from gauges, meters, charts, and graphs
9. Interpret facility and process control water meters
10. Maintain records of operation of treatment facilities:
    a. Daily testing logs
    b. Daily equipment logs
    c. Daily intake and production
    d. Daily maintenance management reports and notes
    e. Microbiological sampling and testing
11. Make appropriate changes in plant processes to optimize performance and efficiency
12. Mix batches of chemical solutions
13. Add chemicals to hoppers and feed equipment
14. Monitor filter performance and backwash filters
15. Monitor the transmission and distribution system
16. Monitor, evaluate, and adjust:
    a. Pretreatment
    b. Coagulation and flocculation (e.g., flocculation tanks, rapid mix units)
    c. Filtration (e.g., biofiltration, diatomaceous earth filters, direct and conventional filtration, membranes, microscreens, slow sand, Greensand, pressure, upflow, rapid sand, cartridge)
    d. Iron/manganese treatment
    e. Ion exchange
    f. Chemical feed pumps
    g. Online instrumentation
17. Operate and control electric motors, pumps, and valves to regulate flow of water at the treatment facility
18. Perform calculations related to process monitoring
19. Ensure the proper handling, storage and use of chemicals:
    a. Acids
    b. Bases
    c. Oxidants
    d. Chemical disinfectants
    e. Corrosion control chemicals

Laboratory Analysis

Job Tasks Included in this Content Area:

1. Calibrate and repair laboratory instrumentation to ensure proper operation
2. Collect water samples
3. Perform sample preservation and documentation for laboratory samples
4. Perform lab tests, record results, and interpret data
5. Use equipment to evaluate water quality
6. Perform analyses:
    a. Color
    b. Turbidity
    c. Free Cl2 residual
    d. Total Cl2 residual
    e. pH
    f. Hardness
    g. Aluminum
    h. Alkalinity
    i. Iron
    j. Temperature

Equipment Operation & Maintenance

Job Tasks Included in this Content Area:

1. Adjust pumps to meet demand
2. Perform facility startup and shutdown per SOP
3. Calibrate inline instrumentation (e.g., pH, turbidimeters, Cl analyzer)
4. Complete equipment maintenance and repair records, including work orders
5. Ensure the operation and maintenance of equipment at the water treatment facility:
    a. Chlorine disinfection system
    b. Filter systems (e.g., biofiltration, diatomaceous earth filters, direct and conventional filtration, membranes, microscreens, slow sand, Greensand, pressure, upflow, rapid sand, cartridge)
    c. Treated water storage tanks
    d. Clearwell
    e. Programmable Logic Control (PLC) System
    f. SCADA
    g. Raw and treated water pumping systems
    h. Water intake equipment
    i. Pumps
    j. Chemical feed equipment
    k. Chemical mixing equipment (e.g., rapid mix, flocculators, static mixers)
    l. Water quality analyzers
    m. Valves
    n. Injectors
6. Inspect, exercise, and maintain valves
7. Maintain facility and process control water meters
8. Install and maintain facility piping (e.g., air, water, chemical)
9. Lubricate pumps, motors, chains, conveyors, and other machinery and equipment
10. Operate and maintain pumps, drivers, and auxiliary equipment
11. Operate and maintain onsite backup power generator
12. Perform calibration of chemical feeders
13. Perform preventive and corrective maintenance to the auxiliary water treatment plant equipment:
    a. Electric motors
    b. Gas and electric powered pumps
    c. Air compressors
    d. Emergency systems
    e. Power generation systems
    f. Pressure and flow regulators
    g. Online analyzers
    h. Filters (e.g., air, oil)
    i. Chemical feed systems
14. Perform routine maintenance of grounds machinery, structures, equipment, and piping systems (e.g., cleaning, painting)
15. Perform inspections on clear well covers, hatches, access covers, vents, and overflows
16. Backwash filters

Source Water Characteristics

Job Tasks Included in this Content Area:

1. Evaluate the following source water characteristics:
    a. Biological (bacterial, protozoa, viruses)
    b. Chemical
    c. Potential sources of source water contamination
    d. Physical
2. Measure static water level and pumping levels of wells
3. Measure and monitor raw water source
4. Perform inspections of ground water well sites and report any issues that may affect water quality (e.g., contamination, flooding, well head protection)
5. Determine if wells are under the direct influence of surface water (GWI)
6. Educate community on source water protection and conservation

20 Questions

9 Recall
11 Application
0 Analysis

Security, Safety, Compliance, & Administrative Procedures

Job Tasks Included in this Content Area:

1. Accept chemical shipments
2. Advise on need to order chemicals, repair parts, and tools
3. Advise system staff and/or contractors of potential problems and alarms
4. Inspect plant safety equipment (e. g., fire extinguishers, AED, smoke and gas detectors)
5. Comply with safety requirements of the facility and1 actively promote safe work practices
6. Develop and maintain standard operating procedures
7. Determine materials, labor, and cost needed for operation, maintenance, and repairs
8. Procure materials, labor, and cost needed for operation, maintenance, and repairs
9. Investigate consumer complaints regarding water quality and take remedial action
10. Take delivery of chemicals by unloading by hand or with equipment such as fork lifts and cranes (e.g., chlorine cylinders, bulk liquids, and dry bagged chemicals)
11. Inspect chemical containers and security tags before taking delivery (e.g., review SDS's)
12. Comply with lockout tagout procedures
13. Determine if water quality violations have occurred
14. Ensure compliance with regulatory agency standards
15. Manage safety and environmental issues in compliance with appropriate regulatory agencies (e.g., Hazardous Waste Disposal and Air Quality Standards)
16. Monitor and control residual effluents to comply with regulatory permit limits
17. Monitor the use of energy and chemicals
18. Complete monthly reports
19. Track and maintain inventory (e.g., equipment, chemical, and general supplies)
20. Evaluate operating records and trends
21. Maintain facility operation records
22. Conduct confined space entries according to appropriate regulatory guidelines
23. Notify the public when reportable maximum contaminant levels are exceeded
24. Perform facility and perimeter security checks
25. Use, handle, and dispose of chemicals according to safety standards
26. Perform safety procedures (e.g., calibration of atmospheric testing devices, chemical hazards and chemical spill response, pathogens, personal protective equipment)
27. Perform supervisory duties:
    a. Determining and assigning work schedules and tasks
    b. Enforcing policies and safety procedures
28. Plan water treatment operations:
    a. Production
    b. Treatment and storage
29. Review and update facility emergency response plans
30. Respond to emergencies (e.g., facility upset, major spill response, natural disasters, system contamination)

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	Treatment Process (31%)*	Laboratory Analysis (14%)*	Equipment Operation & Maintenance (24%)*	Source Water Characteristics (11%)*	Security, Safety, Compliance, & Administrative Procedures (20%)*
Arithmetic (e.g., measurements and calculations)	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate
Biology (e.g., pathogenic organisms)	Basic	Intermediate		Intermediate	
Chemistry (e.g., water chemistry)	Intermediate	Intermediate		Intermediate	
Chemical dosing (coagulants, oxidants, disinfectants, acids and bases)	Intermediate				
Chemical feed equipment (e.g., liquid, solid, gases)			Intermediate		
Chemical properties (e.g., reactivity, compatibility, pH)	Intermediate	Intermediate	Intermediate		
Contaminants (e.g., organic, inorganic)	Intermediate	Intermediate		Intermediate	
Disciplinary procedures					
General electrical principles (e.g. troubleshooting breakers, relays, circuits)			Intermediate		
Internal combustion engines			Intermediate		
Laboratory equipment (e.g., glassware)		Intermediate			
Laboratory instrumentation (e.g., operation and calibration)		Intermediate			

Supporting Knowledge Type	Treatment Process (31%)*	Laboratory Analysis (14%)*	Equipment Operation & Maintenance (24%)*	Source Water Characteristics (11%)*	Security, Safety, Compliance, & Administrative Procedures (20%)*
Laboratory procedures and protocols (e.g., Standard Methods)		Advanced			
Laboratory techniques	Intermediate	Intermediate			
Legislative process					
Mechanical principles (e.g., mixing, solids compression)	Intermediate		Intermediate		
Pneumatics (e.g., actuators, compressors, valves)			Intermediate		
Prime mover of water (e.g., pumps)			Intermediate		
Principles of finance					
Principles of hydraulics (e.g. mass flow balance, detention time, loading, velocity)	Intermediate			Basic	
Principles of hydrology (e.g., hydraulic cycle, aquifers)				Intermediate	
Principles of public relations (e.g., water quality concerns, rate increases)				Basic	Intermediate
Process control instrumentation (e.g., pH, turbidity, temperature, etc.)	Intermediate		Intermediate	Intermediate	
Proper chemical handling and storage		Intermediate	Intermediate		Intermediate
Proper lifting procedures					Basic
Proper sampling procedures (e.g., chain of custody, storage and preservation)		Intermediate			Intermediate
Public administration procedures				Basic	Intermediate
Quality control/quality assurance practices		Intermediate			Basic
Recordkeeping policies		Intermediate			Intermediate
Reporting requirements (e.g., violations, annual reports)					Intermediate
Risk management				Basic	
Safety Data Sheets	Intermediate	Intermediate	Intermediate		Intermediate
Safety equipment (e.g., personal protective equipment, safety showers and eye washes)	Advanced	Advanced	Intermediate		Advanced
Safety procedures and regulations (e.g., lockout tagout, confined space)					Basic
Storage (e.g., clearwells, reservoirs)	Basic		Intermediate		
Valve operation and maintenance			Intermediate		
Watershed protection				Intermediate	

Percent of exam associated with the Content Area

ABC
Association of
Boards of Certification

Association of Boards of Certification
2805 SW Snyder Blvd., Suite 535
Ankeny, IA 50023
Phone: (515) 232-3623
www.abccert.org • abc@abccert.org
www.ProfessionalOperator.org • Info@ProfessionalOperator.org

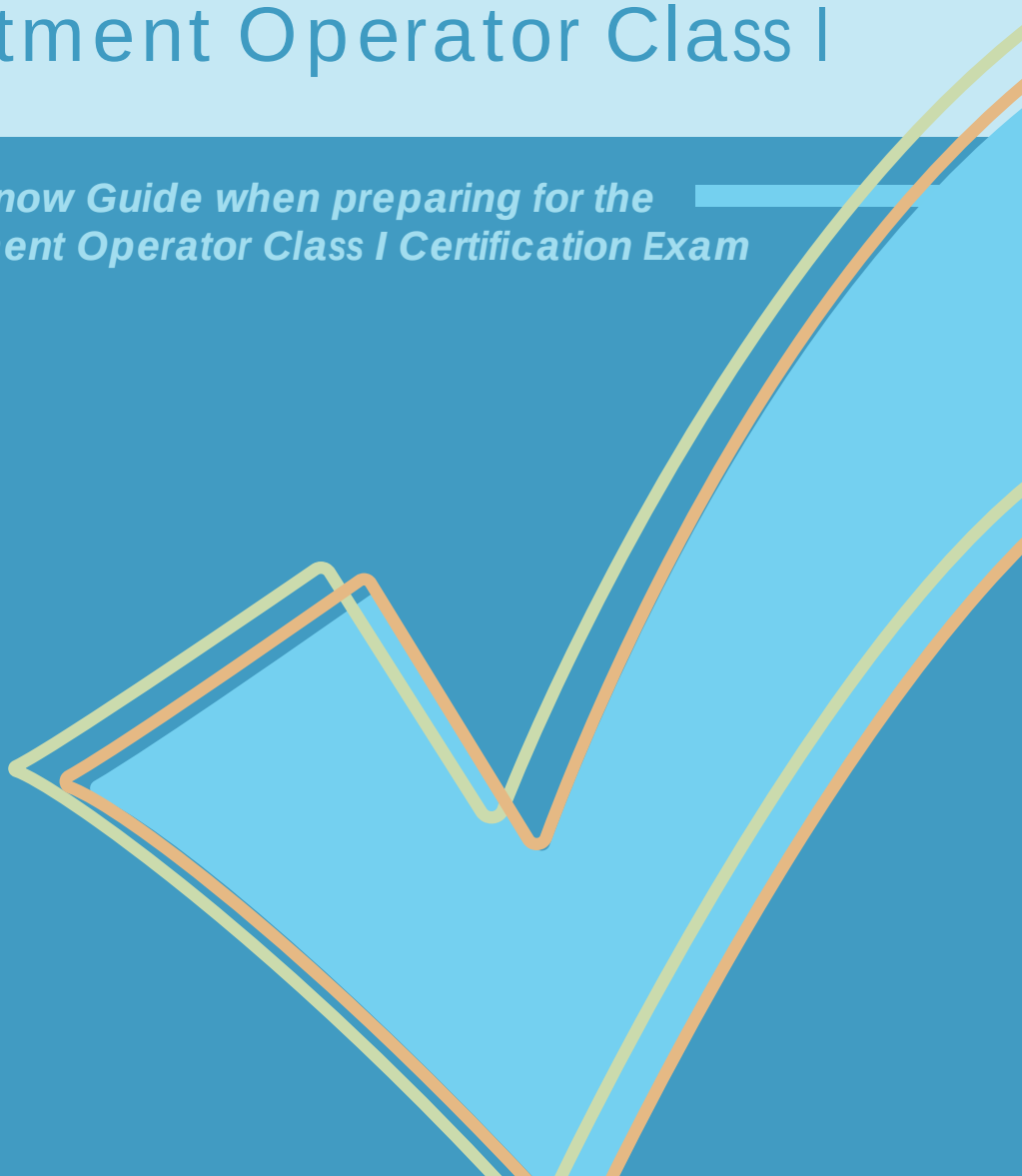
ABC
Association of
Boards of Certification

2017

Need-to-Know Criteria

Water Treatment Operator Class I

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



Before You Dive In…

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

This *ABC Water Treatment 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 Treatment 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 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 2017 edition of the ABC Standardized Water Treatment 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 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.

Copyright Notice

All ABC examination questions are the copyrighted property of ABC. It is forbidden under federal copyright law to copy, reproduce, record, distribute, or display these examination questions by any means, in whole or in part, without written permission from ABC. Doing so may subject violators to severe civil and criminal penalties.

Water Treatment Operator Class I *Need-to-Know Criteria*

Exam Content

The Water Treatment 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 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
30	Treatment Process	12 18 0
13	Laboratory Analysis	5 8 0
27	Equipment Operation & Maintenance	11 16 0
10	Source Water Characteristics	4 6 0
20	Security, Safety, Compliance, & Administrative Procedures	9 11 0
100*	Total	41 59 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).

30 Questions

- 12 Recall
- 18 Application
- 0 Analysis

Treatment Process

Job Tasks Included in this Content Area:

1. Calculate and/or record:
    a. Plant residuals
    b. Daily flow rates
    c. Chemical levels and previous days usage
    d. Filter performance data
    e. Online analyzers data
2. Calculate chemical dosages
3. Interact with HMI and SCADA
4. Determine correct disinfectant dosage and contact time to maintain desired level of residual in system
5. Control treatment plant processes, chemical dosages, and equipment used to treat water
6. Determine and adjust plant flows to meet system demands
7. Troubleshoot malfunctions and problems in plant process and equipment
8. Identify trends and abnormal operation in plant processes by interpreting data from gauges, meters, charts, and graphs
9. Interpret facility and process control water meters
10. Maintain records of operation of treatment facilities:
    a. Daily testing logs
    b. Daily equipment logs
    c. Daily intake and production
    d. Daily maintenance management reports and notes
    e. Microbiological sampling and testing
11. Make appropriate changes in plant processes to optimize performance and efficiency
12. Mix batches of chemical solutions
13. Add chemicals to hoppers and feed equipment
14. Monitor filter performance and backwash filters
15. Monitor the transmission and distribution system
16. Monitor, evaluate, and adjust:
    a. Pretreatment
    b. Filtration (e.g., biofiltration, diatomaceous earth filters, direct and conventional filtration, membranes, microscreens, slow sand, Greensand, pressure, upflow, rapid sand, cartridge)
    c. Ion exchange
    d. Chemical feed pumps
    e. Online instrumentation
17. Operate and control electric motors, pumps, and valves to regulate flow of water at the treatment facility
18. Perform calculations related to process monitoring
19. Ensure the proper handling, storage and use of chemicals:
    a. Acids
    b. Oxidants
    c. Chemical disinfectants

13 Questions

5 Recall
8 Application
0 Analysis

Laboratory Analysis

Job Tasks Included in this Content Area:

1. Calibrate and repair laboratory instrumentation to ensure proper operation
2. Collect water samples
3. Perform sample preservation and documentation for laboratory samples
4. Perform lab tests, record results, and interpret data
5. Use equipment to evaluate water quality
6. Perform analyses:
    a. Turbidity
    b. Free Cl2 residual
    c. Total Cl2 residual
    d. pH

Equipment Operation & Maintenance

Job Tasks Included in this Content Area:

1. Adjust pumps to meet demand
2. Perform facility startup and shutdown per SOP
3. Calibrate inline instrumentation (e.g., pH, turbidimeters, Cl analyzer)
4. Complete equipment maintenance and repair records, including work orders
5. Ensure the operation and maintenance of equipment at the water treatment facility:
    a. Chlorine disinfection system
    b. Treated water storage tanks
    c. Clearwell
    d. SCADA
    e. Raw and treated water pumping systems
    f. Water intake equipment
    g. Pumps
    h. Chemical feed equipment
    i. Chemical mixing equipment (e.g., rapid mix, flocculators, static mixers)
    j. Water quality analyzers
    k. Valves
    l. Injectors
6. Inspect, exercise, and maintain valves
7. Maintain facility and process control water meters
8. Install and maintain facility piping (e.g., air, water, chemical)
9. Lubricate pumps, motors, chains, conveyors, and other machinery and equipment
10. Operate and maintain pumps, drivers, and auxiliary equipment
11. Operate and maintain onsite backup power generator
12. Perform calibration of chemical feeders
13. Perform preventive and corrective maintenance to the auxiliary water treatment plant equipment:
    a. Electric motors
    b. Gas and electric powered pumps
    c. Emergency systems
    d. Pressure and flow regulators
    e. Chemical feed systems
14. Perform routine maintenance of grounds machinery, structures, equipment, and piping systems (e.g., cleaning, painting)
15. Perform inspections on clear well covers, hatches, access covers, vents, and overflows

Source Water Characteristics

Job Tasks Included in this Content Area:

1. Evaluate the following source water characteristics:
    a. Biological (bacterial, protozoa, viruses)
    b. Chemical
    c. Potential sources of source water contamination
    d. Physical
2. Measure static water level and pumping levels of wells
3. Measure and monitor raw water source
4. Perform inspections of ground water well sites and report any issues that may affect water quality (e.g., contamination, flooding, well head protection)
5. Educate community on source water protection and conservation

20 Questions

9 Recall
11 Application
0 Analysis

Security, Safety, Compliance, & Administrative Procedures

Job Tasks Included in this Content Area:

1. Accept chemical shipments
2. Advise on need to order chemicals, repair parts, and tools
3. Advise system staff and/or contractors of potential problems and alarms
4. Inspect plant safety equipment (e. g., fire extinguishers, AED, smoke and gas detectors)
5. Comply with safety requirements of the facility and actively promote safe work practices
6. Develop and maintain standard operating procedures
7. Determine materials, labor, and cost needed for operation, maintenance, and repairs
8. Procure materials, labor, and cost needed for operation, maintenance, and repairs
9. Investigate consumer complaints regarding water quality and take remedial action
10. Take delivery of chemicals by unloading by hand or with equipment such as fork lifts and cranes (e.g., chlorine cylinders, bulk liquids, and dry bagged chemicals)
11. Inspect chemical containers and security tags before taking delivery (e.g., review SDS's)
12. Comply with lockout tagout procedures
13. Determine if water quality violations have occurred
14. Ensure compliance with regulatory agency standards
15. Manage safety and environmental issues in compliance with appropriate regulatory agencies (e.g., Hazardous Waste Disposal and Air Quality Standards)
16. Monitor and control residual effluents to comply with regulatory permit limits
17. Monitor the use of energy and chemicals
18. Complete monthly reports
19. Track and maintain inventory (e.g., equipment, chemical, and general supplies)
20. Evaluate operating records and trends
21. Maintain facility operation records
22. Monitor and record daily weather readings
23. Conduct confined space entries according to appropriate regulatory guidelines
24. Notify the public when reportable maximum contaminant levels are exceeded
25. Perform facility and perimeter security checks
26. Use, handle, and dispose of chemicals according to safety standards
27. Perform safety procedures (e.g., calibration of atmospheric testing devices, chemical hazards and chemical spill response, pathogens, personal protective equipment)
28. Perform supervisory duties - enforcing policies and safety procedures
29. Plan water treatment operations such as:
    a. Production
    b. Treatment and storage
30. Review and update facility emergency response plans
31. Respond to emergencies (e.g., facility upset, major spill response, natural disasters, system contamination)

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	Treatment Process (30%)*	Laboratory Analysis (13%)*	Equipment Operation & Maintenance (27%)*	Source Water Characteristics (10%)*	Security, Safety, Compliance, & Administrative Procedures (20%)*
Arithmetic (e.g., measurements and calculations)	Basic	Basic	Basic	Basic	Basic
Biology (e.g., pathogenic organisms)	Basic	Basic		Basic	
Chemistry (e.g., water chemistry)	Basic	Basic		Basic	
Chemical dosing (coagulants, oxidants, disinfectants, acids and bases)	Basic				
Chemical feed equipment (e.g., liquid, solid, gases)			Basic		
Chemical properties (e.g., reactivity, compatibility, pH)	Intermediate	Basic	Basic		
Contaminants (e.g., organic, inorganic)	Basic	Basic		Basic	
Disciplinary procedures					
General electrical principles (e.g. troubleshooting breakers, relays, circuits)			Basic		
Internal combustion engines			Basic		
Laboratory equipment (e.g., glassware)		Basic			
Laboratory instrumentation (e.g., operation and calibration)		Basic			

Supporting Knowledge Type	Treatment Process (30%)*	Laboratory Analysis (13%)*	Equipment Operation & Maintenance (27%)*	Source Water Characteristics (10%)*	Security, Safety, Compliance, & Administrative Procedures (20%)*
Laboratory procedures and protocols (e.g., Standard Methods)		Intermediate			
Laboratory techniques	Basic	Basic			
Legislative process					
Mechanical principles (e.g., mixing, solids compression)	Basic		Basic		
Pneumatics (e.g., actuators, compressors, valves)			Basic		
Prime mover of water (e.g., pumps)			Basic		
Principles of finance					
Principles of hydraulics (e.g. mass flow balance, detention time, loading, velocity)	Basic			Basic	
Principles of hydrology (e.g., hydraulic cycle, aquifers)				Basic	
Principles of public relations (e.g., water quality concerns, rate increases)				Basic	Intermediate
Process control instrumentation (e.g., pH, turbidity, temperature, etc.)	Basic		Basic	Basic	
Proper chemical handling and storage		Basic	Basic		Basic
Proper lifting procedures					Basic
Proper sampling procedures (e.g., chain of custody, storage and preservation)		Basic			Basic
Public administration procedures				Basic	Basic
Quality control/quality assurance practices		Intermediate			Basic
Recordkeeping policies		Intermediate			Basic
Reporting requirements (e.g., violations, annual reports)					Basic
Risk management				Basic	
Safety Data Sheets	Intermediate	Intermediate	Intermediate		Intermediate
Safety equipment (e.g., personal protective equipment, safety showers and eye washes)	Intermediate	Intermediate	Basic		Intermediate
Safety procedures and regulations (e.g., lockout tagout, confined space)					Basic
Storage (e.g., clearwells, reservoirs)	Basic		Basic		
Valve operation and maintenance			Basic		
Watershed protection				Basic	

Percent of exam associated with the Content Area

ABC
Association of
Boards of Certification

Association of Boards of Certification
2805 SW Snyder Blvd., Suite 535
Ankeny, IA 50023
Phone: (515) 232-3623
www.abccert.org • abc@abccert.org
www.ProfessionalOperator.org • Info@ProfessionalOperator.org

ABC Need-to-Know Criteria for Very Small Water System Operators

ABC
Association of Boards of Certification

2805 SW Snyder Blvd., Suite 535, Ankeny, Iowa 50023

Phone (515) 232-3623 Fax (515) 965-6827

Email abc@abccert.org Website www.abccert.org

Acknowledgment

The Association would like to thank the members of the Distribution Validation and Examination Committee for their effort in supporting ABC's Very Small Water System Certification Program. Committee members included:

- Jess Jones (Chair), Operator Training Committee of Ohio
- Richard Bond, Colorado Springs (CO) Utilities
- Don Jackson, South Carolina Environmental Certification Board
- Ken Kerri, California State University, Sacramento, Office of Water Programs
- Thomas Rothermich, City of St. Louis (MO) – Water Division
- Russ Glaser, Clark Public Utilities, Vancouver, Washington
- Martin Nutt, Arkansas Drinking Water Advisory and Operators Licensing Committee
- Wes Haskell, Old Town Water District, Old Town, Maine
- Shawn Bradford, Aquarion Water Company
- Cindy Cook, Minnesota Department of Health, Drinking Water Protection

Introduction

As part of the development of very small water system certification exams, the Association of Boards of Certification (ABC) conducted a job analysis of very small water system operators during 1998. The definition of a very small water system used during the job analysis was a system serving a maximum population of 500 with no treatment other than disinfection. The Need-to-Know Criteria was developed from the results of ABC's 1998 very small water system operator job analysis.

In 2005, ABC's Distribution Validation and Examination (V&E) Committee revised the need-to-know criteria to reflect current terminology used in the item bank. The information in this document reflects the essential job tasks performed by operators and their requisite capabilities. This document is intended to be used by certification programs and trainers to help prepare operators for entry into the profession.

How the Need-to-Know Criteria Was Developed

In 1998, a seven-member job analysis committee was formed to provide technical assistance in the development of the very small water system operator job analysis. During their meeting, this committee developed the list of the important job tasks performed by very small water system operators. The committee also verified the technical accuracy, clarity, and comprehensiveness of the job tasks. The committee then identified the capabilities (i.e., knowledge, skills, and abilities) required to perform the identified job tasks. Identification of capabilities was done on a task by task basis, so that a link was established between each task statement and requisite capability. This process resulted in a final list of 238 job tasks and 178 capabilities.

Task Inventory

A task inventory was developed from the data collected during the committee meeting. The inventory included 8-point rating scales for frequency of performance and seriousness of inadequate or incorrect performance. These two rating scales were used because they provide useful information (i.e., how critical each task is and how frequently each task is performed) pertaining to certification. The task inventory was sent to 220 certified very small water system operators throughout the United States and Canada. Ninety-three out of the 220 inventories mailed were returned for a response rate 42%.

Analysis of Ratings

The mean, standard deviation, and the percentage of respondents performing each task statement were computed. The mean was used to determine the importance of items and the standard deviation was used to identify items with a wide variation in responses. The percentage of respondents performing each task statement was used to identify tasks and capabilities commonly performed by operators throughout the United States and Canada.

A criticality value of 2(mean seriousness rating) + mean frequency rating was calculated for each item on the inventory. This formula gives extra weight to the seriousness rating in determining critical items and was appropriate because it emphasized the purpose of certification—to provide competent operators.

Core Competencies

The criticality ratings and percentage of operators reporting that they performed the tasks were used to determine what is covered on the very small water system exam. The essential tasks and capabilities that were identified through this process are called the core competencies. The following pages list the core competencies for very small water system operators. The core competencies are clustered into the following job duties:

- Operate System
- Water Quality Parameters and Sampling
- Operate Equipment
- Install, Maintain and Evaluate Equipment
- Perform Safety Duties
- Perform Administrative and Compliance Duties

Core Competencies for Very Small Water System Operators

Operate System

System Design

- Assess system demand
- Flushing program
- System layout
- System map
- Perform pressure readings
- Read blueprints, readings, and maps
- Select materials
- Select type of pipes
- Size mains

System Inspection

- Cross connection surveys/control
- Sample site plan
- Sanitary surveys
- Well inspection

Chlorine Disinfection

- Monitor disinfection process
- Evaluate disinfection process
- Adjust disinfection process

Required capabilities:

- Ability to adjust flow patterns and system units
- Ability to communicate verbally and in writing
- Ability to diagnose/troubleshoot system units
- Ability to discriminate between normal and abnormal conditions
- Ability to evaluate system units
- Ability to inspect pumps
- Ability to maintain system in normal operating condition
- Ability to monitor and adjust equipment
- Ability to perform basic math
- Knowledge of blueprint readings
- Knowledge of cathodic protection
- Knowledge of different types of joints, restraints and thrust blocks
- Knowledge of disinfection concepts and design parameters
- Knowledge of disinfection process
- Knowledge of fireflow requirements
- Knowledge of general chemistry, biology and physical science
- Knowledge of general electrical and hydraulic principles
- Knowledge of hydrology
- Knowledge of measuring instruments
- Knowledge of monitoring requirements
- Knowledge of piping material, type and size
- Knowledge of principles of measurement
- Knowledge of regulations
- Knowledge of sampling procedures and requirements
- Knowledge of sanitary survey process
- Knowledge of standards
- Knowledge of start-up and shut-down procedures
- Knowledge of testing instruments
- Knowledge of well drilling principles
- Knowledge of well-head protection

Core Competencies (continued)

Water Quality Parameters and Sampling

- Chlorine demand/residual/dosage
- Coliforms
- pH
- Temperature
- Turbidity

Required capabilities:

- Ability to calibrate instruments
- Ability to follow written procedures
- Ability to interpret Material Safety Data Sheets
- Ability to perform basic math
- Ability to recognize normal and abnormal analytical results
- Knowledge of basic laboratory equipment
- Knowledge of chemical handling and storage
- Knowledge of general biology, chemistry and physical science
- Knowledge of normal characteristics of water
- Knowledge of principles of measurement
- Knowledge of public notification requirements
- Knowledge of quality control/quality assurance practices
- Knowledge of regulations
- Knowledge of reporting requirements
- Knowledge of safety procedures
- Knowledge of sampling procedures

Operate Equipment

- Blowers and compressors
- Centrifugal pumps
- Chemical feeders
- Chlorinators
- Hydrants
- Hydraulic equipment
- Instrumentation
- Leak detectors
- Positive-displacement pumps
- Valves

Required capabilities:

- Ability to monitor, evaluate and adjust equipment
- Knowledge of drinking water concepts
- Knowledge of function of tools
- Knowledge of general electrical and mechanical principles
- Knowledge of hydraulic and pneumatic principles
- Knowledge of regulations
- Knowledge of safety procedures
- Knowledge of start-up and shut-down procedures
- Knowledge of system operation and maintenance

Core Competencies (continued)

Install, Maintain and Evaluate Equipment

Install and maintain equipment:

- Backflow prevention devices
- Chemical feeders
- Chlorinators
- Corrosion control
- Electric motors
- Hydrants
- Meters
- Pipe repair
- Pumps
- Service connection
- Storage tanks
- Taps
- Valves
- Water mains

Evaluate operation of equipment:

- Inspect equipment for abnormal conditions
- Read charts
- Read meters
- Read pressure gauges
- Troubleshoot electrical equipment

Required capabilities:

- Ability to calibrate equipment
- Ability to diagnose/troubleshoot equipment
- Ability to differentiate between preventive and corrective maintenance
- Ability to discriminate between normal and abnormal conditions
- Ability to evaluate and adjust equipment
- Ability to follow written procedures
- Ability to order necessary spare parts
- Ability to perform general maintenance
- Ability to record information
- Knowledge of corrosion control processes
- Knowledge of dechlorination and disinfection processes
- Knowledge of different types of cross-connections and approved backflow methods and devices
- Knowledge of general electrical, mechanical, hydraulic and pneumatic principles
- Knowledge of lubricant and fluid characteristics
- Knowledge of pipe fittings and joining methods
- Knowledge of piping material, type and size
- Knowledge of regulations
- Knowledge of start-up and shut-down procedures
- Knowledge of system operation and maintenance

Core Competencies (continued)

Perform Safety Procedures

- Chemical handling
- Confined space entry
- Electrical hazards
- Fire safety
- Lock-out/tag-out
- Personal protective equipment
- Traffic/work zone

Required capabilities:

- Ability to communicate verbally and in writing
- Ability to interpret Material Safety Data Sheets
- Ability to recognize unsafe work conditions/safety hazards
- Ability to select and operate safety equipment
- Knowledge of emergency plans
- Knowledge of potential causes and impact of system disasters
- Knowledge of risk management
- Knowledge of safety procedures

Perform Administrative and Compliance Duties

Administrative and Security

- Administer compliance, emergency preparedness and safety program
- Develop budget
- Develop operation and maintenance plan
- Plan and organize work activities
- Record and evaluate data
- Respond to complaints
- Write regulatory authority reports

Comply with Drinking Water Regulations

United States Exams –

- Code of Federal Regulations, Title 40, Part 141 - National Primary Drinking Water Regulations:
  - Subpart A - General definitions
  - Subpart B - Maximum contaminant levels
  - Subpart C - Monitoring and analytical requirements
  - Subpart D - Reporting and recordkeeping
  - Subpart I - Control of lead and copper
  - Subpart Q - Public notification of drinking water violations

Canadian Exams

- Provincial and territorial regulations

Required capabilities:

- Ability to assess likelihood of disaster occurring
- Ability to communicate verbally and in writing
- Ability to coordinate emergency response with other organizations
- Ability to generate written policies and procedures
- Ability to interpret and transcribe data
- Ability to organize information and review reports
- Ability to perform basic math
- Ability to perform impact assessments
- Ability to translate technical language into common terminology
- Knowledge of emergency plans
- Knowledge of local codes and ordinances
- Knowledge of monitoring and reporting requirements
- Knowledge of potential causes and impact of system disasters
- Knowledge of principles of finance
- Knowledge of principles of management
- Knowledge of principles of public relations
- Knowledge of public notification requirements
- Knowledge of public participation process
- Knowledge of recordkeeping function and policies
- Knowledge of regulations
- Knowledge of risk management
- Knowledge of system operation and maintenance

Very Small Water System Certification Exam

The very small water system certification exam evaluates an operator's knowledge of tasks related to the operation of small water systems. The content of the exam was determined from the results of the job analysis. To successfully take an ABC exam, an operator must demonstrate knowledge of the core competencies in this document.

The very small water system exam consists of 50 multiple-choice questions. The specifications for the exams are based on a weighting of the job analysis results so that they reflect the criticality of tasks performed on the job. The specifications list the percentage of questions on the exam that fall under each job duty. For a list of tasks and capabilities associated with each job duty, please refer to the list of core competencies on the previous pages.

ABC Very Small Water System Exam Specifications

Job Duty	Percent of Exam
Operate System	22%
Water Quality Parameters and Sampling	20%
Operate Equipment	10%
Install, Maintain and Evaluate Equipment	16%
Perform Safety Duties	14%
Perform Administrative and Compliance Duties	18%

Suggested References

The following are approved as reference sources for the ABC very small water system examination. Operators should use the latest edition of these reference sources to prepare for the exam.

American Water Works Association (AWWA)

- *Water Transmission and Distribution*
- *Water Quality*
- *Basic Science Concepts and Applications*
- *Water Distribution Operator Training Handbook*
- *Water System Security, A Field Guide*

To order, contact: American Water Works Association
6666 West Quincy Ave.
Denver, CO 80235

Web site: www.awwa.org
Phone: (800) 926-7337
Fax: (303) 347-0804
E-mail: custsvc@awwa.org

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

- *Water Distribution System Operation and Maintenance*
- *Small Water System Operation and Maintenance*
- *Utility Management*
- *Manage for Success*

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

Regulations

For United States exams:

- *Code of Federal Regulations*, Title 40, Part 141 (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)

For Canadian exams:

- *Guidelines for Canadian Drinking Water Quality*. Federal-Provincial-Territorial Subcommittee on Drinking Water. Ottawa, ON: Health Canada (www.hc-sc.gc.ca/waterquality)
- 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)

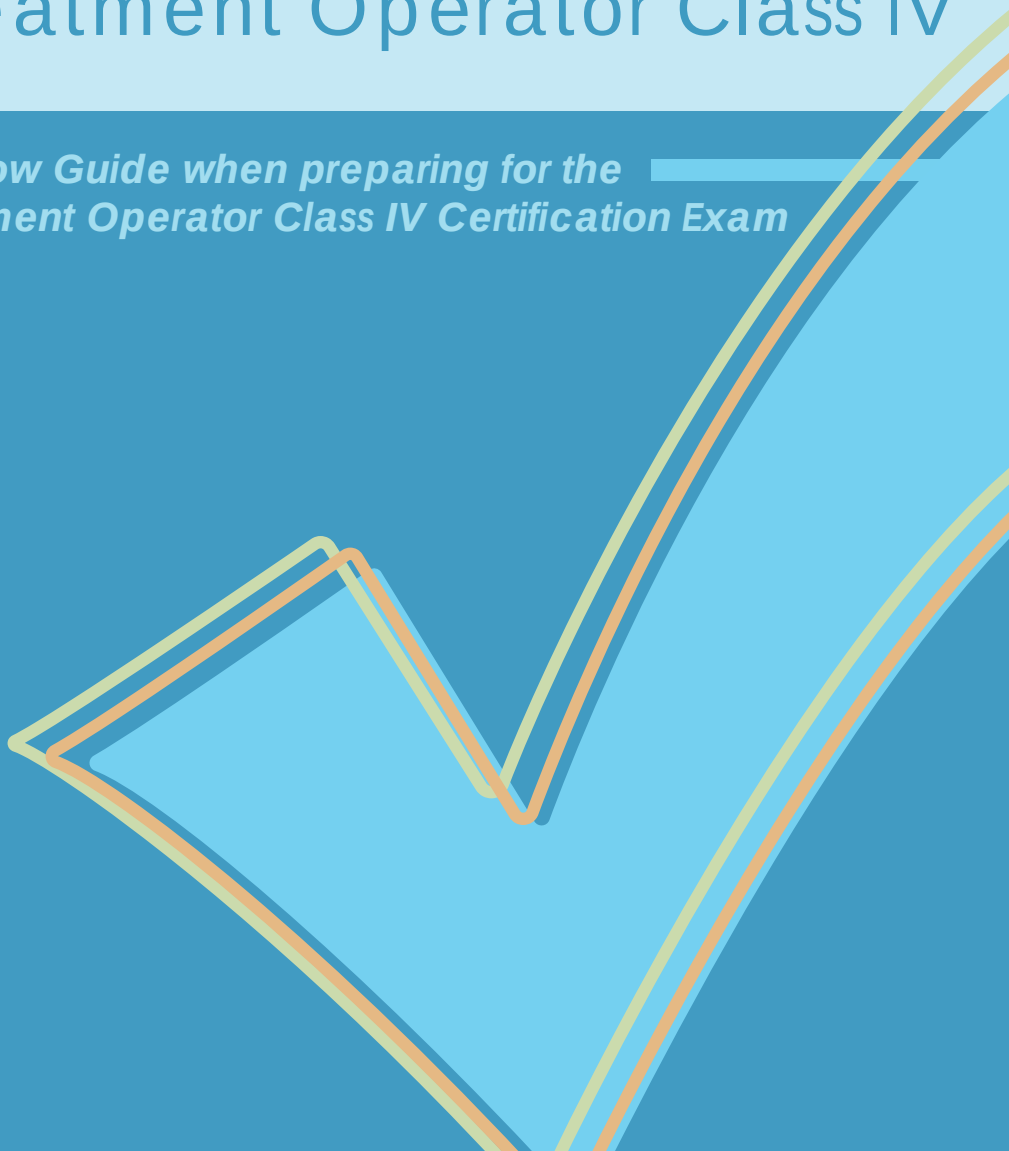
ABC
Association of
Boards of Certification

2017

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 2017 Standardized Wastewater Treatment 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 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 2017 edition 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 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.

Copyright Notice

All ABC examination questions are the copyrighted property of ABC. It is forbidden under federal copyright law to copy, reproduce, record, distribute, or display these examination questions by any means, in whole or in part, without written permission from ABC. Doing so may subject violators to severe civil and criminal penalties.

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).

20 Questions
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)

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, diffusors)
    c. Air compressors
    d. Anaerobic digesters
    e. Analyzers (e.g., DO, pH, H2S, 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, 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. 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)

20 Questions

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. Aaeration systems (e.g., blowers, surface aerators, diffusors)
    c. Air compressors
    d. Anaerobic digesters
    e. Analyzers (e.g., DO, pH, H2S, 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)

35 Questions
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)

10 Questions

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

ABC
Association of
Boards of Certification

Association of Boards of Certification
2805 SW Snyder Blvd., Suite 535
Ankeny, IA 50023
Phone: (515) 232-3623
www.abccert.org • abc@abccert.org
www.ProfessionalOperator.org • Info@ProfessionalOperator.org

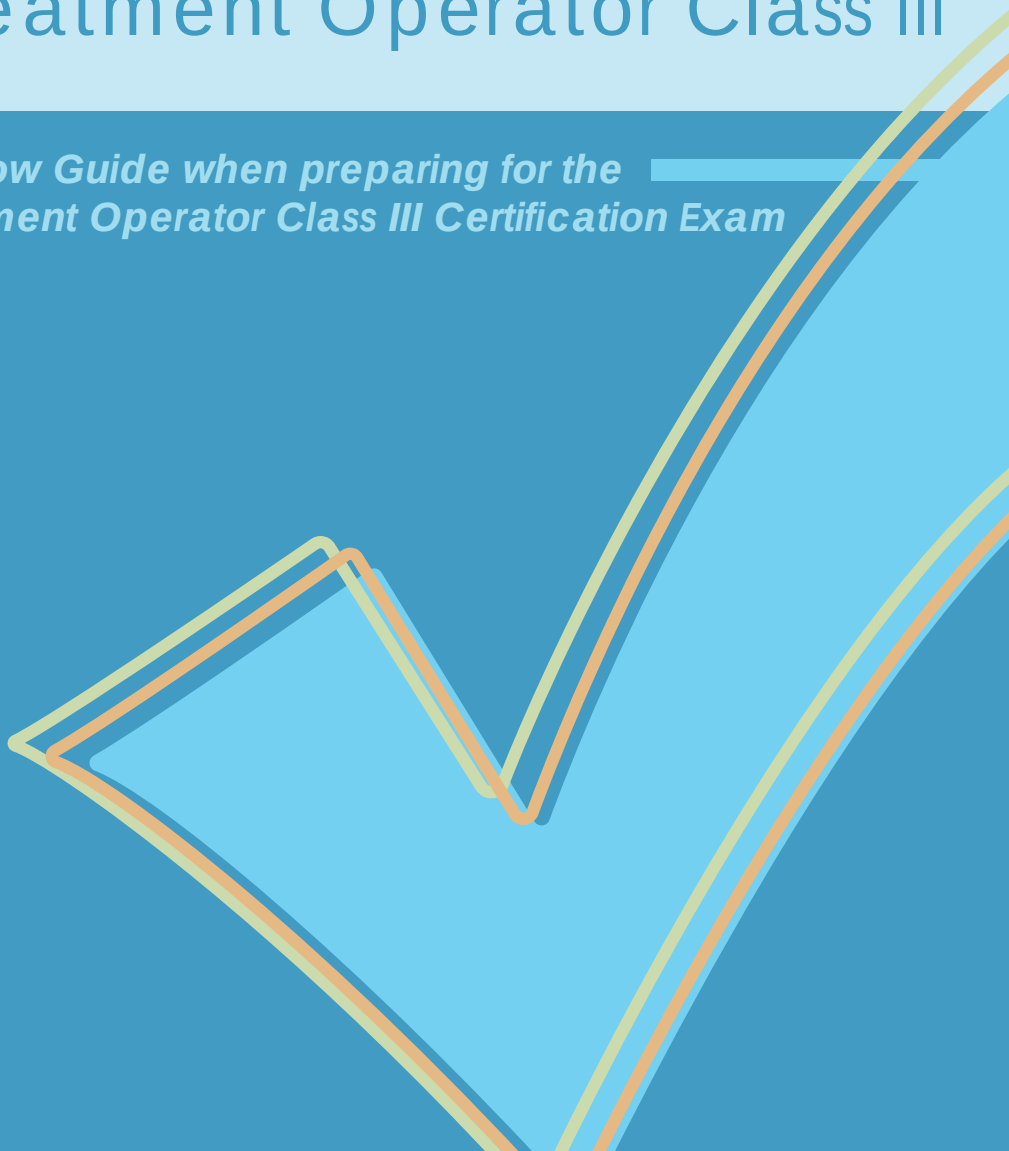
ABC
Association of
Boards of Certification

2017

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



Before You Dive In…

What is ABC's *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 ABC's 2017 Standardized Wastewater Treatment Operator Class III exam. During 2014-2016, 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 2017 edition 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 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.

Copyright Notice

All ABC examination questions are the copyrighted property of ABC. It is forbidden under federal copyright law to copy, reproduce, record, distribute, or display these examination questions by any means, in whole or in part, without written permission from ABC. Doing so may subject violators to severe civil and criminal penalties.

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 Questions	Content Area	Job Task Complexity Levels
15	Laboratory Analysis	2 8 5
20	Equipment Evaluation & Maintenance	6 11 3
25	Equipment Operation	5 10 10
30	Treatment Process Monitoring, Evaluation, & Adjustment	5 10 15
10	Security, Safety, & Administrative Procedures	4 6 0
100*	Total	22 45 33

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).

15 Questions
2 Recall
8 Application
5 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)

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. Perform basic electrical troubleshooting
7. Perform preventative 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
    i. Clarifiers / sedimentation basins
    j. Conveyors
    k. Dechlorination systems
    l. 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)
    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. 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
    l. 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)
u. Mechanical dewatering equipment (e.g., presses, centrifuges)
v. Mixers
w. Motors
x. Power tools
y. Pumps - centrifugal
z. Pumps - positive displacement
aa. 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:

1. 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
    l. 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)
    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. SCADA systems
    cc. Solids thickening processes (e.g., DAF, belt, rotary drum)
    dd. Suspended growth (e.g., activated sludge, MBR, SBR)

30 Questions

- 5 Recall
- 10 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 SCADA systems
7. 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
    b. Mechanical dewatering processes (e.g., presses, centrifuges)
    c. Solids thickening processes (e.g., DAF, belt, rotary drum)

10 Questions

4 Recall
6 Application
0 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. Complete operation reports
4. Complete required regulatory reports
5. Conduct routine security checks
6. Ensure compliance with all applicable regulations
7. 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 Analysis (15%)*	Equipment Evaluation & Maintenance (20%)*	Equipment Operation (25%)*	Treatment Process Monitoring, Evaluation & Adjustment (30%)*	Security, Safety, & Administrative Procedures (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
Comminuters		Intermediate	Intermediate	Intermediate	Basic
Conveyors		Intermediate	Intermediate	Intermediate	Basic
Dewatering equipment (e.g. centerfuges, presses, drying beds)		Intermediate	Intermediate	Intermediate	Basic
Documentation and record keeping	Intermediate	Intermediate		Intermediate	Intermediate

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	Intermediate			Intermediate	Intermediate
Electrical principles (e.g. troubleshooting breakers, relays, circuits)		Intermediate	Intermediate		Basic
Emergency preparedness		Intermediate	Intermediate		Intermediate
Flow measuring devices (e.g. parshal 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, preventative maintenance)		Intermediate	Intermediate		Basic
Hydraulic principles (e.g. mass flow balance, detention time, loading, velocity, HRT)		Basic	Intermediate	Intermediate	
Industry safety practices (e.g. PPE, 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	

Percent of exam associated with the Content Area

ABC
Association of
Boards of Certification

Association of Boards of Certification
2805 SW Snyder Blvd., Suite 535
Ankeny, IA 50023
Phone: (515) 232-3623
www.abccert.org • abc@abccert.org
www.ProfessionalOperator.org • Info@ProfessionalOperator.org

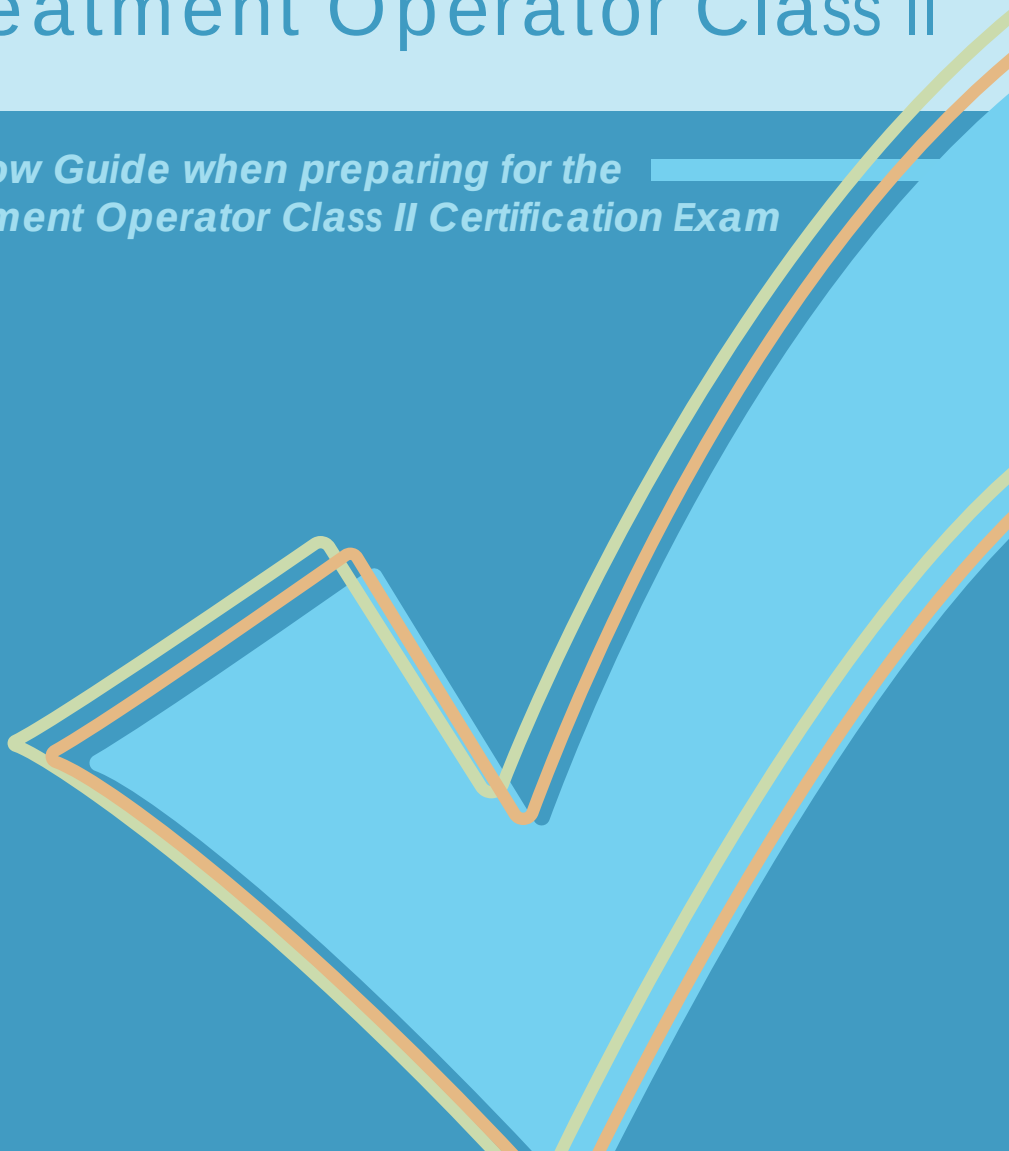
ABC
Association of
Boards of Certification

2017

Need-to-Know Criteria

Wastewater Treatment Operator Class II

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



Before You Dive In…

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

This *ABC Wastewater Treatment Operator Class II Need-to-Know Criteria* was developed to assist operators in understanding the content that will be covered in ABC's 2017 Standardized Wastewater Treatment Operator Class II exam. During 2014-2016, 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 2017 edition of the ABC Standardized Wastewater Treatment Operator Class II 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.

Copyright Notice

All ABC examination questions are the copyrighted property of ABC. It is forbidden under federal copyright law to copy, reproduce, record, distribute, or display these examination questions by any means, in whole or in part, without written permission from ABC. Doing so may subject violators to severe civil and criminal penalties.

Exam Content

The Wastewater Treatment Operator Class II 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
15	Laboratory Analysis	3 9 3
20	Equipment Evaluation & Maintenance	8 9 3
25	Equipment Operation	5 15 5
30	Treatment Process Monitoring, Evaluation, & Adjustment	5 10 15
10	Security, Safety, & Administrative Procedures	6 4 0
100*	Total	27 47 26

This exam includes 12 calculation questions

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

15 Questions

- 3 Recall
- 9 Application
- 3 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)

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. Perform basic electrical troubleshooting
7. Perform preventative maintenance on equipment
8. Inspect the following equipment:
    a. Aeration basins
    b. Aeration systems (e.g., blowers, surface aerators, diffusors)
    c. Aerobic digesters
    d. Air compressors
    e. Analyzers (e.g., DO, pH, H2S, ORP)
    f. Attached growth / fixed film (e.g., RBC, trickling filter)
    g. Bar screens
    h. Chemical feed systems (e.g., polymer, ferric)
    i. Chlorination systems
    j. Clarifiers / sedimentation basins
    k. Dechlorination systems
    l. 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)
    u. Mechanical dewatering equipment (e.g., presses, centrifuges)
    v. Mixers
    w. Motors
    x. Power tools
    y. Pumps - centrifugal
    z. Pumps - positive displacement
    aa. SCADA systems
    bb. Solids thickening processes (e.g., DAF, belt, rotary drum)
    cc. 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. Aerobic digesters
    d. Air compressors
    e. Analyzers (e.g., DO, pH, H2S, ORP)
    f. Attached growth / fixed film (e.g., RBC, trickling filter)
    g. Bar screens
    h. Chemical feed systems (e.g., polymer, ferric)
    i. Chlorination systems
    j. Clarifiers / sedimentation basins
    k. Dechlorination systems
    l. Disinfection equipment (e.g., UV, ozone)
    m. Gates and valves
    n. Generators

o. Grit removal processes
p. Hand tools
q. Heavy equipment
r. Hoists and cranes
s. Instrumentation (e.g., flow, pressure, telemetry)
t. Mechanical dewatering equipment (e.g., presses, centrifuges)
u. Mixers
v. Motors
w. Power tools
x. Pumps - centrifugal
y. Pumps - positive displacement
z. SCADA systems
aa. Suspended growth (e.g., activated sludge, MBR, SBR)

25 Questions
5 Recall
15 Application
5 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. 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. Aerobic digesters
    d. Air compressors
    e. Analyzers (e.g., DO, pH, H_2S, ORP)
    f. Attached growth / fixed film (e.g., RBC, trickling filter)
    g. Bar screens
    h. Chemical feed systems (e.g., polymer, ferric)
    i. Chlorination systems
    j. Clarifiers / sedimentation basins
    k. Dechlorination systems
    l. Disinfection equipment (e.g., UV, ozone)
    m. Filtration and exchange units (e.g., sand, membranes)
    n. Flow equalization systems
    o. Gates and valves
    p. Generators
    q. Grit removal processes
    r. Hand tools
    s. Heavy equipment
    t. Hoists and cranes
    u. Instrumentation (e.g., flow, pressure, telemetry)
    v. Mechanical dewatering equipment (e.g., presses, centrifuges)
    w. Mixers
    x. Motors
    y. Odor control devices (e.g., biofilters, scrubbers)
    z. Power tools
    aa. Pumps - centrifugal
    bb. Pumps - positive displacement
    cc. SCADA systems
    dd. Solids thickening processes (e.g., DAF, belt, rotary drum)
    ee. 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
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. Attached growth / fixed film processes (e.g., RBC, trickling filter)
    b. Secondary clarification / sedimentation processes
    c. Extended aeration processes (e.g., package, SBR, oxidation ditch)
    d. Conventional activated sludge processes (e.g., step feed, plug flow, complete mix, MBR)
11. Operate the nutrient removal systems
12. Operate the following disinfection treatment processes:
    a. Chlorination processes
    b. Dechlorination processes
    c. Disinfection processes (e.g., UV, ozone)
13. Operate the following solids treatment processes:
    a. Aerobic digestion process
    b. Mechanical dewatering processes (e.g., presses, centrifuges)

10 Questions
6 Recall
4 Application
0 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. Complete operation reports
3. Complete required regulatory reports
4. Conduct routine security checks
5. Ensure compliance with all applicable regulations
6. Generate maintenance reports (e.g., daily, monthly, annual)
7. Implement spill notification policy
8. Inspect SCBA equipment
9. Receive chemical deliveries and store
10. Schedule routine activities (e.g., maintenance, operations)
11. 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 (15%)*	Equipment Evaluation & Maintenance (20%)*	Equipment Operation (25%)*	Treatment Process Monitoring, Evaluation & Adjustment (30%)*	Security, Safety, & Administrative Procedures (10%)*
Aeration principles (e.g. mixing, mechanical, diffusers)		Basic	Basic	Basic	Basic
Bacteriological laboratory testing (e.g. coliform, fecal, E coli)	Intermediate			Basic	Basic
Biological laboratory testing (e.g. BOD, SOUR, CBOD)	Intermediate			Basic	Basic
Biosolids disposal and monitoring requirements	Basic			Basic	Basic
Chemical handling and storage		Basic	Basic		Basic
Chemical laboratory testing (e.g. ammonia, phosphorous, alkalinity)	Intermediate			Basic	Basic
Chlorinators (e.g. gas, liquid)		Basic	Basic	Basic	Basic
Clarifiers		Basic	Basic	Basic	Basic
Comminuters		Basic	Basic	Basic	Basic
Conveyors		Basic	Basic	Basic	Basic
Dewatering equipment (e.g. centerfuges, presses, drying beds)		Basic	Basic	Basic	Basic
Documentation and record keeping	Basic	Basic		Basic	Basic

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

Percent of exam associated with the Content Area

ABC
Association of
Boards of Certification

Association of Boards of Certification
2805 SW Snyder Blvd., Suite 535
Ankeny, IA 50023
Phone: (515) 232-3623
www.abccert.org • abc@abccert.org
www.ProfessionalOperator.org • Info@ProfessionalOperator.org

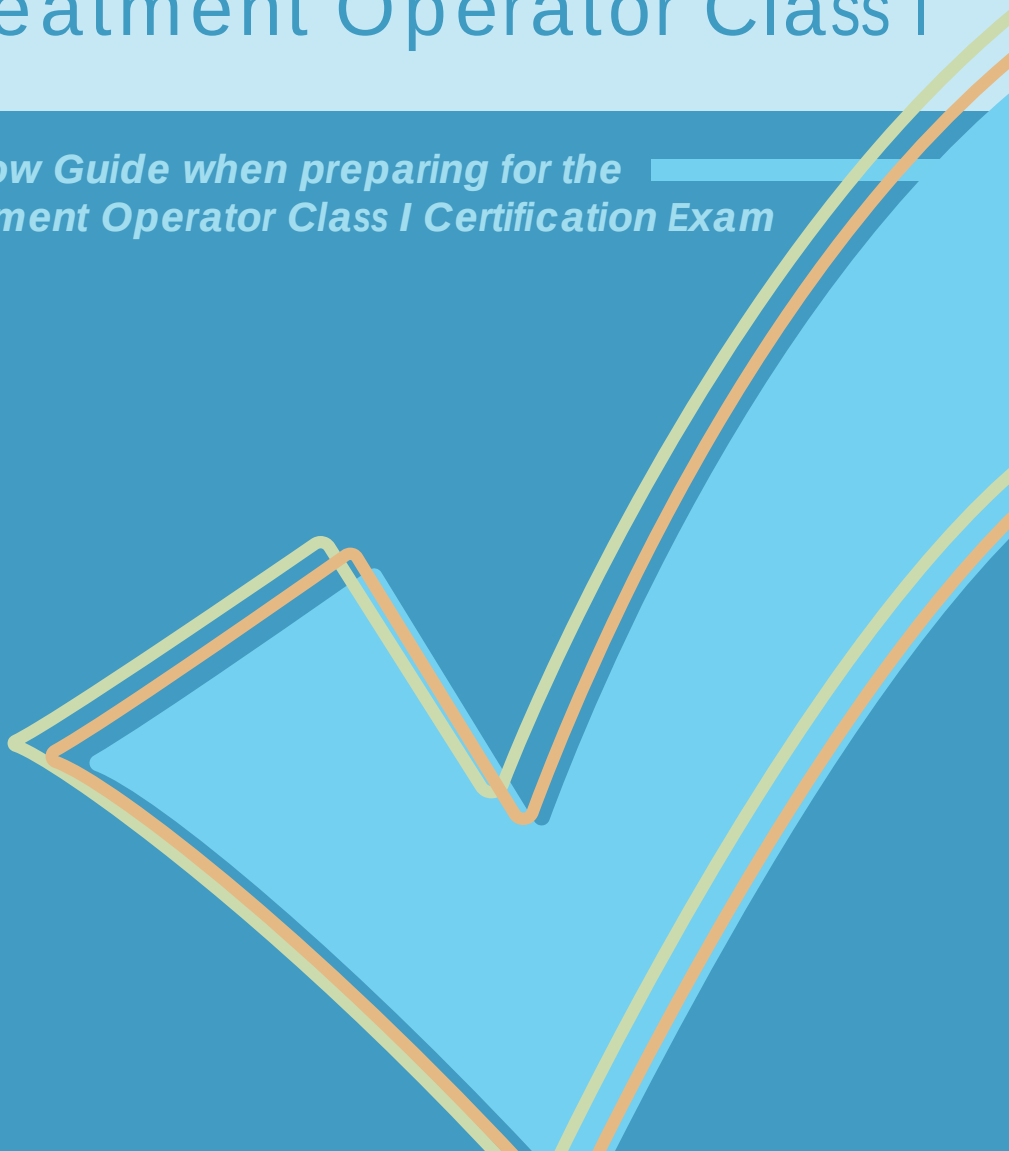
ABC
Association of
Boards of Certification

2017

Need-to-Know Criteria

Wastewater Treatment Operator Class I

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



Before You Dive In…

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

This *ABC Wastewater Treatment 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 Wastewater Treatment Operator Class I exam. During 2014-2016, 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 2017 edition of the ABC Standardized Wastewater Treatment 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 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.

Copyright Notice

All ABC examination questions are the copyrighted property of ABC. It is forbidden under federal copyright law to copy, reproduce, record, distribute, or display these examination questions by any means, in whole or in part, without written permission from ABC. Doing so may subject violators to severe civil and criminal penalties.

Wastewater Treatment Operator Class I *Need-to-Know Criteria*

Exam Content

The Wastewater Treatment 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 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
10	Laboratory Analysis	2 7 1
25	Equipment Evaluation & Maintenance	12 10 3
25	Equipment Operation	8 14 3
30	Treatment Process Monitoring, Evaluation, & Adjustment	5 10 15
10	Security, Safety, & Administrative Procedures	7 3 0
100*	Total	34 44 22

This exam includes 10 calculation questions

*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. Physical analyses
    b. Process control 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:

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. Perform basic electrical troubleshooting
7. Perform preventative maintenance on equipment
8. Inspect the following equipment:
    a. Aeration basins
    b. Aeration systems (e.g., blowers, surface aerators, diffusors)
    c. Aerobic digesters
    d. Air compressors
    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. Gates and valves
    k. Generators
    l. Grit removal processes
    m. Hand tools
    n. Heavy equipment
    o. Hoists and cranes
    p. Instrumentation (e.g., flow, pressure, telemetry)
    q. Mixers
    r. Motors
    s. Ponds / lagoons
    t. Power tools
    u. Pumps - centrifugal
    v. Pumps - positive displacement
    w. SCADA systems
9. Maintain the following equipment:
    a. Aeration basins
    b. Aeration systems (e.g., blowers, surface aerators, diffusors)
    c. Air compressors
    d. Analyzers (e.g., DO, pH, H2S, ORP)
    e. Bar screens
    f. Chlorination systems
    g. Clarifiers / sedimentation basins
    h. Dechlorination systems
    i. Gates and valves
    j. Generators
    k. Hand tools
    l. Heavy equipment
    m. Instrumentation (e.g., flow, pressure, telemetry)
    n. Mixers
    o. Motors
    p. Ponds / lagoons
    q. Power tools
    r. Pumps - centrifugal
    s. Pumps - positive displacement
    t. Suspended growth (e.g., activated sludge, MBR, SBR)

25 Questions
8 Recall
14 Application
3 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. 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. Operate the following:
    a. Aeration basins
    b. Aeration systems (e.g., blowers, surface aerators, diffusors)
    c. Aerobic digesters
    d. Air compressors
    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
    l. Gates and valves
    m. Generators
    n. Hand tools
    o. Heavy equipment
    p. Hoists and cranes
    q. Instrumentation (e.g., flow, pressure, telemetry)
    r. Mixers
    s. Motors
    t. Ponds / lagoons
    u. Power tools
    v. Pumps - centrifugal
    w. Pumps - positive displacement
    x. SCADA systems

30 Questions
5 Recall
10 Application
15 Analysis

Treatment Process Monitoring, Evaluation, & Adjustment

Job Tasks Included in this Content Area:

1. Analyze laboratory data to evaluate and adjust processes
2. Follow industry safety rules and guidelines applicable to treatment processes
3. Implement changes as indicated by laboratory results
4. Operate chemical feed systems (e.g., polymer, ferric)
5. Operate SCADA systems
6. Operate the preliminary treatment processes (e.g., screening, grit, flow equalization)
7. Operate the primary clarification / sedimentation processes
8. Operate the following secondary treatment processes:
    a. Pond / lagoon systems
    b. Secondary clarification / sedimentation processes
    c. Extended aeration processes (e.g., package, SBR, oxidation ditch)
9. Operate the following disinfection treatment processes:
    a. Chlorination processes
    b. Dechlorination processes

10 Questions

- 7 Recall
- 3 Application
- 0 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. Complete operation reports
3. Complete required regulatory reports
4. Conduct routine security checks
5. Ensure compliance with all applicable regulations
6. Generate maintenance reports (e.g., daily, monthly, annual)
7. Implement spill notification policy
8. Inspect SCBA equipment
9. Receive chemical deliveries and store
10. Schedule routine activities (e.g., maintenance, operations)
11. 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 (10%)*	Equipment Evaluation & Maintenance (25%)*	Equipment Operation (25%)*	Treatment Process Monitoring, Evaluation & Adjustment (30%)*	Security, Safety, & Administrative Procedures (10%)*
Aeration principles (e.g. mixing, mechanical, diffusers)			Basic	Basic	
Bacteriological laboratory testing (e.g. coliform, fecal, E coli)	Basic			Basic	Basic
Biological laboratory testing (e.g. BOD, SOUR, CBOD)	Basic			Basic	Basic
Biosolids disposal and monitoring requirements	Basic			Basic	
Chemical handling and storage		Basic	Basic		Basic
Chemical laboratory testing (e.g. ammonia, phosphorous, alkalinity)	Basic			Basic	Basic
Chlorinators (e.g. gas, liquid)		Basic	Basic	Basic	Basic
Clarifiers		Basic	Basic	Basic	Basic
Comminuters		Basic	Basic	Basic	Basic
Conveyors		Basic	Basic	Basic	Basic
Dewatering equipment (e.g. centerfuges, presses, drying beds)		Basic	Basic	Basic	Basic
Documentation and record keeping	Basic	Basic		Basic	Basic

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

Percent of exam associated with the Content Area

ABC
Association of
Boards of Certification

Association of Boards of Certification
2805 SW Snyder Blvd., Suite 535
Ankeny, IA 50023
Phone: (515) 232-3623
www.abccert.org • abc@abccert.org
www.ProfessionalOperator.org • Info@ProfessionalOperator.org

PFA Summary

1/1/2022 through 12/31/2022
Delivery Method: ALL

Client: Virginia Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals(ABC-VA)

Test Program: Virginia Waterworks Operator Class 1 Examination - VAWA1

Exam Type: Virginia Waterworks Operator Class 1 Examination - CLASS1

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	72	13	18.1%	59	81.9%	2	2.7%	74
Repeater	96	26	27.1%	70	72.9%	5	5.0%	101
Total	168	39	23.2%	129	76.8%	7	4.0%	175

Test Program: Virginia Waterworks Operator Class 2 Examination - VAWA2

Exam Type: Virginia Waterworks Operator Class 2 Examination - CLASS2

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	87	46	52.9%	41	47.1%	2	2.2%	89
Repeater	63	23	36.5%	40	63.5%	0	0.0%	63
Total	150	69	46.0%	81	54.0%	2	1.3%	152

Test Program: Virginia Waterworks Operator Class 3 Examination - VAWA3

Exam Type: Virginia Waterworks Operator Class 3 Examination - CLASS3

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	82	38	46.3%	44	53.7%	6	6.8%	88
Recredentialing	6	0	0.0%	6	100.0%	0	0.0%	6
Repeater	51	18	35.3%	33	64.7%	2	3.8%	53
Total	139	56	40.3%	83	59.7%	8	5.4%	147

Test Program: Virginia Waterworks Operator Class 4 Examination - VAWA4

Exam Type: Virginia Waterworks Operator Class 4 Examination - CLASS4

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	80	37	46.3%	43	53.8%	1	1.2%	81
Repeater	54	23	42.6%	31	57.4%	1	1.8%	55
Total	134	60	44.8%	74	55.2%	2	1.5%	136

PFA Summary

1/1/2022 through 12/31/2022
Delivery Method: ALL

Client: Virginia Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals(ABC-VA)

Test Program: Virginia Waterworks Operator Class 5 Examination - VAWA5

Exam Type: Virginia Waterworks Operator Class 5 Examination - CLASS5

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	20	17	85.0%	3	15.0%	0	0.0%	20
Repeater	1	1	100.0%	0	0.0%	0	0.0%	1
Total	21	18	85.7%	3	14.3%	0	0.0%	21

Test Program: Virginia Waterworks Operator Class 6 Examination - VAWA6

Exam Type: Virginia Waterworks Operator Class 6 Examination - CLASS6

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	13	3	23.1%	10	76.9%	0	0.0%	13
Repeater	5	4	80.0%	1	20.0%	0	0.0%	5
Total	18	7	38.9%	11	61.1%	0	0.0%	18

PFA Summary

1/1/2022 through 12/31/2022
Delivery Method: ALL

Client: Virginia Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals(ABC-VA)

Test Program: Virginia Wastewater Works Operator Class 1 Examination - VAWW1

Exam Type: Virginia Wastewater Works Operator Class 1 Examination - CLASS1

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	66	14	21.2%	52	78.8%	5	7.0%	71
Repeater	119	25	21.0%	94	79.0%	6	4.8%	125
Total	185	39	21.1%	146	78.9%	11	5.6%	196

Test Program: Virginia Wastewater Works Operator Class 2 Examination - VAWW2

Exam Type: Virginia Wastewater Works Operator Class 2 Examination - CLASS2

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	112	21	18.8%	91	81.3%	4	3.4%	116
Repeater	188	36	19.1%	152	80.9%	7	3.6%	195
Total	300	57	19.0%	243	81.0%	11	3.5%	311

Test Program: Virginia Wastewater Works Operator Class 3 Examination - VAWW3

Exam Type: Virginia Wastewater Works Operator Class 3 Examination - CLASS3

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	114	40	35.1%	74	64.9%	3	2.6%	117
Repeater	147	40	27.2%	107	72.8%	6	3.9%	153
Total	261	80	30.7%	181	69.3%	9	3.3%	270

Test Program: Virginia Wastewater Works Operator Class 4 Examination - VAWW4

Exam Type: Virginia Wastewater Works Operator Class 4 Examination - CLASS4

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	94	19	20.2%	75	79.8%	6	6.0%	100
Repeater	131	34	26.0%	97	74.0%	4	3.0%	135
Total	225	53	23.6%	172	76.4%	10	4.3%	235

PFA Summary

1/1/2017 through 1/20/2023
Delivery Method: ALL

Client: Virginia Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals(ABC-VA)

Test Program: Virginia Waterworks Operator Class 1 Examination - VAWA1

Exam Type: Virginia Waterworks Operator Class 1 Examination - CLASS1

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	294	69	23.5%	225	76.5%	3	1.0%	297
Repeater	417	99	23.7%	318	76.3%	17	3.9%	434
Total	711	168	23.6%	543	76.4%	20	2.7%	731

Test Program: Virginia Waterworks Operator Class 2 Examination - VAWA2

Exam Type: Virginia Waterworks Operator Class 2 Examination - CLASS2

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	363	183	50.4%	180	49.6%	12	3.2%	375
Repeater	388	103	26.5%	285	73.5%	11	2.8%	399
Total	751	286	38.1%	465	61.9%	23	3.0%	774

Test Program: Virginia Waterworks Operator Class 3 Examination - VAWA3

Exam Type: Virginia Waterworks Operator Class 3 Examination - CLASS3

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	397	210	52.9%	187	47.1%	18	4.3%	415
Recredentialing	7	0	0.0%	7	100.0%	0	0.0%	7
Repeater	298	112	37.6%	186	62.4%	8	2.6%	306
Total	702	322	45.9%	380	54.1%	26	3.6%	728

Test Program: Virginia Waterworks Operator Class 4 Examination - VAWA4

Exam Type: Virginia Waterworks Operator Class 4 Examination - CLASS4

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	337	193	57.3%	144	42.7%	10	2.9%	347
Repeater	188	76	40.4%	112	59.6%	3	1.6%	191
Total	525	269	51.2%	256	48.8%	13	2.4%	538

PFA Summary

1/1/2017 through 1/20/2023
Delivery Method: ALL

Client: Virginia Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals(ABC-VA)

Test Program: Virginia Waterworks Operator Class 5 Examination - VAWA5

Exam Type: Virginia Waterworks Operator Class 5 Examination - CLASS5

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	121	103	85.1%	18	14.9%	3	2.4%	124
Repeater	20	9	45.0%	11	55.0%	0	0.0%	20
Total	141	112	79.4%	29	20.6%	3	2.1%	144

Test Program: Virginia Waterworks Operator Class 6 Examination - VAWA6

Exam Type: Virginia Waterworks Operator Class 6 Examination - CLASS6

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	71	38	53.5%	33	46.5%	1	1.4%	72
Repeater	36	20	55.6%	16	44.4%	2	5.3%	38
Total	107	58	54.2%	49	45.8%	3	2.7%	110

PFA Summary

1/1/2017 through 1/20/2023
Delivery Method: ALL

Client: Virginia Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals(ABC-VA)

Test Program: Virginia Wastewater Works Operator Class 1 Examination - VAWW1

Exam Type: Virginia Wastewater Works Operator Class 1 Examination - CLASS1

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	300	51	17.0%	249	83.0%	15	4.8%	315
Repeater	487	106	21.8%	381	78.2%	17	3.4%	504
Total	787	157	19.9%	630	80.1%	32	3.9%	819

Test Program: Virginia Wastewater Works Operator Class 2 Examination - VAWW2

Exam Type: Virginia Wastewater Works Operator Class 2 Examination - CLASS2

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	504	127	25.2%	377	74.8%	12	2.3%	516
Repeater	630	136	21.6%	494	78.4%	25	3.8%	655
Total	1134	263	23.2%	871	76.8%	37	3.2%	1171

Test Program: Virginia Wastewater Works Operator Class 3 Examination - VAWW3

Exam Type: Virginia Wastewater Works Operator Class 3 Examination - CLASS3

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	522	171	32.8%	351	67.2%	15	2.8%	537
Repeater	587	169	28.8%	418	71.2%	13	2.2%	600
Total	1109	340	30.7%	769	69.3%	28	2.5%	1137

Test Program: Virginia Wastewater Works Operator Class 4 Examination - VAWW4

Exam Type: Virginia Wastewater Works Operator Class 4 Examination - CLASS4

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	541	167	30.9%	374	69.1%	17	3.0%	558
Repeater	697	173	24.8%	524	75.2%	18	2.5%	715
Total	1238	340	27.5%	898	72.5%	35	2.7%	1273

From: Gregory, Valerie@Waterboards
To: Pettus, Tanya (DPOR)
Cc: Del Carlo, Barry@Waterboards
Subject: RE: Waste Water Operator Examination Information
Date: Monday, January 23, 2023 12:49:40 PM

Hello Tanya,

Here are the passing rates for Jan.-Dec. 2022, for Wastewater Operator Examinations:

Grade I: 52%
Grade II: 55%
Grade III: 35%
Grade IV: 27%
Grade V: 30%

Thank you,

Valerie Gregory
Associate Governmental Program Analyst
Examination Analyst
Wastewater Operator Certification
Division of Financial Assistance
State Water Resources Control Board
1001 "I" Street, 17th Floor, Sacramento, CA 95814
(916) 341-5741 | Valerie.gregory@waterboards.ca.gov

Visit for tips at:
saveourwater.com
www.waterboards.ca.gov

From: Pettus, Tanya (DPOR) <Tanya.Pettus@dpor.virginia.gov>
Sent: Friday, January 20, 2023 1:29 PM
To: WB-DFA-OpCertProgram <OpCertProgram@waterboards.ca.gov>
Subject: Waste Water Operator Examination Information

EXTERNAL:

Good afternoon,

I am the Board Administrator for the Virginia Waterworks and Wastewater Worker Operator licensing program, and we have put together a committee to review our exam practices and pass/fail rates. I am gathering information from a sampling of states and was hoping to get pass/fail statistics

for your operator applicants. Is that possible? If so, the most recent statistics would be perfect—but if you have stats from Jan.-Dec. 2022, that would be even better.

Any help with this is greatly appreciated.

Thank you!

Tanya M. Pettus, CP
Board Administrator
Board for Asbestos, Lead, and Home Inspectors
Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals

Department of Professional & Occupational Regulation
Perimeter Center, Suite 400
9960 Mayland Drive
Richmond, VA 23233
Main: (804) 367-8595
Direct: (804) 367-1795

PFA Summary

1/1/2022 through 12/31/2022

Delivery Method: ALL

Client: Oregon Wastewater System Operator Certification Program(ABC-ORWW)

Test Program: Small Wastewater System Examination - SWWS

Exam Type: Small Wastewater System Examination - SWWS

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	4	3	75.0%	1	25.0%	0	0.0%	4
Total	4	3	75.0%	1	25.0%	0	0.0%	4

Test Program: Wastewater Collection - Grade I Examination - WWC1

Exam Type: Wastewater Collection - Grade I Examination - WWC1

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	62	54	87.1%	8	12.9%	0	0.0%	62
Repeater	7	4	57.1%	3	42.9%	1	12.5%	8
Total	69	58	84.1%	11	15.9%	1	1.4%	70

Test Program: Wastewater Collection - Grade II Examination - WWC2

Exam Type: Wastewater Collection - Grade II Examination - WWC2

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	34	24	70.6%	10	29.4%	0	0.0%	34
Repeater	8	5	62.5%	3	37.5%	1	11.1%	9
Total	42	29	69.0%	13	31.0%	1	2.3%	43

Test Program: Wastewater Collection - Grade III Examination - WWC3

Exam Type: Wastewater Collection - Grade III Examination - WWC3

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	8	4	50.0%	4	50.0%	0	0.0%	8
Repeater	1	1	100.0%	0	0.0%	1	50.0%	2
Total	9	5	55.6%	4	44.4%	1	10.0%	10

Test Program: Wastewater Collection - Grade IV Examination - WWC4

Exam Type: Wastewater Collection - Grade IV Examination - WWC4

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	4	3	75.0%	1	25.0%	0	0.0%	4
Repeater	3	1	33.3%	2	66.7%	0	0.0%	3
Total	7	4	57.1%	3	42.9%	0	0.0%	7

Test Program: Wastewater Treatment - Grade I Examination - WWT1

Exam Type: Wastewater Treatment - Grade I Examination - WWT1

	Total Tested	Pass	%	Fail	%	Absent	%	Total
First Time	43	21	48.8%	22	51.2%	2	4.4%	45
Repeater	14	8	57.1%	6	42.9%	2	12.5%	16

PFA Summary

1/1/2022 through 12/31/2022

Delivery Method: ALL

	Total	57	29	50.9%	28	49.1%	4	6.6%	61
Test Program:	Wastewater Treatment - Grade II Examination - WWT2								
	Exam Type:	Wastewater Treatment - Grade II Examination - WWT2							
		Total Tested	**Pass**	**%**	**Fail**	**%**	**Absent**	**%**	**Total**
	First Time	27	22	81.5%	5	18.5%	1	3.6%	28
	Repeater	9	5	55.6%	4	44.4%	0	0.0%	9
	Total	36	27	75.0%	9	25.0%	1	2.7%	37
Test Program:	Wastewater Treatment - Grade III Examination - WWT3								
	Exam Type:	Wastewater Treatment - Grade III Examination - WWT3							
		Total Tested	**Pass**	**%**	**Fail**	**%**	**Absent**	**%**	**Total**
	First Time	18	11	61.1%	7	38.9%	0	0.0%	18
	Repeater	8	4	50.0%	4	50.0%	0	0.0%	8
	Total	26	15	57.7%	11	42.3%	0	0.0%	26
Test Program:	Wastewater Treatment - Grade IV Examination - WWT4								
	Exam Type:	Wastewater Treatment - Grade IV Examination - WWT4							
		Total Tested	**Pass**	**%**	**Fail**	**%**	**Absent**	**%**	**Total**
	First Time	11	3	27.3%	8	72.7%	0	0.0%	11
	Repeater	19	6	31.6%	13	68.4%	0	0.0%	19
	Total	30	9	30.0%	21	70.0%	0	0.0%	30

May 2022 Exam			
Exam	# Examinees	# Passing	% Passing
SWS	8	7	87.5%
WT1	1	1	100.0%
WT2	12	3	25.0%
WT3	54	17	31.5%
WT4	47	14	29.8%
DS1	4	1	25.0%
DS2	120	51	42.5%
TOTAL	246	94	38.2%
BNS	10	5	50.0%
WW1	7	4	57.1%
WW2	12	6	50.0%
WW3	44	19	43.2%
WW4	34	8	23.5%
CS1	6	1	16.7%
CS2	74	57	77.0%
TOTAL	187	100	53.5%
OVERALL	433	194	44.8%

November 2022 Exam		
Exam	# Examinees	# Passing
SWS	7	6
WT1	2	1
WT2	7	2
WT3	58	18
WT4	45	16
DS1	3	1
DS2	123	57
TOTAL	245	101
BNS	7	3
WW1	7	4
WW2	7	4
WW3	38	12
WW4	48	13
CS1	7	3
CS2	63	42
TOTAL	177	81
OVERALL	412	182

% Passing
85.7%
50.0%
28.6%
31.0%
35.6%
33.3%
46.3%
41.2%
42.9%
57.1%
57.1%
31.6%
27.1%
42.9%
66.7%
45.8%
44.2%

Training Courses Currently Board-Approved for Pre-License Education Credit

KENTUCKY OPERATOR CERTIFICATION PROGRAM

***ALLOWS EDUCATION SUBSTITUTIONS FOR WORK EXPERIENCE**

***COURSES MUST BE APPROVED BY THE KENTUCKY ENERGY AND ENVIRONMENT CABINET**

Surface Water Treatment Plant Operations
Pump Installation and Maintenance
Valve Maintenance and Piping System Protection
Electrical Safety (NFPA 70E 2021)
Meters, Valves and Hydrants
Groundwater Wells
Basic Electrical Concepts for Water Operators
Pumps and Motors
Distribution System Water Quality Issues
Pipelines
Storage Tank Facilities
Water Distribution System Operation Overview
Problems Caused by Roots in Sewers
Chemical Storage Course
Laboratory Safety and Inspections Course
Wastewater Treatment Theory 2
Water Quality Management
Math Class 2
Biochemical Oxygen Demand & Carbonaceous BOD
Ultraviolet Disinfection
Drinking Water Ion Exchange Softening
Wastewater Operator 1 Exam Study Guide
Leadership & How to Affect Change in Public Orgs
Media Filtration for Drinking Water
Lock Out Tag Out - Control Hazardous Energy
How to Perform TC Analytical Test for DW Quality
Microscopic Examination of Activated Sludge
Math Class 1
Design & Flow Configurations Membrane Operations
How to Perform Fecal Coliform Analytical Test WW
Hazardous Energy Control Course
Scissor and Aerial Lifts Safety Course
Chemical Handling Course
Fire Protection and Prevention Course
Intro to the Development of a QA/QC Plan
Confined Space Entry
U.S. W & WWTR Utilities - Federal, State, & Local

Wastewater Treatment Theory 1
Terms & Equations for Membrane Operations
United States Water & Wastewater Utility Industry
Fundamentals of Coagulation and Flocculation
Hazard Communication Training Course
Trickling Filters 1
Intro to Membrane Operations for Small Utilities
Drinking Water Disinfection
Basic Safety Fundamentals for Water & Distribution
Activated Sludge
Intro to Distribution System Piping and Valving
Machine Guarding Course
Solids Analysis
Pretreatment Regulations
Drinking Water Precipitation Softening
Membrane Unit Operations
Oxygen Measurements
Cross Connection Control
Permit-Required Confined Space Course
Globally Harmonized Hazard Communication Course
Excavation Safety Course
Hazard Recognition Course
Electrical Arc Flash Safety Course
Anatomy of Service Lateral
Inflow & Infiltration
Water Loss
Distribution System Ops
Development planning & set-up of system w/portable
Field Training & Set up of Asset Management & GIS
AMTA/AWWA Membrane Technology Conference
Fundamentals of Hydraulic Control Valve Design and Air Release Valve Applications
optimzation of water filter treament
Partners in Progress
Understanding Your Pump
The Greatest and Latest from BL Anderson
Sanitary Sewer Lift Station Hydraulic Principles
Bermad Valve Training
Safety & OSHA Training
Pumps, Motors and Hydraulics - Application, Select
Chlorine Safe Handling Seminar
Meter Reading - Then, Now and the Future
2022 Water Professionals Conference
Pretreatment Certification Course - Level 2

Voluntary Pretreatment Certification - Level 1
The State of Collection System Construction Costs
2023 WWETT Show
Backflow Prevention 101
Innovative Casting Adjustments
Fire Hydrant Operation/Maintenance 1 Hour Seminar
Underground Vault Risk Assessment
Innovative Access Solutions
Fire Hydrant & Gate Valve Operation/Maintenance
Critical Components of Wastewater Treatment
Preparing for an On-Site Audit in a Water-Wastewat
Microbiology for Water & Wastewater Analysis
QC-SOPS-Chemistry & Microbiology Methods in a WW L
Ethics in Chemistry and Microbiology Lab for Opera
Basic Chemistry in a Drinking and Wastewater Lab
Colilert-18 for E Coli & Fecal Coliform Analysis
GE Membrane Training
KLM Pump Training
Orbal-The Power of SND
On-Site Generation for Potable Water Disinfection
8-HR. OSHA 1910.146 PERMIT-REQUIRED CONFINED SPACE
Chlorine Field Testing & Bacteriological Sampling
Emergency Response
Confined Space Training
Hazard Communication-Right To Know-Lab Safety
Excavation and Trenching-Equipment-Competent Perso
Pumping - Lift Stations
Vac Truck (Maintence, Setting & Digging etc)
Personal Protective Equipment
Backhoe Operator Training (Heavy Machinery)
Electrical Hazards (Arc Flash)
Traffic Control - Work Zone Safety
Chlorination Process, Chlorine Safety, Maintenance
8 Hr. Responding to Chlorine Emergencies
Module 4 Operator Course
Module 1 Operator Course
Module 3 Operator Course
Module 2 Operator Course
Level 1 Wastewater Operators Course
Phase 1: Compliance & Reporting Operator Course
Level 2 Wastewater Operator Course
Electrical Troubleshooting
OSHA Safety
Electrical Safety and Protection

Fluid Mechanics
Maintaining Wastewater Equipment
Wastewater Treatment Processes
Introduction to Water Technology
Piping Systems Part 2
Piping Systems Part 1
Pumps Part 2
Pumps Part 1
Fire Hydrant Maintenance & Pressure Monitoring
What's Your Water Worth?
Hazard Communication
PPE and Respiratory Protection
Confined Space Entry Safety
Trenching, Excavation, and Lock Out Tag Out Safety
Permit Required Confined Spaces
PPE - Respiratory Protection
Hazard Communication
Electrical Safe Work Practices
Fall Protection
Confined Space Safety
Hazard Communication Safety
Confined Space Safety
Backhoe Safety
System Sustainability through Asset Management and Emergency Response Planning
Service Line Inventory Development Workshop for Utilities by Utilities
RCAP 2021 Wastewater Operator Training
Small System Lead PFAS Regulatory Overview
Understanding Water Loss and Distribution Systems Appurtenances
Controlling Lead in Drinking Water
HB 8(Declaration of Domicile)& the Impact of PFAS
CE for WW Operators-Barren River SRP
CE for Water Operators-Barren River SRP
CE for Water Operators-Jenny Wiley SRP
CE for Wastewater Operators-Jenny Wiley SRP
From the Ditch to the Desk for Drinking Water
Disinfection By-product Mitigation
Cold Weather Emergency Management
Corrosion Control Treatment Optimization
Maintaining Water Quality in Distribution Systems
Surface Water Production 1
Valve and Hydrant Maintenance
Customer Service Inspection and Cross Connections
Drinking Water Filtration A-Z

Small Water Systems 1
Surface Water Production 2
Water Transmission and Distribution
Surface Water Treatment
Advanced Membrane Treatment of Wastewater
Primary Sludge Fermentation
Dissolved Air Flotation
Basic Environmental Chemistry
Utility Operator Calculations
Valve Maintenance for Water & Wastewater Utilities
Advanced Math
Applied Confined Space Safety
Math Basics
Chemical Feed Systems & Pump Calibrations for DW &
Hydraulic Control Valves for Water and Wastewater
Wastewater Treatment
Basic Wastewater
Wastewater Collection
Water Accountability and Leak Detection
Jar Test Procedures
Troubleshooting & Repair of Pressure Reducing Valv
Disinfection Process
Pipeline Locating
Chlorinator Systems and Chemical Handling
Basic Water Works Operations
Sustainable Management of Rural and Small Water &
Pump and Motor Maintenance
From the Ditch to the Desk for Drinking Water
Disinfection By-product Mitigation
Cold Weather Emergency Management
Maintaining Water Quality in Distribution Systems
Surface Water Production 1
Valve and Hydrant Maintenance
Corrosion Control Treatment Optimization
Customer Service Inspection and Cross Connections
Drinking Water Filtration A-Z
Small Water Systems 1
Surface Water Production 2
Water Transmission and Distribution
Surface Water Treatment
Advanced Membrane Treatment of Wastewater
Primary Sludge Fermentation
Dissolved Air Flotation
Basic Environmental Chemistry

Utility Operator Calculations
Valve Maintenance for Water & Wastewater Utilities
Advanced Math
Advanced Math
Math Basics
Chemical Feed Systems & Pump Calibrations for DW &
Hydraulic Control Valves for Water and Wastewater
Wastewater Treatment
Basic Wastewater
Wastewater Collection
Water Accountability and Leak Detection
Jar Test Procedures
Troubleshooting & Repair of Pressure Reducing Valv
Disinfection Process
Pipeline Locating
Chlorinator Systems and Chemical Handling
Basic Water Works Operations
Sustainable Management of Rural and Small Water &
Pump and Motor Maintenance
Submitting Documents via the Kentucky Online Gatew
Kimberly Clark Owensboro
Water Quality Operator Training
Trenching and Shoring
Introduction to Watershed Watch and Sampling
Industrial User Enforcement & Significant Non-Comp
Introduction to Pretreatment
Regulating Categorical Industrial Users
Understanding Local Limits
Watershed Watch Lake Monitoring
Changes to NSF Std 61 & AWWA D102: What's Changed
Cybersecurity and Funding Opportunities Workshop
Water Loss Control for Small Systems
USDA/AWWA Small Systems Training: Setting Rates fo
Tertiary Filtration and UV Disinfection
Activated Sludge
Hite Creek Odor Control System
Centrifuge Operation & Maintenance
Polymer Feed Equipment Operation & Maintenance
Screw Conveyor Operation & Maintenance
Biological Nutrient Removal
Biological Nutrient Removal
Drum Dryer System Training, Safety
Drum Dryer System Training, DDS Operation
Drum Dryer System Training, Part 2

Bells Lane WWTF Disinfection System Upgrades
FOG Removal Techniques from Wet Wells
Biosolids Dewatering
Preparing, Monitoring and Responses to Overflow
Fourth Stage Stationary DO Monitor Preventive Main
Overflow Reporting and Documentation
Overflow Assessment
Hazmat Refresher Training
Public Notification and Cleanup Overflow
MSD's Stormwater Pollution Prevention Plan (SWPPP)
Drum Dryer System Training, Part 3 (MFWQTC)
Disc Filter Operation & Maintenance
Water Booster Pump Operation & Maintenance
Morris Foreman Emergency Spill Response
Biological Nutrient Removal (BNR) Tank Mixer O&M
Confined Space Awareness
Progressive Cavity Pump Operation & Maintenance
CSO & Siphon Preventive Maintenance
APOLLO Artificial Intelligence Training
Competent Person Trenching Refresher Training
Hach Colorimeter Use and Samping Collection
Mechanical Bar Screen Operation & Maintenance
Handheld DO Monitoring Probe O&M
Emulsion Polymer Handling & Safety
UV Disinfection System Operation & Maintenance
UV Disinfection: Theory & Operational Overview
Rotating Equipment and Fluid Sealing
High-Speed Turbo-Compressor Maintenance
High-Speed Turbo-Compressor Operation
Biosolids at Louisville MSD
Field Only Wastewater Lab Certification Prep Train
Drying Basics for Biosolids
Andritz DDS Training for Morris Forman WQTC: Mod 1
Effluent Flume/Gate Operation & Maintenance
IPS-Paperless Records Conversion/Records Managemen
2022 Annual Refresher Training
2021 Annual Refresher Training
Fire Hydrant Maintenance, Hymax Repair & Machines
Water System Distribution Products
Inspector Training for Cured in Place Pipe
Sewer Cleaning 102
Fats, Oils & Grease Management Plan
Operation of Wastewater Treatment Plants Vol I - A
Operation of Wastewater Treatment Plants Vol I - B

Water Treatment Plant Operation Volume II
Membrane Bioreactors
Industrial Waste Treatment Volume I
Manage for Success
Operation of Wastewater Treatment Plants Vol I - C
Operation of Wastewater Treatment Plants Volume II
O & M of Wastewater Collection Systems Volume I
Math Applications in Water Distribution
Water Distribution System Operation & Maintenance
Advanced Waste Treatment
Small Water System Video Information Series
Treatment of Metal Wastestreams
Industrial Waste Treatment Volume II
Water Systems O & M Video Training Series
Water Treatment Plant Operation Volume I
Utility Management
Pretreatment Facility Inspection
Small Water System Operation and Maintenance
Collection Systems Methods
Math Applications in Collection Systems
Math Applications in Water Treatment
Small Wastewater System O & M Volume I
Pretreatment Facility Inspection Training Videos
Small Wastewater System O & M Volume II
O & M of Wastewater Collection Systems Volume II
Filter Surveillance and Evaluation
Excavation Trench Shore Competent Person
Supervision and Personnel Management
Hazard Communications
Confined Spaces II
Emergency Response Planning & Security Training
Confined Spaces
Problem Solving
Competent Person II
Bloodborne Pathogens and Waterborne Diseases
Personal Protective Equipment Procedure
Confined Spaces Entry Procedure
Emergency Action Plan & Fire Prevention Plan
Designated Substances Procedure
Safe Electrical Work Procedure
Trenching and Shoring Procedure
Hot Work Permit Program
Hazard Communication Procedure
Laboratory Safety - Chemical Hygiene Plan

Inspections and Audits Procedure
Lockout Tagout Procedure
Miscellaneous Safety Procedures
Sludge Thickening Module
Chloramines in Drinking Water
Activated Sludge Module 5 - Troubleshooting
Preliminary & Primary Treatment
Basic Safety
History of Assets
Wastewater Treatment Overview
Sludge Dewatering
Basic Math
Sludge Digestion
Basic Instrumentation
Activated Sludge Module 2 -Flow Patterns
BNR Process Control & Troubleshooting
Activated Sludge Module 1 - Basic Concepts
Activated Sludge Module 4 - Microbiology
Chlorination Principles, Safety & Process
Wastewater Treatment Concepts
Wastewater Operator Workshop Mission Math
Effluent Filtration
Lift Station Overview
Reverse Osmosis
Wastewater Operator Study Guide 1
Wastewater Operator Study Guide 2
Wastewater Operator Study Guide 3
So You Want to Be a Utility Manager
Water Treatment Concepts
Lime Softening Process
Fluoride in Drinking Water
Water Distribution Overview
Activated Sludge & BNR Process Control Workshop
Basic Hydraulics
Activated Sludge Module 3 - Loading Rates
Water Treatment and Distribution
Conventional Filtration Rehab & Startup
CCC Program Management #SWE-005
Implementation of CCC Programs #SWE-004
Development of a CCC Program #SWE-003
Cross-Connection Control Program Management
Backflow Basics of Potable Water Systems #SWE-001
BFP Devices, Assemblies, and Methods #SWE-002
Basic Operator Training

Centrifugal Pump Installation, Maintenance, and Tr
Vertical Pump Maintenance and Troubleshooting
Chemical Spill Response Training
Smith & Loveless Pump School
Water Treatment 202
Pumps 202
Chlorination 303
Wastewater Treatment 303
SCADA 202
Wastewater Treatment
Basic Chemistry
Water Mains and Service Connections
Bact-T Sampling
CMOM
Fluid Mechanics
Bacteriological Monitoring 109
Distribution Advanced
Pathogens 101
Water Monitoring
Chlorination 202
Pumps 303
Water Treatment
Activated Sludge
Basic Electricity
Distribution Basics
Distribution 404
Nutrients and Microbes
Valve Operations
Tertiary Treatment
Water and Wastewater Sampling
Modern Disinfection
Chlorine and Disinfection
Cross-Connection ID
Disinfection Basics
Groundwater Production
Collection System Operator
Fats, Oils and Grease (FOG)
Plumbing 101
Pumps and Motors
Pumping Principles
Water Treatment Fundamentals
Disaster Management for Water and WW Utilities
RMP & PSM Program Training
Water Distribution Certification Manual Review

Wastewater Collection System Review
General Water & Wastewater Continuing Education Co
General Water and Wastewater Continuing Education
General Water and Wastewater Continuing Education
Wastewater Certification Review Training
Basic Math for Water Operators
AWWA Water Audit Workshop
Stakeholder Engagement for Rural Water Management
Hydraulic Modeling & Sustainable Management of Rur
Sustainable Management of Rural & Small Systems
Competent Person - Trench/Excavation Safety
Confined Space Entry in Construction
KYTN ICS-NIMS Training Application
Introduction to Cybersecurity
GPS to GIS Parts I-IV
Basics of Water Resources: Groundwater Hydrology
Basics of Water Resources: Groundwater Contaminati
Coagulation, Flocculation and Sedimentation
Storm Water Management: Storm Water Pollution Prev
Advanced HAZWOPER Awareness (MOD #4)
Water Industry Hydraulics
Drinking Water Quality - Water Treatment Technolog
Drinking Water Quality - Monitoring & Security
Disinfection Basics
Aquifer Remediation
Rehabilitation of Water Distribution Systems Designing Renewal
Hazardous Waste Treatment
Pumping Stations – Pumps, Motors, and Electrical Systems
Rehab of Water Distribution Systems-Selecting Rehabilitation Methods
Lead Contamination of Public Water Systems
Protecting Water Systems Through Backflow Preventi
Constructed Wetlands - Free Water Surface Wetlands
Rehab of Water Distribution Systems: Current Techn
Incident Investigation
Maintenance on Pumps, Motors, and Circuits
Water Main Installation
Advanced HAZWOPER Awareness (MOD #2)
Trenching & Shoring
Filtration Basics
Laboratory Safety
HAZMAT Transportation
Advanced HAZWOPER Awareness (MOD #3)
Advanced HAZWOPER Awareness (MOD #1)
Backflow Prevention Overview

Backflow Prevention Methods
Drinking Water Quality - Monitoring & Security
Water Distribution Operator Training Series
Collection System Operator Training Series
Operator Training Series
Utility Electric Service Types
Operation & Maintenance of CL17sc Online Chlorine
Requirements to Obtain and Maintain an Operators L
Introduction to Colorimetry
Wastewater-Based Disease Surveillance: An Overview
Wastewater Treatment Fundamentals II: Solids Hand
Introduction to Asset Management

OREGON

WATER OPERATORS

Oregon Health Authority

***ALLOWS EDUCATION SUBSTITUTIONS FOR WORK EXPERIENCE AT AUTHORITY DISCRETION. EDUCATION NOT REQUIRED TO BE PRE-APPROVED**

WASTEWATER OPERATORS

Oregon Department of Environmental Quality Approved Pre-license Training

***ALLOWS EDUCATION TO BE SUBSTITUTED FOR EXPERIENCE FOR SPECIFIC GRADES (CLASSES)**

***PER REGULATIONS, LOWER CLASS OF LICENSE IS NOT A PREREQUISITE. ANYONE MAY APPLY FOR ANY LICENSE TYPE SO LONG AS ENTRY REQUIREMENTS ARE MET**

Operation of Wastewater Treatment Plants, Volume I

WEF Online Wastewater Treatment Fundamentals Course

Operation and Maintenance of Wastewater Collection Systems, Volume I

Oregon community college wastewater technology coursework

TENNESSEE WATER & WASTEWATER OPERATORS CERTIFICATION BOARD-SANCTIONED TRAINING

***ALLOWS EDUCATION SUBSTITUTIONS FOR WORK EXPERIENCE**

*** APPLICATIONS MUST INCLUDE PROOF OF COMPLETION OR ENROLLMENT FOR REQUIRED BOARD SANCTIONED TRAINING AFTER TWO (2) FAILED EXAM ATTEMPTS, WHERE NECESSARY OR THEY WILL BE CONSIDERED INCOMPLETE AND DENIED. - 0400-49-01-.02-(9)**

*** TUTORING COURSES ARE 3 HRS. AND PROVIDE ASSISTANCE WITH EXAM PREP AND PASSING THE EXAM- NO SUBSTITION CREDITS GIVEN FOR THESE COURSES**

Water Treatment & Distribution Systems Classes

Distribution Systems Board Sanctioned Training *

Water Treatment Board Sanctioned Training *

Advanced Water Treatment *

Intro to Lab Methods

Math Fundamentals for All Certifications

Math Fundamentals for All Certifications

Coagulation/Flocculation Workshop

Water Treatment Lab Week 1

Water Treatment Lab Week 2

Applied Math for All Certifications Week 1

Applied Math for All Certifications Week 1

Applied Math for Water Treatment Week 2 *

Applied Math for Water Treatment Week 2 *

Water Treatment Review

Introduction to Distribution Systems

Water Treatment Tutoring

Distribution System Tutoring

Water Treatment Tutoring

Distribution System Tutoring

Applied Math for Distribution Systems Week 2 *

Applied Math for Distribution Systems Week 2 *

Water Treatment Tutoring

Distribution Systems Tutoring

Small Water Systems

Small Water Systems

Wastewater Treatment & Collection Systems Classes

Collection System Board Sanctioned Training *

Wastewater Treatment Board Sanctioned Training *

Advanced Wastewater Treatment *

Introduction to Lab Methods

Math Fundamentals for All Certifications

Math Fundamentals for All Certifications

Wastewater Treatment Lab Week 1

Wastewater Treatment Lab Week 2

Introduction to Collection Systems

Introduction to Activated Sludge

Applied Math for All Certifications Week 1

Applied Math for All Certifications Week 1

Applied Math for Wastewater Treatment Week 2 *

Applied Math for Wastewater Treatment Week 2 *

Wastewater Treatment Review

Applied Math for Collection Systems Week 2 *

Applied Math for Collection Systems Week 2 *

Wastewater Treatment Tutoring

Collection Systems Tutoring

Wastewater Treatment Tutoring

Collection Systems Tutoring

Wastewater Treatment Tutoring

Collection Systems Training

Biological/Natural Systems

Biological/Natural Systems

Advanced Activated Sludge

WEST VIRGINIA CERTIFICATION AND TRAINING PROGRAM

***ALLOWS EDUCATION SUBSTITUTIONS FOR WORK EXPERIENCE FOR CERTAIN LICENSE TYPES WITH RESTRICTIONS**

***COURSES MUST BE APPROVED BY THE CERTIFICATION AND TRAINING PROGRAM[1]**

Courses offered by the following organization are Commissioner-approved.

WV Rural Community Assistance Program wvcap.org/rcap/

WV Rural Water Association www.wvrwa.org

WV Environmental Training Center www.resa5.k12.wv.us

Sacramento State Office of Water Programs www.owp.csus.edu

WV Section - American Water Works Association wvawwa.org

Environmental Finance Center Network www.efcnetwork.org/upcoming-events/

[1] Regulations state training programs must be approved by 'the Commissioner"

Test Report
FINAL STATS - FT CANDS

VA Survey 2019

1. 00001
Status: Approved

Which do you believe best describes how you prepared for the exam?

- **A. Attended a formal training program**
- **B. Studied on on-your-own**
- **C. Studied with co-workers in your spare time**
- **D. Participated in an apprenticeship program with your employer**
- **E. Little to no preparation**

2. 00002
Status: Approved

If you responded "A", will you share the name of the formal training program you attended?

3. 00003
Status: Approved

How far in advance did you prepare for the exam?

- **A. 1 week**
- **B. 1 month**
- **C. 3 months**
- **D. 6 months or more**
- **E. I did not prepare for the exam**

4. 00004
Status: Approved

How did you pay for this exam?

- **A. Out-of-pocket**
- **B. Out-of-pocket and my employer will reimburse me if I pass**
- **C. Out-of-pocket and my employer will reimburse me if I pass or fail**
- **D. My employer paid and will not pay again if I fail**
- **E. My employer paid and will pay as many times as I take the same exam**

5. 00005
Status: Approved

How many times have you taken this exam?

- **A. First time**
- **B. 2 times**
- **C. 3 times**
- **D. 4 times**
- **E. More than 4 times**

6. 00006
Status: Approved

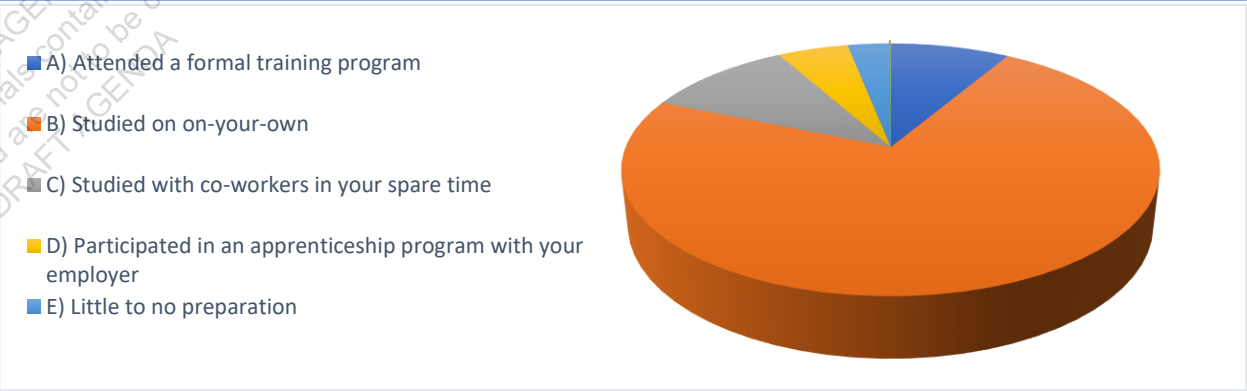
How might you prepare for the next exam differently than you did this time?

7. 00007
Status: Approved

If there was anything on the exam that was unexpected, please tell us about it.

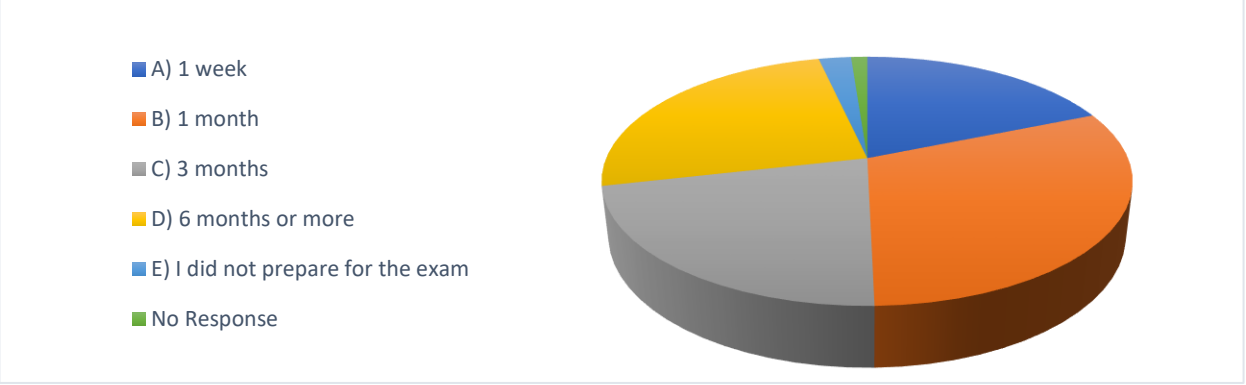
Which do you believe best describes how you prepared for the exam?

Answer	Number of Responses	Percentage of Total Responses
A) Attended a formal training program	130	9%
B) Studied on on-your-own	1,112	73%
C) Studied with co-workers in your spare time	161	11%
D) Participated in an apprenticeship program with your employer	77	5%
E) Little to no preparation	45	3%
No Response	2	0%
Total	1,527	100%



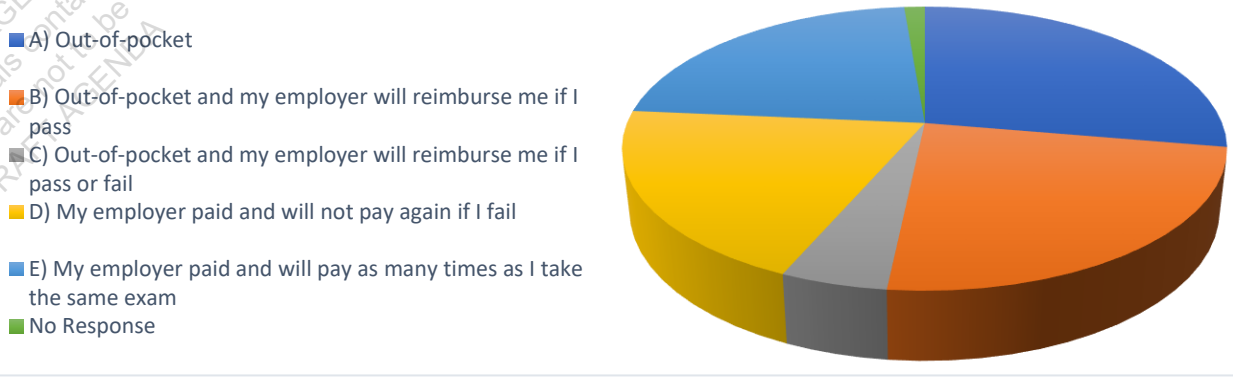
How far in advance did you prepare for the exam?

Answer	Number of Responses	Percentage of Total Responses
A) 1 week	287	19%
B) 1 month	471	31%
C) 3 months	333	22%
D) 6 months or more	382	25%
E) I did not prepare for the exam	36	2%
No Response	18	1%
Total	1,527	100%



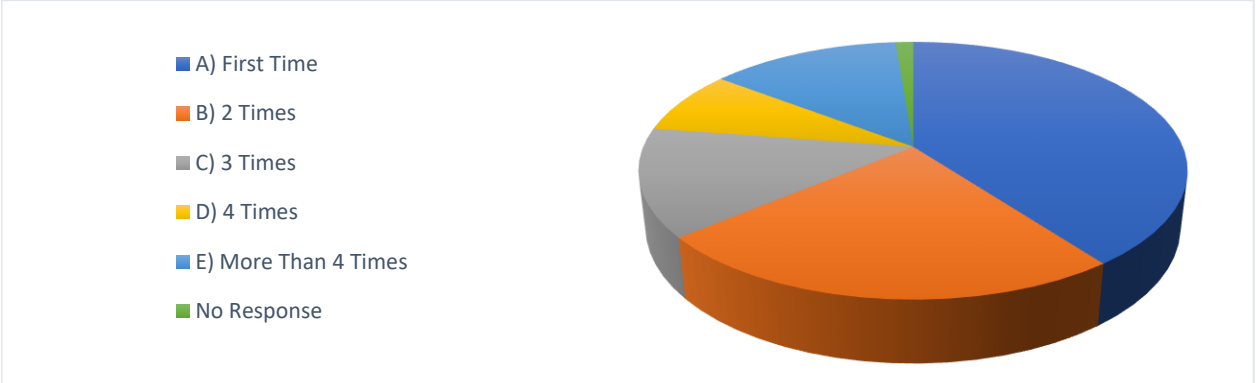
How did you pay for this exam?

Answer	Number of Responses	Percentage of Total Responses
A) Out-of-pocket	423	28%
B) Out-of-pocket and my employer will reimburse me if I pass	366	24%
C) Out-of-pocket and my employer will reimburse me if I pass or fail	74	5%
D) My employer paid and will not pay again if I fail	304	20%
E) My employer paid and will pay as many times as I take the same exam	340	22%
No Response	20	1%
Total	1,527	100%



How many times have you taken this exam?

Answer	Number of Responses	Percentage of Total Responses
A) First Time	607	40%
B) 2 Times	368	24%
C) 3 Times	207	14%
D) 4 Times	122	8%
E) More Than 4 Times	204	13%
No Response	19	1%
Total	1,527	100%



Total Responses	1526
Total Exams	1527
Response Percentage	100%

OVERVIEW OF SCOPE

- Staffing Challenges
- Reciprocity
- Training Availability

RECESS

DISCUSSION

a. Breakout Sessions
    1. Pass Rates
    2. Training
    3. Staffing Challenges
b. Review of Session Discussions
c. Plan for Next Meeting

COMPLETE CONFLICT OF INTEREST FORMS AND TRAVEL VOUCHERS

ADJOURN

Please return your document folders to Raven Custer